

**The evolution of climate change narratives:
Analysis of metaphor scenarios in four genres**

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Appendices

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Appendix 1:

Graphs and Tables discussed in Chapter 8 (not included in the chapter)

1. NEW Extra-Tables

Table A1: NEW eulogy scenarios per year (occurrences)

NEW	GREEN	HOME/FAMILY	RELIGION
2001	1	2	0
2002	2	0	0
2003	0	0	2
2004	1	3	2
2005	4	0	4
2006	9	7	10
2007	26	0	9
2008	6	1	4
2009	18	3	12
2010	3	3	4
2011	4	4	5
2012	5	7	4
2013	4	3	8
2014	14	3	5
2015	10	6	7
2016	7	3	10
2017	9	7	2
Total	123	52	88

Table A2: NEW deterioration scenarios per year (occurrences)

NEW	BODY	DAMAGED CONTAINER
2001	1	6
2002	0	1
2003	1	8
2004	2	20
2005	2	30
2006	8	49
2007	3	83
2008	3	61
2009	7	110
2010	6	26
2011	4	41
2012	2	58
2013	0	46
2014	6	63
2015	8	127
2016	6	96
2017	1	70
Total	60	895

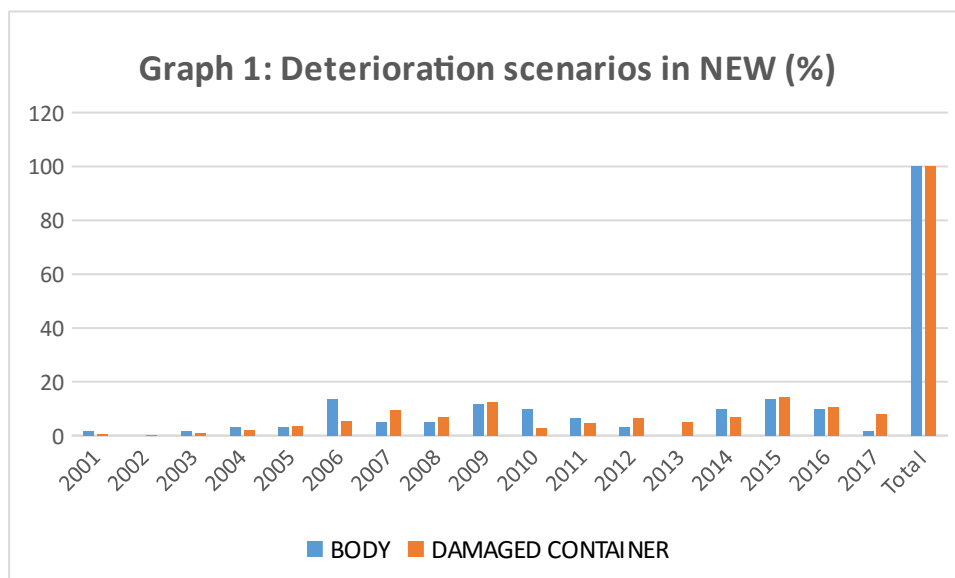
Table A3: NEW materialisation scenarios per year (occurrences)

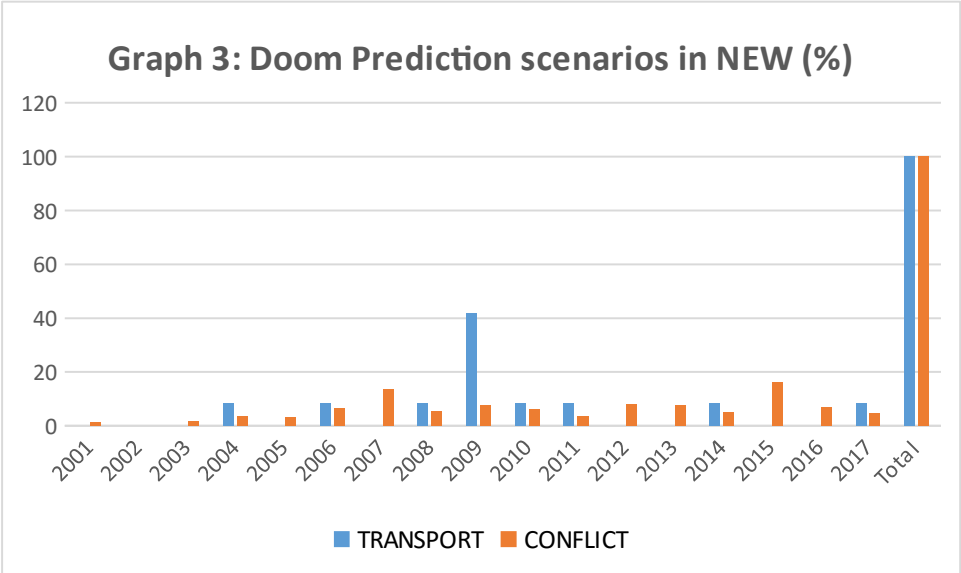
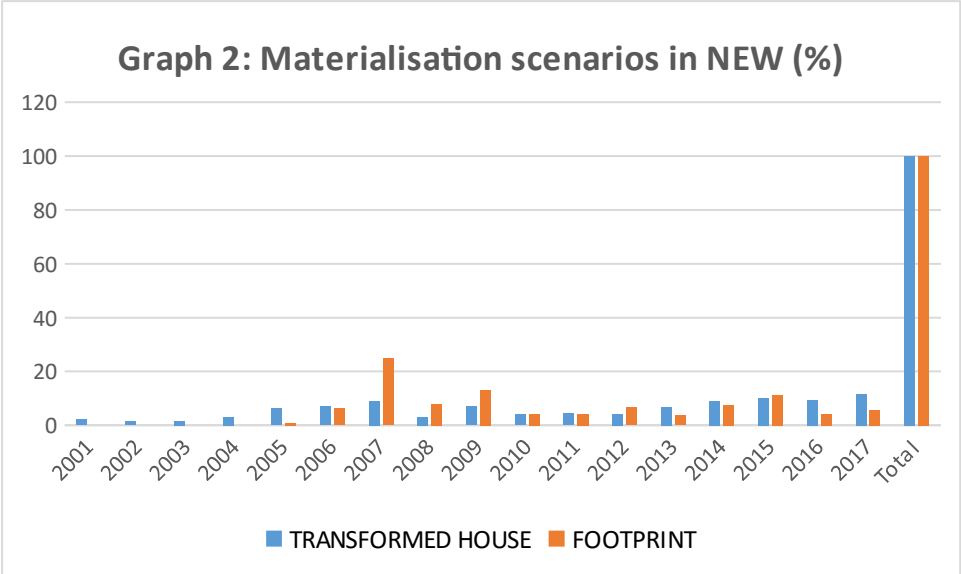
NEW	TRANSFORMED HOUSE	FOOTPRINT
2001	18	0
2002	12	0
2003	14	0
2004	27	0
2005	54	2
2006	60	15
2007	77	60
2008	27	19
2009	60	32
2010	34	10
2011	38	10
2012	37	16
2013	59	9
2014	78	18
2015	87	27
2016	80	10
2017	101	14
Total	863	242

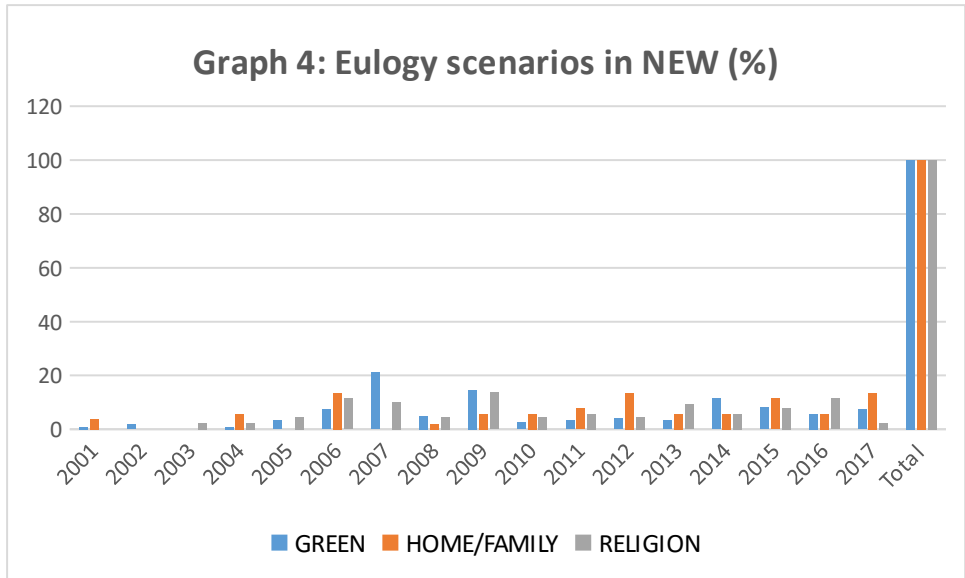
Table A4: NEW doom prediction scenarios per year (occurrences)

NEW	TRANSPORT	CONFLICT
2001	0	4
2002	0	0
2003	0	6
2004	1	12
2005	0	11
2006	1	22
2007	0	45
2008	1	18
2009	5	25
2010	1	20
2011	1	12
2012	0	27
2013	0	25
2014	1	17
2015	0	54
2016	0	23
2017	1	15
Total	12	336

2. NEW Graphs







3. SCI Extra-Tables

Table A5: SCI eulogy scenarios per year (occurrences)

SCI	GREEN	FAMILY /HOME	RELIGION
2001	0	0	0
2002	0	0	1
2003	1	0	0
2004	0	1	0
2005	0	0	0
2006	0	1	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	1	0
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0
Total	1	3	1

Table A6: SCI deterioration scenarios per year (occurrences)

SCI	BODY	DAMAGED CONTAINER
2001	0	2
2002	0	1
2003	1	3
2004	0	5
2005	0	4
2006	0	6
2007	0	5
2008	0	3
2009	1	5
2010	1	5
2011	0	4
2012	0	5
2013	0	5
2014	0	4
2015	0	4
2016	0	5
2017	0	3
Total	3	69

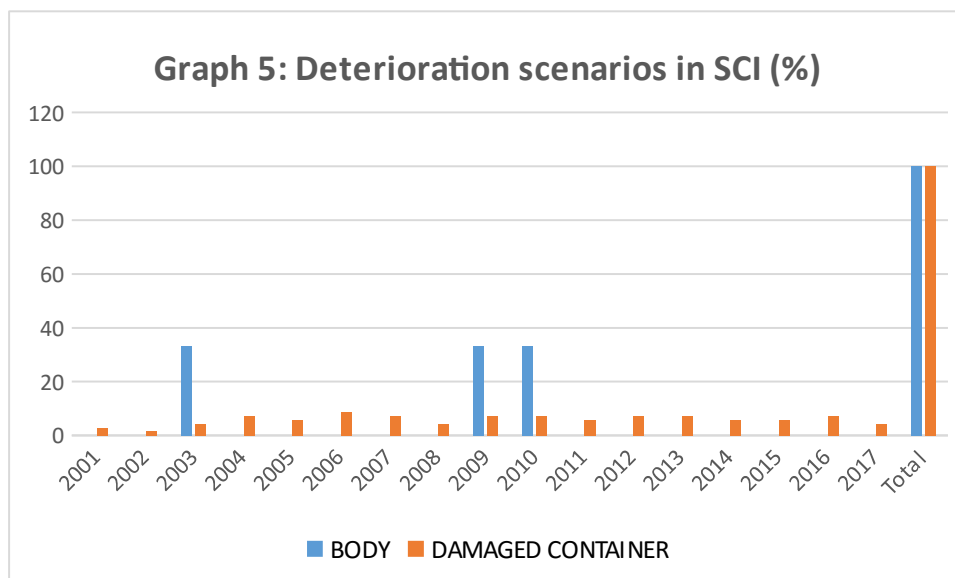
Table A7: SCI materialisation scenarios per year (occurrences)

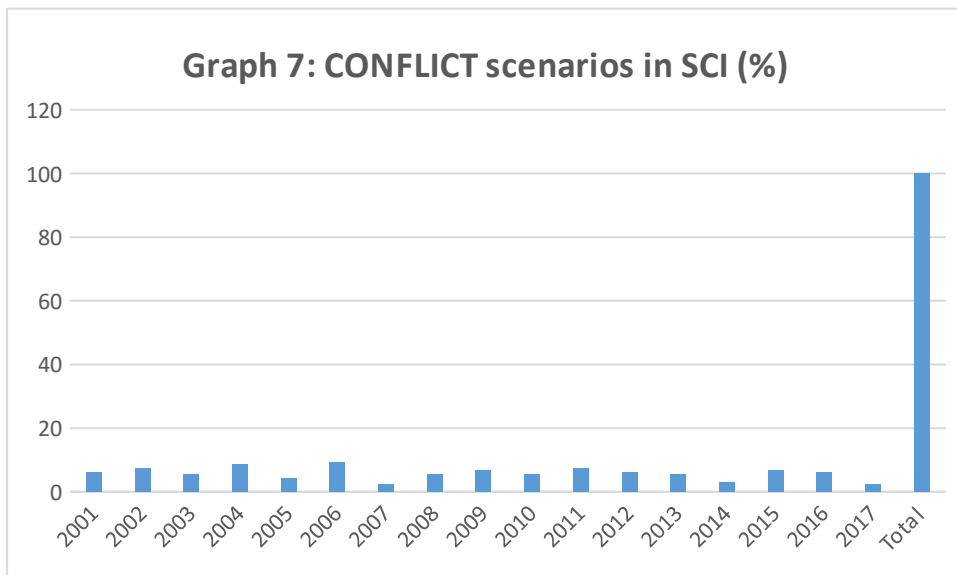
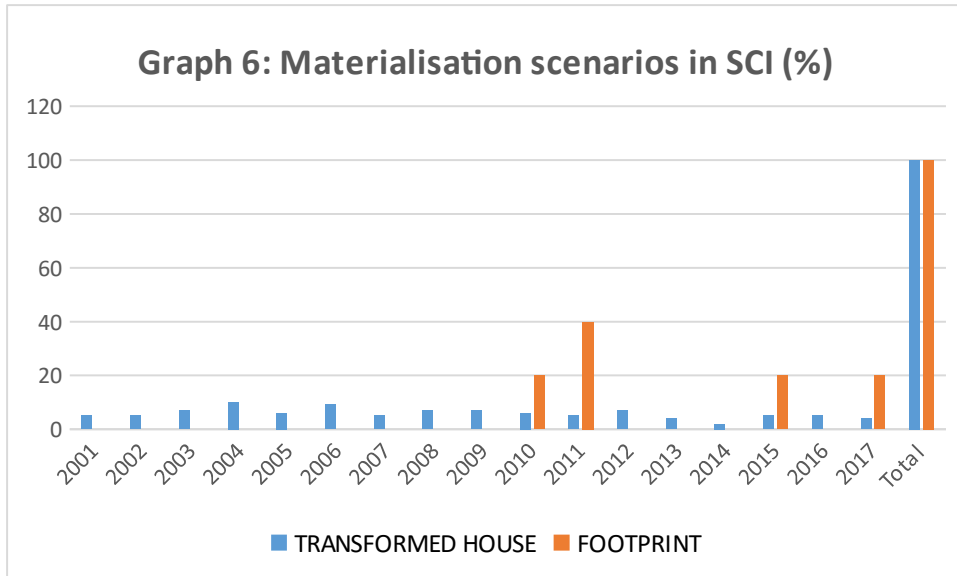
SCI	TRANSFORMED HOUSE	FOOTPRINT
2001	5	0
2002	5	0
2003	7	0
2004	10	0
2005	6	0
2006	9	0
2007	5	0
2008	7	0
2009	7	0
2010	6	1
2011	5	2
2012	7	0
2013	4	0
2014	2	0
2015	5	1
2016	5	0
2017	4	1
Total	99	5

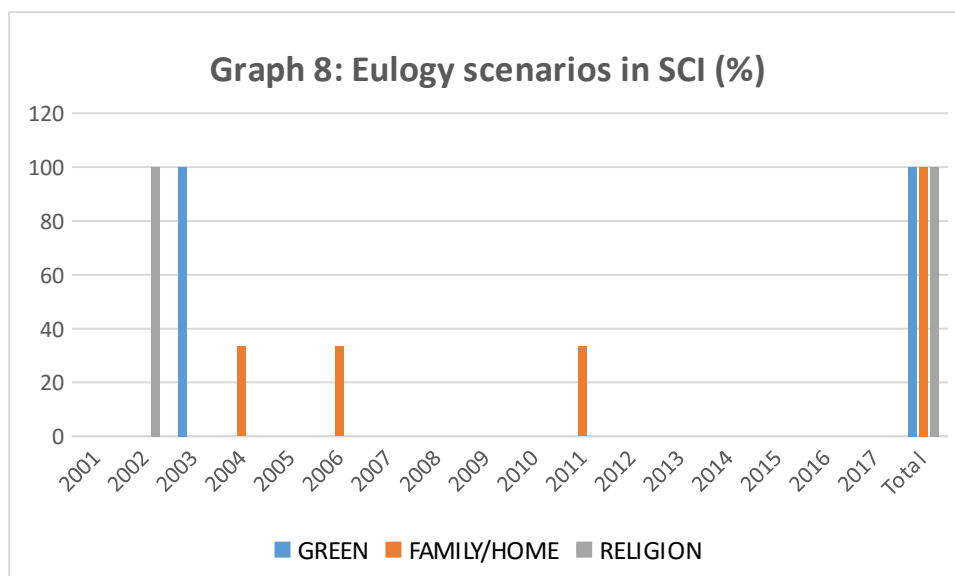
Table A8: SCI doom prediction scenarios per year (occurrences)

SCI	CONFLICT
2001	10
2002	12
2003	9
2004	14
2005	7
2006	15
2007	4
2008	9
2009	11
2010	9
2011	12
2012	10
2013	9
2014	5
2015	11
2016	10
2017	4
Total	161

4. SCI Graphs







5. ENV Extra-Tables

Table A9: ENV eulogy scenarios per year (occurrences)

ENV	GREEN	FAMILY/ HOME	RELIGION
2001	0	0	0
2002	7	1	1
2003	2	0	0
2004	1	0	0
2005	3	1	1
2006	1	0	1
2007	1	0	0
2008	2	0	0
2009	4	1	0
2010	1	1	0
2011	0	1	1
2012	6	0	0
2013	0	1	0
2014	1	1	0
2015	1	1	0
2016	0	0	0
2017	0	0	0
Total	30	8	4

Table A10: ENV deterioration scenarios per year (occurrences)

ENV	BODY	DAMAGED CONTAINER	
2001	0		2
2002	0		6
2003	1		7
2004	0		6
2005	0		5
2006	0		4
2007	0		7
2008	0		7
2009	1		6
2010	1		1
2011	0		4
2012	0		1
2013	0		2
2014	0		5
2015	0		8
2016	0		1
2017	0		0
Total	3		72

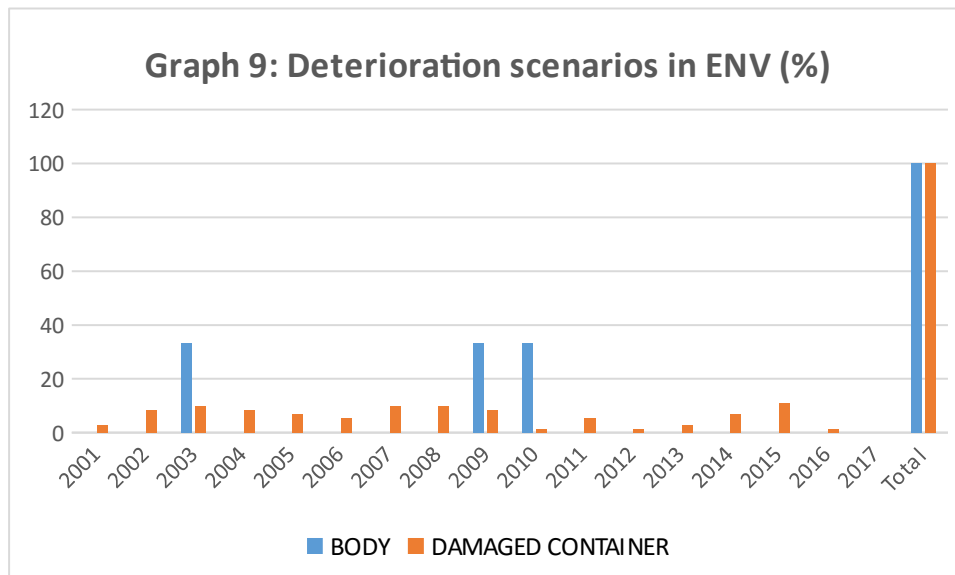
Table A11: ENV materialisation scenarios per year (occurrences)

ENV	TRANSFORMED HOUSE	FOOTPRINT	
2001		2	0
2002		2	0
2003		2	1
2004		6	0
2005		10	1
2006		12	0
2007		7	0
2008		3	0
2009		4	2
2010		3	2
2011		1	2
2012		0	0
2013		3	0
2014		4	0
2015		2	1
2016		2	1
2017		0	0
Total		63	10

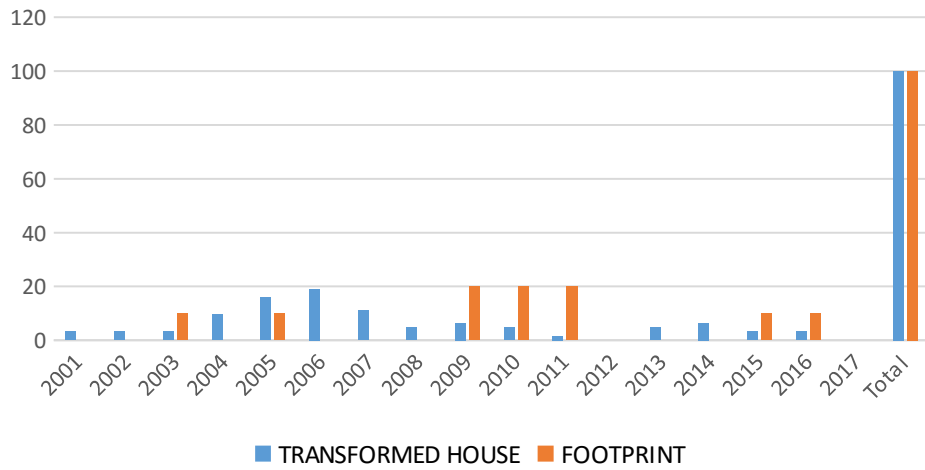
Table A12: ENV doom prediction scenarios per year (occurrences)

ENV	CONFLICT
2001	6
2002	14
2003	5
2004	5
2005	7
2006	2
2007	16
2008	8
2009	16
2010	7
2011	7
2012	6
2013	5
2014	7
2015	10
2016	2
2017	3
Total	126

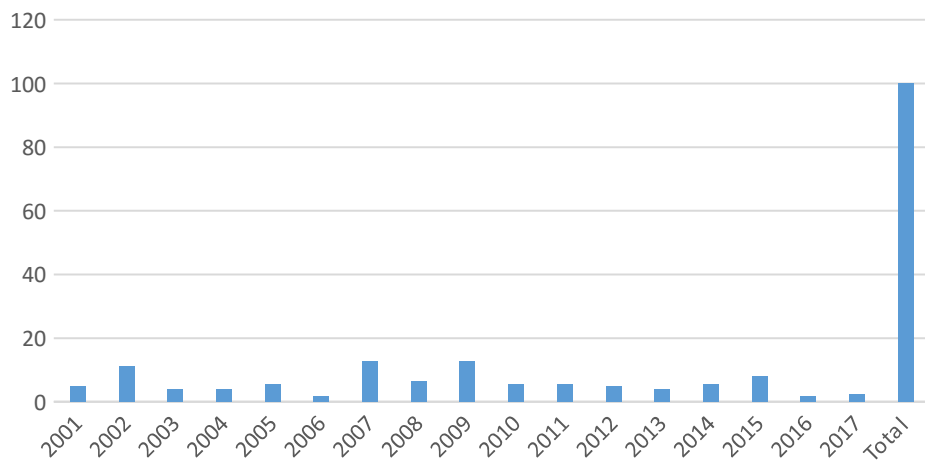
6. ENV Graphs

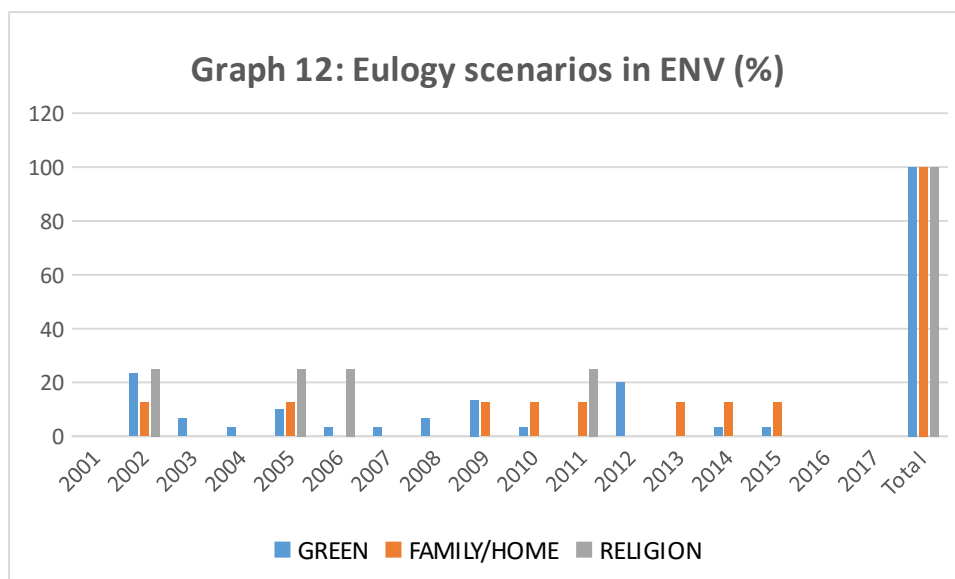


Graph 10: Materialisation scenarios in ENV (%)



Graph 11: CONFLICT scenarios in ENV (%)



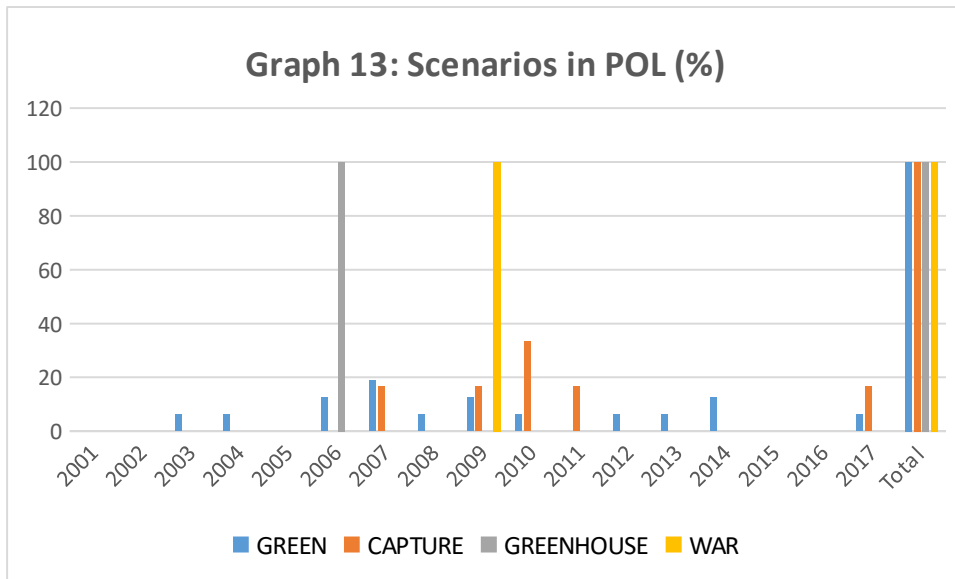


7. POL Extra-Table

Table A13: POL scenarios per year (occurrences)

POL	GREEN	DAMAGED CONTAINER	GREENHOUSE	CONFLICT
2001	0	0	0	0
2002	0	0	0	0
2003	1	0	0	0
2004	1	0	0	0
2005	0	0	0	0
2006	2	0	1	0
2007	3	1	0	0
2008	1	0	0	0
2009	2	1	0	1
2010	1	2	0	0
2011	0	1	0	0
2012	1	0	0	0
2013	1	0	0	0
2014	2	0	0	0
2015	0	0	0	0
2016	0	0	0	0
2017	1	1	0	0
Total	16	6	1	1

8. POL Graph



Appendix 2: Extracts from the corpus 2001-2017 (not included in the thesis)

NEW Extracts

NEW - Eulogy of nature

NEW - GREEN scenario

- 1- THE image of Britain as a **green** and pleasant land will have to be revised as climate change alters the gardened landscape over the next half century, a report said yesterday. *THE DAILY TELEGRAPH* November 20, 2002, Wednesday Is this the end for the English country garden? Climate change may turn up the heat on delphiniums and lupins BYLINE: CHARLES CLOVER
- 2- IT IS NATURE at her most beguiling: the dazzling transformation of a **green** and pleasant land into a riot of blazing oranges and burnt reds. In the United States, the autumnal transition of leaves into a fusion of clarets and golds has long been a national obsession, with millions of foliage fans fuelling an industry worth billions of dollars. Now 'leaf peeping' is set to sweep Britain. Experts say the changing climate here is creating the perfect conditions for a kaleidoscope of seasonal colour to rival the famous hues of north-east America. This autumn is already predicted to be the most colourful in living memory. *The Observer* September 11, 2005 Autumn will set Britain ablaze: Climate change means UK forests will turn dazzling shades of red and orange - and encourage the spread of American-style 'leaf-peepers' BYLINE: Mark Townsend and Sara Vali
- 3- The mighty West Antarctic ice sheet is creaking and dramatic changes are expected, from the Amazon rainforest to the Siberian permafrost. But what about the UK? What else does global warming have in store for our once **green** and pleasant land? *The Guardian* July 22, 2006 Saturday Special report: Global warming: Drought, gales and refugees BYLINE: David Adam
- 4- By 2087, the centenary of the Great Storm, our grandchildren and great-grandchildren will be living in a very different place to today's **green** and pleasant land. (...) Our grandchildren will still inhabit a **green** and pleasant land, but a subtly different one to the one we see today. English youngsters will be amused at tales of regular snowfall and traditional moans about soggy British summers may be a thing of the past. *Daily Mail* October 18, 2007 Thursday WILL WE EVER HAVE ANOTHER HURRICANE? BYLINE: Michael Hanlon
- 5- He (Sir David Attenborough) now predicts that droughts, monsoons, flooding and the devastation of ecosystems and wildlife could make our **green** and pleasant land unrecognisable in the next hundred years as Britain experiences a rise in temperatures comparable to the end of the ice age 12,000 years ago. The 81-year-old broadcaster explains his change of heart. *The Mirror* July 6, 2007 Friday SAVING PLANET EARTH'S WILDLIFE HAS NEVER BEEN MORE URGENT. BYLINE: DEEPA SHAH (my addition in parenthesis)
- 6- The trading mechanism is designed to create scarcity, forcing up the price of carbon and prompting industries such as steel and power generation to invest in cleaner, **greener** technologies, such as

renewable, carbon-free energy and, eventually, carbon capture and storage. So far, it is manifestly not working as planned. *The Guardian* April 3, 2007 Tuesday Financial: Global warming: Smoke alarm. BYLINE: David Gow

- 7- The climate change talks in Bonn over the next two weeks coincide neatly with the annual mass migration of millions of Europeans who will **spew carbon emissions across blue skies and green fields** on their way to rural and seaside idylls. *The Guardian* July 16, 2001 Comment & Analysis: Deluded escapism. BYLINE: Madeleine Bunting
- 8- **Green**, clean and these days, anything but lean in a world threatened by global warming and dwindling oil stocks, ethical funds are suddenly putting on the pounds. *The Daily Telegraph* November 12, 2005 Saturday BYLINE: Jenne Mannion
- 9- That is a point which Tony Blair grasped early on. But his notion of a "Kyoto-lite" to include the US -a scheme for **rewarding new "green" technology**, without binding commitments on emissions -has brought him brickbats within Europe and the Labour party. *The Times* February 17, 2005, Thursday Dire warnings on global warming are just hot air BYLINE: Bronwen Maddox
- 10- Airlines ready for a **dogfight** over EU's plan for **cleaner, greener skies**: Lufthansa leads the way in lobby of MEPs as they vote on a controversial scheme. *The Guardian* July 4, 2006 Tuesday BYLINE: Hans Kundnani and David Gow
- 11- **Green** solutions to eco-threats The National Engineering & Construction Recruitment Exhibition Engineering and construction skills are in demand, as new technologies are developing to help tackle climate change. *The Daily Telegraph* November 23, 2006 Thursday BYLINE: Chris Moss
- 12- **Green** growth is not a dream. The UK has had it since 1997, in which time emissions have fallen by 7 per cent while the economy has grown by 25 per cent. Increases in landfill tax have cut the amount we dump by one-quarter in the same period. *The Independent* September 30, 2006 Saturday With a little bit of goodwill, we can still stop global warming
- 13- The driving message of the eco-doomsters has been '**green** plants good, man bad'. This has become a received wisdom that simply cannot be questioned. It is taught in our schools as fact. It has spurred each of our political parties to turn a deeper shade of **green** than the others. *Daily Mail* January 13, 2006 Friday Does this prove that global warming's all hot air? BYLINE: MELANIE PHILLIPS
- 14- The Tamar seems a model of sustainable development - **green** and welcoming. *The Guardian* - November 23, 2007 Friday G2: The lucky country? BYLINE: Julian Glover
- 15- Global warming: The unheralded polluter: cement industry comes clean on its impact: Plants release over 5% of carbon dioxide emissions Industry sees no chance of **green**-friendly future *The Guardian* October 12, 2007 Friday BYLINE: David Adam
- 16- The rationale for climate change funds seems to makes sense and, given the clamour for all things **green**, they will be a marketing man's dream. *The Sunday Telegraph* October 7, 2007 Sunday 'This goes way beyond building a few wind' BYLINE: Chris Salih
- 17- However, only 1% of consumers currently buy cover that **rewards green behaviour**, suggesting work is needed to attract them to this type of product. *Guardian.com* September 13, 2007 Insurance industry joins climate change fight

- 18- Sutherland has already filmed a public service announcement in the US extolling the virtues of a **green** lifestyle. *The Guardian* August 7, 2007 Tuesday Star of hit show 24 fights global warming 'crime' BYLINE: Owen Gibson
- 19- Responding to criticism that the event created even more carbon emissions, the organisers insisted that they were keeping the concerts as **green** as possible. *Morning Star* July 9, 2007 Monday Britain - Rock stars highlight threat from climate change
- 20- The organisers have designed it to be as **green** as possible. Electricity will be provided from renewable sources. Energy-efficient lighting will be used. *The Independent on Sunday* July 1, 2007 Geldof jeers, as stars sing out for the planet BYLINE: Geoffrey Lean
- 21- Climate change: Challenging business: Offsetting: How low can you go?: Rail companies are exploiting their **green** advantage over airlines by cutting CO2 emissions. *The Guardian* June 27, 2007 Wednesday BYLINE: David Adam
- 22- Mr Miliband, the Secretary of State for the Environment, has advocated the idea that this country should set a **green** example to the world. As the world moves from the declaratory to the delivery phase, the electorates of rich nations will be asked to take some risks in trying to realise the "first-mover advantage" of leading the way to a low-carbon economy. Similarly, there may be a price that has to be paid for African development and an ethical foreign policy. We sense that Mr Blair's cynical reading of public opinion is out of date, and that Brown's Britain could be bolder than Blair's in setting an example to the world - on the environment, on fair trade for Africa and on cleaning up the arms trade. *The Independent on Sunday* June 10, 2007 We need leaders fit for a climate of change
- 23- Going **green** can be profitable, but how can ordinary consumers capitalise on global warming? *The Sunday Times* June 3, 2007 How to profit from global warming BYLINE: John Mulligan and Ali Hussain
- 24- Money: How **green** turned into gold: Shares in companies fighting climate change are soaring on the London Stock Exchange. Critics call it '**green** fever', but it's hard-nosed investors who are driving this particular bandwagon. *The Guardian* June 2, 2007 Saturday BYLINE: Patrick Collinson
- 25- Weekend: Gardens: **Green** is good: Climate change and sustainability dominate next week's Chelsea Flower Show. But what can ordinary gardeners do? Dominic Murphy gives 10 easy ways to **green** up your garden *The Guardian* May 19, 2007 Saturday BYLINE: Dominic Murphy
- 26- Another borough, Richmond upon Thames, is seeking to reward **green** car users with lower parking charges. But such decisions are politically fraught. *The Guardian* April 5, 2007 Thursday Public: Climate change and energy: Demanding the tools for local action
- 27- There's a risk that clumsy initiatives will exhaust public appetite for **green** solutions. *The Daily Telegraph* March 27, 2007 Tuesday Let the free market fight climate change BYLINE: Zac Goldsmith
- 28- A further 26 said they had introduced only limited incentives to encourage **green** behaviour, most of which are aimed at meeting government recycling targets. Only six local authorities said they were taking significant steps to curb household emissions. *The Guardian* January 3, 2007 Wednesday Councils ignore threat of climate change. BYLINE: David Adam, Environment correspondent
- 29- So why have so many scientists produced 'evidence' to support a theory which doesn't stand up to serious scrutiny? The brutal explanation is that they don't get grant money or the approval needed for promotion unless their work supports the politically motivated theory of the times. Look at what's

happened to Dr Bjorn Lomborg, a Danish statistician and former member of Greenpeace. In his book *The Sceptical Environmentalist*, he shows how **green** doom and gloom has been wildly exaggerated. *DAILY MAIL* February 25, 2002 The great global warming con-trick BYLINE: Melanie Phillips

- 30- The story of a South Pacific island which launches a multimillion pound lawsuit against the US, and **green** terrorists who plot to manufacture a series of earthquakes, underwater landslides and tsunamis to prove that global warming is happening, has an unusual denouement: a 14-page bibliography and a five-page authorial note explaining his extreme scepticism about global warming.(...) For this, Lomborg has been subjected to relentless and vicious attack by the massed battalions of the heavyweights of science. *The Guardian* December 11, 2004 Jurassic Park author pours cold water on global warming BYLINE: Patrick Barkham
- 31- American policymakers are one thing, but consumers, wherever they are based or however **green** they pretend to be, are the larger part of the mischief. *The Independent* January 31, 2005, Monday DAVOS MAKES RUNNING ON CLIMATE CHANGE. BYLINE: JEREMY WARNER
- 32- Gordon Brown sought to give himself a **green** image yesterday, tackling climate change with plans to encourage new homes free of carbon emissions, plus a doubling of aviation tax and increased car fuel duty. The chancellor also gave a boost for biofuels and raised landfill taxes. *The Guardian* December 7, 2006 Thursday Financial: Pre-budget report 2006: Environment: Chancellor seeks to give himself a **green** image * Motorists and air passengers face higher costs * Plan to ensure the building of energy-efficient houses: Climate change Campaigners dismiss **green** measures as 'feeble' BYLINE: Terry Macalister
- 33- Brown has failed **green** test say critics: Anger at limited measures to tackle climate change in pre-budget report (...) Mr Brown also said he would waive stamp duty on carbon-neutral homes the government wants to see built by 2016. Environmentalists pointed out that new homes accounted for 1% of Britain's housing stock. The package was far less comprehensive than the private bid to the Treasury for green taxes made by the environment secretary, David Miliband, and subsequently leaked to the media. *The Guardian* December 7, 2006 Thursday BYLINE: Larry Elliott and Patrick Wintour
- 34- Like most **green** initiatives it doesn't amount to much in itself, only in aggregate - when millions of others do likewise. *The Guardian* November 6, 2006 Monday the giving list: Comment: The greening of Westminster. BYLINE: Michael White
- 35- That's the difficult question for the government: going **green** sounds good, especially if experts like Stern promise it won't be too expensive; but explaining to people they will have to cut down on cheap flights and car journeys is a harder sell. *The Observer* October 15, 2006 Business & Media: Climate change is expensive. BYLINE: Heather Stewart
- 36- '**Green** fatigue' leads to fear of backlash over climate change: Britons know that the planet is heating up - but are still not ready to change their lifestyle *The Observer* December 30, 2007 BYLINE: Juliette Jowit and Robin McKie
- 37- **Green** means slow to this government: Why Germans laugh at British boasts of leading the world on climate change *The Guardian* August 6, 2007 Monday BYLINE: Ashley Seager
- 38- THE GLOBAL **GREENWASH** Financial providers have gone **green** with a vengeance. But are they really helping to save the earth or just using climate change as a gimmick to sell mediocre products? *The Sunday Telegraph* July 8, 2007 Sunday BYLINE: Paul Farrow

- 39- Many newspapers, the tabloids, in particular, have in the past been happy to run stories that the dangers to the planet are greatly exaggerated, even that global warming is a **green** conspiracy. *The Guardian* July 4, 2007 Wednesday G2: If half the nation is in denial about the threats we face from climate change, what hope is there? BYLINE: Marcel Berlins
- 40- Even the private sector's getting in on the act. Look out for the latest **green** scam *The Sun* May 4, 2007 Friday Global warming spells death knell for our hoodies BYLINE: Robin Galloway
- 41- David Cameron was ridiculed after it emerged that his official limo trailed behind him while he cycled to work to boost his **green** image. *Sunday Mirror* April 15, 2007 AIRHEADS; EXCLUSIVE HAGUE FLIES 20,000 MILES IN PRIVATE JET, BELCHING 24 TONNES OF CARBON DIOXIDE BYLINE: VINCENT MOSS
- 42- In a recent interview, Martin Durkin, who made Channel 4's film *The Great Global Warming Swindle*, claimed he was subject to "invisible censorship". He seems to have forgotten that he had 90 minutes of prime-time television to expound his theory that climate change is a **green** conspiracy. *The Guardian* April 10, 2007 Tuesday Comment & Debate: There is climate change censorship BYLINE: George Monbiot
- 43- Mr McConnell (Scottish First Minister) emphasised the need for changes in lifestyle to combat climate change and he told the invited audience of environmentalists and business leaders as well as schoolchildren that it was right for ministers to be setting an example on the issue. However, he added, a **green** rhetoric that implied that foreign travel should be the preserve of the wealthy was a non-starter; because the aeroplane could not be uninvented. *The Times* February 6, 2007, Tuesday McConnell vows to cut flights to help climate change BYLINE: Angus Macleod (my addition in parenthesis)
- 44- Which just goes to show how much my old man knew about the weather. Perhaps the greatest myth of all is the one which holds that the Ireland of the past was a peaceful, **green** and pleasant land. *The Mirror* June 26, 2009 Friday GLOBAL WARMING FEARS DON'T HOLD MUCH WATER BYLINE: PAT FLANAGAN
- 45- These changes will also have an enormous impact on our wildlife. Parts of our **green** and pleasant land could become dry and dusty within decades, and some of our native species will face a major struggle for survival. *The Guardian* June 19, 2009 Friday Comment & Debate: Our most able ally BYLINE: Helen Phillips
- 46- However, John Kerry, who will lead the US Senate delegation at the UN climate talks in Poland in December, warned yesterday that hopes the US could help lead a global **green** recovery by paying countries such as India and China to reduce their greenhouse gases might be constrained by the economic crisis. *The Guardian* November 27, 2008 Thursday Front: Climate change watchdog backs expansion of Heathrow BYLINE: Juliette Jowit
- 47- So devastating has been this backlash that even the British Government, which **prides itself on being the greenest of the green**, commissioned a review, published last Monday, urging a slowdown in the move to biofuels. *The Sunday Telegraph* July 13, 2008 The Great Biofuels Con BYLINE: Christopher Booker and Richard North
- 48- From blue chips to the **green** dream: Adair Turner, former CBI boss and now Britain's climate change tsar, tells Nick Mathiason why carbon reduction must begin at home. *The Observer* (London) February 3, 2008 BYLINE: Nick Mathiason
- 49- **Green** dreams: Academia is making moves to tackle climate change - but are they going far enough, fast enough? *The Guardian* January 22, 2008 Tuesday BYLINE: Bibi van der Zee

- 50- Does carbon trading herald the **green** shoots of recovery - or add fuel to the fire of global warming? Carbon trading. *The Sunday Times* November 29, 2009 BYLINE: Richard Girling
- 51- Consider the EU summit last week which didn't offer Tony Blair a new, rather boring chairman's job. It didn't offer much on saving the planet, either. By 2020, apparently, poor countries will need £90bn or so to help them grow in the best **green** ways, and Europe will have to stump up some of that: but the first, much smaller bill for £6bn-plus drops in January, and nobody wants to sign for that. Poland won't pay, others from the east say they can't find the cash. Germany will only go so far. *The Guardian* November 2, 2009 Monday Comment & Debate: The climate of fear: Unless our leaders take radical action, global warming could usher in the far-right strongmen BYLINE: Peter Preston
- 52- Quasitarianism will be so much fun that you'll soon pity the carnivores. And the vegetarians. It's hardly difficult, and you will have a **green** glow of righteousness to light the way. *The Times* October 28, 2009 Wednesday Is it time to cut out meat? BYLINE: Alex Renton
- 53- In fact, so keen are countries from Australia to Britain and America to emulate the clean and **green** Danish capital that a buzzword has been coined: to copenhagenise. *The New Review* October 18, 2009 One day, all cities will look like this...; ...we hope. BYLINE: Robin Barton
- 54- WHEB Sustainability (whebam.com), run by some of the UK's most experienced **green**/ethical fund managers. Focuses on climate change, water issues and demographics. *The Guardian* September 5, 2009 Saturday Money: How to ...: Invest in tackling climate change
- 55- A new campaign allows schools to show off the cool, **green** things that they are doing with art, music, drama, writing and technology. *The Times* July 21, 2009 Tuesday It's cool for kids!; Schools lead the way on climate change BYLINE: Chloe Lambert
- 56- Climate change: **Green** dreams (...) The great majority of carbon cuts will come from energy use, and the white paper is in essence the energy strategy Britain has lacked ever since Margaret Thatcher gave up on coal. Even without climate change it would be needed as an answer to falling North Sea oil and gas output. Already Britain's electricity is becoming too dependent on gas brought in by ship through the Suez canal. *The Guardian* July 16, 2009 Thursday
- 57- Institutional investors largely ignore the "**green**" or ethical credentials of the companies they invest in, focusing instead on dividends and financial returns. *The Sunday Times* July 5, 2009 Charles wants pension funds to take lead on climate change BYLINE: Jonathan Leake; Danny Fortson
- 58- It's true, though, and it's a typically shameful example of the bullying, controlling instinct behind so much nurturing, caring **green** ideology. *telegraph.co.uk* June 16, 2009 Tuesday Now even Moonbat has surrendered on global warming why can't Barry Obama? BYLINE: James Delingpole
- 59- The Prince will argue that being **green** can be good for businesses and can create jobs. He will say that tackling deforestation in the 3.5 billion acres of rainforest on the planet is a priority. *The Sunday Telegraph* March 8, 2009 Less than 100 months; to act BYLINE: ANDREW ALDERSON
- 60- "It is very clear that a lot of countries are watching the **green** component of the Obama plan because they are very interested in quick wins," said Ed Barbier, a University of Wyoming economist and author of a United Nations Environment Programme report on a **green** recovery. (...) The **green** portion of the EU recovery plan comes in a notch higher than the US plan at 14%. (...) The **green** recovery plan was incubated at a liberal thinktank, the Centre for American Progress. *The Guardian*

February 24, 2009 Tuesday **Green** economy: **Great clean-up** - can economic rescue plans also save planet? BYLINE: Suzanne Goldenberg

- 61- Far better to have a planet that is **green** and sustainable for centuries to come than to pay a few pounds less on our bills now. *The Express* December 8, 2010 Wednesday IS FIGHTING GLOBAL WARMING A WASTE OF MONEY?
- 62- Future economic growth must be increasingly **green**, not just to minimize climate change, but as the best way to ensure sustainable prosperity. *telegraph.co.uk* April 6, 2010 Tuesday General Election 2010: what the parties agree on - climate change and the **green** economy BYLINE: By Geoffrey Lean
- 63- The international climate negotiations are edging towards agreement on paying countries to preserve the "**green** carbon" in their forests: felling them at present accounts for about a fifth of all carbon dioxide emissions. But they have constantly shied away from extending the idea to the oceans. *telegraph.co.uk* March 1, 2010 Monday 'Blue carbon' plan to enlist the oceans to fight climate change BYLINE: By Geoffrey Lean
- 64- There is little better on a winter's evening than curling up next to a wood fire, or the modern equivalent, a wood-fired boiler - unless it is the **green** warm glow you get from knowing that the fuel you are using is environmentally friendly and sustainable. Except that it is not always. And nor is that two-year-old diesel car you bought because its fuel efficiency, compared with petrol models, makes it more **green**. *The Guardian* November 28, 2011 Monday Wood fires help fuel climate change, says UN BYLINE: Fiona Harvey
- 65- There has been talk, meanwhile, of a new environmental peacekeeping force - **green** helmets - which could step into conflicts caused by shrinking resources. The UN secretary general, Ban Ki-Moon, is expected to address the meeting on Wednesday. But Germany, which called the meeting, has warned it is premature to expect the council to take the plunge into **green** peacemaking or even adopt climate change as one of its key areas of concern. *Guardian.com* July 20, 2011 Wednesday UN security council to consider climate change peacekeeping BYLINE: Suzanne Goldenberg
- 66- To be anti-**green** now is to be anti-growth. *The Guardian* October 29, 2012 Monday Comment: Tory retreat on climate change is senseless BYLINE: Ian Birrell
- 67- A blueprint to ward off climate change?; Forget eco-bling. The new efficient homes are **green** - on the inside *The Times* June 29, 2012 Friday BYLINE: Claire Carponen
- 68- Some of America's top companies are spending heavily to block action on climate change or discredit climate science, despite public commitments to sustainable and **green** values, a new report has found. (...) Caterpillar Inc, despite its public commitment to sustainability, also worked behind the scenes to block action on climate change. The company spent more than \$16m (£10.3m) on lobbying during the study, with nearly five times as much of that spent lobbying to block climate action than on pro-environmental policies. Other big corporate players were fairly consistent with their public image. Nike and NRG Energy Inc lobbied in support of climate change policy and supported conservation groups. *Guardian.com* May 30, 2012 Wednesday Top US companies shelling out to block action on climate change BYLINE: Suzanne Goldenberg
- 69- Mr Eliasch himself, a wealthy one-time Tory donor, was in the past charged with **green** colonialism, after buying tracts of forest to stop it being cleared. His efforts to find local people alternative work were genuine, but did not assuage his critics. *The Guardian* October 15, 2008 Wednesday Leading article: Climate change: Seeing the wood

- 70- It seemed as if the dam had broken. Channel 4's new commissions suggested that it was at last beginning to wake up to the fact that environmental issues were not just the crazy fantasy of a group of **green** fascists. *The Guardian* July 22, 2008 Tuesday G2: A crusade against science BYLINE: George Monbiot
- 71- This is a major scandal which blows apart the pretence that the science on climate change is "settled", an assertion frequently made by the US politician and **green** fanatic Al Gore who likes to portray sceptics as deniers and "flat earthers". (...) While lecturing the public about the need to protect the environment, the high priests of the **green** cult think nothing of swanning around in limousines and jets or destroying more of the rain forest with their patronising reports. *The Express* December 3, 2009 Thursday Now there are lies, damned lies and global warming BYLINE: Leo McKinstry
- 72- Just look at how multinational companies are waiting to cash in and make billions out of this **green** nonsense at our expense. *The Express* October 21, 2009 Wednesday Hidden agenda behind this climate-change nonsense
- 73- The question now: how authentic is corporate America's growing environmental conscience? **Green** camouflage or a real commitment to action on climate change? *telegraph.co.uk* September 30, 2009 Wednesday Will Obama force corporate America's climate change sceptics to stand up? BYLINE: Rowena Mason
- 74- It just doesn't seem to fit with the wholesome-clean-**green** fantasy to burn coal to create energy, then pump the carbon through pipelines into disused gas fields deep under the ground. But if it uses less space than rubbish landfills and is safer than nuclear waste, then why should there be a problem? (...) You can argue that it's just a flimsy **green** sticking plaster for a gaping environmental wound, but I'm increasingly hearing very senior and expert voices starting to trumpet carbon capture as the way - even a temporary one - to mitigate emissions in the medium-term while we wait for science to invent a cure. *telegraph.co.uk* August 26, 2009 Wednesday Carbon capture: a flimsy plaster or the answer to climate change? BYLINE: Rowena Mason
- 75- How many more **green** scams, cons and generous slices of wishful thinking are out there? (...) Money to try and persuade us that coal is good, coal is **green** and coal is the solution to America's energy needs. *Guardian.com* February 26, 2009 **Greenwash**: Why 'clean coal' is the ultimate climate change oxymoron
- 76- Eighteen months later, as Chris Huhne, the Climate Change Secretary, jets off to Durban for the latest round of negotiations, all that remains is a trail of broken **green** promises. *The Independent on Sunday* December 4, 2011 Cameron's pledges on global warming were only hot air BYLINE: Sarah Sands
- 77- We've just seen a delicious example of this in Ireland - which has been playing the **green** energy scam game more enthusiastically than perhaps any other country in the world - whose Green party has been utterly destroyed in the recent elections. *telegraph.co.uk* February 28, 2011 Monday The real cost of 'global warming' BYLINE: James Delingpole
- 78- Preventing climate breakdown - the four, five or six degrees of warming now predicted for this century by **green** extremists like, er, the World Bank, the International Energy Agency and PriceWaterhouseCoopers - means confronting the oil, gas and coal industries. *The Guardian* December 4, 2012 Tuesday Comment: Break the grip of corporate power to secure our future BYLINE: George Monbiot
- 79- But the continuing march of the turbines is turning ordinary people against the battle against climate change because they see **green** energy destroying the countryside. *telegraph.co.uk* April 30, 2012 Monday Wind farms in the wrong places are turning the public against fighting climate change says Bill Bryson BYLINE: By Louise Gray
- 80- The wholesale clearance of Britain's ancient forests, for example - however devastating to existing ecosystems - eventually produced our present "**green** and pleasant land", sustaining a much bigger

population at an infinitely higher standard of living in what is still mainly a beautiful country. *The Daily Telegraph* October 15, 2014 Wednesday We cannot rest on Mother Nature's laurels BYLINE: GEOFFREY LEAN

- 81- Nuclear Power? No Thanks! - as those Eighties stickers on the side of Citroen 2CVs used to say. Can you image the Government plucking up the courage to take on Swampy and his mates to build half-a-dozen Sellafields in England's **green** and pleasant? *MailOnline* December 15, 2015 Tuesday Tell Sid, we're not cooking with gas anymore! BYLINE: RICHARD LITTLEJOHN
- 82- Britain's **green** and pleasant land, full of rolling hills, oak trees and apple blossom, seems timeless. *MailOnline* April 26, 2017 Wednesday Palm trees, fake laws... and no weeding! BYLINE: COLIN FERNANDEZ
- 83- High-speed rail is the sort of shiny project that any go-ahead government ought to be proposing. Cars and planes bad; trains good, and **green**. The domination of the economy by London and the south-east is The Problem and high-speed trains are The Solution. *Independent.co.uk* February 3, 2013 Sunday Light **green** is not **green** enough; How to measure the fate of the purple hairstreak against tackling climate change?
- 84- Come what may, the star of the New North will shine on. It may well spread its lustre over the clean, **green** and - relatively - empty terrain north of the Emperor Hadrian's long-defunct wall. *Independent.co.uk* September 18, 2014 Thursday The winds of climate change are blowing Scotland's way BYLINE: Boyd Tonkin
- 85- Fracking can be part of the solution to global warming, say UN climate change experts; Intergovernmental Panel on Climate Change says **massive shift to green energy sources is crucial** but that shale gas can help if it replaces dirtier coal (...) The 29-page document has already sparked concern over the cost of countering global warming. Last night, senior Tory MPs warned governments about the risks of increasing funding for renewable energy sources, saying this would drastically raise household and other living costs. *telegraph.co.uk* April 13, 2014 Sunday BYLINE: Emily Gosden
- 86- Future "**green**" cities could resemble dream lands filled with radiant buildings and glowing trees, a report predicts. (...) To meet the increasing demand for food, vertical "urban farms" are also forecast, with crops grown in and on city buildings. Parks could also contribute to food supplies by providing places where people can forage for fruits, edible greenery and even insects. *The Daily Telegraph* April 1, 2014 Tuesday **Dream solutions** to global warming
- 87- Climate Hope City is not a fantasy world but a vision of a **green** urban environment which uses technologies that either already exist around the world or are at the prototype stage. *The Guardian* June 12, 2015 Friday Climate Hope City: how Minecraft can tell the story of climate change BYLINE: Keith Stuart
- 88- **Green** and ethical funds have been around for decades, but unfortunately few are entirely fossil free, with many preferring an "engagement" strategy rather than outright divestment. *The Guardian* May 18, 2015 Monday How to divest your bank account of fossil fuels BYLINE: Patrick Collinson
- 89- China tackles pollution, but has long way to go on labor; China takes on pollution in a big way, with a strengthened federal environmental protection law. But are workers rights problems spreading as companies chase ever-lower costs. BRIC nations' response to climate change is critical to the planet's future. Russia: the unsustainable superpower. Brazil struggles with drought and pollution as the Olympics loom large. Can India lead on corporate sustainability, **green** buildings and clean energy? *The Guardian* May 6, 2015 Wednesday BYLINE: Matthew Wheeland
- 90- Costa Rican residents have certainly benefited from the clean energy, with electricity prices set to tumble between 7% and 15% in April. But despite the world's congratulatory backslaps for the

renowned **green** country, its clean energy production is not likely to last at this scale, nor is it a model that would work in many other parts of the world. *The Guardian* March 30, 2015 Monday The truth behind Costa Rica's renewable energy BYLINE: Lindsay Fendt

- 91- We need an agenda to make the world rich because a rich world is more educated, inventive and **green**. The wrong summit is happening in Paris. If world leaders devoted their time to slashing agriculture subsidies and the protectionism that suffocates trade across Africa and Latin America the benefits to poor nations would be many times bigger than reparations. *The Times* December 7, 2015 Monday Climate change reparations are a ridiculous idea BYLINE: Tim Montgomerie
- 92- Award-winning artisans branch out and make wood a growth industry; It's being hailed as an innovative and **green** solution to the climate change and housing crises, and now designers are building on the potential of timber *The Sunday Times* November 20, 2016 BYLINE: JEFF COLLEY
- 93- Clean, **green** development is the sole route to future global economic growth, according to British economist Lord Nicholas Stern, with a continuation of polluting, high-carbon growth only leading to self-destruction. *The Guardian* October 27, 2016 Thursday 10 years on from the Stern report: a low-carbon future is the 'only one available' BYLINE: Damian Carrington
- 94- A failure to switch to an energy efficient, clean and **green** economy could cause economic problems as British companies would struggle to sell their products in Europe, the CCC warned. In this scenario, firms on the continent might also engage in "dumping" of out-dated, polluting and expensive-to-run cars and consumer products on the UK market. (...) The UK is currently on course to cut emissions by only half the amount needed by 2030 and the CCC said there was an urgent need for action - rather than more promises. A failure to switch to an energy efficient, clean and **green** economy could cause economic problems as British companies would struggle to sell their products in Europe, the CCC warned. In this scenario, firms on the continent might also engage in "dumping" of out-dated, polluting and expensive-to-run cars and consumer products on the UK market. *The Independent* October 13, 2016 Thursday UK must not abandon fight against climate change after Brexit, experts warn BYLINE: IAN JOHNSTON
- 95- Entrepreneur Lord Drayson has unveiled a smartphone-sized gadget which can literally summon energy from the air and allow users to see harmful pollution. The nifty bit of technology uses Freevolt, which harvests the energy emitted by broadcast waves, 3G, 4G and Wi-Fi to provide continuous power, and runs with a corresponding app which tells you which routes have the most good (**green**) air when out and about. *The Guardian* April 29, 2016 Friday Fighting climate change: 10 great tech ideas; Alongside mainstream tech solutions, a myriad of creative approaches have been developed as firms innovate to save the planet BYLINE: Jack Peat
- 96- Using a spell of winter weather to try to rebut the overwhelming evidence about our changing climate might be funny if the issue were not so serious. A good new year's resolution for political leaders around the world would be to do everything in their power in 2018 to save the planet for future generations by reducing the use of fossil fuels, boosting clean, **green** energy and halting rainforest destruction. And trying to talk some common sense into the most powerful one in their ranks. *The Independent* December 30, 2017 Saturday Donald Trump's climate change quips are no laughing matter
- 97- But when building the new India for its 1.3 billion people, whether it relies on coal and oil or clean, **green** energy will be a major factor in whether global warming can be tamed. (...) Despite the compelling reasons for India to follow a **green** path into the future, serious obstacles remain, not least the sorry state of the country's coal-fired power industry, currently forced to slow its operations by a surplus of electricity in the market. (...) The whole world would benefit from a clean, **green** India and can help make it happen, says Stern, by bringing down the interest rates on the loans used to fund the low carbon transition: "The best thing the world could do is help bring down the cost of capital." That means long term finance and help to cut project risks. (...) So can India's leaders bring light to its poorest people, build clean, **green** cities for its billion-strong population and end the plague of air

pollution? Figueres says: "More important than my opinion is their opinion, and they think they can, and do so with many benefits." *The Guardian* November 6, 2017 Monday How India's battle with climate change could determine all of our fates BYLINE: Damian Carrington and Michael Safi

- 98- Why **green** business is the future of good business *The Independent* October 13, 2017 Friday climate change plan branded a 'blueprint for under-achievement' BYLINE: Lizzy Buchan
- 99- The Formula One-style, open-wheel cars reach speeds of 140 mph but only about 80 decibels, compared with 130 decibels for the cars with combustion engines. Instead of screaming down the straightaways the way F1 cars do, FE cars buzz like giant, steal hummingbirds. And they run clean and **green**. *MailOnline* July 16, 2017 Sunday Racing to save the environment! BYLINE: HANNAH PARRY
- 100- World abandoning coal in dramatic style raises hope of avoiding dangerous global warming, says report; Donald Trump may be planning a revival of the dirtiest of the fossil fuels, but the rest of the planet appears to be going **green** instead *The Independent* March 21, 2017 Tuesday BYLINE: Ian Johnston
- 101- We need to set a positive example of a modern, vibrant, **green** economy - and society - that offers hope to the world in deeply troubling times. *The Sunday Times* February 5, 2017 Sunday Set a good example to offset Trump's reliance on fossil fuels BYLINE: JEFF COLLEY
- 102- The remote, 27-square-kilometre solar farm tops an ever-expanding roll call of supersized symbols that underline China's determination to transform itself from climate villain to **green** superpower. *The Guardian* January 19, 2017 Thursday China builds world's biggest solar farm in journey to become **green** superpower; Vast plant in Qinghai province is part of China's determination to transform itself from climate change villain to a **green** energy colossus BYLINE: Tom Phillips
- 103- The essence of Harrabin's message was that whatever the dreadful Mr Trump does to reverse President Obama's world-leading role in keeping global temperatures from rising by more than two degrees, at least we can look for hope to India and China, both now firmly committed to clean, **green**, "renewable" energy. *telegraph.co.uk* January 7, 2017 Saturday It's the facts the BBC leaves out about climate change that are important BYLINE: Christopher Booker
- 104- In a sane world it wouldn't have needed writing. **An obscure green political activist** called John Cook and a few of his eco-cronies produced a pseudo-scientific paper so riddled with flaws that it ought to have been tossed straight in the bin. Instead, it was bigged up by a compliant mainstream media, a desperate and **propaganda-hungry green industry**, and by the US President as a vitally significant meta-analysis offering indisputable proof of the scientific "consensus" on "climate change." *telegraph.co.uk* September 3, 2013 Tuesday If you still believe in 'climate change' read this... BYLINE: James Delingpole
- 105- The Great **Green** Con no. 1: The hard proof that finally shows global warming forecasts that are costing you billions were **WRONG** all along *MailOnline* May 1, 2013 Wednesday BYLINE: DAVID ROSE
- 106- But now the justification for all this **green** oppression is looking ever weaker. *The Express* January 14, 2013 Monday Global warming is nothing more than an expensive con BYLINE: Leo McKinstry
- 107- But since then, Mr Miliband says, the premier has made a "long retreat from the principles in which he once claimed to believe". This has included signing up to the bare minimum required on EU-wide carbon emission reductions of 40 per cent by 2030, deterring investment in renewable energy and wanting to get rid of the "**green** crap" altogether. (...) The Chancellor's failure to mention climate

change in his mini-Budget appalled environmental groups. *Independent.co.uk* December 7, 2014 Sunday Ed Miliband lambasts PM for 'ignoring advice on climate change' BYLINE: Jane Merrick

- 108- The deniers argue that any globally coordinated response to this problem will involve 'socialism' and EU control, calling many exponents of **green** policies 'watermelons' for being **green** on the outside and red on the inside. Yet the same people will often argue that unilateral action on climate change would be an expensive waste of time whilst China is still building coal power plants. We can't work together because it will interfere with freedom - but we can't act alone because it's pointless. Even more confusingly, there are too many on the Right who then have a go at private companies for getting into renewable energy. When the socialist-finder generals aren't calling people watermelons, they are calling out the corporate greed of making a profit from involvement in green energy solutions. *telegraph.co.uk* December 4, 2014 Thursday The Right needs to wake up - climate change is real, and we're causing it BYLINE: Rupert Myers
- 109- Which, presumably, just goes to show that they (policymakers) must be **green-on-the-outside**, red-on-the-inside "watermelons", the whole lot of them. *telegraph.co.uk* October 31, 2014 Friday Did global warming give rise to Boko Haram? BYLINE: Geoffrey Lean (my addition in parenthesis)
- 110- What has been striking about the outraged response from **green** zealots to Paterson's speech is how they did not begin to understand his practical proposals for how an otherwise inevitable disaster can be averted. (...) When Mr Paterson's radical proposals are properly examined, unblinkered by **green** make-believe, it will be seen that he has at last launched the properly informed national debate that alone might save our economy from a barely imaginable catastrophe. *telegraph.co.uk* October 18, 2014 Saturday Ed Miliband and Baroness Worthington, the most expensive man and woman in Britain's history BYLINE: Christopher Booker
- 111- It's a year now since David Cameron was reported to have told his policy bods to "get rid of all the **green** crap" and his big speech this week was notably **green** crap-free. Nobody really minds. Ed Miliband, it is true, had some tokenistic **green** crap in his, but he's also promised an energy-price freeze and didn't explain how the two could possibly go together. Although I suppose he possibly just forgot that bit. Either way, there are votes in cheaper energy and there aren't votes in **green** crap. We know our priorities. *The Times* October 4, 2014 Saturday When animals are all at sea, we're finished BYLINE: Hugo Rifkind
- 112- Klein doesn't necessarily follow the people who see Branson's **green** shenanigans as "a cynical ploy" to build his brand and confuse his critics. But you can grant him his good intentions and still think all this **greenwash** doesn't make a lot of sense. *The Guardian* September 20, 2014 Saturday review: Non-fiction Book of the week: A book for those who don't read climate change books BYLINE: Jenny Turner
- 113- Revealed: How **green** zealots gagged professor who dared to question global warming *MailOnline* May 18, 2014 Sunday BYLINE: DAVID ROSE
- 114- Next time you hear some **green**, doom-mongering Jeremiah insisting that the only way to avoid Armageddon is to go back to eating home-grown organic lentils cooked over wood fires, ask him why it is that the IPCC assumes the very opposite. *The Times* April 21, 2014 The richer we get, the **greener** we'll become; The world's climate change experts are now saying that strong growth doesn't hurt the environment, it protects it BYLINE: Matt Ridley
- 115- The developing countries were perfectly happy for the West to have "the **green** crap", but not to have it themselves. The Western goody-goodies were hoist by their own petard. Since then, the international war against carbon totters on, because Western governments see their **green** policies, like zombie banks, as too big to fail. *The Daily Telegraph* April 7, 2014 Monday The game is up for climate change believers BYLINE: CHARLES MOORE

- 116- Yet as the waters continue to rise the **green** zealots have done a complete reversal. *Express Online* February 13, 2014 Thursday Global warming is about hotter, drier weather... not flooding BYLINE: Leo McKinstry
- 117- But the unpleasant consequence of this continual vilification is that credulous idiots and self-righteous **green** zealots start to believe the hype. There are lots of people out there who now seriously imagine that 'deniers' financed by Big Oil are spreading deliberate lies which will ruin the lives of 'future generations'. *MailOnline* May 29, 2015 Friday Putting my name on this sick headstone won't stop me defying climate zealots BYLINE: JAMES DELINGPOLE
- 118- The one lesson above all we might have learned from Ed Miliband's brief spell in charge of our 'energy and climate change' policy is that he is quite astonishingly out of touch with any practical reality.(...) So lost was he in his **green** fantasy world that his only concern was the 'climate change' part of his job title. He showed no interest in the other half of the job he was paid for, the 'energy' bit, i.e. how to keep our lights on. (...) And it was this same policy which was then so enthusiastically carried on after 2010 by his Lib Dem successors at DECC: first Chris Huhne (until he had to resign before being jailed for lying), and now that lacklustre **green** zealot Ed Davey, so dim that he has shown no more practical grasp of the technicalities of electricity production than Mr Miliband himself. (...) The 'Big Six' energy giants - who, whatever we think of them, were actually keeping the lights on - he treated with disdain or outright hostility, as 'polluting' capitalists, interested only in making 'obscene profits' (unlike those **green**, clean developers of the wind farms which were increasingly disfiguring our countryside). *MailOnline* April 29, 2015 Wednesday The pottiest and costliest mistake of our times BYLINE: CHRISTOPHER BOOKER
- 119- How I was vaporised by the BBC's **Green** Gestapo after daring to mock the Met Office and global warming *MailOnline* December 11, 2015 Friday BYLINE: QUENTIN LETTS
- 120- Part of the problem is the difficulty over understanding how **green** a company is - or even what **green** means - without which we can't really evaluate whether their actions match the rhetoric. When even a simple product like paper can be FSC, recycled, or (in a particularly egregious example of **greenwash** packaging I saw 'suitable for recycling' shown against a recycling logo on **green** background) assessing the full impacts of a multinational is nigh on impossible. *The Guardian* August 7, 2015 Friday Should business leaders speak out more on climate change? BYLINE: Tom Levitt
- 121- In 2013, in the teeth of an energy bill crisis, David Cameron reportedly said it was time to "get rid of all the **green** crap". That statement can be interpreted in two ways: cut everything **green** because it's all crap or cut the **green** policies that are crap and keep those that work. *The Independent* July 15, 2016 Friday Killing the climate change department could be Theresa May's first and biggest mistake BYLINE: Ian Johnston
- 122- The gist of their letter, written in consultation with Richard Black, the former BBC environmental reporter who now runs an ultra-**green** propaganda unit, was to express outrage that The Times had published two articles which appeared to question the official orthodoxy on global warming. *telegraph.co.uk* May 1, 2016 Sunday The climate change brigade, press freedoms - and clockwork bluebells BYLINE: By Christopher Booker
- 123- This scheme has already been smiled on in principle by the **green** zealots of the Committee on Climate Change, run by Lord Deben (aka John Gummer), their only real reservation being that it would be rather expensive. *The Sunday Telegraph* April 24, 2016 Does the Climate Change Committee want to blow us all up? BYLINE: CHRISTOPHER BOOKER

NEW - HOME/ FAMILY scenarios:

- 124- A potent mix of pollutants would scatter the incoming sunlight and bounce more sunbeams back into space. Bingo, you'd lower the rate of global warming, make the planet's current **tenants** a little bit more secure and give the fossil-fuel industries more reason to push hydrocarbons and fill up the corporate coffers. *The Guardian* August 3, 2006 Thursday Comment & Debate: Bring back the acid rain BYLINE: Tim Radford
- 125- In the Kyoto **family** of nations, Europe and the developing countries may be seen as dependants, pensioners and minors; the US as the breadwinner and protector - who is being urged to leave his car in his garage, and to walk to work or to get on his bike. *The Times* April 20, 2001, Friday Unravelling complex concerns over climate change
- 126- How much capital, and in what form, are we leaving in Earth's bank for future generations? Not only are we living beyond our income, we are seriously damaging the planet's future income-generating capacity by the overuse of water, the destruction of the rainforests and the loss of topsoil. Money may be recycled, but spending the Earth's capital produces excess CO2 and other waste that litters the vaults and harms the atmosphere. Seen in economic terms, this is simply untenable. Let us simplify it still further and look at a micro-metaphoric system. Imagine your family had lived for centuries on its income but had always kept a nest egg tucked away. Indulgently living beyond your income would be foolish enough. But what if you then plundered and squandered the nest egg in a generation, thereby destroying your children's capacity to live off this income in the future? Would this make sense? Of course not, but that is exactly what we are doing. Our generation could be seen as the all-time black sheep of the human **family**. *The Daily Telegraph* October 7, 2006 Saturday All steamed up about climate change John Whitmore looks at the huge response to his last column on global warming BYLINE: JOHN WHITMORE
- 127- They are descendants of giant mud-brown grizzly bears adrift on ice floes. Then **Mother Nature** got to work: its fur faded for camouflage on the pack ice and its ears shrank to stop frostbite. *Sunday Express* December 31, 2006 Prince of the Pole; Why we must not let this magnificent animal be killed off by global warming BYLINE: By Stuart Winter
- 128- All these migrating animals are following the most successful plant on the planet - grass, **nurtured** by rains. *Sunday Mirror* November 5, 2006 MELTDOWN; EXCLUSIVE: MAN BEHIND THE BBC'S PLANET EARTH REVEALS THE DEVASTATING COST OF GLOBAL WARMING BYLINE: INTERVIEW BY NIGEL BLUNDELL
- 129- Rather as in the Amazon today, the rain **nurtured** lush vegetation that ensured that much of it evaporated back into the air. The continually moistened winds took rain to the heart of the Sahara. *The Independent* June 5, 2006 Monday Welcome to our future; Why deserts will inherit the Earth Few places on Earth are less hospitable, less suited to human life than the Sahara desert. BYLINE: Fred Pearce
- 130- The devastating rains have already started to fall and we have very little time left to build a proper **roof** to protect **our national home** from the devastating damage of global warming and the hurricanes and flooding it brings. *mirror.co.uk* December 8, 2015 Tuesday Tackle the floods before it's too late BYLINE: Alison Phillips

- 131- Professor Stephen Hawking should not be dismissed as "another nutter" - **Mother Nature** can be a ruthless guardian if abused. *The Express* October 22, 2001 CLIMATE CHANGE COULD BE A FACTOR IN RISING VIOLENCE
- 132- Yet as the catastrophe continues to unfold along the palmfringed coasts of the Indian Ocean, who cannot fail to be reminded that, wars excepted, when it comes to death, mayhem and destruction, Homo Sapiens cannot even begin to compete with **Mother Nature**? *DAILY MAIL* December 27, 2004 FORGET GLOBAL WARMING . . .BYLINE: MICHAEL HANLON
- 133- But we are a hardy breed, hard working and ready to take everything in our stride. We will adapt and cope with the worst that **Mother Nature** has to throw at us. *The Express* April 21, 2004 GLOBAL WARMING IS ALREADY HITTING FARMERS HARDEST
- 134- Since then he (J. Lovelock) has followed developments closely and become increasingly convinced that **Gaia** - to use the metaphor - is likely to **react violently** to the stress caused by the huge amounts of greenhouse gases we pour into the atmosphere each year. *The Independent* May 24, 2004, Monday GURU WHO TUNED INTO GAIA AND GAVE FIRST CLIMATE CHANGE WARNING BYLINE: MICHAEL MCCARTHY (my addition in parenthesis)
- 135- At home, supermarkets are warning that food prices could rise because of bad weather. While rain wrecks some cereals and vegetables, parched soil and searing sun ruin others. Either way, our lives are slowly being affected by **Mother Nature's** boom and bust - drought, flood and drought again. *Sunday Express* August 27, 2006 Sunday Are these shocking pictures the proof of global warming? BYLINE: Stuart Winter
- 136- The countryside is the face of **Gaia**, Lovelock adds, being his concept of the Earth as a **living organism**, or at least a set of biological systems in constant check with each other and which maintain the conditions that make life possible on our planet. (...) We have assailed **his beloved Gaia** for too long and it is about to **wreak revenge**. Ice caps are melting and meadows being transformed into deserts. Millions were killed between 1939 and 1945. Billions will die in the forthcoming climatic change. *The Observer* June 11, 2006 Energy: It's too late for the planet: or can we pull it from the fire? BYLINE: Robin McKie
- 137- As a group, some concerned **mothers** - myself among them- are coming together with their **children** this week because we want to leave our planet in much the same way as it was when we were born: rich, varied and able **to support and feed us all**. *The Guardian* May 20, 2008 Tuesday Comment & Debate: The war to end all wars: The climate change threat needs drastic action. Only a cross-party approach can deliver it BYLINE: Rosie Boycott
- 138- Maybe I'm wrong, though. Maybe - just maybe - the arrival of a giant wall of water in the exact middle of the financial and media capital of **our home planet** will be enough to get this conversation unstuck. *Guardian.com* November 2, 2012 Friday Sandy forces climate change on US election despite fossil fuel lobby BYLINE: Bill McKibben
- 139- And it's why that view from the satellites, however beautiful from a distance, is likely to become ever harder to recognize as **our home planet**. *Guardian.com* February 7, 2012 Tuesday Why the energy industry is so invested in climate change denial BYLINE: Bill McKibben

- 140- This is the third generation of eco-warrior. It started with the wild prophets in the 1970s, who wrote books in woad and became hermits in distant wildernesses, **listening to Gaia** and talking oblivion. *The Sunday Times* December 13, 2009 Great green power grab; Oil barons, Pacific islanders, idealists in bad shoes BYLINE: AA Gill
- 141- More subtly, the more time we spend in air-conditioned environments, the less we are able to cope with the heat provided by **mother nature**. And so, humans being the resourceful species they are, the air-conditioned universe widens further. *The Independent on Sunday* July 25, 2010 The US stays cool, but is global warming the price? BYLINE: Rupert Cornwell
- 142- The earthquake and tsunami will clearly have a severe impact on the economic and social activities of the region. Some islands affected by climate change have been hit. Has not the time come to demonstrate on solidarity - not least solidarity in combating and adapting to climate change and global warming? **Mother Nature** has again given us a sign that that is what we need to do. *telegraph.co.uk* March 14, 2011 Monday Did 'climate change' cause the Japanese earthquake? BYLINE: James Delingpole
- 143- There are idealistic climate "activists" who excoriate the evil oil companies for destroying **Mother Earth**, and jet about from the Arctic to Papua New Guinea trying to save **Her** - and I'm not even sure this is meant to be ironic. Their lengthy exchanges and bickerings suggest a gathering of particularly thick, stoned sociology students. *The Sunday Times* February 6, 2011 Sunday It really doesn't cut any ice; Greenland aims to educate on global warming, but it's lukewarm drama. BYLINE: Christopher Hart
- 144- Perhaps it is time for our leaders to come back down to Earth, and to address problems in the here and now, rather than endlessly moralising about man's behaviour and its future impact on **Mother Earth**. *telegraph.co.uk* January 14, 2011 Friday Did Australia's obsession with global warming contribute to the Brisbane floods? BYLINE: Brendan O'Neill
- 145- When it comes to "**saving Mother Gaia**" and being able to feed and clothe their kids, people can very suddenly become very pragmatic about the threat of "Man Made Global Warming." We've just seen a delicious example of this in Ireland - which has been playing the green energy scam game more enthusiastically than perhaps any other country in the world - whose Green party has been utterly destroyed in the recent elections. *telegraph.co.uk* February 28, 2011 Monday The real cost of 'global warming' BYLINE: James Delingpole
- 146- Our reliance on **Mother Earth** and worries about its sustainability echo our early dependence on our **mother**, restimulating primitive childhood anxieties about loss and annihilation, and the fear that our most urgent needs won't be met. *The Guardian* December 1, 2012 Saturday: You can't ignore this: Anne Karpf is not a climate-change sceptic. BYLINE: Anne Karpf
- 147- Rising temperatures **nurtured** marshy peatlands and thick forests, forcing the mammoths to struggle through poor terrain and squeezing them out of their former territory. *MailOnline* June 14, 2012 Thursday Woolly mammoths were killed off by 'combination of climate change and human hunters' BYLINE: GRAHAM SMITH

- 148- Had Superstorm Sandy struck five years ago, we would by now be hearing all manner of theories linking it to climate change or murky claims that it represented **Gaia's revenge**. *The Daily Telegraph* November 2, 2012 Friday The Big Apple shows the world how to live with climate change BYLINE: FRASER NELSON
- 149- Let us not dwell on such miseries though, for we would only end up doing what so many greens would prefer us to do and kill ourselves - thus sparing **Mother Gaia** the hideous indignity of our defiling presence in her sacred bio-temple. *telegraph.co.uk* June 16, 2009 Tuesday Now even Moonbat has surrendered on global warming why can't Barry Obama? BYLINE: James Delingpole
- 150- According to James Lovelock's Gaia hypothesis, the planet has a way of keeping itself in balance, which greenhouse gases are disrupting. Could **Gaia have discovered how to adjust her thermostat?** *The Times* February 7, 2009 Saturday It's cold comfort for pessimists BYLINE: Mark Henderson
- 151- Well, that's amazing - [the idea] that environmentalists are either non-committal about geoengineering or trying to participate in the early discussions about it. The knee jerk "Don't mess around with **mother nature**" response is not there. *The Observer* October 3, 2010 Observer Review: Discover: COUNTERCULTURE: My bright idea We need a climate plan B BYLINE: Damian Carrington
- 152- **They want to blame man**; Spencer says it's down to **Mother Nature**. As the world's greatest expert on satellite temperature monitoring, Spencer has access to the most accurate climate data yet collected. *The Express* May 7, 2010 Friday Finally, proof that global warming is a load of hot air BYLINE: James Delingpole
- 153- The scientists behind the event recently put out a statement calling for humans to be packed into denser cities so that the rest of the planet can be surrendered to **mother nature**. *MailOnline* March 31, 2012 Saturday 'If you don't believe in climate change you must be sick': Oregon professor likens skepticism to racism
- 154- \$1000 Planning permission will be granted for a new Eco-Dam Hydropower Development (TM) on the Hawkesbury River, causing waterside properties such as Tim Flannery's to sink forever beneath the waters. But Tim won't mind. He'll always happily take a hit for **Mother Gaia**. And on his A\$180,000 (for a three day week) salary as Australia's Climate Commissioner, hell, he can afford it too! *telegraph.co.uk* September 18, 2012 Tuesday Duke and Duchess of Cambridge nearly drowned by climate change BYLINE: James Delingpole
- 155- In future, the Church was to champion the stewardship of the increasingly vulnerable, increasingly polluted planet which is **our only home** - or, as he (the Pope) would see it, God's creation. *Independent.co.uk* September 22, 2015 Tuesday Pope Francis is bringing his holiness to the fight against climate change BYLINE: Michael McCarthy (my addition in parenthesis)
- 156- Underlying that is an awareness (conscious or unconscious) that our current path of capital-and-carbon-driven development is wrecking **our home planet**, running down resources, devastating other species and building up environmental costs that are increasingly difficult to offload on distant countries and coming generations. (...) The key, I think, is to realise that, contrary to what Bill Clinton once said - it's not "the economy, stupid!" - it is in fact the environment that is shaping everything.

Which is to say that we must put **our home** in order before we can consider anything else. *The Guardian* April 18, 2017 Tuesday Climate change: surely the most important news story of our age? BYLINE: Jonathan Watts

- 157- The end of the world is coming - but not for a while yet. That's according to a new study indicating that we have 1.75 billion years left until **Mother Earth** gives up the ghost. *Independent.co.uk* September 19, 2013 Thursday The good news: Earth can support life for 1.75bn years. BYLINE: Jamie Merrill
- 158- The challenge is to find places to put the trees, the people to **nurture** them and money to continue the project. *MailOnline* April 22, 2013 Monday Replanting the redwoods: Group begins planting tree clones to combat global warming BYLINE: SAM WEBB
- 159- Interstellar does so from a post-climate change perspective. It shows a world decimated by a man-made agricultural blight that forces other options to be scoped out. Rather than being a call to arms to preserve the planet, it fast-forwards to a time when any such battle has been lost. Interstellar suggests the survival of the species may depend on enough people extending a sense of empathy beyond their immediate **family**. *The Guardian* October 30, 2014 Thursday How Interstellar made Michael Caine think again about climate change; **Mother nature's** going to be fine - but we might not be, adds Matthew McConaughey, star of film that addresses humans' place in the cosmos BYLINE: Catherine Shoard
- 160- Could **Mother Nature** be riding, yet again, to our rescue? As reported in yesterday's Telegraph, new American research indicates that the earth's vegetation has been absorbing more carbon dioxide than had been thought, thus lessening global warming and providing us with more time to get it under control. (...) But, as scientists also point out, there are limits to **Mother Nature's** patience. The fertilising effect of carbon dioxide is unlikely to continue into the long term because trees and vegetation run into other restraints on growth, notably shortages of nutrients such as phosphorus and nitrogen. And it favours faster-growing species that then die earlier (on "the live fast, die young" principle), releasing the carbon dioxide they have accumulated. (...) What, he asks, will happen with further warming? Perhaps the normally longsuffering **Mother Nature** is trying to tell us something. (...) And indeed, as **mothers** tend to be, nature has long been very forgiving. For centuries **she took everything humanity threw at her without seriously striking back**. *The Daily Telegraph* October 15, 2014 Wednesday We cannot rest on **Mother Nature's** laurels BYLINE: GEOFFREY LEAN
- 161- Perhaps, he (J. Lovelock) suggests, we are not the end point of civilisation but its John the Baptists - the species that either gave birth to, or merged with, a species of electronic life that can **supervise and preserve Gaia** for centuries to come. *telegraph.co.uk* April 3, 2014 Thursday A Rough Ride to the Future by James Lovelock, review BYLINE: Robert Colvile
- 162- So there is a very real hope that the 21st UN Climate Change Conference (COP 21), which starts today, will be the last. Either Prince Charles and Dame Vivienne will prevail, and COP 21 will rescue **Mother Earth** from destruction by agreeing worldwide legally binding carbon emission restraints; or they won't, and then, by their own logic, it will be too late for any international conference to do anything ever again, so they might as well shut up. *The Daily Telegraph* November 30, 2015 Monday The end is nigh for climate-change activists BYLINE: CHARLES MOORE
- 163- For most of us, spring is a delightful time of year. **Mother Nature**, awakening from her winter rest, is pregnant with the possibilities of summer. Our islands, more than most places, are at their best

at this time of year; the greens greener, the trees bursting with ripeness, the hedgerows and wildflower meadows coming into bloom. *The Sunday Times* May 31, 2015 Sunday Get those hankies ready for the hayfever apocalypse BYLINE: Michael Hanlon

- 164- Can **Mother Nature** stop global warming? Probe to see if ocean absorbs ALL man-made carbon *Express Online* January 28, 2016 Thursday
- 165- Climate change 'far from only problem for **mother nature**'; Paris deal hides other threats such as soil erosion *i-Independent* January 2, 2016 BYLINE: Tom Bawden
- 166- Trump says he's sticking to his promise to put America first, claiming the 2015 deal has killed American jobs, will cost billions and has put the US on the back foot. Because money is his oxygen. "We don't want other leaders and other countries laughing at us any more," he spat, "and they won't be." Kathy Griffin breaks down in tears as she accuses Donald Trump of 'breaking her'. No - they're too choked with anger at his crass stupidity and weeping for suffocating **Mother Earth** and the future generations who will suffer. *mirror.co.uk* June 3, 2017 Saturday Donald Trump is poisoning the planet with so much climate change hot air that he should have suffered asphyxiation BYLINE: Rachael Bletchly
- 167- Mr Trump's decision to pull out of the Paris agreement was met with dismay around the world yesterday. China and Europe pledged to unite to save **Mother Earth** as others, including the UK and Russia, reaffirmed their commitment to the international accord. *DAILY MAIL* June 3, 2017 Saturday UK FACES PAYING MORE TO HELP THIRD WORLD TACKLE CLIMATE CHANGE BYLINE: BEN WILKINSON AND JASON GROVES
- 168- Swimming at the beach in the sunshine, in autumn, in the southern hemisphere is not normal ... just as a warm Christmas in the northern hemisphere is not normal. **Mother Earth** is like a patient running a high fever. According to reports released this week, April was another record hot month - "by some margin" - making it 12 months in a row that have set new records for heat. *The Guardian* May 15, 2016 Sunday Shame on you: six new things to feel guilty about BYLINE: Brigid Delaney
- 169- No wonder, then, that the US Intelligence Community's 2013 threat report ranked climate change as a major possible cause of war. Storms cripple and kill. And from now on, the villain won't just be **mother nature**. It will - for the people hurt - be those dastardly emitters, Uncle Sam and John Bull. *Independent.co.uk* November 21, 2013 Thursday Forget the environment, climate change is now about people; And the politics of it are about to get very, very messy BYLINE: Memphis Barker
- 170- **Mother Earth** is a tough bitch; she is a third as old as the universe and has survived shock waves, asteroid impact, increasing heat from the sun and she will survive humans. *The Sunday Times* October 11, 2015 Sunday Keep cool and carry on; How we might buy time in the face of global warming BYLINE: Bryan Appleyard
- 171- One the one side are environmentalists who insist we must cut greenhouse gases or the world will be a smouldering flood-ridden place within the next 100 years. And on the flip side are the climate change deniers, who are convinced that what humans do industrially has little or no impact on global

climates, which they say are governed by **Mother Nature** and the Sun. But now, ahead of a major climate change conference in Paris later this month, NASA has revealed it is investigating so intensely both polar regions, that it may be able to soon discover which camp is right. *Express Online* November 26, 2015 Thursday Global Warming row: Could NASA be about to settle the great climate change debate? BYLINE: Jon Austin

172- Oscar winner Jennifer Lawrence is facing a backlash after appearing to suggest that the recent spate of deadly hurricanes to hit the US are '**mother nature's rage**' against President Donald Trump and his supporters. *MailOnline* September 8, 2017 Friday 'Blame Trump!' Outrage as Jennifer Lawrence claims Hurricane Harvey and Irma are **Mother Nature's** revenge on President for his attitude towards global warming BYLINE: JESSICA FINN

173- If Florida gleaned anything from Hurricane Andrew, the intensely powerful storm that tore a deadly trail of destruction across Miami-Dade County almost exactly 25 years to the day that Hurricane Harvey barreled into the Texas coastline, it was that living in areas exposed to the wrath of **Mother Nature** can come at a substantial cost *The Guardian* August 29, 2017 Tuesday How Harvey - and climate change - could change American real estate BYLINE: Richard Luscombe

174- Gore responded: "Well, hopefully his family will be the last to get fired" - a reference to Trump's daughter, Ivanka, being a climate change believer. His tone is messianic comparing the climate change fight to the titanic struggles which America and the world have fought and won - civil rights, gay marriage, women's suffrage, the anti-apartheid movement. All movements that triumphed after years of those in power saying "No". And, rather than everyone listening to him drone on, he said **Mother Nature** was doing his job better than he ever could. Everywhere you look there are fires, floods, storms and droughts turning the planet into something "like the Book of Revelations". *The Independent* August 10, 2017 Thursday This is what Al Gore really thinks of Donald Trump and climate change BYLINE: Anthony Harwood

175- It is, in essence, to let water in, where possible, not hope to subdue **Mother Nature**: to live with the water, rather than struggle to defeat it *The Independent* June 29, 2017 Thursday The Dutch have solutions to rising seas - and the world is watching BYLINE: Michael Kimmelman

NEW - Religion scenarios:

176- EARLY man is likely to have evolved in response to climate changes that eradicated a lush, watery **Eden** of lakes and woods in the Rift Valley of East Africa, said scientists yesterday. (...) The latest theory is that man's ancestors evolved in response to the stress of losing their watery **Eden**. (...) Until now it has been thought that the East of Africa got drier gradually, eventually forcing man's early ancestors to move out and colonise elsewhere. *THE DAILY TELEGRAPH* September 02, 2005, Friday Man's evolution linked to climate change BYLINE: Charles Clover

177- If there was a golden age for humans on the Earth - a Garden of **Eden** that flowed with milk and honey - it was the high point of the I Holocene, the era that followed the end of the last ice age. (...) It may have been from such places that the myths of past golden ages, and of the **Garden of Eden**, emerged. The people who departed from the Sahara would have taken their memories of a golden past. Biblical scholars have calculated mankind's expulsion from Eden at around 6,000 years ago, when kingdoms across the Sahara would have been collapsing. But the Eden need not have been in the Sahara: similar stories were played out elsewhere. (...) But, according to Chris Reij of the Free University in Amsterdam, improved farming methods, such as digging terraces and holding water on the land, may have encouraged a modest greening of parts of the Sahara, and the resulting vegetation

feedback could be one reason for the revived rains. But it would be a big step to predict from that a reversion to "**Eden**" days. (...) Will the Sahara desert expand and intensify as the drought theorists argue? Or will North Africa be reclaimed by a revived African monsoon? Megadrought or **Garden of Eden**? *The Independent* June 5, 2006 Monday Welcome to our future; Why deserts will inherit the Earth Few places on Earth are less hospitable, less suited to human life than the Sahara desert. BYLINE: Fred Pearce

- 178- Nobody seriously suggests that the climate isn't changing, but there is genuine uncertainty about what influences these changes. In these circumstances, surely it is wrong to demand drastic adjustments to our lifestyles which have no chance of being politically acceptable and even less of bringing us back to some idealised pre-industrial **Eden**? *The Sunday Times* June 4, 2006 Cool heads needed on climate change
- 179- Last month local politicians and activists met to discuss how to make Cornwall the 'green peninsula' of the UK. Welcome to Britain's new green **Eden**. (...) Proud of their independent traditions, language and flag, the Cornish may find that this crisis offers the route to self-sufficiency they have often craved. Welcome to the **New Eden**, surfboards and all. . . *The Observer* February 11, 2007 Another **Eden** is rising in the West: Cornwall has put itself at the cutting edge of new energy to beat global warming BYLINE: David Smith
- 180- So instead we place our faith in technology. In an age in which **science is as authoritative but, to most, as inscrutable as God once was**, we look to its products much as the people of the middle ages looked to divine providence. Somehow "they" will produce and install the devices - the wind turbines or solar panels or tidal barrages - that will solve both problems while ensuring that we need make no change to the way we live. *The Guardian* August 12, 2003 Comment & Analysis: With eyes wide shut: Climate change threatens the future of humanity, but we refuse to respond rationally BYLINE: George Monbiot
- 181- The last 600 years have seen a series of mini ice ages, well documented by those who shivered through them. They coincide with periods of low solar activity, and the next one is due in the middle of this century. So perhaps, instead of **prostrating** ourselves on the **altar** of global warming, we should be worrying about global cooling. *THE DAILY TELEGRAPH* September 20, 2004, Monday Afraid of global warming? Chill out BYLINE: Neil Collins
- 182- However much the letterhead issue has pained him, Bellamy has grown used to brushing off attacks. It is not the first time that he has found himself on the wrong side of the green lobby, and there is a definite potty streak to him (he wanted to be a ballet dancer until the realities of being a 14st 7lb 14-year-old hit home). He has committed **the cardinal sin** of conservationists by working hand in hand with industry, advising companies - including Shell - on how to be more environmentally friendly, through his Conservation Foundation. *The Sunday Telegraph* May 29, 2005, Sunday Still proud to be a crank Interview David Bellamy - botanist, broadcaster and failed ballet dancer - has always been lovably eccentric. BYLINE: Elizabeth Day
- 183- So we must change the way we live and work in order to repent of our **sins** -or as they put it now, "reduce our emissions". *The Times* February 4, 2005, Friday Global warming hotheads would burn sceptics at the stake BYLINE: Mick Hume
- 184- But the political discussion often seems to treat it as a simplistic moral parable, where man-made global warming **takes the place of an angry God punishing us for our sins**. *The Times* October 27, 2006, Friday Global warming BYLINE: Mick Hume
- 185- A new study shows that the catastrophic collapse of the Larsen B shelf, four and a half years ago, was man-made, **not an "act of God"**. It is thought to have been the first time that a major disaster has been proved to have been caused by global warming. *The Independent on Sunday* October 22, 2006 Cracking up; Ice turning to water, glaciers on the move - and a planet in peril BYLINE: Geoffrey Lean

- 186- It depends on revelation, not reality. Climate change forecasts that are used to terrify us are the result of exaggerating any effect of "climate change gases". It relies on original **sin**. CO2 comes overwhelmingly not from anything man created, but from breathing in and out. *The Daily Telegraph* October 31, 2006 Tuesday True belief in climate change and the practical steps that it makes necessary
- 187- And goodly Archbishop Rowan Williams, who self-evidently understands little about the science, has warned of "millions, billions" of deaths as a result of global warming and threatened Mr Blair with **the wrath of the climate God** unless he acts. By betraying the public's trust in their positions of influence, so do the great and good become the small and silly. *The Sunday Telegraph* April 9, 2006 Sunday There IS a problem with global warming... it stopped in 1998. BYLINE: BOB CARTER
- 188- **THE SEVEN DEADLY ECO SINS**; We all know global warming is a fact. And we'd all like to do something to make a difference. But where to begin? The answer, of course, is in our own homes and daily routines. *The Independent* August 14, 2006 Monday BYLINE: Donnachadh McCarthy
- 189- AS THE sun slips over the horizon at the Sardinian coastal town of Alghero, hotelier Massimo Macciocu raises a glass of red wine to toast global warming. For **the weather gods** have given him four extra months of business, putting a huge smile on the face of the ebullient islander. *Sunday Express* July 22, 2007 Sunday Island in the sun is a treat at any time BYLINE: JAMES MURRAY
- 190- It was the best and worst of US government: examining the issues in limitless detail, but ricocheting between fears of the immeasurable, whether China or **offending God's will** for the planet. *The Times* June 8, 2007, Friday Global warming is the big debate in America, too BYLINE: Bronwen Maddox
- 191- Man-made global warming has become **the new Act of God**, to be blamed for everything people fear or loathe. The numberwatch website has an impressive list ranging from A for allergies to W for world bankruptcy. *The Times* June 5, 2007, Tuesday My temper is rising. Must be global warming... BYLINE: Mick Hume
- 192- Fortunately, as the rest of the world quickly discovered to its horror, it took only a slightly more detailed perusal of the speech than Ambassador Gray had obviously given it to realise that this great capitulation by the United States was nothing of the sort. Mr Bush was not, after all, **kneeling at the altar of the Church of Environmentally Aware Correctness** and asking to be **baptised anew in the healing waters of Kyoto-style** targets and carbon emissions caps. *The Times* June 5, 2007, Tuesday On climate change, Bush is all heart BYLINE: Gerard Baker
- 193- The programme also saw global warming as fuelling an anti-capitalist environmentalism that was delaying the industrialised improvement of developing countries. You were left feeling that climate change was now less an issue and more a **doom-laden religion** demanding **sacrifice to Gaia** for our wicked fossil fuel-driven ways. Some of Durkin's interviewees certainly felt that they were being victimised as "**heretics**". *The Times* March 9, 2007, Friday The global warming debate overheats BYLINE: Ian Johns
- 194- THE ENVIRONMENTAL guru behind the radical theory that nuclear power must be embraced to stem the advance of global warming has given a "**hellfire and damnation**" **vision of the future** to the world's leading experts on climate change. *The Independent* June 4, 2004, Friday ENVIRONMENT GURU TELLS CLIMATE CHANGE EXPERTS TO GO NUCLEAR BYLINE: TED DAVENPORT
- 195- But what this study does show is that it is still too early to say for certain whether we are looking forward to a **greenhouse hell** - or whether the story of global warming is no more than a load of hot air. *DAILY MAIL* April 8, 2003 ye olde hot aire; Long, hot summers, vineyards in abundance ...the truth about medieval Britain that debunks the myth of global warming BYLINE: Michael Hanlon

- 196- As our atmosphere's carbon content rises inexorably, the world's ice sheets melt, and the climate changes, it is clear we are heading towards our own meteorological **hell**, albeit one of our own making. *The Observer* June 26, 2005 Turning the Tide: Planet in Peril BYLINE: Robin McKie
- 197- It's an inconvenient truth for Al Gore that hanging chads and the majority of Americans who regarded him as a sanctimonious SOB kept him from the Oval Office. The disgruntled would-be president then went on the road with his global-warming show, visiting so many countries that he's in danger of creating enough hot air to send us all to **hell**. *The Daily Telegraph* September 2, 2006 Saturday Standing room only Andrew English assesses Al Gore's cinematic attempt to warn Americans about global warming BYLINE: ANDREW ENGLISH
- 198- To read Lovelock and others is to sense a reincarnation of medieval **hell**. If we do not cease our **sinful** ways, they wail, we and our descendants will be damned to unspeakable torment in fiery furnaces. There was something of Hieronymus Bosch about Attenborough's programme. (...) Just as medieval man did not behave any better when threatened with hell, so it is unrealistic to expect his successors to surrender the gains of industrial progress on the strength of a J-curve. (...) Certainly evidence points to higher seas. But this has happened before and millions already live below sea level. The **apocalyptic** scenario requires some "tipping point" at which the entire world **goes to hell in a handcart**. *The Sunday Times* May 28, 2006 Global warming might not be so bad, if we keep our cool BYLINE: Simon Jenkins
- 199- So what about the theories expounded in the book *The Revenge Of Gaia*? If James Lovelock is right, our children will be living in a **greenhouse type hell**. *Daily Mail* January 31, 2006 Tuesday A scorched Earth? BYLINE: MICHAEL HANLON
- 200- On the other side of the Atlantic, today's hottest desert could be seeing a wetter future in the one-degree world. At the same time as sand dunes were blowing across the western US, the central Sahara was a veritable **Garden of Eden** as rock paintings of elephants, giraffes and buffalo, also dating from 6,000 years ago, attest. On the borders of what is today Chad, Nigeria and Cameroon, the prehistoric Lake Mega-Chad spread over an area only slightly smaller than the Caspian Sea does now. Could a resurgent north African monsoon drive rainfall back into the Sahara in a one-degree world? Models suggest it could. *The Guardian* April 23, 2007 Monday G2: Six steps to **hell** BYLINE: Mark Lynas
- 201- Even in the UK, a Government that wants us to cut our emissions plans to build tens of thousands of new homes on green-belt land. Every drop of concrete that replaces a hedgerow, spinney or water meadow is a stepping stone on the road to **hell**. Taxing Middle England will simply be a toll fee. *Sunday Express* March 18, 2007 Green taxes are no solution to climate change BYLINE: Stuart Winter
- 202- A PROPERTY executive has won the right to sue his employer over his claim that he was dismissed for his environmental views. An appeals tribunal ruled yesterday that environmentalism had the same protection in law as religious and philosophical beliefs. (...) Green beliefs as valid as **religion**, judge rules; Man allowed to sue over climate change views; Believing in climate change **'is like a religion'** *The Daily Telegraph* November 4, 2009 Wednesday BYLINE: Stephen Adams and Louise Gray
- 203- A "green crusade" has taken place around the world over the past few years, part of a broader phenomenon that could indeed be called "**green religion**". (...) This last quote is, perhaps, the most intriguing. The "**green religion**" meme has been repeated a thousand times by opponents of environmentalism. *Guardian.com* October 6, 2010 Wednesday Israeli government scientist fired for his views on evolution and climate change BYLINE: Leo Hickman
- 204- The clerics want us to get on our knees and humble ourselves before God (an old story). More recently, the greens, and many of our rulers, want us to **abase ourselves before their bureaucratic requirements in the name of a totally impersonal force, nature**. *telegraph.co.uk* May 6, 2008 Tuesday God, climate change and EU BYLINE: Bruno Waterfield

- 205- The medieval market in indulgences ended with the Reformation. You can imagine the outcome of this market in **modern sin**. Oceans of sackcloth-and-ashes piety from those who underspend their carbon credit, and badly informed abuse for people who like flying abroad on holiday. *The Daily Telegraph* May 27, 2008 Tuesday Doubt global warming and be prepared for a unholy row Notebook BYLINE: Harry Mount
- 206- The concept sounds like a clever variation of carbon offsetting, the now mocked method of allowing people to atone for their "carbon **sins**" - flying, driving, heating - by letting them pay for, say, a tree to be planted, or someone else, often in a developing country, to reduce emissions on their behalf. *The Guardian* September 13, 2008 Saturday: 13.09.08: Worthington's war: BYLINE: Leo Hickman
- 207- It's illuminating to discover that my heating thermostat is already set at an eco-friendly 17C ("Put it down one degree and you'll save pounds 200 a year," says Sepe); that my beautiful lavender-tinged Ulster woven Wilton carpet, which is apparently difficult to recycle, might not have been a very ethical purchase; and that bottled water is one of my biggest **sins**. *The Sunday Telegraph* March 30, 2008 Sunday Am I being led up the carbon path? BYLINE: Caroline Phillips
- 208- Not even **God believes in Anthropogenic Global Warming** any more, Archbishop *telegraph.co.uk* October 16, 2009 Friday BYLINE: James Delingpole
- 209- **There's as much proof that God took it out** on that county for producing Mary Coughlan, Daniel O'Donnell and Enya (singers) **than there is for the global warming theory**. *The Mirror* June 26, 2009 Friday GLOBAL WARMING FEARS DON'T HOLD MUCH WATER BYLINE: PAT FLANAGAN (my addition in parenthesis)
- 210- The cause has attracted influential supporters who believe that Christian ideas have something distinctive to offer an environmental campaign. The Bishop of London is one of the more prominent advocates. He argues that in any debate over the intergenerational ethics of climate change - how much we should **sacrifice** now for the sake of our children and grandchildren - the Church has plenty of experience to contribute. (...) Yet while **secular and religious greens** are starting to make common cause, this can still differ radically on ultimate ends. The Science Minister, Lord Drayson, told *The Times* recently that environmentalists should stop insisting that we **sacrifice** our lifestyles for the sake of the planet. (...) **Sacred** narratives can be used to motivate us to make **sacrifices** *The Times* June 20, 2009 Saturday It is time to love thy neighbour in a sustainable fashion BYLINE: Chris Smyth
- 211- For short of the collective apostasy of the Intergovernmental Panel on Climate Change, it is hard to imagine a more rewarding episode for sceptics who have always said that environmentalism is a matter of faith, not facts. For them, the most effective way of discrediting the movement is to depict it as an alliance of gullible consumers and doomy, secular preachers, who rant about **sin, self-scourging and the apocalypse** because they can't produce any evidence. *The Observer* November 8, 2009 Comment & Debate: Welcome to the age of the eco-martyr. BYLINE: Catherine Bennett
- 212- Guilty Western companies are absolved of their climate **sins** by paying for low-carbon projects in developing countries *The Times* December 3, 2009 Thursday Roll up. Roll up!; So much is riding on the Copenhagen summit BYLINE: Ben Webster
- 213- While the works mentioned, and plenty of others, are affecting in their response to the themes of global warming, there are others that seem to be floundering, afflicted by the **sins** of capitalism. Too many seem to be directed at art collectors, at hot trends, at money. Other works dabble in stagnant waters on the mistaken assumption that the neglected margins are cutting-edge. *The Times* December 2, 2009 Wednesday The end of the world? BYLINE: Joanna Pitman

- 214- Climate change denial has become one of the UK's most heinous corporate PR **sins**. *telegraph.co.uk* September 30, 2009 Wednesday Will Obama force corporate America's climate change sceptics to stand up? BYLINE: Rowena Mason
- 215- Can Obama save us from **hell**?; As G8 leaders in L'Aquila wrestle with climate change, Geoffrey Lean reports on the President's mission to prevent global catastrophe *The Daily Telegraph* July 10, 2009 Friday BYLINE: Geoffrey Lean
- 216- With temperature rises of the kind being forecast here, the Sahara, in effect, crosses the sea. And if Spain in 2080 looks like north Africa does today, what is north Africa going to look like? The Danakil depression in Ethiopia? **The seventh circle of hell?** (...) In the first instance, in other words, climate breakdown is a moral issue. We buy the fuel, other people pick up the bill; we get balmy Mediterranean temperatures, other people **get hell on Earth**. *The Guardian* - June 19, 2009 Friday Climate change: Comment: A sunny paradise for some, hell on Earth for others BYLINE: George Monbiot
- 217- RSPCA: not even your pet scorpion is safe from climate change **hell**. *telegraph.co.uk* May 27, 2009 Wednesday BYLINE: James Delingpole
- 218- iPod therefore I **sin**...; Unfortunately for the climate-change lobby, Lent is not about saving the planet *The Daily Telegraph* February 17, 2010 Wednesday BYLINE: George Pitcher
- 219- The weather **gods** must be climate sceptics. Why else would they choose the start of Cancún to smother Europe in snow? *Guardian.com* December 6, 2010 Monday Using doom and gloom so people take climate change seriously doesn't work
- 220- But, perhaps in the throes of one of His Old Testament rages, He would rather you didn't know. **God, alongside half the corporate world and many of its most powerful legislators, has declared war on the climate talks**. *Guardian.com* December 2, 2010 Thursday Cancún climate change summit: Is God determined to prevent a deal? BYLINE: George Monbiot
- 221- Denier's Myth Number Five: **Global warming is a religion**. People have always had an innate psychological need to believe in a **looming apocalypse** - this is just the latest version. Precisely the opposite is the truth. Global warming is based on very close empirical observation of the real world, and deductions based on reason. *The Independent* January 25, 2007 Thursday The last gasp of the global warming deniers BYLINE: JOHANN HARI
- 222- Once a **demigod** amongst thirtysomethings, who remember having their eyes opened to the wonders of science and numbers by this excitable boffin of 1980s TV, Ball is now treated as a sad and pathetic and possibly demented old man. Why? Because **he doesn't buy into climate change orthodoxy**. *telegraph.co.uk* February 18, 2011 Friday The persecution of Johnny Ball and how gross intolerance is crushing free debate on climate change BYLINE: Brendan O'Neill
- 223- Many view the vanishing lake as a **punishment from God or Allah**, but educated locals blame pollution from rich countries. *Sunday Mirror* February 6, 2011 Sunday LAKE DRIED UP, THERE IS NO FOOD MY YOUNGEST 2 CHILDREN DIED; CLIMATE CHANGE REAPS A GRIM HARVEST IN CHAD BYLINE: EMILY MILLER
- 224- The latest research shows that temperatures have not changed over the past 10 years but the **priests** of global warming - scientists who have **sacrificed** their duty to the truth - are still trying to "prove" that

doomsday is nigh. Well, it might be but it won't be our fault. *The Express* November 2, 2011 Wednesday
CLIMATE change is not [...] BYLINE: Peter Hill

- 225- For the past two years, ever since the disappointing Copenhagen climate summit, the 194 negotiating nations have stood indecisively at just such a junction. In one direction leads a steep and rugged pathway to a global agreement - legally binding on developed and developing countries alike - to cut emissions of the greenhouse gases that cause global warming. In the other lies a gentler and more beguiling roadway, paved with voluntary measures and good intentions, which looks like leading to an ultimately **hellish** climate. *telegraph.co.uk* December 19, 2011 Monday Durban deal gives world a chance; Climate change negotiators confounded sceptics as a new global alliance was formed, reports Geoffrey Lean
- 226- Global warming 250 million years ago would have caused '**hell on Earth**'; The sudden and extreme global warming that wiped out almost all life on the planet 250 million years ago would have created a **hell on Earth experience**, research has shown. (...) Huge amounts of carbon dioxide and/or methane from the largest volcanic eruption in history sent temperatures soaring, triggering raging wildfire which destroyed forests and turned fertile land into deserts. Meanwhile, shallow marine environments were drained of oxygen. *telegraph.co.uk* November 18, 2011 Friday
- 227- From its offices on Mt Ararat, the Daily Mail called down **the wrath of God** on the weathermen, who had been proven "hopelessly wrong" and were now "left red-faced". *The Guardian* January 3, 2012 Tuesday
Comment: That sleighbell winter? BYLINE: George Monbiot
- 228- Never has that been more true than in the case of those who **worship at the altar** of global warming. Even though temperatures peaked in 1998 and the world has been getting colder ever since, the warmists refuse to be deflected from their conviction that the planet is in meltdown. *MailOnline* June 12, 2012 Tuesday It's raining, it's pouring, that'll be the global warming... BYLINE: RICHARD LITTLEJOHN
- 229- (Preventing climate breakdown) It means forcing those industries to abandon the four-fifths or more of fossil fuel reserves that we cannot afford to burn. It means cancelling the prospecting and development of new reserves - what's the point if we can't use current stocks? - and reversing the expansion of any infrastructure (such as airports) that cannot be run without them. (...) But the self-hating state cannot act. Captured by interests that democracy is supposed to restrain, it can only sit on the road, ears pricked and whiskers twitching, as the truck thunders towards it. Confrontation is forbidden, action is a **mortal sin**. You may, perhaps, disperse some money for new energy; you may not legislate against the old. *The Guardian* December 4, 2012 Tuesday
Comment: Break the grip of corporate power to secure our future BYLINE: George Monbiot
- 230- Presumably, Professor Lovelock will now be donating all his royalties from his earlier alarmist bestsellers to help fund those proper, principled, decent scientists around the world - Fred Singer, Richard Lindzen, Bob Carter, Ian Plimer, Tim Ball et al - whose careers have been blighted and whose lives have been made misery for having said precisely what Lovelock is now admitting, only much, much earlier. And then, perhaps, using his cachet among his **greenie co-religionists** to make amends for his **sins** by calling for the abolition of the IPCC. *telegraph.co.uk* April 24, 2012 Tuesday 'Global warming? What global warming?' says **High Priest of Gaia Religion** BYLINE: James Delingpole
- 231- **Sacrificing** the Lake District, the Golden Valley, the Scottish islands, even the Wiltshire vales is like Aztecs killing virgins, evidence of the machismo of power in a **godly** cause. This is enhanced by a rerun of town/country antagonism, with metropolitan journalists shouting nimby at their country cousins (there being no danger of a power station on Hyde Park or Clapham Common). *The Guardian* July 17, 2009 Friday
Comment and debate: Ecotowns and turbines are a political slap in the face of the landscape BYLINE: Simon Jenkins

- 232- **Let's play God:** The scientific experiments that might save the world (or destroy it...); Fake volcanoes, giant space mirrors, oceans of iron filings... One of these ideas might save our planet from the worst effects of global warming - or destroy it. *Independent.co.uk* October 20, 2013 Sunday BYLINE: Memphis Barker
- 233- Our **sin** of omission: Removing climate change from the curriculum denies children the right to debate their own future *The Guardian* March 20, 2013 Wednesday BYLINE: John Ashton
- 234- Tragically, environmentalism has now been elevated **into a quasi-religion**, complete with its own well-rewarded **priesthood** and demands for cash to achieve **absolution for our sins**. Those who dare to challenge the green creed are treated like **heretics**. *The Express* January 14, 2013 Monday Global warming is nothing more than an expensive con BYLINE: Leo McKinsty
- 235- If you're a fairly youngish person reading this, you can expect one day to have bratty grandkids dancing around you taunting you about it. 'Ha ha ha! In Granddad's day they were afraid of carbon dioxide! Ha ha ha!' They will breathe on you. 'Look, look, I'm poisoning Granddad! Look, I'm destroying the planet with my poison breath! Oh no, Granddad - I think I'm going to fart - shall I put a cork in? Granddad, there's a cow in the field going to fart - shall we kill it? Granddad, do you think Mummy **will burn in hell for driving a car?** Do you call them **the Devil's Chariot**, Granddad? Do you think light-bulbs are **sinful**, Granddad? Do you flog yourself when you turn one on? Do you think Mummy was **sinful** for having children, Granddad? Should I not have been born, Granddad? Granddad ... you're choking me...' *telegraph.co.uk* November 27, 2013 Wednesday Why climate change is (still) far too important to be left to scientists BYLINE: James Delingpole
- 236- Ireland Floody **hell**..it's climate change *Daily Mirror* September 17, 2013 Tuesday BYLINE: DEMELZA de BURCA
- 237- 350.org, the US-based environmental campaign group which aims to build a "global grassroots movement to solve the climate crisis", has launched a new petition. It wants its supporters to urge the World Meteorological Organization to name hurricanes after "deniers and obstructionists". (...) Of course, the campaign has zero chance of succeeding. **Hell would glaciare** before the WMO would consider such a request. *Guardian.com*. August 28, 2013 Wednesday The era of climate change 'denial' is over BYLINE: Leo Hickman
- 238- CLIMATE CHANGE; **Snow hell** 1yr on from heatwave *The Sun* March 20, 2013 Wednesday BYLINE: GORDON TAIT
- 239- Never underestimate the willingness of powerful people to ignore the evidence they find inconvenient. Never underestimate their willingness to appease industrial lobbyists by repeating the nonsense they generate. Never underestimate their readiness to **sacrifice** the common interests of humankind for the sake of a **belief** they refuse to abandon. *The Guardian* September 17, 2013 Tuesday Comment: How much longer can MPs resist this flat-Earth love-in? BYLINE: George Monbiot
- 240- **Are we playing God with Earth?** Scientist admits he is 'terrified' of the technology being developed to stop global warming *MailOnline* November 26, 2014 Wednesday BYLINE: BEN SPENCER and JONATHAN O'CALLAGHAN
- 241- Zealot of US climate change sceptics Jim Inhofe to determine environmental policy; US environmental policy is in line to handed to senator who says **God, not people, changes the climate** *Independent.co.uk* November 10, 2014 Monday BYLINE: Tim Walker
- 242- Along with his colleague, Partha Dasgupta of Cambridge University (where a cold wind blows straight from the Urals), the professors have made a plea that shocked the science community. **They're calling**

for God to enter the debate on climate change. (...) Religion and the science of climate change might seem strange collaborators, but they shouldn't. Even in wealthier, urbanised parts of the world, where we're supposedly removed from the effects of nature, there's a communal awareness of that "intricate link". It's the sort of folk knowledge that isn't quite science and isn't quite superstition either. *Independent.co.uk* September 21, 2014 Sunday Time for **God to step in on climate change** BYLINE: Ellen E Jones

- 243- For the purposes of a nice snappy headline, it's sort of like a fight between **Gods and coal** (except Buddhists don't really have gods... but if the Buddhists will forgive me?). (...) IT's probably the closest thing the coal industry will ever get to actually **receiving the word of a god** - or rather, **a note from several gods as well as other various prophets, spiritual leaders and the like.** *The Guardian* December 5, 2014 Friday **Gods and faith versus Coal** in name of climate change BYLINE: Graham Readfearn
- 244- This is an interesting one, given that the latest evidence shows that, right now, the Arctic isn't "melting so fast": indeed, Arctic ice coverage has just increased by 50 per cent. So maybe our recent floods are not, therefore, the work of the melting Arctic, but of some other agency. But what? **Perhaps it is the Norse Gods.** (...) All of which raises a fascinating possibility. Perhaps man-made climate change is all in the mind - because, in our instinctive terrors, we always think that something wicked this way comes, especially from the sky: **as a punishment from God,** for things we have done. This paranoia, should it exist, would be hardwired into the human psyche, so we would rarely notice it - as the mind deceives itself. *telegraph.co.uk* January 13, 2014 Monday What if man-made climate change is all in the mind? BYLINE: By Sean Thomas
- 245- Inside the perimeter, guarded by missile batteries, armoured cars, 1,500 police and hundreds of armed UN security officers, France had laid on a spartan **Eden** for the climate-aware. There were avenues, little gardens, a big model Eiffel Tower, all harmonised with naked chipboard, used for walls, stairs and even the lecterns. It was from these symbols of sustainable austerity that leaders held forth - in two parallel assemblies. *The Times* December 1, 2015 Tuesday Obama and Putin show global warming has its limits BYLINE: Charles Bremner
- 246- If there is a **weather god,** we aren't it, yet. *The Guardian* February 16, 2015 Monday Can the CIA weaponise the weather? BYLINE: Patrick Barkham
- 247- Those who have dedicated their lives and careers to your industry must sometimes feel your virtues go unacknowledged while the **sins** of the world are heaped at your door. *The Guardian* March 31, 2015 Tuesday Open letter to Shell's Ben van Beurden from John Ashton BYLINE: John Ashton
- 248- Those assets stored in CO2-neutralising trees have become a tradeable resource. CO2-belching corporations can purge their emission **sins** in freshly seeded woods. *The Independent* November 27, 2015 Friday We can't see the wood for the trees BYLINE: BOYD TONKIN
- 249- It is cost-effective to postpone global climate action. It is profitable to let the world go to **hell.** I believe that the tyranny of the short term will prevail over the decades to come. As a result, a number of long-term problems will not be solved, even if they could have been, and even as they cause gradually increasing difficulties for all voters. *The Guardian* January 20, 2015 Tuesday 'It is profitable to let the world go to **hell**'; As politicians and business leaders gather in Davos, climate expert Jørgen Randers argues that democracy will continue to hamper climate action How concerned are CEOs about climate change? BYLINE: Jo Confino
- 250- Much on show, for instance, has been our favourite "pantomime dame", Prof Julia Slingo, the Chief Scientist for the Met Office, with her organisation's latest bid to alarm us by giving cute little names

such as "Storm Eva" to all these episodes of seasonal wind and rain, which may be **hell** for those flooded out, but are technically not "storms" at all. *The Sunday Telegraph* December 27, 2015 Let's all boo the global warming panto villains BYLINE: CHRISTOPHER BOOKER

- 251- A great many formerly backward countries are at last getting rich and they will not **sacrifice** their new prosperity on the **altar** of ecovirtue. *The Daily Telegraph* November 30, 2015 Monday The end is nigh for climate-change activists BYLINE: CHARLES MOORE
- 252- Sir Tim has set himself the challenge of creating an **Eden** on every continent, bar Antarctica, and he's getting to work in Hobart, Tasmania. This week Australian MPs discussed plans to build an **Eden** on an 8.6-hectare site - although, strangely, concerns were raised about the initiative being "too green". *The Independent* June 10, 2016 The jolly green giant's grand designs; ENVIRONMENT
- 253- End of the world: **God** NOT climate change will cause apocalypse, says Express.co.uk poll *Express Online* January 7, 2016 Thursday BYLINE: Jon Austin
- 254- Most heinous of all the **sins** of emissions is what has happened to our air quality since climate change climbed the political agenda 20 years ago. *The Guardian* February 20, 2016 Saturday Climate change politics is blinding us to the devastating effects of dirty air BYLINE: John Vidal
- 255- Geoengineering is a word that covers a multitude of **sins**, but in this case it refers to sucking CO 2 out of the atmosphere and burying it. *The Guardian* January 29, 2016 Friday 'If the world ends in 2100, we're probably OK'; Two scientists take the long view on climate change. BYLINE: Howard Lee
- 256- 2016 hottest year ever; Climate change putting world in danger of 'extreme weather **hell**' *Daily Mirror* November 15, 2016 Tuesday BYLINE: STEPHEN WHITE
- 257- Millions of Brits set for hay fever **hell** - and it's all because of climate change *mirror.co.uk* August 25, 2016 Thursday BYLINE: Andrew Gregory
- 258- **Hell** Niño; SUNDAY ISSUE the MARINE LIFE OFF OUR COAST AT RISK AS GLOBAL WARMING BITES *The Sun* January 17, 2016 Sunday
- 259- It's the near future, the world is in energy-crisis **hell**, nothing's coming out of the Middle East any more because of what's happening there, and the US has gone it alone. *The Guardian* January 14, 2016 Thursday Great Barrier Reef with David Attenborough review - a heavy message but plenty of sharks BYLINE: Sam Wollaston
- 260- **Hell and high water**: 'freak' weather to become the norm; Last month's wet and warm conditions are in part due to climate change, say most experts - and 'normal' no longer applies to forecasts. *The Independent* January 2, 2016 Saturday By STEVE CONNOR
- 261- Fear of a Brexit **apocalypse** seems to have prompted May to **sacrifice** the fight against climate change in the hope of avoiding a recession that would almost certainly see her removed from office - by her own side, if not Labour. *The Independent* July 15, 2016 Friday Killing the climate change department could be Theresa May's first and biggest mistake BYLINE: Ian Johnston
- 262- I'm proud of the many Christians who will march on April 29 th in the People's Climate March. Around the world people of faith will speak with one voice about the dangers of climate change, and the opportunities for good, renewable, clean-energy energy jobs. Environmental justice and economic

justice go hand in hand. Clean energy is rapidly outpacing fossil fuels in creating jobs -the solar industry already employs twice as many people as coal. We are called to be stewards, tending what's left of **Eden**. *The Guardian* April 22, 2017 Saturday Christian Earth Day lessons: worship by protecting creation; Climate change is a global pro-life issue BYLINE: Paul Douglas

- 263- Stephen Hawking marks his 75th birthday with a warning that Donald Trump has doomed the planet to 'irreversible' global warming that could see Earth subjected to a 250 degree **hell** like Venus (...) President Trump announced last month that the US would be withdrawing from the Paris Agreement. (...) Nearly 200 countries have previously agreed to the carbon emission reduction plan. (...) Trump has stated he wishes to renegotiate the terms of the agreement signed up to by the US, to ensure the US economy and business are not damaged by it. (...) But Professor Hawking has warned that the decision could have dire consequences. *MailOnline* July 2, 2017 Sunday BYLINE: TIM COLLINS

NEW - Deterioration of nature

NEW - DAMAGED BODY scenarios:

- 1- The proposal for a Hollywood sci-fi movie? No. This idea is under serious discussion. The US has already spent around \$100 million to curb climate change by giving the Earth **a new set of "lungs"**. (...) The **lungs** would consist of vast colonies of bacteria and other microbes that are able to scrub the atmosphere of greenhouse gases such as carbon dioxide and methane. As a bonus, they may even convert the pollutants to ethanol, which can be used as a fuel. (...) He concedes that the idea of persuading **the planet's microbial lungs** to take deeper breaths sounds "too science fiction and far-fetched". But Dr Patrinos stresses that the current focus of the "Genomes to Life" project is in basic research: to understand how living things manage their astonishing metabolic feats. (...) The **lungs** might have to be capable of capturing from the atmosphere 300 million tons of carbon dioxide per year, much more than could be achieved with Kyoto. (...) The communities that make up the **lungs** could be concentrated in mines, deep aquifers or deserts. Perhaps soil microbes could be persuaded to hang on to more carbon. Ditto those in the world's oceans. *THE DAILY TELEGRAPH* September 29, 2004, Wednesday Can these bugs save the planet? BYLINE: Roger Highfield

- 2- The Amazon rainforest has been called the **lungs** of the planet, its billions of trees recycling the atmosphere and producing the oxygen vital for all animal life. *Sunday Express* October 16, 2005 PREPARE FOR HOTTEST YEAR EVER BYLINE: Stuart Winter

- 3- Climate change is **killing** the oceans' microscopic '**lungs**' *The Independent* December 7, 2006 Thursday BYLINE: Steve Connor

- 4- The rainforests are the "**lungs**" of the Earth. Continued deforestation clearly increases carbon dioxide in the atmosphere. The forests, which turn that carbon into oxygen - vital for life - also rely on almost constant rainfall. *Sunday Mirror* November 5, 2006 Sunday MELTDOWN; EXCLUSIVE: MAN BEHIND THE BBC'S PLANET EARTH REVEALS THE DEVASTATING COST OF GLOBAL WARMING BYLINE: NIGEL BLUNDELL

- 5- IF you buy something made of wood, look for a FSC mark that will mean it comes from a managed forest. Trees are the **lungs** of the world and absorb up to seven billion tonnes of carbon every year. Plant one, or give one as a present. *The Mirror* October 30, 2006 Monday SO WHAT ON EARTH CAN WE DO ABOUT GLOBAL WARMING?; SAVE THE PLANET WEEK ..HERE'S HOW YOU CAN HELP BYLINE: ROS WYNNE-JONES

- 6- Or at least it had done so until recently. Then along came nasty humanity - a species he (J. Lovelock) likens to a **plague**, with our fossil fuels - and we **stabbed Gaia in the heart**. Her revenge will be to kill us all - nearly. *Daily Mail* January 31, 2006 Tuesday A scorched Earth? Let's stay cool BYLINE: MICHAEL HANLON (my addition in parenthesis)

- 7- The rainforests of the Amazon, the Congo basin and Indonesia are thought of as the **lungs** of the planet. *The Independent* May 14, 2007 Monday Fourth Edition Burning forests 'is main agent of climate change' BYLINE: Daniel Howden
- 8- Our world is clearly in peril and is already showing **symptoms of suffering**. Today climate change kills many more people than terrorism, the government's chief scientific adviser, Sir David King, argues. The 30,000 people who perished during Europe's scorching summer of 2003 are a grim example of this point. *The Observer* June 26, 2005 Turning the Tide: Planet in Peril BYLINE: Robin McKie
- 9- How is it being affected? Death Valley is often held up as an example of what will happen to the rest of the world if we do not heed the warning signs of climate change. But it too will **suffer**. Death Valley is a sensitive environment that straddles a fault line. *The Independent* July 27, 2006 Thursday HOW THE WEST WAS WITHERED. BYLINE: David Us borne
- 10- The sun was no longer **strong enough** to make good and **revive** the rains. Suddenly, what had been a feedback that kept the Sahara watered became a feedback that dried it out. The system had passed a threshold, and it never **recovered**. The green Sahara had become a brown Sahara. The North African monsoon rains had **died**. *The Independent* June 5, 2006 Monday Welcome to our future; Why deserts will inherit the Earth Few places on Earth are less hospitable, less suited to human life than the Sahara desert. BYLINE: Fred Pearce
- 11- The whole planet is about to fry because of global warming caused by manmade carbon dioxide emissions, one of the **antidotes** to which is the beneficent oxygenation of the Earth by the tree world which soaks up carbon dioxide. *Daily Mail* January 13, 2006 Friday Does this prove that global warming's all hot air? BYLINE: MELANIE PHILLIPS
- 12- They have long been thought of as **the antidote to harmful** greenhouse gases, **sufferers** of, rather than contributors to, the effects of global warming. But in a startling discovery, scientists have realised that plants are part of the problem. *The Guardian* January 12, 2006 Thursday Science: Global warming: blame the forests BYLINE: Alok Jha
- 13- Simply cutting carbon emissions is not going to be enough. Our planet is **sickening**. Habitat destruction, exploding populations and unchecked development, to name a few **ailments**, are all contributing to **its terminal condition**. *Sunday Express* March 18, 2007 Sunday Green taxes are no solution to climate change BYLINE: Stuart Winter
- 14- Yesterday I found the perfect **antidote** to pollution and global warming. For the cost of travelling five miles, I was able to walk along the Ridgeway, one of England's oldest tracks, undisturbed by four-wheel drives or motorcycles thanks to the winter ban, look in awe at the beautiful landscape and then be treated to the thrill of a 20-minute aerial display by a pair of red kite as they majestically circled above me. *The Daily Telegraph* February 6, 2007 Tuesday Global warming: fears and forecasts
- 15- In a sense, it is encouraging that there is a growing scientific consensus that industrial pollution is responsible for the accelerating increase in world temperatures, for in theory, at least, that activity is under our own control. When it was shown that the ozone hole was due to the use of CFCs, international regulatory agreement was able to reverse that process by banning the **offending** agents. Nature, fortunately, has remarkable powers of **self-recovery**, as has been shown many times over. *The Independent* January 23, 2001, Tuesday MR BUSH CAN'T DENY THE CAUSE OF GLOBAL WARMING. BUT WILL HE DO ANYTHING?

- 16- Fretting that **gaping holes in the ozone layer were letting in nasty** ultraviolet rays that are going to do for us all? Relax - according to Michael Crichton, it just ain't so. *The Express* December 31, 2004 EPIC DISASTER AS THE GLOBAL WARMING ROW GETS HEATED BYLINE: GRAHAM BALL
- 17- At last! They cry exultantly. We told you so! Global warming is here! Now will you take notice? Leave your cars to rust in the garage, or abandon them by the wayside. You've seen nothing yet. The sun will get still hotter and **the hole in the ozone layer** will grow larger, as you go on pumping out **your deadly greenhouse gases!** *THE DAILY TELEGRAPH* August 08, 2003, Friday Climate Change BYLINE: Peter Simple
- 18- Similarly, asking the airlines themselves to cut back is going to be met with a hollow laugh- growth is their very **lifeblood**. Even when they join the EU's emissions trading scheme, designed to cut CO2 right across Europe, they will not actually cut back their emissions - they will simply buy permits to continue pushing them out, and so carry on growing. *The Independent* March 1, 2008 Saturday Proof that we are not taking climate change seriously BYLINE: Michael McCarthy
- 19- Yesterday a government-commissioned review by the businessman Johan Eliasch spelled out this steely logic. It made an overpowering financial case for investing in the world's arboreal **lungs**. *The Guardian* October 15, 2008 Wednesday Leading article: Climate change: Seeing the wood
- 20- Rainforests are the **lungs** of the Earth but we are **choking** them through our appetite for meat, say environmentalists. *The Observer* September 7, 2008 News: Special report: Is our taste for Sunday roast killing the planet? BYLINE: Robin McKie and Caroline Davies
- 21- This would not come remotely as a surprise to people of my generation, who were taught at school that carbon dioxide was the **lifeblood** of plants, but will perhaps be a shock to the present generation of schoolchildren who are being lectured that man-made CO2 is tantamount to **poison**. *The Independent* October 13, 2009 Tuesday Here's another phoney war: the one on climate change BYLINE: Dominic Lawson
- 22- The entire Amazon region is the largest green **lung** in the world. Its trees and plants produce one-fifth of the Earth's oxygen and absorb as much CO2 every year as is created by the burning of fossil fuels in the entire EU. Preserving the natural environment in this area is a key element of the fight against global warming. *The Sunday Times* November 29, 2009 THE AMAZON'S DIRTY WAR BYLINE: Christine Toomey
- 23- The country is home to the threatened Amazon rainforest, 25 times the size of Britain, often known as "the **lungs** of the planet". *The Sun* March 9, 2009 Monday Eight years left to save the planet; CHARLES' GLOBAL WARMING PLEA BYLINE: BEN JACKSON
- 24- It covers an area 25 times bigger than Britain, is home to a bewildering concentration of flora and fauna and is often described as the "**lungs** of the world" for its ability to absorb vast amounts of carbon dioxide through its immense photosynthetic network of trees and leaves. *The Independent* March 6, 2009 Friday Revenge of the rainforest; The Amazon has long been the **lungs** of the world. But now comes dramatic evidence that we cannot rely on it in the fight against climate change. BYLINE: Steve Connor
- 25- We think of those whose womenfolk plait the hair under their armpits in solidarity with the world's oppressed, whose men don't wash for months on end for fear of polluting **Mother Gaia's precious clear lifeblood** with soap suds; we think of people who can't eat meat, not even a turkey at Christmas, because their strange, backwards religion confines them to bean shoots, mung beans or organic tofu roast. *telegraph.co.uk* December 5, 2010 Sunday Campaign Against Climate Change: a Christmas appeal BYLINE: James Delingpole

- 26- It is the job of climate champions to reverse this outlook, and their training begins with the study of forests - the **lungs** of the earth. *The Daily Telegraph* March 20, 2010 Saturday Climate crunch; Bankers may not be the world's most popular people, but at HSBC they have the good of the planet at heart BYLINE: Serena Allott
- 27- Satellite pictures show how global warming has shrunk Chad's **lifeblood** basin from 25,000 square kilometres to just 1,350 in 40 years. It was the size of Munster in 1963, but is now smaller than Co Kildare. *Sunday Mirror* February 6, 2011 Sunday LAKE DRIED UP, THERE IS NO FOOD MY YOUNGEST 2 CHILDREN DIED; CLIMATE CHANGE REAPS A GRIM HARVEST IN CHAD BYLINE: EMILY MILLER
- 28- But soon it will be necessary to look the bogey of global warming in the face again. That means admitting the importance of limiting population growth. It means protecting the rainforests, which act as the planet's **lungs**. It means not automatically sneering at plans for electric cars, nuclear power and such things. *The Times* December 8, 2011 Thursday The Attenborough Guide to saving the planet; In the end he didn't speak out about climate change after all. He just showed us the pictures and let us decide BYLINE: Camilla Cavendish
- 29- We're told, endlessly, that climate change will mean the end of the Amazon, of the tropical forests, and the Earth will lose its **lungs**. It appears that this is not wholly and completely true. Actually, an increase in CO₂ in the atmosphere is likely to lead to the growth of huge, new, tropical forests. *telegraph.co.uk* July 9, 2012 Monday Climate change will mean new and larger tropical forests BYLINE: Tim Worstall
- 30- Indeed, many scientists now believe we passed the point of no return when we breached the 350ppm carbon dioxide level in 1990. This was the maximum figure our planet could **tolerate** without **suffering** some climate change. *The Observer* December 26, 2010 After a wasted year, climate change must once again be our priority BYLINE: Robin McKie
- 31- Global warming is of this sort, so that words such as "likely" and "probable" are used when making predictions. For those who do not understand statistics, these sound weak compared with the unsubstantiated rhetorical certainties of the deniers. The situation might be compared to **a doctor telling a patient that he is likely to die in a few weeks if he does not undergo certain treatment. The doctor is not being "alarmist" even though he knows that the patient might survive for longer than expected. Similarly, the patient would be extremely foolish to ignore the advice.** *The Observer* February 14, 2010 The big issue: global warming Sceptics are putting words in my mouth
- 32- A multinational study has found that an increase in precipitation in the region would lead the water in the Baltic to become less salty. Such a decrease in salinity would change the make-up of sea life, which is already **suffering** from over-fishing and **harmful** chemicals. *The Independent on Sunday* June 26, 2011 Fears for Baltic's marine life as global warming decreases the salt in the sea BYLINE: Paul Bignell
- 33- **Green cure for a nosebleed: choke the patient;** Climate change is real, but our **remedy** is excessive, futile - and it's strangling the poor *The Times* April 5, 2011 Tuesday BYLINE: Matt Ridley
- 34- Depending on your temperament, within 24 hours or so, the world will have a climate change agreement that should limit carbon emissions and restrict temperatures to a 2C rise; or the talks will fall apart and the chance of an agreement will be lost for ever. (...) Thirty-six hours ago, country after country lined up to suggest that the talks, **if not dead, were on life support.** *The Guardian* December 18, 2009 Friday Climate change: Copenhagen Summit: Last lap Blowing hot and cold BYLINE: John Vidal
- 35- So when sceptics tell me not to worry about climate change, I don't buy it. We are interfering with major geological forces. Carbon dioxide is the planet's thermostat. Nature has flicked the carbon switch before. Now we are flicking the switch again. We are interfering with the **planet's life support systems.** *The Guardian* November 30, 2009 Monday Copenhagen 2009: Why Copenhagen matters BYLINE: Fred Pearce

- 36- But it's like the Montreal Protocol, the international agreement that was made to **cure the hole** in the ozone layer. It took two years after the protocol was signed for someone to work out how to do it. It was actually Margaret Thatcher who put the bones on it and came up with the hard targets. *The Sunday Times* November 15, 2009 What does climate change mean to you?
- 37- And the danger gases that caused the **hole**, CFCs in aerosols and fridges, also added to climate change, so a ban gave the planet's **welfare** a double boost. The **hole** in the ozone layer is now set to disappear by 2073. That will cut the number of skin cancer victims globally by 20million. *Daily Star* September 21, 2010 Tuesday GLOBAL WARMING: IT'S ALL A LOAD OF HOT AIR BYLINE: EMILY HALL
- 38- Inside the building, Spencer Finch's contribution looms large over the staircase leading up to the galleries. A hovering amorphous mass of blue, made from what looks like a mound of discarded transparent Christmas wrapping, has been suspended from the ceiling. It is perhaps intended to evoke the **frailties** of the Earth's atmosphere, like a **hole** in the ozone layer brought down to earth. *The Sunday Telegraph* January 10, 2010 Warming to a theme; art Despite occasional preachiness, this exhibition on climate change is a cautionary memorial with some striking pieces BYLINE: ANDREW GRAHAM-DIXON
- 39- Their prediction caught enormous attention and was strongly challenged partly because the non-toxic properties of CFCs were thought to be **environmentally safe**. Their work gained widespread recognition more than a decade later with the discovery of the ozone **hole** over the Earth's polar regions. *telegraph.co.uk* March 12, 2012 Monday Prominent Global warming scientist F Sherwood Rowland dies aged 84;
- 40- Opec: Oil demand to hit 111m barrels by 2040 despite climate change; World's leading oil producing group sees crude remaining as the world's economy **life blood** through to 2040 as Asian demand grows *telegraph.co.uk* November 6, 2014 Thursday BYLINE: Andrew Critchlow
- 41- The jungles of the Amazon, sometimes called the **lungs** of the planet, absorb huge quantities of carbon dioxide, the main cause of global warming. Logging is meanwhile the second most important source of emissions. *i-Independent* September 24, 2014 Brazil refuses to sign up for plan to save rainforest BYLINE: David Osborne
- 42- The fit of pique gravely undermines the declaration, which was meant as a centre-piece of the one-day summit. The Amazon jungles, "the **lungs** of the planet", absorb huge quantities of carbon dioxide, the main cause of global warming. Logging is the second biggest source of emissions. *Independent.co.uk* September 24, 2014 Wednesday Climate Change summit: Brazil refuses to sign UN's pledge to slow deforestation BYLINE: David Osborne
- 43- One of the last great wildernesses on earth - known as the **lungs** of the world - is balancing dangerously close to a "tipping point" where forest fires will become so commonplace and extensive that they will change much of the landscape forever, scientists said. *The Independent* April 15, 2014 Tuesday Fires could turn Amazon rainforest into a desert; Human activity and climate change a threat to 'lungs of the world', says study BYLINE: STEVE CONNOR
- 44- And there lies the problem. Fossil fuels such as oil, gas and the biggest environmental villain of them all, coal, remain the **lifeblood** of the global economy. *telegraph.co.uk* January 8, 2015 Thursday Climate change scaremongering won't trouble oil junkies BYLINE: Andrew Critchlow
- 45- Add to these the importance of caring for the Amazon rainforest - the "**lungs** of the planet", which stores more carbon dioxide than anywhere else on Earth - and it becomes clear why social and environmental progress in Brazil is at least as important as its economic growth. *The Guardian* May 6, 2015 Wednesday Brazil struggles with drought and pollution as Olympics loom large BYLINE: Matthew Wheeland

- 46- So putting the focus back on to land as free-to-access "green **lungs**" is not a case of taking off in a new direction, but rather of going back. Except the threats facing the natural landscape are rather different now. *The Sunday Telegraph* April 5, 2015 The greening of a national treasure BYLINE: Peter Stanford
- 47- From the Amazon to the Nile to the Mekong, rivers are a **lifeblood** for many nations, filling taps and irrigation canals and generating hydroelectricity that is powering economic development.(...) Likewise, China, Laos and others are building dams on the Mekong, the **lifeblood** of south-east Asia, even though van Vliet's study suggests the river will **suffer** reduced flows in future. (...) On the face of it hydroelectricity seems an obvious **antidote** to climate change. Hydrodams are among the world's largest power sources and free of carbon emissions *The Guardian* January 27, 2016 Wednesday From the Nile to the Amazon, climate change threatens hydropower BYLINE: Fred Pearce
- 48- Salt Lake is warming at twice the rate seen in other parts of the country, and is running out of water. The city's water is the **lifeblood** for over a million residents in the area. *The Independent* June 18, 2017 Sunday US states to fight climate change after Donald Trump pulls out of Paris agreement BYLINE: CLARK MINDOCK
- 49- And the experts warned climate change was not a distant problem that would happen somewhere else but an "immediate and grave threat" that, **like a patient who was gravely ill**, needed action straight away with the technology available *mirror.co.uk* June 23, 2015 Tuesday Climate change to have 'catastrophic' impact on our health warn experts BYLINE: Andrew Gregory
- 50- Either the humans or the rivers have to **suffer**. At the moment, it is the rivers, although in the longer term a **sick** river will produce less water, so the humans will end up in trouble as well. *The Guardian* October 12, 2015 Monday Britain's water crisis BYLINE: Nick Davies
- 51- My family were lucky: the only thing ruined for us was Boxing Day. Yet weather reports seemed like **terminal diagnoses** and left us feeling powerless, at the mercy of something huge and unforgiving. *Independent.co.uk* December 27, 2015 Sunday I'm trapped in my home thanks to the flooding, why can't anyone admit that this is climate change? BYLINE: Ellie Mae O'Hagan
- 52- That sort of attitude spells trouble for us all in the long term. While the motion's signatories see that, too many in investment circles suffer from environmental **myopia**. *Independent.co.uk* January 20, 2016 Wednesday Climate change can wait for too many investors in oil; Outlook BYLINE: James Moore
- 53- Ice in the Arctic staged a surprise **revival** in 2013, bucking the long-term trend of decline, according to the first analysis of the entire ice cap's volume. The **revival** was the result of cooler temperatures that year and suggests that, if global warming was curbed, the Arctic might **recover** more rapidly than previously thought. *The Guardian* July 21, 2015 Tuesday Arctic sea ice volume showed strong **recovery** in 2013; Cooler temperatures **revived** sea ice levels suggesting a rapid **recovery** was possible if global warming was curbed, scientists say BYLINE: Damian Carrington
- 54- The Earth's **protective ozone layer** is slowly **recovering**, United Nations scientists report, but the unintended knock-on effect is increasing climate change. Successful implementation of the 1987 Montreal Protocol, aimed at reducing Ozone Depleting Substances (ODSs) including many chemicals used in aerosol cans and refrigerators, mean the ozone layer is expected to **recover** to 1980 levels by the middle of this century. (...) But the ozone layer is still far from **healed**. The long-lasting chemicals still lingering in the atmosphere create an annual autumnal ozone **hole** above the extreme Southern Hemisphere and the **hole** hasn't closed up. *Independent.co.uk* September 11, 2014 Thursday Ozone layer is **healing** - but we are now contributing to climate change more than ever; Montreal Protocol saw decrease in use of ozone-**harmful** chemicals but substitutes are thought to considerably increase climate change emissions BYLINE: Rose Troup Buchanan

- 55- If a switch happens, we would be exposed to solar winds capable of **punching holes** into the ozone layer. *MailOnline* January 31, 2014 Friday Forget global warming, worry about the MAGNETOSPHERE BYLINE: ELLIE ZOLFAGHARIFARD
- 56- Ozone itself is a greenhouse gas and its reduction has seen more heat reflecting back into space. Although the ozone **hole** has begun to show the first signs of **recovery**, levels are still significantly reduced. *The Guardian* March 13, 2015 Friday Why is Antarctic sea ice at record levels despite global warming? BYLINE: Karl Mathiesen
- 57- The ozone **hole** is slowly **recovering**, and HFCs are now seen as just a small part of the climate change problem. If only it took just a few nights of negotiations to eliminate fossil fuels, too. *The Observer* October 15, 2016 Saturday Kigali deal on HFCs is big step in fighting climate change BYLINE: John Vidal
- 58- A further reason is because **the hole in the ozone layer** - caused by gases in aerosols called CFCs - is beginning to **heal up** - helping to shield Antarctica from solar radiation. The **hole** has started to close since the polluting CFCs have been banned. *MailOnline* July 21, 2016 Thursday A FIFTH of global warming in the past 150 years has been missed by historical records due to 'quirks', Nasa study claims BYLINE: MARK PRIGG
- 59- The **hole** in the ozone layer over the Antarctic has finally begun to **'heal'** after persisting for years. (...) A further reason is because the **hole** in the ozone layer - caused by gases in aerosols called CFCs - is beginning to **heal up** - helping to **shield** Antarctica from solar radiation. The **hole** has started to close since the polluting CFCs have been banned. *MailOnline* July 20, 2016 Wednesday The Antarctic is COOLING BYLINE: COLIN FERNANDEZ
- 60- The **hole** in the ozone layer over the Antarctic has finally begun to **'heal'** after persisting for years. *MailOnline* July 8, 2016 Friday Climate change is already killing people BYLINE: ABIGAIL BEALL

NEW - DAMAGED CONTAINER scenarios

- 61- Other attempts by man to reduce pollution for other reasons are now known to increase global warming. The complex atmospheric changes which cause the **hole** in the ozone layer also allow heat to **escape** from the Earth. **If the ozone hole is mended**, as scientists predict it will be, then the Earth will heat up faster than it otherwise would. *The Guardian* January 23, 2001 Global warming: A world of extremes as the planet heats up BYLINE: Paul Brown
- 62- At once the cheerfulness melts away, like a polar ice-cap **underneath a hole in the ozone layer**. Bellamy stiffens. Even his (David Bellamy's) rumpled blue T-shirt appears to acquire a layer of starch. The beard metamorphoses: no longer sheep's wool, but the mad curlicues of a Biblical prophet proclaiming the Great Flood to be just a bit of a trickle, really. *The Sunday Telegraph* May 29, 2005, Sunday Still proud to be a crank Interview David Bellamy - botanist, broadcaster and failed ballet dancer - has always been lovably eccentric. BYLINE: Elizabeth Day (my addition in parenthesis)
- 63- Professor Pyle said overall the mixing of the air in the northern hemisphere was far more rapid than in the Antarctic so a **"hole"** in the ozone layer did not occur. Instead, as the air mixed in spring, there was a general **thinning of the protective ozone over** the whole of the northern hemisphere. *The Guardian* April 27, 2005 Ozone layer most fragile on record BYLINE: Paul Brown

- 64- Crutzen, who won a Nobel Prize in 1995 for his work on the **hole in the ozone layer**, believes that political attempts to limit man-made greenhouse gases are so pitiful that a radical contingency plan is needed. *The Independent* July 31, 2006 Monday Scientist publishes 'escape route' from global warming BYLINE: Steve Connor
- 65- Nearly five decades later, at the age of 86, Lovelock's apparent moment of madness has been vindicated. He lives with his second wife, Sandy, in an idyllic old mill on the border of Cornwall and Devon. His study is lined with books and home-made instruments - his most famous invention was a highly sensitive electron-capture detector, which enabled scientists to link the gases in aerosol sprays to **the destruction of the ozone hole**. (It also made millions of dollars for the manufacturers, Hewlett-Packard, but the patent royalties did not come his way.) *The Independent on Sunday* February 5, 2006 Sunday 'The lush, comfortable world we are used to is going rapidly' BYLINE: Steve Connor
- 66- Even before yesterday's breakthrough, the Montreal Protocol was seen as the most effective environmental treaty. Agreed shortly after the discovery of **the ozone hole above Antarctica**, it has already phased out almost all of the chemicals primarily responsible - the chlorofluorocarbons or CFCs once used in aerosol sprays and refrigeration. *The Independent on Sunday* September 23, 2007 Bush takes lead on global warming action
- 67- Chris Rapley, 60, comes to the museum from the British Antarctic Survey. In his 10 years as director, the institution that discovered **the hole in the ozone layer** in the 1980s, has taken its place in the front line of climate science. *The Daily Telegraph* July 24, 2007 Tuesday 'We need fewer people, not greener ones' BYLINE: Charles Clover
- 68- While able to pinpoint **the hole in the ozone layer** and carbon emissions as the man-made causes of the increased winds, the researchers were unable to identify which of them had the greater effect. (...) Since the industrial revolution an estimated 500 gigatonnes of carbon dioxide has been **released** into the atmosphere through the use of fossil fuels, cement manufacture and changes in land use. *The Times* May 18, 2007, Friday Rapid rise in global warming is forecast BYLINE: Lewis Smith
- 69- As global warming melts the more southerly parts of the previously frozen sub-soil, frozen gas-water compounds (methane hydrates) and methane gas will **escape** into the atmosphere, driving global temperatures up even further. (...) Although ocean warming will gradually warm under-sea sediments and slowly **release** deeply buried methane, the major natural occasions on which methane can **escape** on a rapid and massive scale from these buried reserves is when underwater landslides expose previously buried gas-bearing sediments, thus reducing pressure in an instant. *The Independent* June 16, 2001, Saturday GLOBAL WARMING: METHANE THREATENS TO REPEAT ICE AGE MELTDOWN BYLINE: David Keys
- 70- The report by the Royal Society into ways of controlling carbon dioxide emissions says the Government's climate-change levy is too crude because it penalises the use of energy by industry alone rather than the **release** of carbon dioxide from all sources. *The Independent* November 18, 2002, Monday COST OF ELECTRICITY MUST RISE 15% TO FIGHT GLOBAL WARMING' BYLINE: Steve Connor
- 71- Fourth, there will be pressure to find ways of off-setting the damage caused by excessive energy use. Some of these will be patches, such as higher sea walls to protect low-lying regions. But some will tackle the root cause. We will have to discover ways of mopping up the carbon we **release**, even if it is only by planting more trees. *Independent on Sunday* July 15, 2001, Sunday ECONOMIC VIEW: LET OUR LEADERS SORT OUT THE FUTURE OF THE PLANET. BYLINE: Hamish Mcrae
- 72- Are scientists certain about this? Scientists agree that global warming is taking place and the vast majority believe it is man made. Burning fossil fuels **releases** carbon dioxide. Intensive agriculture and rubbish tips **release** methane. The only uncertainty is the scale of the process and whether we can adapt to it. *The Guardian* July 14, 2001 The heat is on for a solution in Bonn BYLINE: Paul Brown

- 73- A positive "radiative forcing", such as that caused by an increasing concentration of greenhouse gases in the atmosphere, tends to warm the Earth's surface. A negative radiative forcing, caused for instance by the **release** of particles into the atmosphere from a volcanic explosion, causes cooling. *The Independent* July 12, 2001, Thursday GLOBAL WARMING REPORT: THE DOUBTS - EFFECT OF POLLUTION WILL LAST FOR GENERATIONS BYLINE: Steve Connor
- 74- And crucial mechanisms are poorly understood, notably complex feedback processes: rising temperatures could trigger more clouds that reflect sunlight back into space to offset further warming by negative feedback; other feedback mechanisms are positive, so increased warming could **release** more greenhouse gases as forests die. *THE DAILY TELEGRAPH* June 13, 2001, Wednesday What's the future for planet Earth? BYLINE: Roger Highfield
- 75- And crucial mechanisms are poorly understood, notably feedback processes: rising temperatures could create more clouds that reflect sunlight back into space to offset further warming - so called negative feedback; other mechanisms create positive feedback, for example increased warming could **release** more greenhouse gases as forests die or microbes in soil work faster. *THE DAILY TELEGRAPH* August 20, 2003, Wednesday It might get even hotter... BYLINE: Roger Highfield
- 76- Rising sea temperatures could trigger an even more nightmarish scenario. Warmer oceans might release massive amounts of methane stored beneath the sea bed, dramatically amplifying the greenhouse effect and causing **runaway** global warming. *The Observer* January 5, 2003 FOCUS: CLIMATE CHANGE: Whatever happened to the weather? BYLINE: Mark Townsend
- 77- If carbon dioxide **released** when coal, oil and gas are burnt is already heating the earth's atmosphere alarmingly, as many scientists claim, the impact of China and India coming up to Western levels would be catastrophic. *The Times* October 29, 2004, Friday Do you want global warming, nuclear power or poverty? BYLINE: Graham Searjeant
- 78- The trust's projections are based on the presumption that such demanding targets cannot be met. Little can be done to halt global warming over the next 30-40 years because of the vast amount of such gases already **released** by burning fossil fuels, the trust believes. But there is a chance to mitigate the worst impacts of global warming beyond that date. *The Guardian* October 25, 2004 Dire warnings from global warming report BYLINE: Owen Bowcott
- 79- Carbon dioxide **released** by the burning of coal, oil and gas, and by manmade greenhouse gases fuels global warming by trapping heat that would normally dissipate into space. *DAILY MAIL* October 11, 2004 Global warming fear as levels of CO soar BYLINE: ANIL DAWAR
- 80- A possibility raised by scientists at the Meteorological Office's Hadley Centre is that, as the world warms, it begins to **release** more carbon from natural sources which normally soak it up, such as forests, soils or oceans.(...) If they start **releasing** carbon, instead of storing it, it is known as "positive feedback". *THE DAILY TELEGRAPH* October 11, 2004, Monday Global warming clock begins to tick faster Carbon dioxide levels in the atmosphere are rising quicker than at any time since records began, researchers in Hawaii have discovered BYLINE: Charles Clover
- 81- The phenomenon is blamed on the burning of fossil fuels like coal, oil and gas which **release** greenhouse gases that trap the sun's heat in the atmosphere. *The Express* October 8, 2004 STAND BY FOR MORE VOLATILE WEATHER AS THREAT OF GLOBAL WARMING GROWS BYLINE: John Ingham

- 82- A single three-hour air flight **releases** more polluting gasses than the average motorist racks up in a year. *The Independent* September 15, 2004, Wednesday THE GLOBAL WARMING CRISIS BYLINE: JOHANN HARI
- 83- Wetlands normally **release** large quantities of methane into the atmosphere owing to the activity of microbes that thrive there. The emissions contribute to global warming, and are predicted to increase because of a feedback effect: methane-producing microbes are sensitive to temperature, and make more of the gas when temperatures rise. (...) Kills fish and other water-dwelling animals by lowering the pH of lakes and rivers and **releasing** toxic aluminium from soil *The Times* August 3, 2004, Tuesday Acid rain turns into an unlikely ally in the battle against global warming BYLINE: Mark Henderson
- 84- FIVE American power companies are being sued to lower the amount of carbon dioxide they **release** into the environment in what are being described as the first "global warming" lawsuits. *THE DAILY TELEGRAPH* July 22, 2004, Thursday US power firms face 'global warming' lawsuits BYLINE: Simon English
- 85- GLOBAL WARMING is set to dramatically worsen because of huge amounts of carbon dioxide (CO₂) being **released** from the world's peatlands, a study has found. Scientists analysing the huge stores of natural CO₂ locked up in peatlands have found they are being released into the environment at an accelerating rate. At the current rate, the CO₂ **released** from peatlands will exceed those produced by the burning of fossil fuel as early as 2060. (...) The amount of CO₂ being **released** from peatlands is accelerating at a rate of 6 per cent per year. *The Independent* July 8, 2004, Thursday PEAT BOG GASES ACCELERATE GLOBAL WARMING' BYLINE: STEVE CONNOR
- 86- So who is to blame? Partially - and here lies the irony - the chain of causation leads straight back to Alaska itself. Oil extraction has dominated Alaskan industry for more than 20 years, and this oil has been contributing directly to rising temperatures through the greenhouse gases **released** into the atmosphere during its combustion. (...) With 21st-century warming predicted as high as a staggering 10deg. C, much of the remaining permafrost is likely to thaw - further damaging forests, houses, roads and other infrastructure, and raising the spectre of massive **releases** of the greenhouse gases carbon dioxide and methane from bogland hitherto inert and frozen. *The Guardian* February 14, 2004 Weekend: MELTDOWN: Alaska is a huge oil producer and has become rich on the proceeds. BYLINE: Mark Lynas
- 87- These gases, **released** by burning fossil fuels, form a blanket round the world which traps the sun's heat. *The Express* January 8, 2004 THIRD FACE EXTINCTION IF GLOBAL WARMING RAISES THE TEMPERATURE BY 3C BYLINE: John Ingham
- 88- Geoff Jenkins, head of the Hadley Centre, released the figures at the climate change convention meeting in Milan, where politicians are still trying to reach agreement on the Kyoto protocol to start legally binding reductions in greenhouse gas **releases** to the atmosphere. *The Guardian* December 10, 2003 Climate change doubles Britains stormy weather BYLINE: Paul Brown
- 89- All of which helps to explain why new findings that parts of the Amazon jungle in fact **release**, and not absorb, carbon dioxide will be causing quite a stir in Milan. *The Guardian* December 4, 2003 Life: Would planting more trees save us from global warming BYLINE: David Adam
- 90- Global warming is widely blamed on the burning of fuels like coal and oil, which **release** greenhouse gases such as carbon dioxide. They trap the sun's heat, forcing up temperatures. (...) Conditions at the end of the Permian Period, when volcanic eruptions fuelled a "**runaway** greenhouse effect", were so severe that only one species of large land animal lived and it took 100million years for species diversity to return to former levels. *The Express* June 18, 2003 SCIENTISTS SAY GLOBAL WARMING COULD LEAD TO MASS EXTINCTION; WE'RE DOOMED BYLINE: John Ingham

- 91- Coal fires occasionally start from spontaneous combustion as chemicals in the seams react with oxygen and water to **release** heat. But most are lit by forest fires on the surface, or sparks from welding equipment or explosives. Blazes can smoulder for decades or even centuries, exploding into new life as galleries collapse to create fresh draughts of oxygen. *The Guardian* February 15, 2003 Colorado science conference
BYLINE: Tim Radford
- 92- Global warming can adapt a "**runaway**" character, proceeding with terrifying speed: we know from the atmospheric records preserved in ice cores that this has happened in the past. *The Independent* October 12, 2004, Tuesday LEADING ARTICLE: NOW, MORE THAN EVER, IT IS IMPERATIVE TO CONFRONT AMERICA OVER CLIMATE CHANGE
- 93- SCIENTISTS fear the world is on the brink of **runaway** global warming. (...) Levels of greenhouse gas carbon dioxide rose by 1.5 parts per million a year in recent decades. But between 2002 and 2003 the amount jumped to more than two ppm. Experts fear this will lead to catastrophic changes in the climate far sooner than predicted. It could spark rises in sea levels, violent storms and severe flooding. *The Mirror* October 12, 2004, Tuesday NEW FEAR FOR GLOBAL WARMING
- 94- Positive feedback, on the other hand, which occurs when the output goes back to add force to the input, can magnify the whole process until it takes on a "**runaway**" character. (...) This fear is well founded, because records of ancient climates deduced from cores driven deep into the polar ice show that this has happened in the past: previous episodes of warming at the end of ice ages have indeed developed a **runaway** character, with enormous temperature rises of as much as 10 degrees centigrade in 50 years. *The Independent* October 11, 2004, Monday GLOBAL WARMING: HOW FEEDBACK' CAN SUPPRESS THE EARTH'S ABILITY TO REMOVE GREENHOUSE GASES BYLINE: MICHAEL MCCARTHY
- 95- David Battisti, Professor of Atmospheric Sciences at the University of Washington in Seattle, said that while there were uncertainties in the models, these had probably downplayed the extent of future change. When the same models were used to look at previous climate change, they showed a lower warming effect than actually happened. This suggested a "feedback effect" that could bring about **runaway** temperature increases, far greater than presently forecast. *The Times* June 16, 2004, Wednesday Gloom over global warming BYLINE: Mark Henderson
- 96- His theory (Lovelock's) that only a massive expansion of nuclear power, which produces virtually no carbon dioxide, can now check a **runaway** global warming scenario has attracted strong criticism. *The Independent* June 4, 2004, Friday ENVIRONMENT GURU TELLS CLIMATE CHANGE EXPERTS TO GO NUCLEAR NUCLEAR POWER TELLS CLIMATE CHANGE EXPERTS: GO NUCLEAR BYLINE: TED DAVENPORT (my addition in parenthesis)
- 97- He (Lovelock) believes only a massive expansion of nuclear power, which produces almost no CO₂, can now check a **runaway** warming which would raise sea levels disastrously around the world, cause climatic turbulence and make agriculture unviable over large areas. He says fears about the safety of nuclear energy are irrational and exaggerated, and urges the Green movement to drop its opposition. (...) His appeal, which in effect is asking the Greens to make a bargain with the devil, is likely to fall on deaf ears, at least at present. "Lovelock is right to demand a drastic response to climate change," Stephen Tindale, executive director of Greenpeace UK, said last night. "He's right to question previous assumptions. "But he's wrong to think nuclear power is any part of the answer. Nuclear creates enormous problems, waste we don't know what to do with; radioactive emissions; unavoidable risk of accident and terrorist attack." (...) Tony Juniper, director of Friends of the Earth, said: "Climate change and radioactive waste both pose deadly long-term threats, and we have a moral duty to minimise the effects of both, not to choose between them." *The Independent* May 24, 2004, Monday ONLY NUCLEAR POWER CAN NOW HALT GLOBAL WARMING' BYLINE: MICHAEL MCCARTHY (my addition in parenthesis)
- 98- They confirmed something environmentalists have predicted for decades - the destruction of the Amazon forest would make the local climate 2C (4F) warmer because trees soak up carbon dioxide

from the atmosphere, and burning them **releases** it. But then the scientists looked at temperate zones and found the opposite. (...) This is because ripening corn and other staples would reflect more sunlight back into space, and **release** more moisture into the air, while dark forests would absorb sun light and send thermometers soaring. (...) In September, European researchers showed that in the hot summer of 2003, most of the carbon stored in forests in the previous four years was **released** back into the atmosphere, to accelerate global warming and trigger yet more heatwaves. *The Guardian* December 9, 2005 Science: Climate change theory barks up wrong tree, study shows BYLINE: Tim Radford

99- TVs, videos and computers left on standby can use up to 85 per cent of the energy they would if fully on. The power wasted **releases** an extra one million tonnes of carbon into the atmosphere every year, contributing to global warming. *The Independent* December 3, 2005 Saturday CLIMATE CHANGE: Ten things that the government can do...

100- Unlike other natural resources such as petroleum, coal and nuclear fuels, biofuels are a renewable energy source. They have the advantage of being 'carbon neutral': although burning them **releases** carbon into the atmosphere, they have already absorbed that carbon as plants. For this reason they are championed by environmentalists as a way to reduce CO2 **released** into the atmosphere by using them to replace non-renewable energy sources. *The Independent* November 7, 2005, Monday GLOBAL WARMING: WHAT ARE BIOFUELS? BYLINE: MATTHEW BEARD

101- It is not only damage to infrastructure that will result from the melting permafrost in Alaska and Siberia. Vast amounts of organic material remain frozen within the permafrost and any melting would result in the **release** of unmeasured amounts of methane and carbon dioxide. The **release** of these gases would, in turn, add to global warming, impacting Alaska's fragile ecosystem. *The Independent* October 21, 2005, Friday THE IMPACT OF CLIMATE CHANGE: IS THIS PROOF OF GLOBAL WARMING? BYLINE: ANDREW BUNCOMBE

102- In temperate climates, forests act as a carbon "sink", with some of the greenhouse gases **released** from fossil fuels becoming locked away again as wood, leaf litter and buried vegetation. But the picture in the summer of 2003 was dramatically different. Plant growth in Europe dropped that summer by 30% overall, and much of the carbon dioxide removed from the atmosphere in the previous four years was **released** again. *The Guardian* September 22, 2005 Science: Killer heatwave may have fuelled global warming BYLINE: Tim Radford

103- Last month, *New Scientist* reported that something similar is happening in Siberia. For the first time on record, the permafrost of western Siberia is melting. As it does so, it **releases** the methane stored in the peat. Methane has 20 times the greenhouse warming effect of carbon dioxide. The more gas the peat **releases**, the warmer the world becomes, and the more the permafrost melts. (...) Two weeks ago, scientists at Cranfield University discovered that the soils in the UK have been losing the carbon they contain; as temperatures rise, the decomposition of organic matter accelerates, which causes more warming, which causes more decomposition. Already the soil in this country has **released** enough carbon dioxide to counteract the emissions cuts we have made since 1990. *The Guardian* September 20, 2005 Comment & Debate: It would seem that I was wrong about big business BYLINE: George Monbiot

104- The Kyoto treaty's attempts to curb man-made emissions of greenhouse gases are being undermined by extra carbon dioxide **released** naturally from the ground as a result of climate change. (...) Since 1978, Britain's soil is estimated to have **released** an extra 13 million tons of carbon dioxide a year, which is more than the 12.7 million tons a year saved by cleaning up industrial pollution during that period. (...) Soil is a vast store of carbon, holding about 300 times more than the amount of carbon dioxide **released** through the burning of fossil fuels. *The Independent* September 8, 2005, Thursday VICIOUS CIRCLE OF CO2 EMISSIONS IS SPEEDING UP CLIMATE CHANGE BYLINE: STEVE CONNOR

105- The Met Office's Hadley Centre for the study of climate change had predicted that the Amazon forest would begin to die back, accelerating the **release** of carbon and causing more climate

change, if global average temperatures reached three degrees above pre-industrial levels. (...) Peatlands were burned on the orders of the former Indonesian dictator Suharto in an attempt to create one of the world's largest rice plantations. It has since been found that the acid soils are unsuitable for growing rice, making the Mega Rice Project one of the world's greatest environmental disasters and one that has led to air pollution as far away as peninsular Malaysia and Thailand. (...) Meanwhile, predictions of how the Amazon forest will behave in response to global warming have been modified by research carried out by Oxford, Leeds and Edinburgh universities. *THE DAILY TELEGRAPH* September 03, 2005, Saturday Peat bog burning blamed for much of global warming BYLINE: Charles Clover

- 106- At the current rate of burning, the peat swamp's entire carbon stocks, built up over 27,000 years from forest litter too wet to rot, will be **released** into the atmosphere by 2040. *The Guardian* September 3, 2005 Global warming is dictator's legacy BYLINE: David Adam
- 107- Climate change has become a big issue, and the UK is using its presidency of the G8 to move it even further up the political and business agenda. The long-term aim is the strict implementation of the 'polluter pays' principle, as applied to carbon dioxide (CO₂) emissions. There is now a price attached to these: in future, energy users will have to pay for every ton of CO₂ they **release** into the atmosphere. *Independent on Sunday* July 3, 2005, Sunday MARKET: EXPERT VIEW: BILL ROBINSON BYLINE: ABIGAIL TOWNSEND
- 108- As the world gets hotter, will it give up its carbon stores, thus triggering more warming and then even more carbon **release**, a **runaway** greenhouse effect that would change our planet beyond all recognition? *The Observer* June 26, 2005 Turning the Tide: Planet in Peril: Condemned to death by degrees if we fail to act BYLINE: Robin McKie
- 109- When fossil fuels are burnt in cars or power stations they **release** carbon dioxide. This traps the sun's heat, warming up the atmosphere and the surface of the planet. *The Express* June 9, 2005 HOW THE DIRE EFFECTS OF CLIMATE CHANGE WILL BE COMING YOUR WAY SOON BYLINE: George Monbiot
- 110- The scientific evidence that **runaway** climate change has become a reality is now irrefutable. *The Independent* December 3, 2005 Saturday LEADING ARTICLE: Global warming and the need for all of us to act now to avoid catastrophe
- 111- Two degrees is the point beyond which most climate scientists predict catastrophe: several key ecosystems are likely to flip into **runaway** feedback; the biosphere becomes a net source of carbon; global food production is clobbered, and 2 billion people face the risk of drought. All very reasonable, I'm sure. *The Guardian* October 25, 2005 Comment & Debate: The chief scientific adviser has become a government spin doctor BYLINE: George Monbiot
- 112- Once past these tipping points, the world will be confronted with **runaway** global warming. *The Guardian* June 10, 2005 Comment & Analysis: If we make global warming history we'll all be better off BYLINE: Robin Cook
- 113- Human activity is increasing the concentration of carbon dioxide and other greenhouse gases to levels unprecedented in human history. If we do nothing, or next to nothing, those levels will continue to rise, progressively increasing the risk of **runaway** global warming. *The Guardian* June 7, 2005 Comment & Analysis: And what if the sceptics are wrong? BYLINE: Michael Howard
- 114- This is impressive, until you discover that a single jumbo jet, flying from London to Miami and back every day, **releases** the climate-change equivalent of 520,000 tonnes of carbon dioxide a year. One daily connection between Britain and Florida costs three giant wind farms. *The Guardian* April 26, 2005 Comment & Analysis: An ugly face of ecology BYLINE: George Monbiot

- 115- The atmosphere will heat up even further and even more gases will be **released: a runaway** greenhouse effect. (...) 1957 US oceanographer Roger Revelle warns of the dangers of **releasing** greenhouse gases. *The Observer* January 30, 2005 GLOBAL WARMING: How we put the heat on nature BYLINE: Robin McKie and Mark Townsend
- 116- In 1998 Dr Baliunas co-wrote an article that argued for the **release** of more carbon dioxide. It was mass-mailed to US scientists with a petition asking them to reject Kyoto. *The Guardian* January 27, 2005 Oil firms fund climate change 'denial' BYLINE: David Adam
- 117- The spring thaw has been advancing one day a year since 1988, according to Nasa scientists. An early thaw means a longer growing season for the Arctic and the boreal forest, the ring of mostly evergreen trees that stretches across the northern reaches of North America and Eurasia, but it also means that more carbon, stored in the region's usually frozen soils, will be **released** into the air, accelerating global warming. *The Guardian* January 15, 2005 Bear facts point to global warming in Arctic BYLINE: John Vidal and Paul Brown
- 118- So will Kyoto really make a difference to whether global warming is contained; can it save the planet from the potential of **runaway** global warming that is being debated this week at the Hadley Centre for Climate Change in Exeter? Here we explain the nuts and bolts of Kyoto, how it works, and what it does. *The Guardian* February 3, 2005 Life: Kyoto issue: Cover story: What is this Kyoto thing all about anyway? BYLINE: Paul Brown
- 119- These could include widespread agricultural failure, water shortages and major droughts, increased disease, sea-level rise and the death of forests - with the added possibility of abrupt catastrophic events such as "**runaway**" global warming, the melting of the Greenland ice sheet, or the switching-off of the Gulf Stream. *The Independent* January 24, 2005, Monday COUNTDOWN TO GLOBAL CATASTROPHE; CLIMATE CHANGE BYLINE: MICHAEL MCCARTHY
- 120- Exactly how much is being **released** into the atmosphere is unknown, although some estimates put it as high as 100,000 tons a day - which means a warming effect greater than America's man-made emissions of carbon dioxide. (...) So the message is clear: frozen peat bogs that turn into heat-absorbing lakes **release** methane, which means a stronger greenhouse effect and higher temperatures, leading to more permafrost melting. The cycle was clearly documented in 2006 but just how strong this positive feedback turns out to be has yet to be fully determined. *The Independent* December 29, 2006 Friday Our worst fears are exceeded by reality; The Planet; GLOBAL WARMING BYLINE: STEVE CONNOR
- 121- Rising CO₂ concentrations in the atmosphere are also causing oceans to acidify. Since the beginning of the industrial revolution a third of the CO₂ **released** by fossil fuel burning has been absorbed by the oceans. *The Guardian* December 7, 2006 Thursday Science: Extinctions in the future: Explainer: Global warming BYLINE: James Randerson
- 122- But by 2030 the world's population will have risen to 8.2 billion. Dividing the carbon sink of 2.7 tonnes by that population equally (not that we would ever be that fair), would allow each of us to **release** 0.33 tonnes per year. We in the UK now **release** 2.6 tonnes each, and would therefore need to reduce our emissions by 87 per cent (the US and Australia by 94 per cent). *The Daily Telegraph* December 2, 2006 Saturday A Stern warning John Whitmore looks at the implications of the recent report on climate change BYLINE: John Whitmore
- 123- Schmidt points out that Monckton also forgets, in making his calculations, that "climate sensitivity is an equilibrium concept": in other words that there is a time-lag of several decades between the **release** of carbon dioxide and the eventual temperature rise it causes. *The Guardian* November 14, 2006 Tuesday Comment & Debate: This is a dazzling debunking of climate change science. BYLINE: George Monbiot

- 124- Other greenhouse gases add to the warming: methane, **released** by fuels and paddy fields; nitrous oxides, mainly from fertilisers; and a few manufactured chemicals. Now at last, the world is beginning to try to restrain them, before climate change runs out of control. *The Independent on Sunday* November 12, 2006 Carbon footprints; News analysis: CLIMATE CHANGE; In the future we may each have our own personal emissions allowance. BYLINE: Geoffrey Lean
- 125- Biodiesel is prepared from plants such as rape seed, and is supposed to be carbon-neutral because the carbon emitted when it is burned to **release** energy was absorbed from the atmosphere while the plant grew. (...) Scientists are not yet convinced biofuels are a genuine solution to global warming. Although they are considered carbon neutral, because the carbon they **release** when burned was absorbed from the atmosphere while they grew, there are concerns about emissions produced during farming and processing crops. *The Guardian* September 22, 2006 Friday National: Climate change: Branson pledges \$3bn transport profits to fight global warming BYLINE: Dan Milmo and David Adam
- 126- They (greenhouse gases) include carbon dioxide, methane and nitrous oxide, which are **released** by cars, modern industry and agriculture. Their concentration in the atmosphere has risen by more than 30 per cent since 1800. *Daily Mail* September 19, 2006 Tuesday England's overheating; Rising temperatures blamed on manmade climate change BYLINE: EMILY COOK (my addition in parenthesis)
- 127- For them, it's a beautiful cycle - burning fossil fuels causes the Arctic to melt, **releasing** yet more fossil fuels to burn. Profits cascade in at every stage. (...) But beyond even the hard figures, there is a remarkable untold story unfolding in one of the darkest parts of the planet, showing that Big Oil is actually banking on **runaway** global warming. *The Independent* November 6, 2006 Monday Global warming is good news - for oil companies BYLINE: JOHANN HARI
- 128- It would cost much less to prevent **runaway** climate change than to seek to live with it. (...) They fall to the same point by the same date, but far more gases have been produced in the second case, making **runaway** climate change more likely. *The Guardian* October 31, 2006 Tuesday Comment & Debate: Drastic action on climate change is needed now - and here's the plan BYLINE: George Monbiot
- 129- The amount of carbon dioxide in the atmosphere, measured in parts per million, at which scientists fear 'a tipping point' will occur. At this stage, irreversible melting of ice caps and glaciers will trigger a **runaway** greenhouse effect. *The Observer* October 15, 2006 Climate change: BRITAIN'S CHANGING CLIMATE IN NUMBERS
- 130- As we do, and as more of the sun's heat is unable to **escape**, the air and the sea warm. But that takes time, which means that whatever we do, our climate destiny is fixed for the next few decades. *The Guardian* July 22, 2006 Saturday Special report: Global warming: Drought, gales and refugees BYLINE: David Adam
- 131- After this point the land would begin to **release** carbon into the atmosphere (carbon dioxide levels rising from the current 380 parts per million to more than 1,000 parts per million by 2100). *The Independent* September 1, 2006 Friday 'Compost effect' may cause global warming to reach crisis point in 2050 BYLINE: Sarah Cassidy (my addition in parenthesis)
- 132- By the end of the year the trees had **released** more than two-thirds of the carbon dioxide they have stored during their lives, helping to act as a break on global warming. Instead they began accelerating the climate change. *The Independent on Sunday* July 23, 2006 Amazon rainforest 'could become a desert' BYLINE: Geoffrey Lean and Fred Pearce
- 133- In Siberia permafrost peatbogs are thawing, starting the **release** of massive quantities of trapped methane. In Alaska graves dug in once permanently frozen ground are spilling open. *The Independent* July 19, 2006 Wednesday A primer in climate change for doubters

- 134- How many times faster greenhouse gases are being **released** compared to the last period of extreme global warming. *The Independent on Sunday* May 21, 2006 Sunday Chilling facts The truth about ice loss and global warming BYLINE: Adam Jacques
- 135- They predicted that other likely changes at this level were a decline of the Amazon forest - leading to a massive **release** of carbon into the atmosphere - and the melting of ice in Greenland and some in Antarctica. *The Daily Telegraph* April 15, 2006 Saturday 'Too late' to stop 3C rise in temperature Chief scientist says the world must start to adapt to cope with global warming. BYLINE: Charles Clover
- 136- Hurricanes such as Katrina, which devastated New Orleans last summer, start as clusters of thunderstorms over the tropical oceans. Evaporating water rises and cools, condensing as clouds, and the change from vapour to droplets **releases** energy that heats the air and drives it still higher. If enough of these storms form in close proximity they can create a column of humid air which sucks air in at the base and **releases** it at the boundary between the atmosphere and stratosphere. *The Guardian* March 17, 2006 Friday Global warming blamed for increasing force of hurricanes BYLINE: James Randerson
- 137- The practice of planting trees to offset carbon emissions has been criticised by some environmental groups who say that it takes many years of growth for saplings to compensate for the emissions of a few hours' flight - and that once trees die, they will **release** carbon anyway. *The Guardian* March 8, 2006 Wednesday Financial: Climate change: Virgin Atlantic to tackle environmental impact ... of its limousines BYLINE: Andrew Clark
- 138- But look what happens around 1850 and the start of the industrial revolution (before then, the only greenhouse gases being **released** into the earth's atmosphere were the occasional fart from a carthorse). *The Guardian* February 21, 2006 Tuesday G2: Television & Radio: Last night's TV: First Devon was like Jamaica. BYLINE: Sam Wollaston
- 139- Widespread **releases** of methane and carbon dioxide at the start of the Eocene period 55 million years ago caused temperatures to increase rapidly by as much as 10C (18F) at high latitudes and around 5C (9F) in tropical areas. (...)The big temperature increases at the start of the Eocene were caused by the **release** of frozen methane hydrates at the bottom of the oceans and in Arctic permafrost. (...) **Release** of methane can occur through natural processes, including underwater landslides or other seismic events, or by warming of ocean waters. Once **released**, the gas can induce atmospheric warming that has a positive feedback effect, **releasing** still more gas as ocean waters and permafrost regions begin to warm. The process can reach a tipping point where it starts to accelerate rapidly. (...) Current human activity is **releasing** about the same amount of greenhouse gases as during this period but around 30 times faster. *The Daily Telegraph* February 17, 2006 Friday Lesson from 55 million years ago says climate change could be faster than expected BYLINE: Nic Fleming
- 140- Greenhouse gases are being **released** into the atmosphere 30 times faster than the time when the Earth experienced a previous episode of global warming. (...) Although carbon can be **released** suddenly and naturally into the atmosphere from volcanic activity, it takes many thousand of years for it to be removed permanently by natural processes. *The Independent* February 17, 2006 Friday Global warming '30 times quicker than it used to be' BYLINE: Steve Connor
- 141- Less snow cover actually means colder soil temperatures and hence the **release** of less carbon dioxide. *The Independent* February 11, 2006 Saturday Why flutter of butterfly's wings explains global warming BYLINE: STEVE CONNOR

- 142- It had been thought that the 600million tons produced each year were largely due to the burning of fuels, plus the cultivation of rice and the digestive gases **released** by grazing animals. *Daily Mail* January 12, 2006 Thursday Can planting more trees make global warming WORSE? BYLINE: JULIE WHELDON
- 143- The atmospheric scientist Paul Crutzen would like to save the world and darken your day. He proposes in this month's issue of the journal *Climatic Change* that to screen themselves from **runaway** global warming, humans could use heavy artillery to lob huge explosive shells laden with sulphate particles high into the stratosphere. *The Guardian* August 3, 2006 Thursday Comment & Debate: Bring back the acid rain: A scientist who worked out the ozone problem says pollution could save us from global warming BYLINE: Tim Radford
- 144- British efforts to combat climate change have focused on preventing carbon dioxide levels rising above 450 parts per million, equivalent to a rise of 2C. If the world warms by more than this, many climate experts believe fragile ecosystems will be pushed beyond their "tipping point", triggering **runaway** global warming. (...) Scientists have long known that green- house gases raise temperatures by insulating the planet. But a less well known mechanism is that the warmer the planet gets, the more carbon dioxide is **released** naturally by soil and oceans. The result is a mechanism where atmospheric carbon dioxide creates warming that causes even more carbon dioxide to be **released**. *The Guardian* May 23, 2006 Tuesday Climate change: Global warming predictions are underestimated say scientists BYLINE: Ian Sample
- 145- 'The magic of photosynthesis is that it takes the carbon [in the atmosphere] and converts it into lignin,' says Perkins. Burning that woody material **releases** the carbon so there is no net gain of carbon that can affect the climate. *The Observer* December 9, 2007 Creating a low-carbon Britain: A special report BYLINE: James Randerson
- 146- The WMO's annual Greenhouse Gas Bulletin shows that the amount of carbon dioxide - the main greenhouse gas, responsible for about two-thirds of man-made global warming, mainly **released** by burning fossil fuels - jumped by some 2 per cent last year, one of its sharpest-ever rises. *The Independent* on Sunday December 2, 2007 Rich countries blamed as greenhouse gas emissions hit record; Bali conference is the world's last chance to avoid 'catastrophic' global warming, experts warn
- 147- The report, which aims to be the most comprehensive study of the subject yet completed, claims a vegetarian diet including cheese, butter and milk would probably not noticeably reduce carbon emissions because dairy cows are a major source of the biggest greenhouse gas pollution from livestock - the methane **released** when cattle burp. *The Observer* November 11, 2007 Why eating less meat could cut global warming BYLINE: Juliette Jowit
- 148- Man-made emissions of greenhouses gases were triggering a positive feedback in the climate in which temperature increases generated further temperature rises and the **release** of vast amounts of carbon dioxide from natural stores on land and in the oceans. *The Independent* October 29, 2007 Monday Rapid global warming will create famine and drought, Lovelock warns By Steve Connor
- 149- Why should we be concerned about what happens in the Arctic? Well, apart from protecting the Inuit and the beauty of their land, what happens to them will come back and bite us with a vengeance (...) Much of their land was permanently frozen. If the land warms up it will **release** enough methane to raise the temperature of the world by 2.5C, resulting in a catastrophe. *Mail on Sunday* October 28, 2007 Sunday On thinning ice; Sam Branson braves melting frozen rivers -and a ravenous polar bear -- on his epic journey across an Arctic assailed by global warming BYLINE: SAM BRANSON
- 150- Now the bad news for the environment Stansted airport alone is responsible for the **release** of the equivalent of around one tonne of CO2 into the atmosphere every six seconds. *The Times* October 27, 2007, Saturday Climate change: what we do and don't know

- 151- As timber is carted off for export, giant agribusinesses often move in. And so spins the nightmare cycle: a growing **release** of carbon dioxide into the atmosphere which in turn alters weather patterns and destroys delicate ecosystems. *The Observer* October 14, 2007 Business & Media: Business: Economics: New money is last hope in battle to save rainforests BYLINE: Nick Mathiason
- 152- In the long term, only carbon **capture and storage** could significantly reduce cement emissions, and the industry sponsors research into how this could be done. (...) The booming Chinese economy has created such a demand for building materials that cement production there last year **released** 540,000 tonnes of carbon dioxide - just short of Britain's total output from all sources. *The Guardian* October 12, 2007 Friday Global warming: The unheralded polluter: cement industry comes clean on its impact: Plants **release** over 5% of carbon dioxide emissions Industry sees no chance of green-friendly future BYLINE: David Adam
- 153- And as supplies shrink, production will become ever more concentrated in potentially unfriendly areas such as Russia and the Middle East. And burning oil **releases** carbon dioxide. (...) What's more, as the forests and peatlands are destroyed, vast amounts of carbon dioxide are **released**, far offsetting any benefit to the climate gained by substituting the biofuel for oil. *Daily Mail* July 12, 2007 Thursday ARE COWS KILLING THE PLANET? BYLINE: Geoffrey Lean
- 154- Some tree-planting projects in Guatemala, Ecuador and Uganda have been accused of disrupting water supplies; evicting thousands of villagers from their land; seizing grazing rights from farmers; cheating local people of promised income; and running plantations where the soil **releases** more carbon than is absorbed by the trees. *The Guardian* June 16, 2007 Saturday National: Special report: Climate change: The inconvenient truth about the carbon offset industry BYLINE: Nick Davies
- 155- Earth Hour saw energy consumption in the city fall by 10.2 per cent, meaning many fewer tonnes of carbon dioxide were **released** than otherwise would have been. Spectacular photographs recorded the blacked-out skyline. *The Observer* June 10, 2007 Climate change: Switch it off! BYLINE: Amelia Hill
- 156- Researchers have found that the number of times a patch of soil is ploughed, and even the type of soil a vegetable is grown in, radically alters the amount of greenhouse gases **released** into the atmosphere. This could mean that clay soil in one part of the world may **release** more greenhouse gases than sandy soil elsewhere. *The Sunday Telegraph* June 3, 2007 Sunday HOW THE CO2 EMISSIONS COMPARE: GREENER BY MILES BYLINE: RICHARD GRAY
- 157- Some stored carbon dioxide (CO₂) has even been **released** into the atmosphere. *The Daily Telegraph* May 18, 2007 Friday Global warming 'to speed up as seas fail to absorb CO₂' BYLINE: Charles Clover
- 158- In the next 24 hours, deforestation will **release** as much CO₂ into the atmosphere as 8 million people flying from London to New York. Stopping the loggers is the fastest and cheapest solution to climate change. So why are global leaders turning a blind eye to this crisis? *The Independent* May 14, 2007 Monday The hidden cause of global warming
- 159- Aircraft emissions have a greater warming effect because they are **released** at altitude. The UK government says this exaggerated impact means that 1 tonne of carbon dioxide **released** from an aircraft does the same damage as 2.5 tonnes emitted from cars or power stations. *The Guardian* May 9, 2007 Wednesday Flights reach record levels despite warnings over climate change BYLINE: David Adam
- 160- As these "compost heaps" were cooked by the magma, they **released** trapped carbon. (...) One fear is that, as the oceans warm, they will **release** greater quantities of methane hydrates, one of the most damaging contributors to global warming. *The Times* April 27, 2007, Friday How global warming erupted 55m years ago BYLINE: Lewis Smith

- 161- Once the trees have gone, desert will appear and the carbon **released** by the forests' burning will be joined by still more from the world's soils. This could boost global temperatures by a further 1.5oC - tipping us straight into the four-degree world. (...) As the oceans warm, they could be **released** once more in a terrifying echo of that methane belch of 55 million years ago. In the process, moreover, the seafloor could slump as the gas is **released**, sparking massive tsunamis that would further devastate the coasts. Again, no one knows how likely this apocalyptic scenario is to unfold in today's world. The good news is that it could take centuries for warmer water to penetrate down to the bottom of the oceans and **release** the **stored** methane. (...) Acting much like today's fuel-air explosives (or "vacuum bombs"), major oceanic methane eruptions could **release** energy equivalent to 10,000 times the world's stockpile of nuclear weapons. (...) This moment comes as the hundreds of billions of tonnes of carbon **locked up** in Arctic permafrost - particularly in Siberia - enter the melt zone, **releasing** globally warming methane and carbon dioxide in immense quantities. *The Guardian* April 23, 2007 Monday G2: Six steps to hell: By the end of the century, the Earth could be more than 6C hotter than it is today, according to the Intergovernmental Panel on Climate Change. BYLINE: Mark Lynas
- 162- 34bn tonnes of carbon could be **released** if the country's forests were destroyed - equivalent to the UK's entire carbon output since 1946. *Guardian.com* April 12, 2007 World Bank must lead on climate change
- 163- Flying is a particularly contentious environmental issue. Although it only accounts for 7% of global carbon emissions, these are **released** high in the atmosphere where they can do the most damage. *The Guardian* April 9, 2007 Monday Media: Carbon copy: Climate change may be a big story but many journalists still take emission-heavy trips abroad. BYLINE: Claire Dodd
- 164- Higher concentrations of carbon dioxide, **released** during the burning of fossil fuels, will be a boon for plant life. *Daily Mail* April 6, 2007 Friday The good news and the bad on global warming
- 165- When the temperature increases, more gas is **released** into the atmosphere and when global temperatures cool, more CO2 is absorbed. *Sunday Express* March 4, 2007 Why the Sun is to blame for causing our global warming BYLINE: Stuart Winter
- 166- Feedback effects such as carbon dioxide **release** from soils and methane from permafrost kick in. *The Guardian* January 27, 2007 Saturday Climate change: Four scenarios Increasing risk
- 167- Since the start of the industrial revolution, we have **released** lots more greenhouse gases - around 1,000 billion tonnes of them. *The Independent* January 25, 2007 Thursday The last gasp of the global warming deniers BYLINE: JOHANN HARI
- 168- Many human activities, from flying and driving to heating homes and workplaces, burn fossil fuels and this **releases** greenhouse gases into the atmosphere. (...) For a small payment, many organisations such as Climate Care and Global Cool will reduce the amount of CO2 that your activity **releases** carbon offsetting. Most of the offsetting involves investments in renewable energy, energy efficiency in the Third World and reforestation in the tropics. (...) Instead of absorbing CO2, some experts say trees in non-tropical areas trap heat and add to global warming, while digging holes to plant saplings **releases** greenhouse gases from the soil. *Mail on Sunday* January 14, 2007 Sunday Join Wood in the forest and tackle global warming BYLINE: TOM MCGHIE
- 169- The principle of offsetting is to redeem the amount of CO2 generated by a particular activity - from a flight to Sydney to cooking the Christmas turkey - by paying a sum to be invested in a project that will remove or prevent the equivalent amount of CO2 from being **released** into the atmosphere. (...) Forestry projects do not offer guaranteed carbon **sequestration** as trees eventually die and **release** their carbon as they decay *The Independent* January 11, 2007 Thursday Does carbon offsetting really help in the fight against climate change? BYLINE: CAHAL MILMO

- 170- This deliberate act of pollution would result in a barely detectable haze of sulphate particles perfectly sized to block some of the incoming sunlight but allow heat radiation from earth to **escape** into space. *The Independent* July 24, 2007 Tuesday If the current inundations are the result of global warming we will, of course, need to take action BYLINE: Thomas Sutcliffe
- 171- Temperature and CO₂ are bound together. When one goes up, the other will follow. In prehistory temperatures often started rising 800 years before levels of the gas, and Gore evades this point. But it is irrelevant to what is happening now, because for the first time ever enormous amounts of extra CO₂ are being **released**. (...) GORE SAYS: The culprit is humanity's emissions of "huge quantities" of carbon dioxide and other greenhouse gases, which trap more of the infrared radiation of the sun that would otherwise **escape** out into space. *The Independent on Sunday* March 4, 2007 **An inconvenient truth or hot air?** BYLINE: Geoffrey Lean
- 172- Ladies and gentlemen, I have the answer! Incredible as it might seem, I have stumbled across the single technology which will save us from **runaway** climate change! (...) When you review the plans for fossil fuel extraction, the horrible truth dawns that every carbon-cutting programme is a con. Without supply-side policies, **runaway** climate change is inevitable, however hard we try to cut demand. The talks in Bali will be meaningless unless they produce a programme for leaving fossil fuels in the ground. (...) Already this technology, a radical new kind of **carbon capture and storage**, is causing a stir among scientists. It is cheap, it is efficient and it can be deployed straight away. It is called . . . leaving fossil fuels in the ground. (...) Aha, you say, but what about **carbon capture and storage**? When governments use this term, they mean catching and burying the carbon dioxide produced by burning fossil fuels. It is feasible, but there are three problems. The first is that fossil fuels are being extracted and burned today, and scarcely any carbon **capture** schemes yet exist. The second is that the technology works only for power stations and large industrial processes: there is no plausible means of dealing with cars, planes and heating systems. The third, as Alistair Darling, then in charge of energy, admitted in the Commons in May, is that the technologies required for commercial carbon **capture** "might never become available". (The government is prepared to admit this when making the case, as he was, for nuclear power, but not when making it for coal). *The Guardian* December 11, 2007 Tuesday Comment & Debate: The real answer to climate change is to leave fossil fuels in the ground BYLINE: George Monbiot
- 173- This is the point at which severe environmental impacts are expected to start kicking in. Critically, we have just 10 to 15 years to reverse emissions before **runaway** climate change takes hold, with dying forests and melting permafrost, for example, emitting ever more CO₂, leading to spiralling climate change. This is the time for definitive action. (...) The carbon **released** by this wholesale destruction puts Indonesia right up there with China and the US in terms of greenhouse gases emitted - these countries are culprits numbers one, two and three, respectively. *Morning Star* December 3, 2007 Monday Paying the price; Ronnie Hall reports from the Bali summit on why market-based solutions are not the answer to the problems of climate change BYLINE: Ronnie Hall
- 174- The business leaders echoed the findings of last year's Stern Review in which the British economist argued that bringing emissions under control now would cost less than one per cent of global GDP annually, whereas "business as usual" would quickly result in **runaway** climate change and an eventual loss of at least one-fifth of the world's GDP. *The Independent* December 1, 2007 Saturday Businessmen back urgent action to halt climate-change emissions BYLINE: Daniel Howden
- 175- Saving the world's poorest people from the effects of **runaway** climate change will require the west to cut carbon emissions by four-fifths and display the political commitment shown by the United States in developing the atomic bomb or putting a man on the moon, the United Nations said last night. (...) That kind of temperature rise, with the related increase in sea levels and disruptive weather, could cause havoc in poorer countries, which would be hardest hit by climate change and which have the least money to mitigate the effects. *The Guardian* November 28, 2007 Wednesday National: Climate change report: Findings: Crops hit, more water shortages, higher sea levels, bigger disease risk BYLINE: Larry Elliott and Ashley Seager

- 176- **Runaway** climate change is too serious and urgent a threat to be dealt with in this piecemeal fashion. Clean technology is an admirable goal, but it is never going to be developed in the absence of a market framework that penalises existing carbon-emitting technologies. *The Independent* September 29, 2007 Saturday Bush's hollow words on climate change
- 177- Positive feedback, on the other hand, which occurs when the output goes back to add force to the input, can magnify the whole process until it takes on a "**runaway**" character. (...) This fear is well founded, because records of ancient climates deduced from cores driven deep into the polar ice show that this has happened in the past. Previous episodes of global warming at the end of ice ages have indeed developed a **runaway** character, with enormous temperature rises of as much as 10C in 50 years. *The Independent* May 18, 2007 Friday Earth's natural defences against climate change 'beginning to fail' BYLINE: Michael McCarthy
- 178- Yet the public now believes strongly that increasing human carbon dioxide emissions will cause **runaway** warming; it is surely a strange cause of climate change that naturally postdates its supposed effect? *The Sunday Telegraph* April 8, 2007 Sunday A DANGEROUS CLIMATE The latest IPCC report, published on Friday, is the most alarming yet BYLINE: Bob Carter
- 179- Too often the struggle against climate change is presented as one that can be fought either on an individual level, or through government action. The truth is that both are necessary if we are to avoid the cataclysm of **runaway** global warming. *The Independent* April 2, 2007 Monday The green gap between concern and action
- 180- He (Ed Miliband) said that there was only a short time left -as little as ten years, according to some scientists -to act to stop **runaway** temperature rises that will bring a host of natural disasters. (...) The prediction makes the European Union's target of limiting the rise to 2C even more challenging, and suggests that the 2-3C limit proposed in the Stern report last year will be harder to achieve than was thought. *The Times* February 3, 2007, Saturday Damning report seeks to end debate over global warming BYLINE: Lewis Smith (my addition in parenthesis)
- 181- Every scheme that could give us a chance of preventing **runaway** climate change should be considered on its merits. *The Guardian* January 30, 2007 Tuesday Comment & Debate: Don't be fooled by Bush's defection BYLINE: George Monbiot
- 182- In the last 200 years, humans have excavated and burned huge quantities of fossil fuels stored in the Carboniferous period, **releasing** ancient stored carbon. *The Guardian* April 29, 2004 Life: The Primer: This is what we know about global warming ...so why haven't we done anything about it yet? BYLINE: Paul Brown and Tim Radford
- 183- Global warming is not just a theory. It is an inevitable consequence of **releasing** greenhouse gases into the atmosphere and depends upon world population, the increasing demand for energy and the burning of forests to free land for cultivation. *The Times* August 18, 2003, Monday Greenhouse gases and climate change
- 184- The good news is that it can be done with existing technology, by cutting energy waste, expanding the use of renewable sources, growing trees and crops (which remove carbon dioxide from the air) to turn into fuel, **capturing** the gas before it is released from power stations, and - maybe - using more nuclear energy. (...) What could happen? Famously wet tropical forests, such as those in the Amazon, go up in flames, destroying the world's richest wildlife habitats and **releasing** vast amounts of carbon dioxide to speed global warming. *Independent on Sunday* February 6, 2005, Sunday SPECIAL REPORT: GLOBAL WARMING: APOCALYPSE NOW: HOW MANKIND IS SLEEPWALKING TO THE END OF THE EARTH BYLINE: GEOFFREY LEAN

- 185- This (organisms that breakdown carbon in soil) is **releasing** more carbon dioxide into the atmosphere. *The Mirror* January 21, 2005, Friday SOIL CLIMATE CHANGE FEAR (my addition in parenthesis)
- 186- The Taiga is receding as temperatures rise - leaving bare tundra in its wake, Permafrost used to seal up the tundra for most of the year but it is increasingly melting, **releasing** its vast store of methane a greenhouse gas 20 times more potent than carbon dioxide. *Sunday Mirror* November 5, 2006 MELTDOWN; EXCLUSIVE: MAN BEHIND THE BBC'S PLANET EARTH REVEALS THE DEVASTATING COST OF GLOBAL WARMING BYLINE: NIGEL BLUNDELL
- 187- Its very own eco-capitalism has so far helped a dirty Chinese company to clean up its act by incinerating the toxic gas produced by its refrigerant process rather than **releasing** it into the atmosphere. *The Independent* November 4, 2006 Saturday Saving the planet all part of the job to green capitalist BYLINE: SUSIE MESURE
- 188- Increased amounts will therefore accelerate warming, cause more melting of Siberian bogs and Arctic wasteland, and so **release** even more. The discovery of these levels of methane **release**, revealed in a report in Nature last week, suggests that the planet is rapidly approaching a critical tipping point at which global warming could trigger an irreversible acceleration in climate change. The revelations about Siberia's methane add to these worries. Methane is produced in soil by bacterial decomposition and normally **released** into the air. *The Observer* September 10, 2006 Siberian thaw to speed up global warming: The **release** of trapped greenhouse gases is pushing the world past the point of no return on climate change BYLINE: Robin McKie and Nick Christian
- 189- Short smoke stacks stopped pollution **escaping** over a wider area and its farmers were forced to sell their products locally to prevent the spread of toxins they contained. *The Mirror* November 28, 2006 Tuesday MOST POLLUTED TOWN IN EUROPE BYLINE: ANTON ANTONOWICZ
- 190- Using natural products cuts the number of unnecessary chemicals we and the workers producing them are exposed to, and reduces the levels of poisons **escaping** into the environment. (...) One of the gifts of the Industrial Revolution was the extraordinary surge of knowledge in chemistry. Advances in medical pharmacology transformed the lives of millions of people, but the **release** of a vast array of artificial chemicals into the atmosphere has led to the pollution of even the deepest oceans, threatening the world's fundamental chemistry. *The Independent* August 14, 2006 Monday THE SEVEN DEADLY ECO SINS; we all know global warming is a fact. BYLINE: Donnachadh McCarthy
- 191- As a rough guide, for every pounds 100 of gas bill, we **release** about a ton of carbon dioxide into the air each year. That's expensive. Worse, for many of us it is a burgeoning moral burden - every time I crank up the heating now, I feel slightly criminal, like a dieter gorging on chocolate. *The Daily Telegraph* March 25, 2006 Saturday the green gospel according to Dave with global warming an ever-increasing threat, we all have a duty to do our little bit. BYLINE: Sarah Lonsdale
- 192- That is why the Met Office's warning that the Amazon rainforest could die by mid-century, **releasing** its stored carbon from trees and soils into the air, is so worrying. *The Guardian* August 30, 2006 Wednesday Society: Environment: Global meltdown: Scientists fear that global warming will bring climatic turbulence, with changes coming in big jumps rather than gradually BYLINE: Fred Pearce
- 193- Power generation accounts for the biggest single source of carbon dioxide and equivalent greenhouse gases, with 61 million tons being **released** into the atmosphere in Britain in 2004. *The Independent* July 19, 2006 Wednesday Are you wondering why it's so hot today?

- 194- As soil bacteria heat up, they respire more, generating more CO₂. As temperatures rise, tropical forests die back, **releasing** the carbon they contain. These are examples of positive feedbacks. (...) As seawater warms, for example, it **releases** carbon dioxide. As soil bacteria heat up, they respire more, generating more CO₂. (...) This makes the **capture** of CO₂ from the air roughly three times as expensive as the British government's costings for building wind turbines, twice as expensive as nuclear power, slightly cheaper than tidal power and eight times cheaper than rooftop solar panels in the UK. *The Guardian* December 4, 2007 Tuesday Comment & Debate: This crisis demands a reappraisal of who we are and what progress means BYLINE: George Monbiot
- 195- The report, to be published on Saturday in Valencia, will also not contain worrying evidence published in the past year that the Southern Ocean has started to take up less carbon dioxide from the atmosphere, accelerating the pace of global warming, or predictions that there could be other "positive feedbacks," such as the Amazon forest dying and **releasing** carbon back into the atmosphere. *The Daily Telegraph* November 12, 2007 Monday Climate change to threaten a third of wildlife BYLINE: Charles Clover
- 196- The problem is that we're **releasing** more CO₂ than ever before - about 10 tonnes for each one of us in the UK per year - by burning fossil fuels like coal and oil. *The Mirror* July 6, 2007 Friday SO WHAT EXACTLY IS GLOBAL WARMING?
- 197- It is dangerous because of its direct impacts on people and places (it could, for example, trigger the irreversible melting of the Greenland ice sheet and the collapse of the Amazon rainforest) and because it is likely to stimulate further warming, as it encourages the world's natural systems to start **releasing** greenhouse gases. *The Guardian* May 1, 2007 Tuesday Comment & Debate: The rich world's policy on greenhouse gas now seems clear BYLINE: George Monbiot
- 198- That range of temperatures would cause sea levels to rise between 18 and 59 centimetres. Levels would rise more than that if the Greenland ice sheet melted faster than expected or if the tropical rain forests began to die back, **releasing** more carbon into the atmosphere. *The Daily Telegraph* February 3, 2007 Saturday Official: global warming is all our fault BYLINE: Charles Clover
- 199- MELTDOWN **RELEASING** DEADLY METHANE *The Independent* January 1, 2007 Monday World faces hottest year ever
- 200- The DTI is expected, possibly as early as this week, to launch a national consultation on **capture and storage - or sequestration** - of carbon dioxide from coal and gas-fired power plants. (...) Estimates suggest 90 per cent of emissions can be reduced by **capture and storage**, and under the North Sea the UK has one of the world's biggest and safest stores because the gas should solidify in the alkaline aquifers - porous deposits of bedrock. The lowest estimate for the potential **storage** capacity range is 10 years worth of fossil fuel supply. (...) The UK is also among the best-placed countries in the world for marine power, which could supply double the national energy demand. Future cost estimates vary widely, but the government's Carbon Trust has picked marine energy as the next priority for renewable energy investment, and believes the UK could **capture** 20-25 per cent of the global wave and tide industries. *The Observer* August 1, 2004 North Sea burial for greenhouse gases: New wave of marine-based solutions to global warming BYLINE: Juliette Jowitt
- 201- Emissions of greenhouse gases such as carbon dioxide must be cut, and carbon **sequestration** projects, which use tree-planting or other means to remove carbon dioxide from the atmosphere, needed to be supported. *The Times* January 8, 2004, Thursday Wildlife begins to feel the heat of global warming BYLINE: Mark Henderson
- 202- For its part, the Carbon Trust has steered clear of areas such as nuclear and so-called carbon **sequestration**, where carbon waste is effectively stored underground in old oil and gas fields. *The*

Sunday Telegraph June 15, 2003, Sunday Progressive companies regard climate change as an opportunity rather than a threat
BYLINE: Doug Morrison

- 203- Known as carbon **capture and storage (CCS)**, this involves trapping the CO₂ coming from power station chimneys, liquefying it, and storing it permanently deep underground. *The Independent* November 1, 2005, Tuesday GLOBAL WARMING: THE MOST IMPORTANT STEP SINCE THE KYOTO PROTOCOL
BYLINE: MICHAEL MCCARTHY
- 204- The week before, it was one of the partners with BP and Shell in a leading edge green technology carbon **capture**, whereby natural gas is "decarbonised" into hydrogen and carbon dioxide, the hydrogen fuelling the power station and the CO₂ being pumped into North Sea oilfields to improve oil recovery. *Sunday Times* July 10, 2005, Sunday While G8 talks, Perth acts on global warming
BYLINE: Robert Ballantyne
- 205- The **capture and storage** of CO₂, or carbon **sequestration**, is not new but the Miller project would be Britain's first. Under the scheme, carbon dioxide emitted by power stations would be liquified, pumped back out to the North Sea via a disused oil pipeline and stored in the depleted Miller field. *The Sunday Telegraph* May 01, 2005, Sunday Greenhouse gases buried at sea
BYLINE: Sylvia Pfeifer
- 206- A G8 deal with China to incorporate carbon **sequestering** technology on to its new power stations as soon as the technology becomes available could benefit the whole world. *The Independent* July 5, 2005, Tuesday LEADING ARTICLE: THERE IS STILL POTENTIAL FOR PROGRESS AT GLENEAGLES
- 207- Britain's dependence on fossil fuels will not be escaped quickly. So reducing the damage such fuels do is essential, through schemes such as carbon **capture** at power stations, which Mr Brown warmly supported this week, but only with words instead of cash. *The Guardian* December 9, 2006 Saturday
Leading article: Climate change: Beyond words
- 208- Mr Brown said he wanted to curb CO₂ emissions from houses, which accounted for 30% of all **releases**. (...) At the same time, Mr Brown will cut duty for biodiesel on pilot projects and increase landfill tax from £21 to £24 per tonne. He also unveiled plans to help carbon capture **sequestration** projects to bury carbon emissions, and to set up a new institute for environmental technologies with a budget of £550m. *The Guardian* December 7, 2006 Thursday Financial: Pre-budget report 2006: Environment: Chancellor seeks to give himself a green image
BYLINE: Terry Macalister
- 209- Sir Nicholas's report calls for a rapid increase in research and development of low carbon technologies, and in "carbon **capture**", which involves putting carbon emissions into underground **storage** rather than pumping them into the atmosphere. *The Independent* October 30, 2006 Monday 'Almost too late' to stop a global catastrophe
BYLINE: Andy McSmith
- 210- Some diplomats are pushing for ever closer engagement with China, working urgently to perfect the technology that might **capture** the carbon generated by coal-fired power stations, sending it back into the earth rather than into the atmosphere. That's especially pressing in the case of China, which is building a new coal-fired station every four or five days. *The Guardian* October 25, 2006 Wednesday
Comment & Debate: When it comes to global warming, market rule poses a mortal danger
BYLINE: Jonathan Freedland
- 211- But to make the new rationing scheme feasible, governments have to establish a carbon-neutral infrastructure: that means redesigning our transport systems to cure us of our addiction to cars; electricity generation not from nuclear but renewables and gas-fired power stations utilising **carbon capture and storage** *The Guardian* September 30, 2006 Saturday Review: Books: Philosophy and environment: Change or die: There's still time to save the planet from global warming

- 212- A "green growth" strategy - increased energy efficiency, more renewable fuels and new **carbon-capture** technologies - could stabilise the atmosphere at acceptable levels. (...) Green growth is not a dream. Energy efficiency and new **carbon-capture** technologies could stabilise the atmosphere
The Independent September 30, 2006 Saturday With a little bit of goodwill, we can still stop global warming
- 213- If Britain is to meet a 90% cut in emissions, the government must slow energy consumption and shift the economy towards renewables. The biggest emission savings, say the authors, will come from **capturing and storing** carbon emissions from coal and gas, and the generation of wave, wind and tidal energy. *The Guardian* September 15, 2006 Friday Global warming: Warning: bigger carbon cut needed to avoid disaster
- 214- We are addressing the wrong problem. In the UK, energy is about to run out. In 10 years, a third of our power stations will be worn out or against EU pollution laws. By 2035, oil prices could be ten times today's. Our children would be far better off if we sequestered North Sea oil by leaving it in the ground than if we **sequestered** carbon dioxide at Peterhead. *The Sunday Telegraph* November 12, 2006 Sunday WRONG PROBLEM, WRONG SOLUTION BYLINE: Christopher Monckton
- 215- The Government's climate-change levy on industry has penalised energy use rather than emissions. This emphasis should be reversed. The Government should also sponsor more research into carbon **sequestration** techniques. *The Independent* October 26, 2006 Thursday Climate change: Our green paper; Tony Blair says global warming is among the biggest threats of our age.
- 216- Carbon **capture and storage** is going to be essential here, but the technology has hardly begun to be used commercially. *The Independent* September 5, 2006 Tuesday We must start adapting to climate change BYLINE: FRANCES CAIRNCROSS
- 217- Carbon was buried during the ice ages, and was **released** when the ice-sheets retreated. When this happened "there was no smooth transition. The planet simply jumped". (...) And should the planet warm enough to **release** the trillions of tonnes of methane that are trapped in the frozen Siberian peat bogs and strange "clathrate" lattices at the bottom of the colder oceans - a catastrophic event that has occurred before and is pleasingly described here as "a prehistoric megafart" - then all bets are off. (...) So what are these other systems? Many of them are to do with carbon-**capture** processes that are already being forced into reverse by rising temperatures: the destruction of the world's great forests, of course, but also the melting of the arctic permafrosts, which are already giving up huge quantities of CO2 now that they have begun to thaw. *The Daily Telegraph* July 1, 2006 Saturday We must act now BYLINE: JAMES FLINT
- 218- Sweeney has high hopes for its Norwegian North Sea project that it says will **capture and store** underground up to 2.5 million tonnes of carbon dioxide annually - the same as would be produced by one million cars. It will cost £ 870m. The project is a joint venture with Norwegian oil firm, Statoil and will depend on 'substantial' government funding. Shell's renewables chief sees carbon **capture and storage** as a vital tool for cutting CO 2 emissions and helping to reduce global warming, but the technique is still in its infancy. (...) With Britain seemingly heading for a nuclear future, and with energy firms' emphasis on carbon **sequestration** accounting for huge sums of money, is there a danger that both agendas will seize all the investment money, leaving renewable energy in the cold? *The Observer* June 11, 2006 Energy: It's too late for the planet: or can we pull it from the fire? BYLINE: Nick Mathiason
- 219- How do you know that the behaviour the trade induces does not cancel out the carbon it **sequesters**? (...) While they have a pretty good idea of how much carbon our factories and planes and cars are **releasing**, scientists are much less certain about the amount of carbon tree-planting will absorb. When you drain or clear the soil to plant trees, for example, you are likely to **release** some carbon, but it is hard to tell how much. Planting trees in one place might stunt trees elsewhere, as they could dry up a river that was feeding a forest downstream. Or by protecting your forest against loggers,

you might be driving them into another forest. As global temperatures rise, trees in many places will begin to die back, **releasing** the carbon they contain. Forest fires could wipe them out completely. (...) As the trees grow, they are supposed to absorb the carbon we **release** when we burn fossil fuels. Despite the new findings, it still seems fair to say that forests are a net carbon sink, taking in more greenhouse gases than they **release**. (...) When you drain or clear the soil to plant trees, for example, you are likely to release some carbon, but it is hard to tell how much. (...) The timing is also critical: emissions saved today are far more valuable, in terms of reducing climate change, than emissions saved in 10 years' time, yet the trees you plant start absorbing carbon long after your factories **released** it. *The Guardian* January 17, 2006 Tuesday Comment & Debate: The scam of global warming is that we pay others for our complacency BYLINE: George Monbiot

- 220- Among schemes under discussion will be "**geosequestration**", a process for **capturing** carbon dioxide and **storing** it underground, and "clean coal", a technology for treating fossil fuel so that it **releases** fewer harmful gases. *The Guardian* January 12, 2006 Thursday Private sector will defeat climate change, US tells anti-Kyoto summit BYLINE: Owen Bowcott
- 221- But there are no easy answers: renewable energy sources such as wind, wave and solar could all provide low-carbon electricity but are at varying stages of development; biofuels and hydrogen could reduce transport emissions but there are inherent risks; carbon **capture and storage** could significantly reduce emissions from fossil fuel power plants but there is yet to be a full-scale, commercially viable demonstration. *The Times* December 18, 2007, Tuesday Climate change and plans for new technology
- 222- Carbon **capture and storage (CCS)** for coal is particularly urgent since coal-fired electric power is currently the dominant technology round the world and emerging nations will be investing heavily in these technologies. *Guardian.com* November 29, 2007 Stern: Climate change a 'market failure'
- 223- The Prime Minister announced, for the third time, the launch of a competition to build a **carbon capture and storage** power station - the kind of technology that his Foreign Secretary says we must develop and sell to China. We asked when this demonstrator project would be working. The answer? 2014. Why? Because that is how long industry says it will take. I remember coming back from Norway in 1997 and asking the new Labour Trade Secretary, Patricia Hewitt, whether Britain had any plans for **carbon capture and storage** (which the Norwegian oil industry was already doing). She looked at me as though I were mad. (...) What needs to happen, if the developed world is to demonstrate how we can stick within 2C of present global average temperature, is a vast escalation of renewable power, **carbon capture and storage**, and for each home in the land to be highly insulated and to become its own power station. *The Daily Telegraph* November 20, 2007 Tuesday Too little, too late to reverse climate change BYLINE: CHARLES CLOVER
- 224- Mr Brown did announce some steps in the right direction. The Green Homes Service is a positive attempt to make our existing houses greener, but it needed some practical incentive, such as cutting VAT on energy-efficient repairs and maintenance on private houses which create nearly 30 per cent of Britain's carbon emissions. It was good that he announced a competition to build in Britain one of the world's first commercial carbon capture and storage projects. But swift action will be required if that is to be exported to developing nations like China, which is now building two coal-fired power stations a week. And his commitment to the £1bn public-private Energy Technologies Institute, to focus on off-shore wind, wave and tidal energy, is welcome - although Britain starts from a far lower base than most of our European neighbours, despite having the greatest wind, wave and tidal resource in Europe.(...) It was good that he announced a competition to build in Britain one of the world's first commercial **carbon capture and storage** projects. *The Independent* November 20, 2007 Tuesday An immense challenge, but a tepid response

- 225- The oil cartel could join industrialised countries in helping to fund research and development into **carbon capture and storage**. *The Guardian* November 16, 2007 Friday Act now on climate change, says UN official BYLINE: Terry Macalister
- 226- The IPCC also produces one-off reports on subjects such as carbon **capture and storage**, and its work was rewarded when the panel shared the Nobel peace prize with Al Gore last month. *The Guardian* November 5, 2007 Monday The green list: Solutions v sophistry: The IPCC, a global panel of scientists and policy-makers, has now clearly shown the causes and effects of climate change. BYLINE: David Adam
- 227- Yes, the mining company brings oil, gas and coal out of the ground, but it points out that it also controls one third of all uranium in the world and can therefore provide fuel for a new generation of relatively carbon-free nuclear plants. Equally, it argues, gas is one of the cleaner forms of energy, while coal plays an important role in the future when combined with the **capture and storage** of carbon through **sequestration**. *The Guardian* November 5, 2007 Monday The green list: Green or greedy? BYLINE: Terry Macalister
- 228- First, it is likely that the bit of the Common Agricultural Policy that will really suffer is money for rural development and environmental projects, not the giant agri-businesses. Second, the extra money for the structural and cohesion funds is being earmarked for trans-European networks and carbon-intensive energy infrastructure in eastern Europe, both of which are likely to accelerate global warming. Instead, Hale (Director of the Green Alliance) argues, a dedicated low-carbon fund should be set up for Europe's energy and infrastructure, money set aside for **carbon capture and storage**, extra funds for research in green technologies, a sovereign investment fund to help move China and India towards low-carbon economies, and a budget to help the poorest countries adapt to climate change. *The Guardian* October 29, 2007 Monday Climate change cannot be bargained with BYLINE: Larry Elliot (my addition in parenthesis)
- 229- Sir David called for an increase in carbon trading - the transfer of technology, such as carbon **capture and storage** - to major polluting countries such as China and for more money to be spent on adaptation in countries, including Britain. *The Daily Telegraph* October 25, 2007 Thursday Climate change is 'biggest single global challenge' BYLINE: Charles Clover
- 230- The public spending review also provided a chance for the government to announce it would be going ahead with a competition for carbon **capture** experiments - but ones that removed CO₂ after coal was burned in power plants rather than before and it would provide support for only one such prototype facility, not two. *The Guardian* October 10, 2007 Wednesday Financial: Pre-budget report 2007: Transport & Environment: Climate change: Lack of initiatives leaves green groups disappointed BYLINE: Miles Brignall and Terry Macalister
- 231- No new coal power stations after 2020 without **carbon capture and storage**. Existing stations will have until 2025 to introduce the technology. *The Guardian* September 14, 2007 Friday Quality of life: Cameron's green tax pledge to families: The details: Tories plan to fight climate change with taxes and green tape
- 232- The report is also bad news for Cameron's commitment to the natural environment. The Conservatives have expressed considerable anxiety about the impact on the countryside of the Government's planning white paper. There's little of that from Redwood. The Campaign to Protect Rural England described his report as "confused and contradictory and, at its worst, a recipe for environmental degradation". There are, however, some positives. The report includes strong support for rail expansion and **carbon capture and storage** technology, and, in parts, greater use of brown-field land for development. *The Independent* August 20, 2007 Monday Tory policies on climate change are inconsistent BYLINE: STEPHEN HALE

- 233- There is also a new layer of climate-change jargon - Kyoto, carbon footprints, offsetting, energy descent, carbon **capture and sequestration**. This is an almost impenetrable set of new concepts which are still bitterly argued over. *Morning Star* August 16, 2007 Thursday Feature - Selling climate change BYLINE: Mark Ballard
- 234- For a world that's hooked on fossil fuels, it sounds like a godsend: **carbon capture and storage**. (...) Worldwide geological storage capacity is in principle enough to cope with 80 times the world's current annual CO₂ emissions from fossil fuels. It has been projected that 20-40% of these emissions could be suitable for **capture and storage** by 2050. (...) And, in the wake of the G8 summit deal on climate change earlier this month, it's pretty certain that carbon **sequestered** in this way will count towards reduction targets in the post-2012 successor to Kyoto 1. *The Guardian* June 27, 2007 Wednesday Climate change: Challenging business: Biofuels: Storing up trouble for the future BYLINE: Roger East
- 235- Have you noticed, by the way, that Europeans like to sneer at the US for being anti-science and replacing the rule of reason with Biblical fundamentalism? In fact, almost all the really exciting new research into the technologies of emissions reduction, **carbon capture and carbon sequestration** are being done by clever scientists in the US. *The Times* June 5, 2007, Tuesday On climate change, Bush is all heart BYLINE: Gerard Baker
- 236- There are problems, too, with landfill projects trying to **capture** and harness another greenhouse gas, methane: it is tempting for projects to exaggerate the amount of methane the landfill is leaking *The Guardian* June 2, 2007 Saturday Global warming: Truth about Kyoto: huge profits, little carbon saved BYLINE: Nick Davies
- 237- However, forest experts say governments continue to pursue science fiction solutions to the coming climate catastrophe, preferring bio-fuel subsidies, carbon **capture** schemes and next-generation power stations. (...) And yet there is no agreement on placing a value on the vastly more valuable land in developing countries. More than 50 per cent of the life on Earth is in tropical forests, which cover less than 7 per cent of the planet's surface. They generate the bulk of rainfall worldwide and act as a thermostat for the Earth. Forests are also home to 1.6 billion of the world's poorest people who rely on them for subsistence. However, forest experts say governments continue to pursue science fiction solutions to the coming climate catastrophe, preferring bio-fuel subsidies, carbon capture schemes and next-generation power stations. Putting a price on the carbon these vital forests contain is the only way to slow their destruction. *The Independent* May 14, 2007 Monday Burning forests 'is main agent of climate change' BYLINE: Daniel Howden
- 238- The last major regulatory hurdle for the **capture and storage** of CO₂ emissions in Europe is expected to be cleared by the end of the year, when the law of the sea relating to the north-east Atlantic is expected to be amended to allow **storage** under the sea bed. If and when it happens, it will open the way to a major new business market for the potential prime players in Europe - the UK and Norway - and could give them an edge over possible rivals in the US, where similar legal changes could be slower to arrive. The world market in carbon **capture and storage (CCS)** has been estimated at £ 150bn a year by Edinburgh University. (...) CCS has been identified by the Intergovernmental Panel on Climate Change and other groups as potentially the best response to climate change in the short and medium term. By **capturing** emissions and burying them, BP, Centrica and other energy producers planning such schemes would dramatically cut back the **release** of CO₂. *The Observer* May 6, 2007 Business & Media: CLIMATE CHANGE: How Europe can seize the market in carbon **capture** BYLINE: Neasa MacErlean
- 239- Existing and emergent technologies, ranging from renewable energy and nuclear power to carbon **capture and storage**, will be adequate to make the necessary reductions in emissions, they asserted in a new study. And this can be done at comparatively low cost - provided the right incentives are put in place. *The Independent* May 5, 2007 Saturday Climate change can be halted if governments act now, concludes UN BYLINE: Michael McCarthy

- 240- The IPCC said that it wants every country to be subject to carbon trading schemes, in which companies pay for the carbon they emit. **Carbon capture and storage**, in which carbon is caught as it is produced and stored in rock formations under the sea, was highlighted as a key technology. (...) Each sector of society must play its role, according to the report. Farmers are expected to improve land management so that the soil absorbs more carbon. The transport sector was urged to bring in more hybrid and fuel-efficient vehicles. A reduction in deforestation was cited as an important route to cutting carbon emissions. *The Times* May 5, 2007, Saturday Global warming can be controlled -but only if nations act now, UN told BYLINE: Lewis Smith
- 241- By 2030, the report sees the wider use of carbon **capture and storage** as a way to offset the inevitable increase in coal in the booming developing economies of China and India. (...) And while lifestyle changes made by individuals get a mention for the first time, written heavy between the lines on each of the report's 35 pages is the message that it is the responsibility of governments to force through the required changes. *Guardian.com* May 4, 2007 Slowing climate change is going to cost
- 242- As well as plans for more nuclear power, genetically modified biofuels and carbon **capture**, the report sets out a vision of the future that is a mixture of existing policies, such as energy efficiency and renewable energy from wind and wave farms, and more futuristic ideas for hydrogen car fleets and 'intelligent' buildings which control energy use. *The Observer* April 29, 2007 UN facing a backlash on emissions action plan BYLINE: Amelia Hill and Juliette Jowit and Robin McKie
- 243- Greater use of renewable energy, nuclear power and biofuels will be needed to stabilise emissions, while protecting the world's forests could offer a more "cost-effective" solution. And it calls for the wider use of technology to **capture** carbon dioxide spewed from power stations and store it underground, known as **carbon capture and storage (CCS)**. *The Guardian* April 28, 2007 Saturday Environment: UN: we have the money and know-how to stop global warming BYLINE: David Adam
- 244- The US argues that it is investing more than the EU in technologies such as carbon **capture**, which could help countries such as China to tackle emissions. *The Independent* April 27, 2007 Friday Divisions over global warming threaten EU-US climate meeting BYLINE: Stephen Castle
- 245- In Miliband's vision, the remaining plants will be forced to speed up the development of what amounts to global warming's silver bullet: **carbon capture and storage, or CCS**, whereby CO₂ could apparently be pumped out of power stations, along pipelines, and into empty oil and gas fields under the ocean (which in Drax's case would probably entail a pipeline running from Megawatt Valley to the North Sea). (...) **Carbon capture and storage** may be the only answer because, terrifyingly, there's probably only one question: given that King Coal is here to stay, what are we going to do? *The Guardian* April 14, 2007 Saturday Weekend: THE BURNING ISSUE: A single chimney at Yorkshire's Drax power station pours out more pollution than entire countries. BYLINE: John Harris
- 246- The trading mechanism is designed to create scarcity, forcing up the price of carbon and prompting industries such as steel and power generation to invest in cleaner, greener technologies, such as renewable, carbon-free energy and, eventually, carbon **capture and storage**. So far, it is manifestly not working as planned. *The Guardian* April 3, 2007 Tuesday Financial: Global warming: Smoke alarm: EU shows carbon trading is not cutting emissions BYLINE: David Gow
- 247- The report explains that it is easier and cheaper to reduce energy use than to **capture and store** byproducts of fossil fuels, such as CO₂. For example, insulating a building could save euros 150 for each tonne of carbon dioxide reduced. (...) The study criticises the EU for giving priority to reducing emissions in electricity generation, which has the potential to lower its CO₂ emissions by 6bn tonnes by 2030, while failing to give at least equal attention to the forestry industry that could reduce its share by 7bn tonnes through improved management. *The Guardian* March 28, 2007 Wednesday International: European Union's climate change goals will cost euros 1 trillion BYLINE: Kate Connolly

- 248- When negotiations start this December for a deal to replace the Kyoto protocol, China and India will resist binding targets to reduce emissions. (...) Speaking at a recent lecture in Beijing, Professor Sachs said China needed to move quickly towards clean coal and carbon **capture** technology. *The Guardian* March 26, 2007 Monday Environment: Fighting for air: frontline of war on global warming BYLINE: Jonathan Watts, Linfen and Randeep Ramesh
- 249- There will be investment in renewable energies such as solar, wind and wave power, but also in the more controversial **carbon capture and storage** scheme. *Guardian.com* March 13, 2007 Climate change bill is revolutionary
- 250- Mr Pearson held talks with British Airways before Christmas to urge it to recognise that transatlantic flights had to be included to make the scheme credible. Limiting the scheme to intra-EU flights would only **capture** 20% of EU aviation carbon emissions. *The Guardian* January 5, 2007 Friday Labour targets airlines over carbon emissions BYLINE: Patrick Wintour
- 251- One project aims to make carbon **sequestration** - which prevents emissions by **storing** the gas underground - a reality. *The Observer* November 25, 2007 Green Business Guide: Academics are racing to slow climate change BYLINE: Anushka Asthana
- 252- Lackner's concept is a variant of carbon **sequestration** technology which involves the seizing of carbon and **storing** it underground. (...) Chance of success: 4/5 Carbon **sequestration** is likely to play a major role in the world's battle against climate change, though perhaps not in the form of synthetic trees. (...) An absorbent coating, such as limewater, on slats would capture carbon dioxide so that it could be removed and then buried. However, critics say the scheme suffers from the fact that engineers could end up expending more energy in **capturing** carbon dioxide than they would save. *The Observer* October 7, 2007 Focus: CAN SCIENCE REALLY SAVE THE WORLD? BYLINE: Robin McKie and Juliette Jowit
- 253- In addition, it's investigating building high-efficient power stations at its existing sites at Tilbury or Blyth, Northumberland, and looking at ways of **capturing** carbon dioxide from new coal-fired plants and **storing** it under the North Sea in depleted gas reservoirs. *The Daily Telegraph* December 31, 2007 Monday The burning question of sustainable energy BYLINE: Andrew Cave
- 254- At present our centralised power stations waste two-thirds of the energy they generate in the form of waste heat - that's the steam you see floating from cooling towers. According to the Government's own figures, by **capturing** that heat and using it with CHP technology, the nuclear programme could be shelved, giving us cheaper and cleaner fuel. *The Independent on Sunday* September 9, 2007 Gordon plays the jolly Green giant, but he needs to get serious
- 255- Just how all this is to be achieved has yet to be worked out. **Capturing** thousands of tons of carbon spewed out by coal-fired power stations is tricky. There is, as yet, no proven way of doing it. Nonetheless, such pledges are a step in the right direction. Energy producers are also the largest energy consumers. *The Daily Telegraph* May 7, 2007 Monday For my next mission: save the world EDF chief Vincent de Rivaz believes nuclear power is the answer to stopping climate change. BYLINE: Sophie Brodie
- 256- It (G. W. Bush's security budget) could, for instance, have paid to transform the way we generate electricity, by **capturing carbon and storing it** in the ground, rather than **releasing** it into the atmosphere. *The Guardian* April 18, 2007 Wednesday Comment & Debate: There is now no doubt that global warming is a security threat to us all BYLINE: Jonathan Freedland (my addition in parenthesis)
- 257- The idea is already being used to develop ways of **capturing** carbon dioxide from power stations, but Sir Richard's prize will focus on stimulating ways of **capturing** carbon dioxide from the atmosphere - a much harder task because the gas will be in lower concentrations compared to the emissions from a

power station chimney. (...) The irony of basing an environment prize for absorbing carbon dioxide on a prize for **releasing** the gas in the fastest way possible will not be lost on many environmentalists who want to curb the unnecessary use of fossil fuel rather than relying on untried and unproven technological fixes for global warming. *The Independent* February 9, 2007 Friday Branson offers £10m to the person who can prevent the climate change crisis BYLINE: Steve Connor

- 258- Dr Laut's analysis of the flaws is accepted by most scientists familiar with the research, including Paul Crutzen, an atmospheric chemist at the Max Planck Institute in Germany, who won a Nobel Prize for his work on understanding the **hole** in the ozone layer. *The Independent* December 14, 2009 Monday Sunspots do not cause climate change, say scientists BYLINE: Steve Connor
- 259- The term '**ozone hole**' was effective in banning CFCs. A similarly imprecise but emotive phrase could focus minds on the climate (...) In the 80s, the "**hole** in the ozone layer" was almost as iconic as Duran Duran and Maggie Thatcher. The world worried and governments responded. *Guardian.com* September 21, 2009 Monday Global burning: could a phrase save us from catastrophic climate change? BYLINE: Jonathan Watts
- 260- CLIMATE change fears were rubbish yesterday as experts revealed the ozone layer is repairing itself. (...) Scientists had claimed a **hole** in the layer would cause a series of environmental and health disasters. *Daily Star* September 21, 2010 Tuesday GLOBAL WARMING: IT'S ALL A LOAD OF HOT AIR BYLINE: EMILY HALL
- 261- The early days of new ministers are notoriously gaffe-prone. So John Gummer kicked off as environment secretary back in 1993 by demonstrating on TV that he didn't know the difference between the ozone **hole** (a problem solved) and global warming (a problem he never did solve). *The Guardian* May 8, 2010 Saturday Review: Prime Minister's questions: National debt, climate change, an ongoing war BYLINE: Fred Pearce
- 262- Giant ozone **hole** found above Arctic (...) Not again! Scientists have discovered a **hole** five times the size of Germany in the ozone layer above the Arctic which is similar to the **hole** over the Antarctic. *Independent.co.uk* December 28, 2011 Wednesday The 12 most-read 2011 articles in Environment BYLINE: Majid Mohamed
- 263- Incidentally... why don't we hear anything these days about the **hole** in the ozone layer, which we were told a few years ago would soon fry us all to a crisp? Were scientists granted a gagging order to stop anyone from talking about it? *The People* June 19, 2011 Clear the hot air; Forget climate change and teach kids facts BYLINE: Charlie Catchpole
- 264- Temperatures at the South Pole are also being kept down by the **hole** in the ozone layer - caused by the **release** of now banned CFC gases from aerosols - which opens each year in the atmosphere. The **hole** causes more westerly winds which, through a complex interaction between ice, sea and wind, lower temperatures. *MailOnline* October 12, 2012 Friday Now there's more ice at South Pole than ever BYLINE: DAVID DERBYSHIRE
- 265- The 60-year-old outfit, whose achievements have included the discovery of the **hole** in the ozone layer, is to be merged with the National Oceanography Centre in Southampton as part of a cost-saving exercise. *The Observer* September 30, 2012 Front: Antarctic groups merger threatens climate change research BYLINE: Robin McKie and Gemma O'Neill
- 266- The introduction of many such gases dates back to the 1980s, when British scientists found a huge **hole** forming in the ozone layer over Antarctica. (...) The cause of the **hole** was determined to be chlorofluorocarbons (CFCs) - gases used as refrigerants, in air-conditioning and in aerosols as propellants. *The Sunday Times* September 16, 2012 Sunday Green gases heat up Earth BYLINE: Jonathan Leake

- 267- The discovery of the "ozone **hole**" caused alarm, because a thinly scattered stratospheric layer of the blue-tinged gas is all that protects terrestrial life from lethal ultraviolet solar rays. For more than a decade, some scientists had worried that CFCs, used in a huge range of products from foams to aerosol cans, were eroding it - and, sure enough, observations soon showed they were to blame. *The Daily Telegraph* September 15, 2012 Saturday Global warming: the heat's back on BYLINE: Geoffrey Lean
- 268- Summer ice cover has dropped dramatically while permafrost in Siberia is melting. The first phenomenon reduces the planet's ability to reflect solar heat back into space. The second will **release** excess amounts of methane. Combined, they worsen the rate of global warming. *The Observer* December 28, 2008 Focus: Facing the future BYLINE: Robin McKie
- 269- The chance of a catastrophic **release** of methane from frozen sub-sea stores at high latitudes is also rated low. *The Guardian* December 17, 2008 Wednesday National: Global warming 'could make seas rise 1.5 metres' BYLINE: James Randerson
- 270- Almost half the CO₂ **released** by human activity between 1800 and 1994 is **stored** in oceans. If carbon dioxide emissions continue as expected, the surface of the eastern Pacific ocean is set to become more acidic and between 2C (3.6F) and 3C warmer. *The Times* December 16, 2008 Tuesday Climate change takes the fight out of cannibalistic giant squid; Warming seas threaten habitat, says scientist BYLINE: Frank Pope
- 271- Diplomats suggested giving eastern European countries a "solidarity fund" drawn from some of the money polluting companies will have to pay for permits that allow them to **release** large amounts of carbon dioxide. But Reinfeldt warned that there was a limit to how much financing richer countries could fork out and that they would not accept any dilution of the goals the EU set last year. *Guardian.com* December 12, 2008 Climate change: EU leaders close to emissions deal
- 272- Trees and plants soak up carbon dioxide as they grow, but **release** it again as they are burned or left to rot. *The Independent on Sunday* December 7, 2008 Ancient skills 'could reverse global warming' BYLINE: Geoffrey Lean
- 273- Scientists claim to have discovered evidence for large **releases** of methane into the atmosphere from frozen seabed stores off the northern coast of Siberia. (...) The warming caused by the gas could destabilise permafrost further, they fear, leading to yet more methane **release**. (...) Methane **release** from stores of so-called gas hydrates, that can form on land or under the sea, is not new to researchers. Huge quantities are known to exist in the Arctic, but special circumstances would need to exist for significant **releases** to occur. (...) He said the process of methane **release** from hydrates had been filmed by robotic vehicles off the coast of Vancouver Island in Canada, for example. (...) In most cases, methane **released** from the sea bed is consumed by micro-organisms as it bubbles up to the surface. But if it is released quickly enough it could make it into the atmosphere. (...) Estimates for the amount of carbon locked up in the hydrates vary from 500 to 5000 gigatonnes. Scientists predict that warming will **release** some of these deposits, but modelling the temperature rise that would trigger significant releases has proved extremely difficult. (...) A large injection of the gas - which is 21 times more potent as an atmospheric heat trap than carbon dioxide - has long been cited by climate scientists as the potential trigger for **runaway** global warming. The warming caused by the gas could destabilise permafrost further, they fear, leading to yet more methane **release**. *Guardian.com* September 23, 2008 Arctic 'methane chimneys' raise fears of runaway climate change
- 274- Last year a major report into the environmental impact of meat eating by the Food Climate Research Network at Surrey University claimed livestock generated 8 per cent of UK emissions - but eating some meat was good for the planet because some habitats benefited from grazing. It also said vegetarian diets that included lots of milk, butter and cheese would probably not noticeably reduce emissions

because dairy cows are a major source of methane, a potent greenhouse gas **released** through flatulence. *The Observer* September 7, 2008 INSIDE: UN says eat less meat to curb global warming BYLINE: Juliette Jowit

- 275- Our peatlands, which cover much of our upland regions, are massive stores of carbon dioxide. In England and Wales, they could absorb up to 41,000 tonnes of CO₂ a year if they were in pristine condition. But if damaged by burning, as well as by too much draining of water and by overgrazing, as has occurred in the past, they could **release** hundreds of thousands of tonnes of carbon dioxide. *The Observer* September 7, 2008 News: Special report: Is our taste for Sunday roast killing the planet? BYLINE: Robin McKie and Caroline Davies
- 276- Over the decades, melting polar ice sheets would increase sea levels to the point where whole island nations - not to mention parts of Britain - would be smothered. The **release** of CO₂ could spiral beyond human control if the heat stopped natural forest fires from burning themselves out. In the darkest scenario, civilisation would be on the slipway to oblivion. (...) A joint agreement to find a way of making carbon **capture** work, and to fund it, would be a first step. Every country could argue that the vast funds involved are unaffordable. Each, however, is one part of the same planet - and it can no longer afford delay. *The Guardian* August 7, 2008 Thursday Leading article: Climate change: Planning for the worst
- 277- PwC has raised its projections for the amount of carbon that would be **released** between now and 2050 because it expects stronger economic growth in China and India over the next four decades, which in turn would lead to more use of energy and more carbon emissions. (...) Significant carbon reductions were technologically feasible, said the report, if the world made a big move into renewable energy, increased its energy efficiency and embarked on large-scale **carbon capture and storage (CCS)** to trap emissions released by burning coal. *Guardian.com* July 3, 2008 Avoiding climate change disaster is affordable
- 278- But the other great lesson is that sticking with current policy is actually a very risky option, rather than a safe bet. Betting on Kyoto could mean triggering the collapse of the West Antarctic ice sheet and crossing thresholds that involve massive methane **release** from melting Siberian permafrost. *The Guardian* June 12, 2008 Thursday Comment & Debate: Climate chaos is inevitable. BYLINE: Mark Lynas
- 279- The Amazonian forests are important for absorbing the carbon dioxide that is **released** by the burning of fossil fuels, which causes climate change. *The Times* June 9, 2008 Monday Climate change
- 280- The drying of blanket bog could be catastrophic to the amount of carbon **released** into the atmosphere. *The Independent* May 19, 2008 Monday Development and climate change putting wildlife habitats at risk
- 281- Extra carbon dioxide in the atmosphere enhances a natural process known as the greenhouse effect. Greenhouse gases, such as carbon dioxide, absorb heat and **release** it slowly. Without this process, Earth would be too cold for life to survive. (...) One potential trigger could be the **release** of methane from methane clathrate compounds buried on the sea floor. Currently these deposits are frozen, but if the oceans warm sufficiently they could melt, burping vast quantities of methane into the atmosphere. (...) Although average global temperatures are predicted to rise, this doesn't necessarily mean that we'll be sitting in our deckchairs all year round. The extra energy from the added warmth in the Earth's atmosphere will need to find a **release**, and the result is likely to be more extreme weather. *The Guardian* April 28, 2008 Monday The Earth: Climate change: the facts: The subject of global warming has become impossible to ignore. But what are its implications? BYLINE: Kate Ravilious
- 282- Greenhouse gas emissions are growing much faster than previously thought because of several factors that were not fully appreciated before, including the **release** of methane from thawing permafrost, the acidification of oceans, and the decay of carbon sinks. *The Independent* April 17, 2008 Thursday Stern warns that climate change is far worse than 2006 estimate BYLINE: Danny Fortson

- 283- Indonesia's carbon emissions are likely to increase, the study predicts, as most future forest clearance will be conducted in areas with deep peat, which **releases** greenhouse gases when it decomposes or burns. *Guardian.com* February 27, 2008 Sumatran deforestation driving climate change and species extinction, report warns
- 284- Growing crops to make biofuels results in vast amounts of carbon dioxide being **released** into the atmosphere and does nothing to stop climate change or global warming, according to the first thorough scientific audit of a biofuel's carbon budget. (...) Two separate studies published in the journal *Science* show that a range of biofuel crops now being grown to produce "green" alternatives to oil-based fossil fuels **release** far more carbon dioxide into the air than can be absorbed by the growing plants. (...) Both studies looked at how much carbon dioxide is **released** when a piece of land is converted into a biofuel crop. (...) Such conversions of land to grow corn (maize) and sugarcane for biodiesel, or palm oil and soybean for bioethanol, **release** between 17 and 420 times more carbon than the annual savings from replacing fossil fuels, the scientists calculated. *The Independent* February 8, 2008 Friday Biofuels make climate change worse, scientific study concludes BYLINE: Steve Connor
- 285- There are uncertainties, though - for example, the planet's oceans, forests and soils could **release** their massive stocks of carbon as the world warms, leading to much greater temperature rises than human emissions alone would cause. *Guardian.com* February 1, 2008 Q&A: Climate change
- 286- Here, three worlds seem to exist in virtual isolation. In the physical world, global warming appears to be spilling over into **runaway** feedback: the most dangerous situation humankind has ever encountered. *The Guardian* December 9, 2008 Tuesday Comment & Debate: Cyberspace has buried its head in a cesspit of climate change gibberish BYLINE: George Monbiot
- 287- The uncertainty derives from how the Earth's giant ice sheets will react to warmer temperatures. Most of the predicted change in sea level in the IPCC report comes from thermal expansion - if the world's oceans all warmed by 1C, then they would expand to raise the overall level by about 70cm. (...) Jim Hansen, of Nasa, has argued that most estimates of sea level rise are too conservative. He says that feedbacks in the climate system would quickly accelerate ice melt, and could lead to **runaway** collapse. *The Guardian* December 9, 2008 Tuesday International: Climate change: The science: Melting away: Ice sheet at risk BYLINE: David Adam
- 288- This gets a little complicated, but please bear with me while I explain why Turner's proposal is about as likely to stop **runaway** climate change as the Maginot Line was to hold back the Luftwaffe. (...) Last week a paper published in *Geophysical Research Letters* produced what could be the first hard evidence that **runaway** global feedback has begun. In 2007 methane levels in the atmosphere, which had previously levelled off, began rising again. The most likely reason is that the Siberian permafrost is melting, as a result of the **runaway** warming of the Arctic. This wasn't supposed to begin for another 80 years. The great global meltdown appears to have started, yet Turner proposes that we carry on with the old plan as if nothing has changed. *The Guardian* December 2, 2008 Tuesday Comment & Debate: Long, detailed, impressive - but futile in the face of **runaway** climate change: BYLINE: George Monbiot
- 289- It can be such a, let's be frank, dull and impenetrable subject that there are those who believe the obfuscation is intentional, to repel prying eyes from exposing the murky workings of the only truly international system up and running that's designed, by curbing greenhouse gas emissions via the "cap and trade" principle, to protect us against **runaway** climate change. (...) Bryony Worthington, who has inhaled the fug of emissions trading every day for the past decade, first as an environmental campaigner, then as a government official, and finally as a lobbyist for a giant energy firm, has had enough. (...) Using her unique knowledge of how "this game" works, she wants to expose its underbelly and help to spark greater debate about what, she believes, is a vitally important component of our collective fight against climate change. (...) She welcomes the announcement by Gordon Brown on Thursday that the energy firms must help pay for homes to be better insulated, but says there are more important things the government could be concentrating on, such as **carbon capture and storage**

(CCS) technology - the great, unproven hope for cleaning up coal. *The Guardian* September 13, 2008 Saturday
Saturday: 13.09.08: Worthington's war BYLINE: Leo Hickman

- 290- Yesterday a report from the New Economics Foundation said there may be just 100 months left before greenhouse gas emissions pass a tipping point, triggering **runaway** global warming. Greenpeace predicted that the increasing urgency of climate change would mean more people would be prepared to go to jail to draw attention to environmental issues. *The Guardian* August 2, 2008 Saturday Environment: Kingsnorth camp BYLINE: Matthew Taylor
- 291- The short version of his answer is 'nothing'. The IPCC report predicts that, should humanity continue to produce most of its energy through processes that **release** CO₂ into the atmosphere, the planet will warm by between 1.8C and 4C over the next century. (...) That the world will end up much richer at the end of the 21st century, even with **runaway** global warming, is no guarantee that some dreadful things won't happen on the way. *The Sunday Telegraph* July 6, 2008 ENVIRONMENT; DO SOMETHING OR DO NOTHING? BYLINE: ALASDAIR PALMER
- 292- When Sir Nicholas Stern published his study of the economics of climate change, environmentalists -myself included - lined up to applaud him: he had given us the answer we wanted. He showed that stopping **runaway** climate change would cost less than failing to prevent it. But because his report was so long, few people bothered to find out how he had achieved this result. It took me a while, but by the time I reached the end I was horrified. (...) Stern's methodology has a disastrous consequence, unintended but surely obvious. His report shows that the dollar losses of failing to prevent a high degree of global warming outweigh the dollar savings arising from not taking action. It therefore makes economic sense to try to stop **runaway** climate change. *The Guardian* February 19, 2008 Tuesday Comment & Debate: Juggle a few of these numbers, and it makes economic sense to kill people BYLINE: George Monbiot
- 293- Methane and carbon dioxide, currently trapped in the frozen permafrost of the Arctic, will be **released** in vast quantities *The Observer* December 20, 2009 Why I believe all is not lost – yet BYLINE: ROBIN McKIE
- 294- At this stage, the Arctic permafrost enters the danger zone. Methane and carbon dioxide in the soils will be **released** into the atmosphere. (...) After a 3C global temperature rise, global warming may run out of control and efforts to mitigate it may be in vain. Millions of square kilometres of Amazon rainforest could burn down, **releasing** carbon from the wood, leaves and soil and thus making the warming even worse, perhaps by another 1.5C. *The Guardian* December 19, 2009 Saturday National: Climate change: What will happen when the world gets warmer? Four possible scenarios BYLINE: Alok Jha
- 295- The road transport industry is also keen to increase the use of biofuels, and an EU directive last year requires 10% of all road transport fuel to come from plants by 2020. Theoretically the fuels are carbon-neutral: when burned they only **release** the carbon dioxide they absorbed while the plants were growing. Campaigners argue biofuels are not as sustainable as they seem and say more biofuels would mean the destruction of virgin forests - and the **release** of their stored carbon - to create agricultural land. Heinz Ossenbrink, of the EC's Institute of Energy (IoE), said research carried out by EU-funded scientists increasingly pointed to a long-term problem for large-scale biofuels use, namely the emissions of nitrous oxide. This is about 270 times more potent than carbon dioxide as a greenhouse gas and is **released** through use of fertilisers to grow biofuel crops. *The Guardian* December 8, 2009 Tuesday National: Climate change: Alternative energy: Nitrous oxide concerns hit high hopes for biofuels BYLINE: Alok Jha
- 296- As the Telegraph's Geoffrey Lean explains quite simply in his latest column, "since the Industrial Revolution, humanity has dug, squeezed and pumped half a trillion tons of carbon in coal, gas and oil from beneath the surface of the Earth, burnt it, and **released** it as carbon dioxide in the atmosphere". *telegraph.co.uk* December 7, 2009 Monday Copenhagen: climate change sceptics have been outmanoeuvred. For now. BYLINE: Will Heaven

- 297- The country is infamous for its production of lignite - also known as brown coal - which **releases** more CO₂ than any other type of coal. *The Sunday Times* December 6, 2009 SHIFTING SANDS; From great British landscapes to the harsh reality of climate change
- 298- Climate change is widely blamed on the burning of fossil fuels which **release** greenhouse gases such as 2 into the atmosphere, where they trap the sun's heat. *The Express* December 2, 2009 Wednesday THE BIG CLIMATE CHANGE 'FRAUD' BYLINE: John Ingham
- 299- What should make us especially anxious is the significant probability of a really drastic climatic shift, triggering a grave and irreversible global trend: rising sea levels due to the melting of Greenland's icecap, **runaway release of methane** in the tundra, and so forth. *The Independent* December 2, 2009 Can we fix it? Perhaps, but it depends who you ask BYLINE: Enjoli Liston
- 300- The coal deposits are prone to uncontrollable fires, and these have created an ecological disaster: land subsidence is a common occurrence, and the fires **release** poisonous gases into the water, air and land. *The Sunday Times* November 29, 2009 THE SHARP END; Life at the forefront of climate change
- 301- There is little forest left now and little productive farming. Much of the land in this region that stretches north to the border with Colombia was long ago contaminated by millions of gallons of toxic waste, gas and crude oil **released** untreated into the environment. *The Sunday Times* November 29, 2009 THE AMAZON'S DIRTY WAR BYLINE: Christine Toomey
- 302- Fuelled by the hype surrounding Climategate, those who believe that climate change has nothing to do with mankind's **release** of greenhouse gases into the atmosphere have had a storming week - led, in case you hadn't noticed, by our very own James Delingpole. *telegraph.co.uk* November 29, 2009 Sunday Climategate won't make global warming go away, despite what Delingpole tells you BYLINE: Will Heaven
- 303- This week Helmer convened a conference of climate change deniers at the European parliament. Speakers included Ross McKittrick, a Canadian professor who has said data indicating global warming has been fiddled; Tom Segalstad, a Norwegian geologist who says human-**released** CO₂ would not have a large effect on the climate *Guardian.com* November 20, 2009 Friday Climate change denial MEP attacks church BYLINE: Allegra Stratton
- 304- Professor Le Quere said that Copenhagen was the last chance of coming to a global agreement that would curb carbon-dioxide emissions on a time-course that would hopefully stabilise temperature rises to within the danger threshold. "The Copenhagen conference next month is in my opinion the last chance to stabilise climate at C above pre-industrial levels in a smooth and organised way," she said. "If the agreement is too weak, or the commitments not respected, it is not 2.5C or 3C we will get: it's 5C or 6C - that is the path we're on. The timescales here are extremely tight for what is needed to stabilise the climate at C," she said. Meanwhile, the scientists have for the first time detected a failure of the Earth's natural ability to absorb man-made carbon dioxide **released** into the air. *The Independent* November 18, 2009 Wednesday World on course for catastrophic 6° rise, reveal scientists BYLINE: Steve Connor and Michael McCarthy
- 305- Plants soak up carbon dioxide as they grow and **release** it when they are burnt or rot. *Morning Star* November 11, 2009 Wednesday World - Norway pays £150m to save rainforests; Guyana given money as part of scheme to slow climate change
- 306- If this treaty is ratified in its present form it would be a disaster. Its effect would be to encourage the destruction of rainforests and accelerate the catastrophic **release** of carbon dioxide into the atmosphere that such felling would entail. *The Independent* October 28, 2009 Wednesday Planting the seeds of environmental disaster

- 307- Food waste in landfill causes the **release** of methane, and you waste the energy it took to get it to you. *The Times* October 28, 2009 Wednesday Is it time to cut out meat? BYLINE: Alex Renton
- 308- China's President Hu Jintao attended a special climate summit in New York last month to promise to reduce the amount of carbon **released** for each unit of GDP by "a notable margin" by 2020. And even India - long the most recalcitrant of the group - has agreed to set its own target. *The Daily Telegraph* October 20, 2009 Tuesday Gordon saves the world (AGAIN) BYLINE: Geoffrey Lean
- 309- Temperature rises in the Amazon would cause the rainforests to die. In Alaska and Siberia the permafrost would melt, causing more carbon dioxide to be **released**. It is also thought that more CO₂ will be released by organic materials in the soil decomposing at a faster rate, while warmer oceans would be less able to absorb the greenhouse gas. *The Daily Telegraph* September 28, 2009 Monday Climate change 'could cause devastation within 50 years' BYLINE: Louise Gray
- 310- Carbon dioxide removal techniques discussed include afforestation (cheap, but of limited use for carbon removal), bioenergy and carbon sinks on land, burial of carbon-trapping biomass such as wood on land and in the ocean to trap the carbon dioxide that would otherwise be **released** in decomposition or burning, enhanced weathering of rocks (very effective but expensive) and ocean fertilisation. *telegraph.co.uk* September 14, 2009 Monday A grown-up response to climate change BYLINE: Ian Douglas
- 311- Ice sheets are disappearing at a dramatic rate - and these could have other, unexpected impacts on the planet's geology. According to Professor Mark Maslin of UCL, one is likely to be the **release** of the planet's methane hydrate deposits. These ice-like deposits are found on the seabed and in the permafrost regions of Siberia and the far north. (...) There is also a danger of earthquakes, triggered by disintegrating glaciers, causing tsunamis off Chile, New Zealand and Newfoundland in Canada, Nasa scientist Tony Song will tell the conference. The last on this list could even send a tsunami across the Atlantic, one that might reach British shores. *The Observer* September 6, 2009 National: Climate change: Melting ice will trigger wave of natural disasters BYLINE: Robin McKie
- 312- Scientists fear that warming could **release** billions of tonnes of methane from frozen soils in the Arctic, driving global temperatures even higher. *Guardian.com* September 3, 2009 Thursday Global warming has made Arctic summers hottest for 2,000 years
- 313- One such potential solution is "biochar", a charcoal created by decomposing biological matter, which is then **stored** in the ground, rather than **released** as carbon. *The New Review* July 12, 2009 Rebel with a cause BYLINE: Harriet Walker
- 314- This technique enables extraction of fuel from small, difficult-to-access coal seams, and could double the world's current coal reserves. It also avoids the **release** of the pollutants sulphur dioxide and nitrogen dioxide. (...) Recognising the continued role of the fossil fuel in China, the European Commission proposed a plan this week to co-finance a demonstration coal plant that aims to have near zero emissions through the use of **carbon capture and storage** technology. *Guardian.com* June 28, 2009 Sunday China recruits algae to combat climate change
- 315- The bill would gradually impose a ceiling on the carbon emissions that cause global warming, ultimately cutting them by 83% from 2005 levels by 2050 by forcing industries to obtain permits for the emissions they **release** in the atmosphere, or to buy offsets by investing in cleansing projects like planting trees. *The Observer* June 28, 2009 World: Victory on climate change boost president's position BYLINE: Suzanne Goldenberg
- 316- Furthermore, the data does not take into account the carbon dioxide **released** by deforestation, which accounts for almost 20% of all greenhouse gas emissions and takes place overwhelmingly in the

developing world. *The Guardian* June 26, 2009 Friday National: Tackling climate change BYLINE: David Adam and Duncan Clark

- 317- Because deforestation **releases** a fifth of the world's carbon dioxide emissions and tropical rainforests provide a vast carbon sink that absorbs greenhouse gases. *The Times* May 28, 2009 Thursday Save the rainforests or climate change strategy is doomed to fail, warns Prince BYLINE: Mark Henderson
- 318- The amount of carbon **released** into the atmosphere from deforestation in the tropics is so uncertain that estimates range from 0.7 to 2.6bn tonnes a year. Other scientists say that some feedback processes in the atmosphere are so unclear they do not even know if they will speed up global warming or slow it down. *Guardian.com* March 4, 2009 Industry leaders denying climate change
- 319- About half of the absorbed carbon has been soaked up by the oceans, but how the other half has been **stored** on land remains uncertain. A big concern is that as temperatures rise, sinks may start to **release** some of their **stored** CO₂ and pump it into the atmosphere, causing a feedback effect that accelerates global warming. *The Times* February 25, 2009 Wednesday Big setback to understanding climate change BYLINE: Mark Henderson
- 320- Although individual trees are known to soak up carbon as they photosynthesise and grow, large patches of mature forest were once thought to be carbon neutral, with the carbon absorbed by new trees balanced by that **released** as old trees die. *The Guardian* February 19, 2009 Thursday National: Bigger trees helping fight against climate change BYLINE: David Adam
- 321- Water below 200 metres around the Crozet Islands takes at least a century to flow into shallow depths where the carbon can be **released**. Once back in the atmosphere carbon, as carbon dioxide, is a greenhouse gas. *The Times* January 29, 2009 Thursday Davy Jones' locker can slow climate change BYLINE: Lewis Smith
- 322- The research, whose results are published in the journal *Nature*, was the first to demonstrate that extra iron in the sea could take carbon out of circulation for at least a century - the time it would take for the currents to lift the deepest water into the island shallows where the carbon would be **released**. *The Times* January 29, 2009 Thursday Sending carbon to Davy Jones' locker BYLINE: Lewis Smith
- 323- As the Arctic's sea-ice cover decreases, less and less sunlight will be reflected back into space. And as tundras heat up, more and more of their carbon dioxide and methane content will be **released** into the atmosphere. *The Observer* January 18, 2009 'We have only four years left to act on climate change - America has to lead': Jim Hansen is the 'grandfather of climate change' and one of the world's leading climatologists BYLINE: Robin McKie
- 324- Each 10 sq m of urban surface changed from dark to white, he says (Surabi Menon, who works with Akbari at Lawrence Berkeley), has the same cooling effect as preventing the **release** of a tonne of carbon dioxide. So why not include such resurfacing in carbon offset schemes? *The Guardian* January 16, 2009 Friday G2: Paint it: Global warming may seem like an overwhelmingly complex problem to tackle. BYLINE: David Adam (my addition in parenthesis)
- 325- Algae that falls a couple of miles below the surface will remain there for hundreds of years; algae that remains only a few hundred metres from the surface **releases** carbon back into the atmosphere. *Mail on Sunday* January 4, 2009 Sunday Will green algae save the world from global warming? BYLINE: Jo Macfarlane
- 326- It might be the equivalent of sweeping the dust bunnies under the bed instead of hoovering them up. It might be that **the captured carbon escapes** years later - we might pump it all into disused oil wells only for it to belch out in an enormous fart of global warming gases in the future. (...) Three magic words - **carbon capture and storage, or CCS**. Yes, the process creates lots of carbon, but we will stop

it leaking into the atmosphere. (...) There is an idea about **capturing** carbon, but it hasn't been done yet on an industrial scale. It might be too expensive. *Morning Star* August 28, 2009 Friday Feature - Climate Change - Britain & Canada's assault on Kyoto BYLINE: Solomon Hughes

- 327- The Prince of Wales told the summit that the world only had seven years to halt **runaway** climate change that would drive food shortages, terrorism and poverty. Humanity had reached a "point of crisis" and the "survival of the species" was in peril. United Nations officials have also failed to agree on how much long-term aid richer countries, including the US and Japan, should give to developing nations. (...) The Prime Minister last week faced criticism when he increased by pounds 300 million Britain's payments to an EU fund to help poor countries limit their carbon emissions. It made the UK the largest contributor to the fund with total payments of pounds 1.5 billion. *The Daily Telegraph* December 16, 2009 Wednesday COPENHAGEN SUMMIT 2009; Brown warns of climate change risk to humanity BYLINE: James Kirkup and Louise Gray
- 328- Amid the dripfeed of news and gossip from [sic], it's not always easy to get a handle on the bigger picture. What will the kinds of commitments currently being discussed mean for the future temperature of the planet? And, given what we've heard so far, how optimistic should we be about the chance of avoiding **runaway** climate change? (...) That doesn't necessarily mean imminent **runaway** climate change, but it does mean we'll be gambling with the future of the planet - and the odds don't look great. (...) The seriousness of the situation is underlined by [sic]. According to PwC's analysis, the world can emit about 1,300 gigatonnes of CO₂ by 2050 if it is to have a "fair" chance of avoiding 2C. At current rates of carbon intensity improvement - the amount of CO₂ **released** per unit of GDP - this budget will be used up by 2034, 16 years ahead of schedule. *Guardian.com* December 15, 2009 Tuesday Can we halt **runaway** climate change? Not likely BYLINE: Duncan Clark
- 329- And even if agreement is reached at Copenhagen, there are doubts over whether the targets and timetable will be sufficiently rigorous to forestall **runaway** planetary warming. There is a feeling that national leaders are failing to be sufficiently radical in the negotiating chamber. *The Independent* December 12, 2009 Saturday Climate change demands better political leadership
- 330- Lucy and Jorge Orta have built a makeshift refugee camp Antarctic Village, stitched from the flags of all the nations that would be crippled by **runaway** warming. (...) The theme that pervades the exhibition is the slow realisation that our existence here is arbitrary and contingent. Life on this rock in space developed by fluke, and it can be ended by a series of man-made flukes - like **releasing** massive amounts of a colourless, odourless warming gas into the atmosphere. *The Independent* December 9, 2009 Wednesday At last our artists are confronting the reality of climate change BYLINE: Johann Hari
- 331- Preventing **runaway** global warming may be twice as expensive as previously thought and Britain will have to incur billions of pounds of additional debt to cover its share of the cost, according to the world's most influential climate change economist. Lord Stern of Brentford said that future generations would find it easier to pay off the debt than to cope with the consequences of climate change. *The Times* December 2, 2009 Wednesday Cost of combating global warming set to double BYLINE: Ben Webster
- 332- The talk now in the climate labs - in the tea rooms and, yes, in their private emails - is of tipping points and **runaway** warming. The fear is that beyond 2C or so, warming and rising sea levels may be impossible to halt. Even if we cut our emissions to zero. *The Guardian* November 30, 2009 Monday Copenhagen 2009: Why Copenhagen matters BYLINE: Fred Pearce
- 333- What the scenarios associated with a 6C temperature rise ought to expose is just how wrongheaded and short-sighted such an attitude is. Any upfront costs that will be required to clean up our economies cannot rationally be compared to the costs that **runaway** climate change threatens to inflict on the entire planet. *The Independent* November 18, 2009 Wednesday A climate change warning we ignore at our peril

- 334- Faith or fact? The ruling by an employment tribunal that the sacked executive Tim Nicholson (former environmental policy officer) could claim discrimination over his belief in what he calls "**runaway**" climate change sets a precedent that eco-warriors now have a philosophy on a par with other religious faiths under employment rules. *The Sunday Times* November 8, 2009 Have a little faith in climate change (my addition in parenthesis)
- 335- And yet we are told that the deal at the United Nations climate change conference in Copenhagen that would set all this in stone might not actually happen. Some British government officials have suggested that Copenhagen might only produce a "political" agreement, rather than a legally binding replacement for the Kyoto protocol. In other words, warm words rather than action. That would be a disastrous failure. Copenhagen has long been presented as a crucial moment in **the battle against runaway climate change**. *The Independent* November 7, 2009 Saturday A deal on climate change must not be postponed
- 336- The difference is that rather than trying to make us consume more, Omond (climate activist) is attempting to raise awareness of the perils of **runaway** climate change. (...) As the climate crisis becomes more acute and the gap between government action and what actually needs to be done grows ever wider, Omond is surely right when she states "the world needs loads more activists." Intelligent, thoughtful and not afraid to be arrested, Omond is one such activist. *Morning Star* October 27, 2009 Tuesday Feature Activism with a difference BYLINE: Ian Sinclair (my addition in parenthesis)
- 337- But we're well aware that what counts as a sustainable footprint depends on a whole host of assumptions, including how quickly we reduce our emissions and how much risk of **runaway** climate change we're prepared to accept. *Guardian.com* October 21, 2009 Wednesday Let us equip you with the right tool to help you fight climate change BYLINE: Duncan Clark
- 338- A new analysis shows that the world must begin a low-carbon industrial revolution by 2014 at the latest, or **runaway** climate change will become almost inevitable. The report's release was timed to coincide with the London meeting of the MEF, which was started by US President Barack Obama this year and is intended to smooth the progress towards the climate conference. The Energy and Climate Change Secretary, Ed Miliband, is hosting the meeting, which involves environment and energy ministers from the largest economies in both the developed and developing worlds, from the US and the UK on the one hand to China and India on the other. The ministers will be discussing some of the sticking points which emerged in the last session of pre-Copenhagen negotiations in Bangkok 10 days ago. The talks on a new climate treaty, which would limit carbon emissions from all countries, resume in Barcelona in two weeks. *The Independent* October 19, 2009 Monday 'We can't compromise with Earth' BYLINE: Steve Connor and Michael McCarthy
- 339- If no diplomatic agreement to drastically cut emissions and hold temperature increases to 2 or even 3C can be reached at Copenhagen, many climate scientists predict **runaway** climate change which could see temperatures rise by as much as 4C by 2100. *The Guardian* September 8, 2009 Tuesday Front: Miliband sets out to shock on global warming tour BYLINE: John Vidal
- 340- The phenomenon threatens to set off **runaway** heating of the planet, say climatologists.(...) scientists were saying that America, the world's scientific superpower, was virtually blinding itself to climate change by cutting funds to the environmental satellite programmes run by the Oceanic and Atmospheric Administration and Nasa. A report by the National Academy of Sciences this year warned that the environmental satellite network was at risk of collapse. *The Observer* July 26, 2009 Home: News: Revealed: the secret evidence of global warming Bush tried to hide BYLINE: Suzanne Goldenberg and Damian Carrington
- 341- This is the point that has now been reached, with even conservative estimates predicting that the world is reaching the tipping point for the start of **runaway** climate change. *Morning Star* June 10, 2009 Wednesday Culture - On the brink of meltdown BYLINE: Susan Darlington

- 342- A number of studies published since the IPCC report was prepared show that carbon emissions are rising faster than expected and that existing greenhouse gas targets may not be enough to prevent catastrophic temperature rise. Climate experts, including Jim Hansen, of Nasa, have warned about so-called "tipping points" that could lead to **runaway** warming and rapid sea level rise. *The Guardian* February 9, 2009 Monday National: Scientists plan emergency summit on climate change BYLINE: David Adam
- 343- The forest agreement, which is known as REDD+ - the acronym stands for Reducing Emissions from Deforestation and Degradation (plus a few other things such as replanting) - foresees the eventual "monetisation" of the great rainforests of countries such as Brazil, Congo and Indonesia, with the host nations receiving funding for not cutting them down and so **releasing** CO2 (perhaps eventually in the form of carbon "credits" that can be traded in emissions trading schemes). (...) An outline treaty to prevent deforestation because of the carbon emissions **released**. *The Independent on Sunday* December 12, 2010 World agrees cap on global warming and deforestation BYLINE: Michael McCarthy
- 344- The other is so-called "cap-and-trade" - imposing a global cap on the quantity of carbon that can be **released** into the atmosphere and then allocating or auctioning tradable permits to producers of energy and fuels, allowing them to release carbon up to a certain amount into the atmosphere. (...) The supposed advantage of "cap-and-trade" is that it fixes the amount of carbon allowed into the atmosphere, whereas with a carbon tax it is uncertain how much will be **released**. (...) The only way to combat **runaway** climate change is to drastically reduce the amount of carbon dioxide going into the atmosphere. *Morning Star* December 8, 2010 Wednesday Feature - Green power to the people
- 345- The findings by 30 leading scientists suggest that if countries do everything they have promised, there will still be a 5bn tonne gap per year between their ambition and what the science says is needed. This gap, said the UN, is the equivalent of the emissions **released** by all the world's vehicles in a year. Many countries have committed themselves to holding temperature rises to no more than 2C (3.6F) by 2080 but to achieve this global emissions must be reduced from 56bn tonnes annually today to 44bn tonnes by 2020. *The Guardian* November 24, 2010 Wednesday UN says emission pledges well short of climate change goal BYLINE: John Vidal
- 346- The stove creates heat by turning wood or other biomass into charcoal, a process that **releases** combustible gases. (...) But whatever we do with non-CO2 gases, Zaelke (a leading expert on rapid responses to global warming) says, we also urgently need not just to reduce carbon dioxide, but to get to a point as soon as possible where the world becomes carbon negative, with humans **sequestering** more CO2 than we **release**. *Guardian.com* October 21, 2010 Thursday Could barbecues help fight climate change? BYLINE: Duncan Clark (my addition in parenthesis)
- 347- Back in December, when hundreds of world leaders and their entourages jumped on planes and therefore **released** a bunch of carbon to talk about climate change in Copenhagen, Canadian artists from Nunavik sculpted a polar bear made of ice to send a message about climate change threatening polar bears. As the bear melted, the point was elegantly made. *Guardian.com* July 12, 2010 Monday Putting the heat on climate change's 'bikini babes' BYLINE: Leo Hickman
- 348- Woodward also expects the future productivity of Irish land to depend on how the soil **releases** carbon dioxide into the atmosphere. In a wet climate such as Ireland's, the soil is more likely to retain carbon. *The Sunday Times* June 13, 2010 Climate change makes Ireland greener BYLINE: Gabrielle Monaghan
- 349- Opening the windows will make no difference because the outside temperature will be too warm for the heat in homes to **escape**. The "urban heat island effect", in which buildings and roads absorb heat during the day and **release** it at night, could result in the temperature on the hottest nights remaining above 25C. *The Times* June 1, 2010 Tuesday 20C and rising: climate change will make cities even hotter at night BYLINE: Ben Webster

- 350- **Release** of even a fraction of stored gas could trigger abrupt climate warming as methane is a greenhouse gas about 30 times more potent than carbon dioxide. *The Guardian* March 5, 2010 Friday Climate change: After emails and errors, fightback begins to prove global warming is caused by humans BYLINE: Alok Jha
- 351- Vast amounts of methane - which is 25 times more effective at trapping heat than carbon dioxide - are stored in the permafrost and scientists have long warned that, if it **escapes** as temperatures rise, it could greatly accelerate global warming. *telegraph.co.uk* March 5, 2010 Friday Methane from frozen seabeds could accelerate global warming, new research suggests BYLINE: Geoffrey Lean
- 352- John Beddington's comments come in the wake of an admission by the Intergovernmental Panel on Climate Change (IPCC) that a claim in its 2007 report that Himalayan glaciers could melt away by 2035 was unfounded. The admission has been used as ammunition by climate change sceptics, who say the public is being misled. Beddington said scientists should give a caveat to their predictions where there was uncertainty, and release source data "wherever possible" - but added that uncertainty was no excuse for inaction. He explained that large-scale climate modelling using computers meant "quite substantial uncertainties" which needed to be communicated. While it was unchallengeable that burning fossil fuels **released** CO2 that warms the Earth, "where you can get challenges is on the speed of change" *The Guardian* January 27, 2010 Wednesday Climate change verification 'must be handled with care' BYLINE: Haroon Siddique
- 353- It (sea ice) also creates a barrier between the water and the atmosphere, reducing the amount of heat that **escapes** from the sea into the air. *The Guardian* December 21, 2010 Tuesday Comment: That snow outside is what global warming looks like BYLINE: George Monbiot (my addition in parenthesis)
- 354- Life is unexpectedly starting to surge back into the world's moribund bid to avert **runaway** global warming, after the surprising success of the latest climate summit in this Mexican seaside resort at the weekend. *The Daily Telegraph* December 13, 2010 Monday CLIMATE CHANGE BACK FROM THE BRINK BYLINE: Geoffrey Lean
- 355- Preventing **runaway** climate change means getting out of fossil fuels. It means renouncing two-fifths of existing reserves. It also means a global moratorium on prospecting, not just in deep water, but everywhere. If we can't use it, we should stop looking for it. (...) The third defence is to insist that the link between fossil fuel burning and global warming can be broken by means of **carbon capture and storage (CCS)**: burying the emissions produced by power stations. In theory, and to some extent, it could. (...) Even if it were, **CCS** could do nothing to help reduce emissions from burning oil, almost all of which, in the UK, is used for transport and heating. There is no viable means of **capturing** carbon dioxide from these sources. We now obtain twice as much energy from oil in this country as we do from coal. *The Guardian* - September 28, 2010 Tuesday Comment: We can't use it - so why the heck are we prospecting for oil anyway?: To stop **runaway** climate change we have to get out of fossil fuels. BYLINE: George Monbiot
- 356- Dennis's own research, which dates fluctuating temperatures in ice cores stretching back thousands of years, does not support the more catastrophic current predictions of **runaway** global warming. *Guardian.com* February 4, 2010 Thursday Detectives question climate change scientist over email leaks BYLINE: David Leigh
- 357- One of the greatest fears is that with the disappearance of the Arctic sea ice in summer, and rapidly rising temperatures across the Arctic region, the trapped methane could be suddenly **released** into the atmosphere leading to rapid and severe climate change. *Independent.co.uk* December 14, 2011 Wednesday Methane discovery stokes new global warming fears Shock as retreat of Arctic releases greenhouse gas BYLINE: Steve Connor
- 358- In 2010, figures released this month reveal, the amount of CO2 **released** reached 33.51 billion tonnes, compared to 31.61 billion the year before: the jump of almost six per cent is thought to be the highest ever, even though much of the world is in recession. (...) China's latest five-year plan includes ambitious targets for reducing the amount of carbon **released** for each unit of production. Australia has

agreed a carbon tax. (...) Indonesia and Brazil are tackling deforestation, the largest source of CO2 **releases** after burning fossil fuels. And many businesses are cutting their emissions radically. *The Daily Telegraph* November 28, 2011 Monday ARE WE ALL IN THIS TOGETHER? BYLINE: Geoffrey Lean

- 359- Carbon dioxide, once **released** into the atmosphere, stays there and continues to have a warming effect for about a century, and industrial infrastructure is built to have a useful life of several decades at least. *Guardian.com* November 9, 2011 Wednesday World headed for irreversible climate change in five years BYLINE: Fiona Harvey
- 360- One of the greatest threats is the melting of the permafrost regions of the northern hemisphere which could **release** vast quantities of methane gas from frozen deposits stored underground for many thousands of years. *Independent.co.uk* November 9, 2011 Wednesday Climate change melting polar regions faster than ever before; One of the clearest signs of climate change is the loss of floating sea ice in the Arctic BYLINE: Steve Connor
- 361- I realise that some are genuinely concerned by the so-called "fracking" required to **release** shale gas, but the Environment Agency has reviewed Cuadrilla's operations and said it does not consider that they are a risk to the environment - including water resources. *The Independent* October 25, 2011 Tuesday Why won't Huhne celebrate our gas windfall? BYLINE: Dominic Lawson
- 362- While such quantities - enough to fill 60 million Albert Halls - would reduce the UK's reliance on imported fuel as North Sea supplies run out, untrammelled shale gas exploration ("fracking" or fracturing the shale to **release** bubbles of natural gas) can cause devastation. (...) And last week a £ 1bn **carbon capture and storage** demonstration scheme was cancelled. A further dulling of the coalition's green sheen has come with the announcement that subsidies for households to install solar panels are to be drastically reduced. *The Observer* October 23, 2011 CLIMATE CHANGE: Now is not the time to renege on green pledges
- 363- Supporters of biofuels claim carbon dioxide is only **released** during plant growth while fossil fuels emit greenhouse gases. *The Express* September 30, 2011 Friday Green biofuel 'makes climate change worse' BYLINE: John Ingham
- 364- Most hypotheses suggest that at certain times, movements of tectonic plates caused carbonate-rich rocks and sediments to **release** their CO2. *The Observer* July 17, 2011 Remember the last time Antarctica was a tropical paradise...BYLINE: Robin McKie
- 365- Although carbon dioxide emissions have risen during the past 10 years, surface temperatures have not followed the same rapid increase which was seen in the previous three decades, leading some climate change sceptics to suggest that global warming this century has "stopped". (...) However, a study by Robert Kaufmann, of Boston University, and his colleagues has discovered that the levelling off of surface temperatures during this period can be explained by the sulphate particles which were **released** into the atmosphere from coal-burning power stations. This has the effect of reflecting sunlight and heat away from Earth. *I-Independent* July 5, 2011 How China's coal-fired power plants are keeping things cool BYLINE: Steve Connor
- 366- A tropical tree plantation can extract as much as 10 tonnes of carbon per year from the atmosphere but destroying a hectare of rainforest **releases** 250 tonnes immediately. *The Times* June 20, 2011 Monday Planting trees 'does little to reduce global warming' BYLINE: Ben Webster
- 367- The region has the world's largest oil reserves after Saudi Arabia, but their extraction can **release** up to three times the amount of greenhouse gases compared with producing crude oil. *i-Independent* June 1, 2011 Tar sands row fuels green debate BYLINE: Sarah Morrison

- 368- There are truly gargantuan amounts of carbon locked away in the plant matter of this permafrost. What is expected to be **released** amounts to about half of all fossil fuel emissions over the past 200 years. *i-Independent* May 30, 2011 'Feedback' effect could lead to accelerated global warming BYLINE: Steve Connor
- 369- And you certainly wouldn't have expected David Cameron's latest plan. He has decided to convert us to a new energy source that seems, in the US, to have **released** cancer-causing chemicals and radiation into the water supply - and will unleash even more planet-cooking gases than coal. Trapped under very hard shale rock in Lancashire, there is a large amount of natural gas. (...) But a bombshell study by three professors at Cornell University, published in the prestigious peer-reviewed journal *Climatic Change* last month, found that the process of fracking **releases** so much methane - one of the most potent warming gases - that it could be as much as 43 per cent worse than coal. *The Independent* May 14, 2011 Saturday UP IN FLAMES BYLINE: JOHANN HARI
- 370- Ploughing has **released** carbon dioxide that would otherwise have been locked away in the soil. *DAILY MAIL* April 13, 2011 Wednesday BIOFUELS 'MAY CAUSE CLIMATE CHANGE'
- 371- The development of new techniques for fracturing shale rocks to **release** their load of natural gas has revolutionised the energy industry in the past three years. Suddenly, vast deposits of previously inaccessible gas have become available for exploitation. *The Guardian* April 8, 2011 Friday Shifting role in changing climate BYLINE: Fiona Harvey
- 372- The researchers used computer models to assess the impact of the disappearing Arctic sea ice, particularly in the area of the Barents and Kara seas north of Scandinavia and Russia, which have experienced unprecedented losses of sea ice during summer. Arctic sea ice has been in retreat over recent decades, with record lows recorded in September 2007. The normal recovery of the sea ice during winter has also been affected, especially in the Barents and Kara seas which have seen significant losses of ice cover over the past decade. Their models found that, as the ice cap over the ocean disappeared, this allowed the heat of the relatively warm seawater to **escape** into the much colder atmosphere above, creating an area of high pressure surrounded by clockwise-moving winds that sweep down from the polar region over Europe and the British Isles. *Independent.co.uk* September 9, 2011 Friday Expect more extreme winters thanks to global warming, say scientists BYLINE: Steve Connor
- 373- But by that point it will be too late, not just for the people of the Bolivian Andes, but for the world as a whole, if the rise in world temperatures is to be kept beneath two degrees C - the increase which scientists regard as the absolute maximum if **runaway** climate change is to be avoided. *telegraph.co.uk* December 2, 2011 Friday Climate change: Third World reaps a bitter harvest BYLINE: By Geoffrey Lean
- 374- We know that carbon dioxide is an important greenhouse gas, radiating back into the atmosphere the heat of the Sun - we have known it for more than a hundred years. No serious scientist disputes it. And we know, beyond any doubt, that CO2 emissions are soaring, not to say in **runaway** mode. *Independent.co.uk* November 23, 2011 Wednesday Michael McCarthy: These leaks do nothing to undermine the case for man-made global warming BYLINE: Michael McCarthy
- 375- When the government's statutory advisers propose a shorter timescale for cutting emissions than one of Britain's leading greens, we should ask ourselves some hard questions about our priorities. The longer it takes, the less likely we are to prevent **runaway** climate change. (...) If we shut the door on nuclear power, we create a generation gap. As the committee points out, the maximum likely contribution to our electricity supply from renewables by 2030 is 45%, and the maximum likely contribution from **carbon capture and storage** is 15%. Where will the balance come from? *Guardian.com* August 8, 2011 Monday Greens must not prioritise renewables over climate change BYLINE: George Monbiot
- 376- The figures are not exact, but show how even the minimum of infrastructural improvement - considered a prerequisite for economic development - will be reined in in poor countries unless money

is made available for them to adapt to climate change, and unless rich countries lessen the chances of **runaway** warming by reducing emissions quickly. *Guardian.com* June 15, 2011 Wednesday Climate change will cost poor countries billions of dollars, studies say BYLINE: John Vidal

- 377- Within the following two weeks - probably on 16 May - the cabinet will decide whether or not to drop its commitment to prevent **runaway** climate change. *The Guardian* May 10, 2011 Tuesday Comment: This 'greenest government ever' is the greatest threat yet to our environment BYLINE: George Monbiot
- 378- Forests and trees store carbon. When they're burnt down or cleared - a process referred to as deforestation - this stored carbon is **released** back into the atmosphere as carbon dioxide and contributes to climate change. *Guardian.com* December 19, 2012 Wednesday What's Redd and will it help tackle climate change?
- 379- Ban's comments echoed the concerns of China and other developing countries, which say rich nations have a historical responsibility for global warming because their factories **released** carbon emissions into the atmosphere long before the climate effects were known. *telegraph.co.uk* December 5, 2012 Wednesday Wind farms in Africa will save British lives, says Minister BYLINE: Louise Gray
- 380- Forests play an important an important role in climate change. The destruction and degradation of forests contributes to the problem through the **release** of CO₂. (...) Combined with the sun's energy, the **captured** carbon is converted into trunks, branches, roots and leaves via the process of photosynthesis. *Guardian.com* November 29, 2012 Thursday To what extent could planting trees help solve climate change?
- 381- They (scientists) fear greenhouse gas being **released** by bacteria responsible for plant decomposition. But, on the other hand, the plants act as important 'sink' soaking carbon up from the atmosphere. *MailOnline* November 27, 2012 Tuesday Climate change (not suicide) killed off Europe's lemmings FIVE TIMES during the last Ice Age, study claims (in addition in parenthesis)
- 382- Other Gelisols have materials that are very nutrient rich - these will **release** a lot of nitrogen into ecosystems. *MailOnline* November 26, 2012 Monday Melting permafrost 'will DOUBLE carbon and nitrogen levels in the atmosphere': Experts issue chilling new climate change warning BYLINE: DAMIEN GAYLE
- 383- China - the main problem at the 2009 Copenhagen summit - is starting its own emissions trading scheme to control carbon **releases**, and its new leadership is expected to give a higher priority to the environment. *telegraph.co.uk* November 23, 2012 Friday Doha: the world holds its breath before climate change summit BYLINE: Geoffrey Lean
- 384- About half the 375 billion tonnes of carbon **released** into the atmosphere, mainly from burning fossil fuels, since 1750 remains trapped in the atmosphere. *MailOnline* November 21, 2012 Wednesday Greenhouse gases reached record levels in 2011, prompting warning that global warming can only get worse BYLINE: LEWIS SMITH
- 385- Flames lick up from below the canopy, smoke billows across the horizon, and down below, the carbon that has been stored in the forest for hundreds of years is **released** into the atmosphere. *The Guardian* November 15, 2012 Thursday Front: Special report: Amazon rainforest: The ultimate ranger on frontline of Amazon deforestation BYLINE: Jonathan Watts
- 386- The U.S. Energy Department describes methane hydrate as a lattice of ice that traps methane molecules but does not bind them chemically. They are **released** when warmed or depressurized. (...) Most deposits are below the sea floor off the continental shelf or under permafrost. Shallow pockets of methane hydrate **release** the potent greenhouse gas into the atmosphere and that process is exacerbated by climate warming. *MailOnline* November 12, 2012 Monday Revealed: The \$29 million Alaskan science project that could make energy from ICE - but experts warn it could 'unleash climate change monster'

- 387- The role of shale gas in this bonanza has been overlooked by supporters of the controversial fuel. In the US, which has pioneered the technology of fracking - whereby rocks are blasted apart under huge pressure to **release** natural gas - the resulting gas has been championed as a green fuel because it emits half the carbon of coal when burned. *The Guardian* October 29, 2012 Monday Resurgence of coal puts climate change targets at risk BYLINE: Fiona Harvey
- 388- Removing the lid from the pole will **release** heat equivalent to fast-forwarding human-caused climate change by two decades, say scientists. (...) Will this be the first great tipping point to tumble the world into a new and hostile climate regime, as the cooling, reflective ice vanishes? Will the new, warm Arctic radically alter the temperate weather enjoyed by Europeans, for whom global warming has seemed a distant concern? We seem to be prepared to take that chance. The shrinking ice has not opened new leads for decisive global action to tackle climate change. Instead, in a vicious irony, the new channels are being exploited for oil and gas exploration, unearthing more of the very fuels driving the warming. *The Guardian* September 15, 2012 Saturday National: Climate change: Comment: World's distress signal is ignored BYLINE: Damian Carrington
- 389- Sea ice is seen as important because of its disappearance could lead to other important changes to the Arctic environment. One immediate effect is the opening up of shipping lanes that could lead to new oil and gas explorations within the region, triggering political tensions as well as further **releases** of carbon dioxide from the mining and burning of fossil fuel. (...) Scientists have already observed a link between disappearing sea ice and the **release** of methane, a greenhouse gas that is more than 20 times more potent than carbon dioxide, from beneath the Arctic Ocean. Researchers flying over the melting sea ice reported last May that significant quantities of methane are being **released** from between the cracks in the ice. (...) Other scientists have observed huge plumes of methane being **released** from beneath the permafrost of the East Siberian Arctic Shelf off northern Russia. The Arctic is known to have huge stores of trapped methane in the form of gas hydrates, which some experts fear may be **released** if Arctic permafrost continues to melt. *Independent.co.uk* August 28, 2012 Tuesday A new low for global warming BYLINE: Steve Connor
- 390- A phenomenon that inspired marine cloud brightening is ship trails: clouds that form behind the paths of ships crossing the ocean, similar to the trails that airplanes leave across the sky. Ship trails form around particles **released** from burning fuel. *MailOnline* August 21, 2012 Tuesday Could man-made clouds halt global warming by reflecting sunlight? BYLINE: EDDIE WRENN
- 391- Peat soils which are farmed - and thus exposed to the atmosphere - **release** greenhouse gases. Extreme weather can change the amount of greenhouse gases being **released** from peat soils - and understanding this could lead to a way to control the effect. *MailOnline* July 26, 2012 Thursday Could extreme weather be causing climate change? New study aims to find if peat bogs **release** greenhouse gas when it rains BYLINE: ROB WAUGH
- 392- Sea buckthorn uses nitrogen from the air to produce nutrients. Trials suggest that its chemical tinkering **released** a lot of nitrous oxide, perhaps 1.6mg of extra nitrous oxide for every square metre of land. *MailOnline* July 20, 2012 Friday It's no laughing matter... Nitrous oxide may have caused the end of the last ice age - and could yet accelerate global warming BYLINE: DAMIEN GAYLE
- 393- It is understood the journey, which is a 286 mile round-trip from London, used 71.5 gallons of fuel and **released** three-quarters of a ton of CO2 into the atmosphere. *telegraph.co.uk* May 23, 2012 Wednesday Will.I.Am attends climate change talk in helicopter BYLINE: Hannah Furness
- 394- Last November, Prince Charles, as president of WWF UK, flew to Tanzania to hand out "Living Planet" awards to five "community leaders" involved in WWF projects around the delta of the Rufiji River, which holds the world's largest mangrove forest. Part of their intention has been to halt further damage to the forest by local farmers, who have been clearing it to grow rice and coconuts. This is

because the mangroves store unusual amounts of "carbon" (CO₂), viewed as the major contributor to global warming. (Another WWF project in the delta is to find a way of measuring just how great a threat **release** of that CO₂ might be.) *The Sunday Telegraph* May 6, 2012 How climate change has got WWF bamboozled BYLINE: CHRISTOPHER BOOKER

- 395- A report in Nature Geoscience suggests that as well as huge 'surges' of methane being **released** by melting permafrost, the gas might be being released from the ocean itself. (...) Now it seems that some at least is being **released** into the atmosphere - causing unknown and unpredictable effects on the environment. (...) It's already known that methane is being **released** into the atmosphere - both from the Siberian permafrost, and, as more recently discovered by survey ships, from the sea bed. (...) These **releases** can be larger and more abrupt than any land-based release. The East Siberian Arctic Shelf is a methane-rich area that encompasses more than 2 million square kilometers of seafloor in the Arctic Ocean. (...) During Earth's coldest periods, it is a frozen arctic coastal plain, and does not **release** methane. (...) The melting of the arctic shelf is melting 'permafrost' under the sea, which is **releasing** methane stored in the seabed as methane gas. *MailOnline* April 24, 2012 Tuesday Global warming puzzle becomes even MORE complex - as methane is detected seeping directly from the Arctic ocean BYLINE: ROB WAUGH
- 396- It (*Nature's* paper) was previously thought that the source of carbon driving the warming was in the ocean, in the form of frozen methane gas in ocean-floor sediments. But now the experts believe the carbon **released** into the atmosphere millions of years ago came from the melting permafrost in the Polar Regions. *telegraph.co.uk* April 5, 2012 Thursday Past global warming caused by thawing permafrost BYLINE: Louise Gray
- 397- It (*Nature's* paper) also suggests that imminent "**runaway**" climate change - whereby our actions in pumping greenhouse gases into the atmosphere contribute to melting permafrost or sea changes that **release** stores of methane - is a real possibility. *Guardian.com* April 4, 2012 Wednesday Study suggests rising CO₂ in the past caused global warming BYLINE: Fiona Harvey (my addition in parenthesis)
- 398- An open ocean without sea ice allows heat to **escape** from the relatively warmer water to the atmosphere above it. *The Independent* February 4, 2012 Saturday Science behind the big freeze: is climate change bringing the Arctic to Europe? BYLINE: STEVE CONNOR
- 399- Nor have they - or airports, oil companies or car manufacturers - obtained the consent of all those it will affect to **release** carbon dioxide into the atmosphere, altering global temperatures and - through rising sea levels, droughts, storms and other impacts - damaging the property of many people. *Guardian.com* January 6, 2012 Friday Why libertarians must deny climate change, in one short take BYLINE: George Monbiot
- 400- Pessimists suggest that the cycle has now been pushed so far off balance that soils themselves may begin to **release** even more of the unwelcome compounds. The problem of excess fertility is spreading through the whole of nature, with unpredictable results. *telegraph.co.uk* January 3, 2012 Tuesday If carbon dioxide isn't a worry, nitrous oxide could not possibly offer any threat... right? BYLINE: Steve Jones
- 401- By "global warming", I mean, of course the kind of **runaway**, unprecedented, catastrophic warming which George Monbiot et al have been bleating on about for the last two or three decades. *telegraph.co.uk* December 19, 2012 Wednesday Global Warming? Not a snowball's chance in hell BYLINE: James Delingpole
- 402- Sea levels rising far faster than we thought, warns latest study to raise the alarm over **runaway** global warming *MailOnline* November 30, 2012 Friday BYLINE: DAMIEN GAYLE
- 403- The US can shed its longstanding dependence on Saudi Arabian oil within the next decade, redrawing the world's political systems and potentially leading to **runaway** global warming. *The Guardian* November 13, 2012 Tuesday Climate change fears as US predicted to be world's top producer by 2017 BYLINE: Fiona Harvey

- 404- The opponents of carbon tax argue that we must adapt to climate change rather than prevent it. But that is a counsel of despair; the consequences of **runaway** climate change for food production could be devastating. *The Times* July 19, 2012 Thursday Don't give up - climate change just got easier BYLINE: Camilla Cavendish
- 405- However if temperatures rise too fast there is a "**runaway** effect" as the microbes are producing heat so fast it cannot be **released** and builds up, potentially causing fires. Gases also build up eventually causing a huge 'burp' or explosive **release** of carbon into the atmosphere all at once. (...) However if temperatures rise too fast there is a "**runaway** effect" as the microbes are producing heat so fast it cannot be **released** and builds up, potentially causing fires. Gases also build up eventually causing a huge 'burp' or explosive **release** of carbon into the atmosphere all at once. (...) **The compost bomb** also causes a positive 'feedback loop' as the hotter the soil gets the harder the microbes work, causing yet more heat. Also the gases **released** cause more global warming. (...) Although the global population is stabilising and we are more efficient at producing energy, human beings are causing more carbon dioxide to be **released** than ever before because the amount individuals consume is still rising, causing a number of environmental impacts. (...) In gardens every spring compost heaps are beginning to warm up as the microbes in the soil get to work breaking down vegetable matter and **releasing** a certain amount of greenhouse gases - as well as a pungent smell. *telegraph.co.uk* March 27, 2012 Tuesday '**Compost bomb**' is latest climate change 'tipping point'; Climate change could fuel a giant '**compost bomb**', scientists have warned, as decaying vegetation stuck under the ice or in peat bogs starts to heat up and tips the world into dangerous global warming. BYLINE: Louise Gray
- 406- In the past few days, the researchers have seen areas of sea foaming with gas bubbling up through "methane chimneys" rising from the sea floor. They believe that the sub-sea layer of permafrost, which has acted like a "**lid**" to prevent the gas from **escaping**, has melted away to allow methane to rise from underground deposits formed before the last ice age. (...) The first evidence that millions of tons of a greenhouse gas 20 times more potent than carbon dioxide is being **released** into the atmosphere from beneath the Arctic seabed has been discovered by scientists. (...) Underground stores of methane are important because scientists believe their sudden **release** has in the past been responsible for rapid increases in global temperatures, dramatic changes to the climate, and even the mass extinction of species. *The Independent* September 23, 2008 Tuesday The methane **time bomb**; Arctic scientists discover new global warming threat as melting permafrost **releases** millions of tons of a gas 20 times more damaging than carbon dioxide BYLINE: Steve Connor
- 407- The latter method could also reduce the potential problems of the planned worldwide increase in the number of fossil-fuel power stations. The International Energy Agency predicts the world's use of power will increase by 50% by 2030, with 77% of that coming from fossil fuels; **CCS** holds the promise of preventing up to 90% of the carbon emissions from a power station **escaping** into the atmosphere. (...) The CO2 could come directly from the air, from plants or else from coal-fired power stations using **carbon capture and storage technology (CCS)**. *Guardian.com* september 1, 2008 Geoeengineering: The radical ideas to combat global warming
- 408- But then I looked at the facts. It was discovered more than a century ago that burning fossil fuels would **release** warming gases and therefore increase global temperatures, and since then, hundreds of thousands of scientists have independently reached the conclusion that it will have terrible consequences. (...) That's why I won't use the word "sceptic" to describe the people who deny the link between **releasing** warming gases and the planet getting warmer. I am a sceptic. *The Independent* December 4, 2009 Friday How I wish that the global warming deniers were right BYLINE: Johann Hari
- 409- The melting of Russia's permafrost could have catastrophic results for the world, Tchouprov says, by **releasing** billions of tonnes of carbon dioxide and the potent greenhouse gas methane, that was previously trapped in frozen soil (...) Many Russians, however, are sceptical that climate change exists. Others rationalise that it might bring benefits to one of the world's coldest countries, freeing up a melting Arctic for oil and gas exploration, and extending the country's brief growing season. Russia's scientific community seems sceptical of global warming and the Kremlin doesn't appear to regard the issue as a major domestic problem; public awareness of climate change in Russia is lower than in any

other European country. *Guardian.com* October 20, 2009 Tuesday Climate change in Russia's Arctic tundra: 'Our reindeer go hungry. There isn't enough pasture' BYLINE: Luke Harding

- 410- During the extreme drought of 2005, the Amazon became a net producer of carbon dioxide, **releasing** an estimated 3 billion tons of the greenhouse gas into the atmosphere - a net increase of 5 billion tons *The Independent* March 6, 2009 Friday Revenge of the rainforest BYLINE: Steve Connor
- 411- The result could lead to **runaway** warming. Field's (director of Global Ecology at Carnegie Institute) warning was echoed by French scientists, who said the IPCC's estimate that sea levels would rise around 40cm by 2100 was likely to be a best case scenario. *The Guardian* February 16, 2009 Monday National: The tropics on fire: scientist's grim vision of global warming BYLINE: Ian Sample
- 412- Instead, the forests were burned, **releasing** the gases into the air. *Morning Star* February 16, 2009 Monday World - Experts warn of climate change errors
- 413- Black carbon, the component of soot that gives it its colour, is thought to be the second largest cause of global warming after carbon dioxide. Formed through incomplete combustion of fossil fuels, wood and vegetation, it delivers a double whammy. (...) While in the air, it is spread around the globe by the wind, and helps to heat the atmosphere by absorbing and **releasing** solar radiation. *The Independent on Sunday* January 4, 2009 Soot reduction 'could help to stop global warming' BYLINE: Geoffrey Lean
- 414- If less heat is **escaping** to space, we should observe more returning to the Earth's surface. *Guardian.com* July 19, 2011 Tuesday Heartland Institute launches a 'closed' climate change wiki BYLINE: Leo Hickman
- 415- Deserts will spread, ice caps melt, sea levels rise, coastal zones will be inundated and hundreds of millions of people will be left homeless. Rising temperatures will melt the world's regions of permafrost, **releasing** more carbon dioxide and methane, which will raise temperatures even further. *The Observer* December 4, 2011 GLOBAL WARMING: We can't afford to go cool on climate change
- 416- On the other hand, soil decomposition increases with warmer temperatures meaning soil microbes are respiring and **releasing** carbon into the atmosphere, potentially increasing climate warming. *The Daily Telegraph* November 18, 2011 Friday Are lemmings behind a leap in global warming? BYLINE: Louise Gray
- 417- Most importantly, China doubled coal consumption between 2003 and 2007 - the same as the worldwide increase in coal in the previous 22 years - **releasing** sulphur into the atmosphere. *The Express* July 5, 2011 Tuesday So much for global warming as Planet Earth gets colder BYLINE: John Ingham
- 418- But these sources - including shale gas **released** by blasting dense rock with water - are associated with methane leaks, water pollution and potentially higher greenhouse gas emissions even than coal. (...) In the UK two small earthquakes have taken place near sites where a company is using "fracking" - **releasing** gas from dense shale rocks by blasting it with water and chemicals. *The Guardian* June 7, 2011 Tuesday Natural gas no solution to climate change BYLINE: Fiona Harvey
- 419- Large-scale thawing of the permafrost, the frozen soil that traps vast amounts of carbon, may already be underway, **releasing** more of the gases that cause climate change. *Guardian.com* December 5, 2012 Wednesday Scientists to reveal full extent of Arctic ice loss amid climate change fears BYLINE: Suzanne Goldenberg
- 420- Enda Reilly, a Dublin musician, is being paid by councils in Leinster to mould the environmental awareness of children, aged between nine and 13, to run workshops that impart the dangers of global warming through song. Reilly's self-penned hits include Chewin' the Cud, about how cows digest grass to make milk, **releasing** methane emissions into the atmosphere as a result, and I'm a Greenhouse Gas.

- 421- But there is no question that the economic situation makes the fight a harder sell. Our task is to argue that we can both invest to grow the economy and tackle emissions. That's why a green industrial strategy is so important, from renewable energy to **carbon capture and storage (CCS)**. The EU decision to invest billions of euros in **CCS** is part of that. *The Independent* December 15, 2008 Monday How have you lightened your carbon footprint?
- 422- Nothing remotely like immediate global emissions cuts of 3 per cent a year is going to be on the table at Copenhagen, and even if such a target were accepted, meeting it would be impossible: the key technologies which might deliver it, such as **carbon capture and storage**, are years away from coming on stream. *The Independent* December 15, 2008 Monday A sliver of cheer on climate change BYLINE: Michael McCarthy
- 423- To reduce carbon emissions, the direct solution is **carbon capture and storage**: we separate carbon dioxide from the exhaust plume at the power station, turn it into liquid and inject it into wells left empty by previous oil extraction. That is, we reverse the oil production process. The technology exists. What is needed is the will to fund it. *The Sunday Times* December 14, 2008 Tackling global warming amid the chill BYLINE: FRANCIS WILSON
- 424- The package also includes provision for 12 pilot projects on **carbon capture and storage**, using novel technology to collect CO₂ emitted from power stations and bury it underground where it cannot warm the world. *The Guardian* December 13, 2008 Saturday National: Climate change: EU leaders claim historic agreement on cutting pollution BYLINE: Ian Traynor and Nicholas Watt
- 425- Lower emissions from cars and renewable energy would be crucial, EU leaders said. Gordon Brown hailed the agreement as "ambitious", saying: "Europe and America acting together on climate change can persuade the rest of the world that we can reach a global agreement in Copenhagen next year. Europe's claim to be the leader on climate change will be not only upheld but advanced by what we agree today." British officials said Mr Brown won a last-minute concession under which the EU will spend £9bn on **carbon capture and storage**, paving the way for "clean coal" plants if it works on a commercial basis. Britain hopes to win two of 12 demonstration projects. *The Independent* December 13, 2008 Saturday EU accused of subsidising climate change after 'watered-down' deal BYLINE: Andrew Grice
- 426- If the Germans win the argument, the incentives for going greener will be minimised and revenue from the scheme will collapse. Many observers have argued that that revenue should be invested in green energy schemes and pilot plants for **carbon capture and storage**. *Guardian.com* December 12, 2008 Climate change: EU leaders reach compromise deal on emissions
- 427- The other two laws concern renewable energy and national targets to reach the 20% across Europe and the establishment of centrally funded pilot projects for **carbon capture and storage**, technology that aims to collect CO₂ from power plants and bury it. *Guardian.com* December 12, 2008 Two years of leading battle on climate change end in two days of hard haggling
- 428- Almost 200 countries have gathered for a UN Climate Change Conference in Poznan, Poland, to discuss a deal to replace the Kyoto Protocol. For many of those attending, the most pressing issue is whether the world can agree on targets to reduce carbon emissions. However, Bjørn Lomborg, a professor at Copenhagen Business School and author of the *Skeptical Environmentalist*, said the meeting is focusing on the wrong area. He said that targets to cut emissions will be difficult to police, expensive to achieve and almost impossible to agree. Instead, he said, the world should be investing heavily in new technologies like **carbon capture and storage**, which **stores** carbon underground so that poorer countries like China could continue to burn coal without harming the environment. *The Daily Telegraph* December 11, 2008 Thursday Carbon targets 'are not the; way to rescue the planet' BYLINE: Louise Gray

- 429- All existing and new coal-fired power stations could and should be fitted with clean-coal technology, including **carbon capture** to remove 90 per cent of CO₂. *Morning Star* December 11, 2008 Thursday Feature - No half-measures
- 430- How developing countries will access affordable clean technology to reduce emissions, such as **carbon capture** and solar power, developed by companies in industrialised countries. *The Guardian* December 8, 2008 Monday Climate change: The politics: Road to Copenhagen
- 431- Lord Turner's committee said coal-fired power stations - the most polluting way of generating energy - should be fitted with technology to **capture and store** carbon dioxide after 2020. (...) Ministers will decide next year whether to make the targets in the 480-page report official. But electricity and gas bills would soar as renewable energy costs more than gas and coal. *Daily Mail* December 2, 2008 Tuesday £500 per home to fight climate change; Power bills will soar and fuel poverty hit 1.7m BYLINE: David Derbyshire
- 432- Policies needed: financial incentives, regulations such as emissions limits or clear guidelines to ensure **carbon capture** *The Guardian* December 2, 2008 Tuesday National: Global warming: Cut greenhouse gas emissions by a fifth, ministers told BYLINE: Juliette Jowit
- 433- The new technique of **carbon capture and storage** will probably come on stream in the next 10 years. It takes the CO₂ out of power station waste gases, liquefies it, and pipes it down into deep geological strata to be stored. *The Independent* December 2, 2008 Tuesday 12 years to halve UK CO₂ BYLINE: Michael McCarthy
- 434- PLANS by energy group E.ON to build a pounds 2bn power station will be dealt a blow tomorrow when a government-funded report calls a halt to developing coal-fired generators until new **carbon capture** technology is ready. (...) But Lord Turner has also decided that using more coal-fired stations to generate electricity should not be approved until **carbon capture and storage (CCS)** is available for commercial use. Experts say **CCS** is years away. *The Sunday Telegraph* November 30, 2008 Climate change report pours cold water on pounds 2bn power station plan BYLINE: Russell Hotten
- 435- The energy package includes measures to support **carbon capture and storage** projects and renewable energy. The planning reforms are expected to speed up approval for projects such as wind farms and nuclear power stations. *The Independent* November 27, 2008 Thursday Key climate change Bills to become law; Business in brief
- 436- For now, the government remains committed to investment in nuclear energy and **carbon capture and storage**. *The Guardian* November 6, 2008 Thursday Public: Business: Environment: Restructuring: At last - cohesion on climate change
- 437- The likely licensing of a new coal-fired power station at Kingsnorth is another urgent issue. Vague suggestions that it will be made "ready" for **carbon capture** must be meaningfully fleshed out, and soon, or it will set an appalling precedent. *The Guardian* October 20, 2008 Monday Leading article: Climate change: The greening of Brown
- 438- Business leaders are keen to win public money for experimental schemes such as **carbon capture and storage**, which has been linked with E.ON's proposed Kingsnorth coal-fired power station. *The Guardian* September 19, 2008 Friday Global warming: Business chiefs urge action on climate change
- 439- Out of the blue, the environmentalists say, the legitimacy of the government to pursue an expanding coal policy has been undermined and it may have become impossible for E.ON, the German owners of

Kingsnorth, to go ahead with a new plant without fitting a £500m carbon **capture and storage** plant to collect and dispose of the greenhouse gases. (...) In the past decade, prosecutions of protesters against GM crops, incinerators, new roads and nuclear, chemical and arms trade companies have all collapsed after defendants argued that they had acted according to their consciences and that they were trying to prevent a greater crime. Greenpeace itself has a four-nil record against the crown using the same defence and was widely known to be seeking a jury trial to present complex arguments about coal and climate change. *The Guardian* September 12, 2008 Friday G2: Climb every chimney BYLINE: John Vidal

- 440- The energy minister, Malcolm Wicks, justified pressing ahead with Kingsnorth as long as it was "carbon **capture ready**" in an interview with the *Guardian* last week. The as yet unproven technology of carbon **capture storage** is thought capable of cutting greenhouse gas emissions by 90%. *The Guardian* August 11, 2008 Monday Climate change: High street banks face consumer boycott over investment in coal projects BYLINE: Terry Macalister
- 441- Charting a way between the hard rocks of climate change and the jagged edges of energy security will depend on carbon **capture**. It could transform coal into a truly clean energy source, though exactly how is not yet clear. The government grasps its importance, but says making full carbon **capture** a condition for new coal plants would make them too costly to build. *The Guardian* August 11, 2008 Monday Leading article: Kingsnorth protest: The coalface of climate change
- 442- The as yet unproven technology of **carbon capture storage (CCS)** is thought capable of cutting greenhouse gas emissions by 90%, but Wicks admitted the EU was well away from its target of building as many as 12 demonstration projects. (...) Ministers are under pressure from scientists, the Tories, Liberal Democrats and some of its own backbenchers to say it will withdraw the operating consent from Kingsnorth if by a fixed date -probably 2020 - the plant fails to **capture** 90% of its emissions. *The Guardian* August 9, 2008 Saturday Energy: Minister: We must build Kingsnorth to get clean coal BYLINE: Patrick Wintour
- 443- One big unknown is the stage at which dangerous tipping points would be reached that lead to further warming - for example the **release** of methane hydrate deposits in the Arctic. *Guardian.com* August 6, 2008 Climate change: Prepare for global temperature rise of 4C
- 444- The furore over carbon **capture** reveals how coal power has become a key new target of UK environmentalists. (...)At present, there are no **CCS** plans for Kingsnorth. Its new plant would vent its carbon dioxide into the atmosphere. The Conservative party wants a moratorium on building any new coal plants until **carbon capture** technology is proven. (...) The scientists writing in *The Observer* are not opposed in principle to new coal plants like Kingsnorth. But they want the government to act on its promises to be the 'global leader' in developing the as-yet unproven **carbon capture and storage (CCS)** technology. This technology, if it works, could reduce emissions from coal plants by up to 90 per cent by storing the gases underground. More than five years after promising an 'urgent detailed implementation plan' for carbon **capture**, the government intends to help fund one small-scale project which should be operational by 2014. Companies taking part in the competition to build this demonstration plant are not even sure how much money they will receive. (...) The company has entered the government's competition to build a **carbon capture and storage** demonstration plant, proposing to test the **CCS** technology on one of the new Kingsnorth units. *The Observer* July 27, 2008 News: Eco Wars: UK scientists hit out at new coal station plans BYLINE: TIM WEBB
- 445- Carbon **capture and storage**, electric cars, marine and wave, hydrogen and solar industries are all expected to emerge as vast industries within 20 years. *The Guardian* July 16, 2008 Wednesday Climate change: It's the environment, stupid BYLINE: John Vidal
- 446- That's why we need to develop and deploy technologies like **carbon capture and sequestration** quickly. But we also need to put far more effort into renewable energy like solar power, nuclear and sustainable biofuels. (...) Technological advances such as methane **capture** and NOx inhibitors, and

support for sustainable agricultural practices, offer ways to reduce the climate impact of animal agriculture. *The Independent* July 7, 2008 Monday What are you doing to save the planet?

- 447- **CCS** is a range of technologies aimed at **capturing**, transporting and storing carbon dioxide produced at power stations and factories *The Guardian* June 9, 2008 Monday UKs climate change plans incoherent, says scientist BYLINE: Alok Jha
- 448- This latter camp includes Gordon Brown, who last week backed nuclear power and carbon **capture** in an article in the Guardian. (...) Nuclear power, if it returns to Britain on any scale, will take decades to replace carbon-based electricity, while **carbon capture and storage (CCS)** is still at an experimental stage. (...) Delivering **CCS** involves two distinct challenges: first, to **capture** polluting gases, and then to put them somewhere they can do no harm. There are proven ways to take carbon dioxide from exhaust gases (or the fuel source) of coal power stations. But not all the carbon can be **captured** and the process takes energy, adding to inefficiency and meaning more fuel must be burned. Carbon **capture** will only ever make coal power stations, which will never be wholly clean, much less polluting. (...) Meanwhile, despite empty talk of new power stations being "capture ready", pressure is growing for new polluting plants, such as the one at Kingsnorth in Kent, just to keep the lights on. Britain's blackout last week confirmed that the existing infrastructure is strained. Electricity prices are soaring, even before the huge cost of carbon **capture** is factored in. The technology will work in the end, but someone will have to pay for it if carbon **capture** is ever to produce more than hot air. *The Guardian* June 2, 2008 Monday Leading article: Climate change: A captivating remedy
- 449- Carbon **capture's** champion seems to be the oil companies: can we trust them? *Guardian.com* May 28, 2008 So what are we going to do about global warming?
- 450- The European Commission made proposals to strengthen the EU Emissions Trading Scheme by establishing a central European cap for emissions; to require companies in the power sector to buy these allowances through an auction; to require almost all companies to do likewise by 2020; and to build 10 to 12 (as yet unfunded) **capture and storage** demonstration projects. *The Independent* March 12, 2008 Wednesday We've reached the moment of truth on climate change BYLINE: STEPHEN HALE
- 451- CBI in the mid-90s - who is now Britain's "climate czar". Will emissions trading make these cuts possible? Almost certainly, not on its own - we will need new technology such as **carbon capture and storage**, a big increase in renewable energy, and much more energy efficiency.(...) It will not remotely be enough on its own - other technologies will be required, such as **carbon capture and storage** *The Independent* March 11, 2008 Tuesday What is carbon trading, and will it help in the battle against climate change? BYLINE: MICHAEL MCCARTHY
- 452- Mr Wicks (holder of the government's energy brief) grows increasingly animated when talking about technology. He is "enormously enthusiastic" about the emerging potential of **carbon capture and storage**, for which the Government has pledged hundreds of millions of pounds to sponsor a commercial-scale project to demonstrate how carbon can be stripped from a power plant's flues and then **stored** safely underground - probably at sea in former oil and gas fields. However, he makes a thinly veiled swipe at big oil companies such as BP and Shell, which have been pushing for the Government to sponsor a second competition focused on slightly different **carbon capture** technology. *The Times* February 22, 2008, Friday Minister with global warming and electricity bills on his plate BYLINE: Robin Pagnamenta (my addition in parenthesis)
- 453- However, emails between Eon and an official in the Department of Business, Enterprise and Regulatory Reform suggest that the company is confident that the secretary of state, John Hutton, will formally approve the 1600MW plant in May without it having to make assurances over carbon **capture**. Eon official Martin Land wrote to Gary Mohamed, the official who is drafting consent conditions for the plant, saying that the company did not want the government to mention carbon

capture. The company and the government have both stressed in public that the Kingsnorth plant may be fitted with CO2 **capture** technology in the future. *The Guardian* February 1, 2008 Friday Global warming: Energy firm wants carbon freedom at new coal-fired plant BYLINE: John Vidal

- 454- As climate change becomes an increasing concern, geoengineering is making a comeback. Scientists are looking at the atmosphere, the ocean, the land and even space to create a variety of effects, including helping to reduce the effect of sunlight on the Earth and **sequestering** carbon. *The Guardian* May 29, 2008 Thursday Technology: Can the ecohackers save us? BYLINE: Danny Bradbury
- 455- We need to pay the tropical rainforest nations to halt further deforestation; develop carbon **capture, and storage** and fit it to power stations, particularly the many planned coal-fired stations around the world; and research ways of removing greenhouse gases from the atmosphere. *The Express* December 29, 2009 Tuesday Let's all rise to challenge of tackling climate change
- 456- But because the evidence is so powerful, we also need to take other important steps, such as investing in **carbon capture and storage**. *The Express* December 21, 2009 Monday Don't clutch at straws on threat of climate change
- 457- We know that **capture and storage** will dispose of just a small fraction of the carbon in these fuels. *The Guardian* December 15, 2009 Tuesday Comment: This is bigger than climate change. BYLINE: George Monbiot
- 458- Carbon finance and the market can help link solutions in Britain to solutions in Africa. For example, growing trees to **capture** carbon could become a new cash crop for Africa's farmers if the right framework is agreed in Copenhagen. *The Daily Telegraph* December 8, 2009 Tuesday Africa's crucial role in climate change solution BYLINE: Bob Geldof
- 459- To appreciate how difficult this is, it's instructive to consider the few countries that have set out to cut emissions to zero. (What this means, in effect, is that they can use carbon, but only if their emissions are **captured**, buried or offset by forests or trading.) *The Independent on Sunday* December 6, 2009 What on Earth? BYLINE: David Randall
- 460- We need to try to use more renewable energy; we need **carbon capture and storage** on the production side and, in many countries, we need nuclear. *The Independent on Sunday* December 6, 2009 How to save the world BYLINE: Jonathan Owen
- 461- BRITAIN'S first "**carbon capture**" coal-fired electricity plant will be built in Hatfield, South Yorkshire. The pounds 2.4billion project will see harmful carbon dioxide removed from the coal before it is burnt. It will then be piped away from the plant to be buried in an offshore gas field 100 miles away. *Sunday Mirror* December 6, 2009 GOING GREEN BRITAIN BYLINE: VINCENT MOSS
- 462- As well as an emissions deal, industrialised nations will have to reach agreement on how much cash to give to developing countries to help them develop carbon-**capture** technology. There are divisions on the issue within the European Union, let alone between the world's major economies. *The Independent* December 5, 2009 Saturday All roads lead to Copenhagen as 100 world leaders head to summit BYLINE: Nigel Morris
- 463- The continuing development of **Carbon Capture and Storage** technology (see "New Technology") may increase the acceptability of coal. But for now it seems reasonable to fear that lack of large-scale public investment in energy technologies other than nuclear and coal power may undermine other emissions-reduction policies. (...) "CLEAN COAL": the strategy known as **Carbon Capture and Storage (CCS)** has made significant advances. Available technologies include: coal cleaning by "washing" to reduce ash and sulphur dioxide emissions; flue-gas desulphurisation; low-NOx burners; and sequestration of liquid carbon dioxide, once **captured**, into deep geological strata. In each case, the

technology is there, but it won't make a significant difference without very significant investment. *The Independent* December 2, 2009 What now?; The problem and the potential consequences are all too clear. BYLINE: Cathy Holding

- 464- **Carbon capture and storage.** Coal and waste materials are burnt in permanently running power stations that provide electricity, heat and sometimes hydrogen. The carbon dioxide this creates is captured and sent, safely, to be disposed of in disused oil wells and aquifers. **Carbon capture and storage** has been practised in the North Sea by the Norwegian company Statoil since 1996. EU leaders have promised around 12 pilot projects attached to coal-fired power stations by 2020. *The Sunday Times* November 29, 2009 20 PROVEN WAYS TO SAVE THE EARTH BYLINE: Charles Clover
- 465- Some of that support came through today, with the announcement of a joint research centre, with US and Indian government funds, to help speed the development of more energy efficient technologies, as well as carbon **capture and storage**. It is thought the US government will contribute \$100m a year to the centre over the next five years. *Guardian.com* November 24, 2009 Tuesday US and India pledge common action on climate change BYLINE: Jonathan Watts
- 466- Most of that technology - ranging from carbon **capture and storage**, solar power and zero-emission vehicles - will need to be deployed in emerging economies. *The Guardian* November 23, 2009 Monday Climate change: Countdown to Copenhagen BYLINE: Alok Jha
- 467- The biotech giant Monsanto is included for presenting GM crops as another climate-change solution, while the South African company Sasol is shortlisted due to its lobbying for carbon **capture and storage** to compensate for the conversion of coal into petrol. Shell is also in the running over its promotion of carbon **capture** while investing in environmentally destructive oil extraction from the Canadian tar sands. *The Independent on Sunday* November 15, 2009 'Angry Mermaid' joins fight against climate change BYLINE: Jonathan Owen
- 468- It's not enough. If we get carbon **capture** on coal, that won't change it either, or electric cars. There isn't a breakthrough in technology that is going to get us there. The only thing left for us to do is to cut down our consumption and improve the efficiency of existing technology. It's in our hands. At the same time we can help to develop the technology we will need, whether it is nuclear, carbon **capture**, offshore wind farms, tidal energy, younameit. *The Sunday Times* November 15, 2009 What British business wants from Copenhagen BYLINE: DOMINIC O'CONNELL
- 469- The policy statements, which will go out to consultation until February, also underlined the government's commitment to "clean coal" technology. It is pressing ahead with four trials of **carbon capture and storage** technology, which aims to bury emissions underground, and reiterated that no coal plants would be built without it. The government also reaffirmed its target of 30% of electricity generation from renewables by 2020. *The Guardian* November 10, 2009 Tuesday National: Ten to follow: UK's nuclear future is mapped out as race to tackle climate change heats up BYLINE: David Teather
- 470- Altering the atmosphere could also weaken solar power and reverse years of work to **close the hole in the ozone layer**. (...) Renamed **carbon capture and storage**, the idea is now mainstream energy policy in countries including Britain, despite still being unproven and dismissed by many as too expensive and unworkable on a large scale. Last month, the International Energy Agency said the world should build 100 full-scale **carbon-capture** power stations by 2020, and 850 by 2030. (...) The 1982 UN Law of the Sea Convention and the 1967 Outer Space Treaty could be used to regulate activities and experiments in those shared spaces, but **releases** to the atmosphere are legally more problematic because nations have sovereignty over their own airspace. (...) A decade ago, an unproven idea called carbon **sequestration**, that would see carbon emissions from power stations trapped under the ground, was talked up by a small group of advocates, but was dismissed by most people as too expensive and unworkable on a large scale. *The Guardian* November 4, 2009 Wednesday G2: Not a cloud in the sky BYLINE: David Adam

- 471- **Captured** carbon would still need to be disposed of. One of the few options that could turn back the clock and reduce carbon levels in the atmosphere. *The Guardian* November 4, 2009 Wednesday G2: Seawater clouds and space mirrors Five extreme ways to beat climate change BYLINE: David Adam
- 472- Alberta's latest proposal to rid tar sands of their dirty image is a \$2C billion subsidy for **carbon capture and storage (CCS)** facilities. Shell plans to install CCS by 2015 at an upgrading plant but admits that it would reduce carbon emissions from its tar sands production by only 15-20 per cent. *The Times* November 4, 2009 Wednesday It's a dirty business - the new gold rush that is blackening Canada's name BYLINE: Ben Webster
- 473- Torres has donated euros 10m (£9m) of his own money to environmental issues, and is aiming to reduce the output of CO2 in the winery by 30% by 2020. He has a hybrid car and has bought them for his staff, invested in a wind park and is experimenting with the **capture** and use of CO2 from wine fermentation. *The Guardian* October 30, 2009 Financial: The Friday interview: Spain's vintage vintner who is changing with the environment BYLINE: Elena Moya
- 474- It means redesigning whole economies on a low-carbon model, which involves a lot of effort and a lot of expense; among much else, you have to close down your coal-fired power stations or fit them with costly equipment to **capture** their CO2 and bury it underground. *The Independent* October 20, 2009 Tuesday Is an agreement on climate change in Copenhagen still on the cards? BYLINE: MICHAEL McCARTHY
- 475- Administration officials and Democratic leaders in the Senate have repeatedly extolled the economic benefits of passing climate change legislation. (...) There was also a less optimistic picture for the prospects of developing **carbon capture and storage** technology. *Guardian.com* October 14, 2009 Wednesday Obama's climate change bill could hurt US economy BYLINE: Suzanne Goldenberg
- 476- The CCC says Britain should slash emissions from the power sector by 50% before 2020 by building 8,000 new wind turbines, alongside four new coal power stations fitted with carbon **capture** technology and three new nuclear power plants. (...) The fall in economic activity has lowered CO2 emissions in Europe and left companies in the EU's emissions trading scheme with a surplus of carbon credits. The committee estimates this could result in a carbon price of just (EURO)20 a tonne in 2020, rather than the (EURO)50 a tonne used for its previous analysis. *Guardian.com* October 12, 2009 Monday Recession 'threatens UK effort to tackle global warming' BYLINE: David Adam
- 477- In the power sector, the amount of CO2 needed to produce a kilowatt of electricity in Britain should drop from 540 grams today to 300g in 2020, says the report, and to make this happen we need two new nuclear power stations (with a third by 2022), four new coal-fired plants fitted with the emerging **carbon capture and storage** technology, and 23 megawatts of wind power - which equates to about 8,000 new wind turbines across Britain. (...) Four coal-fired power plants with **carbon capture and storage** technology must be built by 2020. *The Independent* October 12, 2009 Monday Cars must be electric, says climate tsar BYLINE: Michael McCarthy
- 478- The first term of a Tory government will also push ahead with technology on **carbon capture and storage** - using revenue from the emissions-trading scheme to pay for the clean coal alternative. *The Independent on Sunday* October 4, 2009 Global warming is not on our back burner BYLINE: Jane Merrick
- 479- Just a quick spot check on some of the largest constituents, yields pictures of a wind turbine (GlaxoSmithKline), a happy cyclist (Vodafone), solar panels (HSBC) and all kinds of clean energy from algae biofuel to carbon **capture** plants (BP and Shell). *telegraph.co.uk* September 30, 2009 Wednesday Will Obama force corporate America's climate change sceptics to stand up? BYLINE: Rowena Mason

- 480- Britain could collaborate with India on developing new technology for storing solar power - one of the biggest challenges in making solar a mainstream power source - and could offer **carbon capture and storage (CCS)** deals to reduce emissions from India's coal-fired power stations. *The Daily Telegraph* September 3, 2009 Thursday Let's cash in on carbon BYLINE: Dean Nelson
- 481- Another is the **capture** of carbon dioxide by devices that can filter the air, perhaps using solar energy to power the process. A variation on this theme is the proposal to fertilise the oceans with iron to stimulate algal blooms that could in theory **capture** carbon dioxide and convert it to solid material which would fall to the seabed. But the Royal Society warned of that project's possible unintended consequences for the marine environment. *The Independent* September 2, 2009 Wednesday Man-made eruptions - 'Plan B' in the battle for the planet BYLINE: Steve Connor
- 482- On the one hand there is a large and committed green movement, represented this week by the climate camp now in place where the Peasants' Revolt once gathered in Blackheath in south-east London. Many of its supporters, for the best of reasons, want human life to change radically and immediately: an end to the global free market, to meat-eating, to air travel, to all coal-produced electricity. They disapprove of mechanisms to bring down carbon emissions such as the European Union's carbon trading scheme; some dislike technological solutions such as **carbon capture and storage**. *The Guardian* September 1, 2009 Tuesday Leading article: Climate change: The way we must live now
- 483- The institution says a single synthetic tree costing £15,000 could **capture** ten tons of carbon dioxide from the air every day, making it thousands of times more efficient at absorbing CO₂ than a real tree. The trees would be coated with synthetic materials that absorb CO₂, which would then be removed and stored underground in depleted oil and natural gas reservoirs. The institution wants millions of pounds to be invested in research on technology to beat the threat of global warming to Britain. *DAILY MAIL* August 27, 2009 Thursday HOW FORESTS OF FAKE TREES COULD FIGHT GLOBAL WARMING
- 484- You can argue that it's just a flimsy green sticking plaster for a gaping environmental wound, but I'm increasingly hearing very senior and expert voices starting to trumpet carbon **capture** as the way - even a temporary one - to mitigate emissions in the medium-term while we wait for science to invent a cure. *telegraph.co.uk* August 26, 2009 Wednesday Carbon **capture**: a flimsy plaster or the answer to climate change? BYLINE: Rowena Mason
- 485- Carbon **capture** may be acceptable to some environmentalists but co-operation with Russia's nuclear industry is not. *Guardian.com* July 17, 2009 Friday Global warming to open up north-east Arctic tanker route
- 486- The two other members of what Mr Miliband calls the energy trinity are nuclear and carbon-**capture** coal. *The Guardian* July 16, 2009 Thursday Leading article: Climate change: Green dreams
- 487- Technological fixes. Nuclear power and the coming technology of **carbon capture and storage** may - stress the "may" - mean we can carry on with our electricity-based lifestyle while slashing our emissions, as renewable energy on its own is unlikely to be sufficient. Electric motors and hydrogen fuel cells may allow us to maintain private car mobility, carbon-free, on the roads. *The Independent* July 10, 2009 Friday Will it really be possible to meet the G8's climate change targets? BYLINE: MICHAEL MCCARTHY
- 488- He (J. Shepherd, climate scientist) cited the recent DECC proposals on **carbon capture and storage (CCS)** as an example. The department plans to legislate that any new coal-fired power station must demonstrate CCS on a proportion of its output. Once the technology is proven, a judgment made by the EnvironmentAgency around 2020, power plants would have five years to scale up to full CCS. *Guardian.com* June 29, 2009 Monday Energy bills 'too low' to combat climate change (my addition in parenthesis)
- 489- Industrialists and business people broadly supported the move, with industries likely to thrive as a result thought to include low-carbon transport, renewable energy, carbon **capture** and microgeneration

of energy (such as domestic wind turbines and solar panels). *The Sunday Times* June 28, 2009 Tough CO2 target 'gives Scots economy an edge' BYLINE: Ian Fraser

- 490- The bill also exempts older coal-fired power plants for a number of years, even though these are the biggest contributor to US emissions, and the Environmental Protection Agency's ability to regulate CO2 emissions from those plants. It also gives coal companies \$60bn to invest in technology to **capture** carbon dioxide emissions. *Guardian.com* June 25, 2009 Thursday Making climate change history
- 491- Consequently, says Nayagam (business consultant in energy sector), the energy sector is thirsty for talent and skills in areas such as "smart" energy, clean technology, renewables in wind and solar, **carbon capture and storage**, and enhanced oil recovery. (...) According to the 2008 report, *The Race to Capture the Carbon Pound*, commissioned by Shell from Vivid Economics, the market for carbon-reducing technologies in the UK, by 2030, could be comparable to those for major commodities such as wheat and steel today. This means there will be a wholly new tranche of jobs available. (...) Mindful of the skills gap, several companies launched schools programmes, including British Gas' Generation Green, with the hope of fostering a wider interest in science careers. *The Guardian* June 23, 2009 Tuesday Education: Science scores: How to inspire tomorrow's scientists BYLINE: Carolyn Fry and Terry Slavin (my addition in parenthesis)
- 492- Developing techniques for **carbon capture and storage**. That would enable China to clean up its many coal-powered energy plants. *Guardian.com* June 4, 2009 Thursday Barack Obama seeks US-Chinese deal on global warming
- 493- President Obama's recent economic stimulus package included \$50 billion of funding and tax incentives for energy efficiency measures such as better insulation and more sustainable sources of energy, such as wind farms, **carbon capture and storage** demonstration projects. *The Times* May 26, 2009 Tuesday US says energy cuts key to saving planet; Obama's climate change strategy to be outlined at Times symposium of Nobel laureates BYLINE: Mark Henderson ; Robin Pagnamenta
- 494- There is concern that the big energy companies will be pushing **carbon capture and storage (CCS)** as a way of keeping the oil-based economy running. *The Guardian* May 25, 2009 Monday Financial: Climate change summit hijacked by world's biggest polluters BYLINE: Terry Macalister
- 495- The first communications, in the autumn of 2007, were initiated by the Chinese. Xie Zhenhua, the vice-chairman of the National Development and Reform Commission, the country's central economic planning body, made the first move by expressing interest in a co-operative effort on **carbon capture and storage** and other technologies with the US. (...) Co-operating on new technology including **carbon capture and storage** and fuel efficiency for cars. *The Guardian* May 19, 2009 Tuesday Front: Revealed: US and China's secret climate change talks BYLINE: Suzanne Goldenberg
- 496- But even here the green hue is darkened by our continuing dependence on oil, coal and gas, and plans to build more runways, roads and new coal fired power stations that **capture** only a small proportion of their carbon emissions. *Guardian.com* May 1, 2009 Friday No green shoots on climate change
- 497- Miliband said he discussed co-operation on the development of **carbon capture and storage (CCS)** technology, which could bury emissions from coal power stations, with the US energy secretary, Steve Chu. The US and UK are to hold a summit next month to try to push ahead with those efforts. (...) CCS technology is unproven at commercial scale and will be costly to develop, but many see it as essential given that countries with large coal reserves, such as the US and China, are very likely to rely on those reserves for power. *Guardian.com* March 6, 2009 Countries that block global climate change deal risk isolation

- 498- Its other key strategy is to promote **carbon capture and storage (CCS)**. That is, the idea of catching carbon dioxide before it goes up the stack of a power plant, and burying it out of harm's way underground - forever. It promotes the idea and not the technology, because there is currently no such technology. (...) Bear in mind these reports were written before the US government last year pulled out of FutureGen, its only large-scale R&D programme for carbon-capture technology. An industry confident of the technology's future might have been expected to plug the funding gap and keep right on going. But not so far. An analysis of ACCCE's members in December by the Center for American Progress found that their total investment in R&D for **carbon capture and storage** in recent years added up to a total of \$3.5bn, compared with profits for one year of \$57bn. Sorry, but belief isn't enough. Put up or shut up. (...) That is a very dangerous argument indeed. It is the reason why Nasa climate scientist James Hansen is supporting the demonstration in DC, and insists that no new coal-fired power stations should be built unless and until all their carbon dioxide can be **captured** and buried forever. *Guardian.com* February 26, 2009 Greenwash: Why 'clean coal' is the ultimate climate change oxymoron
- 499- He (Lord Chris Smith, Chairman of government's environmental watchdog) will also say the UK should become a world leader in **carbon capture and storage** technology, which allows the burial of carbon dioxide from fossil fuel power stations. *Guardian.com* February 11, 2009 Nicholas Stern: Spend billions on green investments now to reverse economic downturn and halt climate change (my addition in parenthesis)
- 500- Hansen advocates a three-pronged attack on the climate problem - all measures he has promoted before. First, he wants a moratorium and phase-out of coal-fired power stations - which he calls "**factories of death**" - that do not incorporate **carbon capture and storage**. (...) To offset these increases in emissions Japan has bought credits from China through the clean development mechanism - an instrument set up by the Kyoto protocol - yet China's emissions have continued to increase rapidly. China has now overtaken the US as the biggest polluter in the world. *Guardian.com* January 1, 2009 Climate change policies failing, Nasa scientist warns Obama
- 501- But if their (rich countries') forestry activities do **store** away carbon, they can account for this **sequestration** and receive carbon credits. *The Guardian* December 15, 2009 Tuesday National: Climate change: Pollution loopholes: When less means more BYLINE: John Vidal (my addition in parenthesis)
- 502- In the next 50 years, some believe many green jobs will be in climate-change mitigation, such as flood defences and carbon **sequestration**. *The New Review* November 15, 2009 Is the grass any greener? BYLINE: Robin Barton
- 503- A German research ship, the Polarstern, is steaming towards a region off the coast of Argentina in the South Atlantic, where it intends to **release** six tonnes of iron sulphate over an area of 115 square miles. (...) About half of the man-made carbon dioxide **released** since the Industrial Revolution has been absorbed by the natural carbon "sink" of the ocean. (...) Some studies have suggested that, although iron fertilisation can cause blooms to form, they are quickly eaten up by other marine organisms and digested in a way that **releases** carbon dioxide back into the atmosphere. *The Independent* January 29, 2009 Thursday Is there a technological solution to the problem of global warming? BYLINE: STEVE CONNOR
- 504- **CARBON CAPTURE** At a cement plant in Texas, construction is under way on a \$115m Capitol-SkyMine project billed as the world's first for-profit **carbon capture** plant, which converts CO2 into baking soda. The plant, due to be finished in 2012, is expected to **capture** 75,000 tons of CO2 and mineralise the CO2 emissions as baking soda. *The Independent on Sunday* November 28, 2010 Global action is needed now more than ever BYLINE: Jonathan Owen and Matt Chorley
- 505- Promises of big money were made for renewables and **carbon capture and storage**, and a new green investment bank was confirmed. (...) Some £200m will go to stimulate UK-based offshore windpower but the most financially ambitious initiative announced yesterday was to spend "up to" £1bn on a single commercial-scale **carbon capture and storage (CCS)** plant for a coal power station. Four such plants

were originally planned as part of the government's **CCS** competition. *The Guardian* October 21, 2010
Thursday 2010: Comprehensive spending review: Culture: Energy and climate change Green investment bank gets go-ahead
BYLINE: John Vidal and Tim Webb

- 506- The highest-profile scheme to be confirmed is to build a demonstration plant for **Carbon Capture and Storage (CCS)**, the technology to enable coal-fired power stations to minimise their emissions of CO₂ by **capturing them and storing them** under the seabed. *The Independent* October 21, 2010 Major projects to tackle climate change escape the knife BYLINE: Michael McCarthy
- 507- Disposing of CO₂ by burying it in the ground, known as **carbon capture and storage (CCS)**, is now regarded as essential for tackling climate change, yet the technology is in its infancy. (...)As long as all CO₂ is being "**sequestered**" (buried or otherwise disposed of) by then, the climate problem will be controllable - and this is the time frame the fossil fuel industry has to take care of emissions. The key point is not to start using any of the remaining four trillion tones of fossil fuels which thought to constitute the world's reserves. *The Independent* September 27, 2010 Monday Climate change crisis 'can be solved by oil companies' BYLINE: Michael McCarthy
- 508- Within a reduced budget, the climate change secretary is pushing to secure money for a green investment bank and the four **carbon capture and storage (CCS)** demonstrations to pioneer cleaner coal power stations, brought in by the former climate change secretary, Ed Miliband. *The Guardian* September 22, 2010 Wednesday Liberal Democrat Conference: Climate change and social policy BYLINE: Allegra Stratton James Randerson Polly Curtis
- 509- We face a crisis and need to take action, by preserving the rainforest, investing in carbon **capture** and carrying out research into possible methods of geo-engineering. *The Sunday Telegraph* September 12, 2010 The evidence for global warming demands our action
- 510- Without deploying **carbon capture and storage** technologies for coal and gas, Europe has no workable climate policy. *The Independent* September 4, 2010 A climate for European action BYLINE: Tom Burke
- 511- That kind of dogmatic assertiveness brought great joy and comfort to the Al Gore cultists; to sceptics it was a reminder that the Royal Society's founding members dabbled in alchemy - was the Society returning to its roots? Is **carbon capture** the new Philosopher's Stone? *telegraph.co.uk* May 28, 2010 Friday Latest climate climbdow: the Royal Society reviews its statements on global warming BYLINE: Gerald Warner
- 512- Other possibilities include building on the nuclear industry already in the north-west and concentrating the development of new **carbon capture and storage** technology for coal power in Yorkshire and Humberside, close to the emptying North Sea oil and gas fields where the emissions might be buried. *The Guardian* April 26, 2010 Monday Campaign 2010: Battlegrounds: Last chance to save planet BYLINE: Damian Carrington
- 513- Another thing we've done is highlight what we believe are problems with technological issues surrounding **carbon capture** [using a filter to hinder emissions], which was part of Ayrshire Power's proposal. *The New Review* February 14, 2010 The thin green line BYLINE: Robin Barton
- 514- The funding for **carbon capture and storage** was quietly shelved. The Green Investment Bank delayed yet again. *The Independent on Sunday* December 4, 2011 Cameron's pledges on global warming were only hot air BYLINE: Sarah Sands
- 515- Fulfilling the fourth budget will require large scale introduction of technologies such as heat pumps for home heating, electric cars, renewables, nuclear power and the **capture and storage** of emissions from hydrocarbon power stations. *The Times* December 2, 2011 Friday We need action not unity to save the planet BYLINE: Hannah Devlin

- 516- Another critical project, to develop **carbon capture and storage**, has been thrown into doubt. *The Guardian* November 29, 2011 Tuesday Leading article: Climate change: Brownfield thinking
- 517- "Well, what a surprise" could be the only response to last week's news that the Longannet coal-fired power station in Scotland has finally abandoned its £1 billion project (at our expense) to develop "**carbon capture and storage**". *telegraph.co.uk* October 22, 2011 Saturday Chris Huhne condemns us all to fuel poverty BYLINE: Christopher Booker
- 518- Britain's efforts to fight climate change suffered an embarrassing setback yesterday when the Government abandoned plans for the UK's first coal-fired power plant fitted with technology to **capture and store** carbon emissions. (...) The project's collapse is a blow to Britain's declared aim of being the first country with a full-scale generating plant employing carbon **capture and storage (CCS)** - a complex new technology which takes CO2 out of power station waste gases, liquefies it, and buries it deep underground, or in this case under the North Sea. *Independent.co.uk* October 20, 2011 Thursday £1bn flagship green scheme is cancelled BYLINE: By Michael McCarthy
- 519- Meanwhile carbon **capture** technology, a project in which Britain was to have been a world leader, is proving ever more elusive, and the £1bn competition announced by the last government with such fanfare has only one entrant whose negotiations with the energy department appear to be parked. *The Guardian* October 14, 2011 Friday Leading Article: Climate change: Off the boil
- 520- The financial crisis and fading government support for climate action have seriously eroded global plans to **capture and store** carbon, the International Energy Agency (IAE) warned yesterday. (...) But delegates including the US energy secretary, Steven Chu, heard at a meeting, held in Beijing, that the global temperature is on course to rise by 3.5C, due to poor progress both on **carbon capture and storage**, and on acceptance of a carbon price and other carbon-cutting efforts. (...) **Sequestration** - the depositing of greenhouse gases underground - was supposed to account for a fifth of the world's emissions reductions under the agency's roadmap for keeping global temperature rise within 2C (4F) by the end of the century. (...) The US has 24 CCS projects - more than any other country - but they are mostly for enhanced oil extraction, which has a relatively limited capacity for carbon **sequestration**. *The Guardian* September 23, 2011 Friday Economic crisis has hit global climate change goals BYLINE: Jonathan Watts
- 521- The financial crisis and fading government support for climate action have seriously eroded global plans to **capture and store carbon**, the International Energy Agency warned on Thursday. (...) But delegates including the US energy secretary Steven Chu heard at a meeting, held in Beijing, that the global temperature is on course to rise by 3.5 degrees, due to poor progress on both **carbon capture and storage**, the acceptance of a carbon price and other carbon-cutting efforts. (...) Projects to **capture** and bury a major chunk of that are behind schedule and finding it harder to secure funds. *Guardian.com* September 22, 2011 Thursday **Carbon capture** progress has lost momentum BYLINE: Jonathan Watts
- 522- His (Andrew Lockley, moderator of the geoengineering group Google site) own area is finding geo-engineering ways to **capture** methane on a vast scale from melting tundra landscapes. (...) Richard Branson's "carbon war room" is backing **carbon capture and storage** technologies. Behind the scenes, airlines, GM and chemical companies are believed to be cautiously investigating the potential. *The Observer* July 10, 2011 Green v greed BYLINE: John Vidal (my addition in parenthesis)
- 523- Furthermore, delays in building the first **carbon capture and storage** demonstration plants and boosting use of public transport were damaging efforts to meet Britain's legally binding carbon targets. *The Guardian* June 30, 2011 Thursday Call to force energy firms to insulate all homes BYLINE: Damian Carrington
- 524- The only way emissions from these plants could be controlled would be through "**carbon capture and storage**" (CCS) - yet Greenpeace in Germany has already mounted a successful scaremongering

campaign against this new technology, helping to ensure that future fossil emissions will go into the atmosphere unabated. (...) Unfortunately, the new coal plants will spew out more radioactivity into surrounding areas than any of the German nuclear plants would have done if they stayed open, thanks to the fact that trace isotopes in coal **escape** up power station chimneys. *Guardian.com* June 15, 2011 Wednesday What Italy's nuclear referendum means for climate change BYLINE: Mark Lynas

- 525- Trees, for example, are particularly good as they take up water, **capture** pollution, offer shade and a habitat for wildlife, and add aesthetic value to the garden. *Independent.co.uk* May 24, 2011 Tuesday Dig for victory: how your garden can help beat climate change BYLINE: Victoria Summerley
- 526- It is also hoped that the commitment to renewable energy - the committee says 40% of the UK's power should come from wind, wave and tide sources by 2030 - will stimulate new industries. These would include the development of tidal power plants, wave generators and **carbon capture and storage** technology - which would extract carbon dioxide from coal and oil plants and pump it into underground chambers. All three technologies, if developed in Britain, could be major currency earners. *The Observer* May 15, 2011 Coalition commits Britain to historic climate change deal BYLINE: Toby Helm and Robin McKie
- 527- How much so became clear this week when the European Commission - with 275 million euros to spend on **carbon capture and storage (CCS)** projects failed to find a single one worthy of getting any cash. (...) **CCS** is supposed to capture carbon from fossil fuels - coal, oil and gas - before it can be emitted to the atmosphere to accelerate global warming, and **store** it safely. *telegraph.co.uk* December 20, 2012 Thursday Governments and greens alike neglect the most vital technology for combating climate change BYLINE: Geoffrey Lean
- 528- The great hope of **carbon capture and storage (CCS)** has yet to materialise, at least at viable cost. *The Daily Telegraph* December 19, 2012 Wednesday Climate goals left in disarray as China and India lead rush for coal BYLINE: Ambrose Evans-Pritchard
- 529- Deben (former Tory environment secretary) , pictured, heads the Committee on Climate Change, the statutory body that advises ministers on how to meet the carbon targets set out under the Climate Change Act. In his first in-depth interview after taking up the job in September, Deben said he would brook no watering down of the legislation, and would fight to see it strengthened. That is likely to mean opposing the government's plans for 20 gas-fired power stations, which could be allowed to run "unabated" - without **carbon capture and storage** technology - until 2045. *The Guardian* December 3, 2012 Monday Environment: Thatcher minister turned green champion ready for battle with Tory climate sceptics BYLINE: Fiona Harvey (my addition in parenthesis)
- 530- The letter to the Government is signed by the chief executives of RenewableUK, which represents more than 600 wind and wave and tidal energy producers, the Nuclear Industry Association and the **Carbon Capture and Storage** Association, which represents "**clean gas**" generation. *Independent.co.uk* November 5, 2012 Monday Britain's nuclear, wind and tidal industries put aside differences in appeal to government to combat climate change BYLINE: Oliver Wright
- 531- Renewable UK, the **Carbon Capture & Storage** Association and the Nuclear Industry Association argue that the target will drive investment in the growing low carbon energy sector, creating jobs. (...) Nuclear energy and **carbon capture and storage** need a strong signal from Government to persuade banks to invest in the expensive technologies. *telegraph.co.uk* November 5, 2012 Monday Jobs at risk because of Cabinet row over energy. BYLINE: Louise Gray
- 532- However, there is one technology that could help us. It is called **carbon capture**, where carbon dioxide from industrial emissions is effectively removed from the air and **stored** in a safe place where it can do no harm. (...) It was set up only three years ago, the brainchild of Tony Marmont, a soft drinks millionaire and renewable energy fanatic. Yet the small start-up seems to have stolen a march on the

rest of the world by demonstrating CO2 **capture** as a viable industrial prospect. (...) The process is still in the early stages of development, and far too inefficient yet to compete with conventional fossil fuels. There are efficiency problems at each stage, from **capturing** the carbon dioxide from air to combining it catalytically with hydrogen derived from water vapour to make Syngas, methanol and more complex hydrocarbons. *Independent.co.uk* October 19, 2012 Friday A technology that goes one better than carbon **capture** could be crucial in fighting climate change BYLINE: Steve Connor

- 533- Relying on gas plants to keep the lights on would risk breaking the commitment to decarbonise the power sector. The only way around this is to fit gas plants with "**carbon capture and storage**" technology, but this is untested. *The Times* October 12, 2012 Friday The power game: how a climate change loophole may put Britain's foot on the gas BYLINE: Tim Webb
- 534- More than a hundred **carbon capture and storage projects (CCS)** must be built to avoid dangerous global warming, an international CCS group said this week, as fears were raised over whether UK projects would benefit from an EU fund for 12 demonstration plants. *Guardian.com* October 11, 2012 Thursday **Carbon capture**: 130 plants needed 'to avoid dangerous climate change' BYLINE: Adam Vaughan
- 535- Of course, the politicians will deny this, but they can only do so on the basis of wishful thinking. They are not going to get their "**carbon capture**" or their 32,000 wind turbines, let alone those "hundreds of thousands of green jobs". *The Sunday Telegraph* July 29, 2012 Government plans to break its won climate change law BYLINE: CHRISTOPHER BOOKER
- 536- DECC wants a balanced mix that takes advantage of our relatively modest domestic gas reserves and sees some unabated gas, but plenty more being used in harness with CCS or as back up power. Osborne, as laid bare by his bullying letter to Davey (energy secretary) , wants a "gas hub" with unabated gas a "core" part of our energy mix for decades to come. The green NGOs are not exaggerating: this is a fight for the credibility of the Climate Change Act, the future of the low carbon economy, and the chance to lead the world in emerging green technologies. If all barriers to gas are removed and rapid investment is authorised over the next 10 years, then it will indisputably crowd out investment in lower carbon alternatives, including nuclear and CCS, as well as renewables. (...) Davey yesterday tried to downplay the row, pointing out that DECC's strategy has always been to keep its options open by supporting a balanced energy mix featuring renewables, nuclear, **carbon capture and storage**, and some gas. (...) The big question for green businesses and investors now is what happens next? In the short term, the answer has to be a surge in investment in low carbon projects. Yes, the Chancellor is not helping and the political risk will probably add to the price of capital. But the renewables obligation, the soon-to-be-launched Green Deal, and the government's various other green policies are good enough to drive investment. (...) In the medium term, businesses have a huge role to play in ensuring that this autumn's battle for the future of the UK's energy policy is won by those who respect the need to curb carbon emissions and build a green economy. (...) Finally, in the long term green businesses desperately need a strategy of depoliticisation. It will be difficult to publicly condemn the Chancellor, while also urging people to try and take the political heat out of the debate, but that is what has to be done. *Guardian.com* July 26, 2012 Thursday George Osborne's gas push has shattered the climate change consensus (my addition in parenthesis)
- 537- Firms are putting in a third of the annual investment needed for onshore and offshore wind, the pipeline for new nuclear plants was "very weak" and the timeline for demonstrating **carbon capture and storage** had slipped. *The Daily Telegraph* June 29, 2012 Friday Greenhouse gases fall, but it's due to the mild weather
- 538- Ashton (Foreign Office) also told MPs that far from leading the world, the UK was falling behind important economic competitors such as Germany, Korea, China and Japan in some of the big future industries such as offshore wind energy and **carbon capture and storage** systems for gas and coal power stations. (...) Tory committee member Dr Phillip Lee challenged Ashton, however, suggesting that there were still hundreds of millions of people who wanted a better standard of living in developing countries like China, and in the UK during the recession, who would not support policies

which pushed up the price of energy and so goods and services they wanted to buy. *Guardian.com* June 22, 2012 Friday Climate change envoy warns against cutting investment in green energy BYLINE: Juliette Jowit (my addition in parenthesis)

- 539- The only hope of reconciliation lies in the universal deployment of **carbon capture and storage**: technology which removes the carbon dioxide emanating from power stations and buries it. But the government has made it clear that it does not believe this is going to happen. (...) If the government believed that widespread **carbon capture and storage (CCS)** was a realistic prospect, it would ratchet down the emissions from gas plants, forcing them to use the technology. (...) The draft bill explains that any new coal plant that "forms part of" the **capture and storage** programme will be exempted from the emissions standard. What it does not say is that a single gram of CO₂ needs to be captured from the plant in question. The bill makes this explicit. It defines a power station in the capture and storage programme as one in which **CCS** "is or is to be . . . used in commercial electricity generation". *The Guardian* May 29, 2012 Tuesday Comment: Britain's climate change policy is going up in smoke BYLINE: George Monbiot
- 540- Today, Ardmucknish Bay at Benderloch is testing a potentially planet-saving technology - a method to '**capture**' carbon dioxide, then bury it harmlessly under the sea without altering. (...) The research is hoped to bring important information about the environmental impacts associated with **carbon capture and storage**. *MailOnline* May 14, 2012 Monday Is this the 'cure' for global warming? BYLINE: ROB WAUGH
- 541- For every tonne of carbon **captured** by the newly planted trees the community receives a carbon credit; later these can be sold on the global market to the benefit of the community. *The Observer* May 13, 2012 World: Peru's mountain coffee farmers fight climate change to save livelihoods BYLINE: Lucy Siegle
- 542- Scientists will store and then 'leak' carbon dioxide to study what would happen if pipes cracked. The world's first **carbon capture and storage** experiment is to take place under the Argyll seabed next week. *MailOnline* May 10, 2012 Thursday Can this help us solve global warming? First carbon **capture** experiment to take place under Scottish seabed next week BYLINE: EDDIE WRENN
- 543- The oil refinery and gas power plant at Mongstad will have millions of tonnes of its climate-warming carbon dioxide funnelled back under the North Sea. And there are plans aplenty around the world for **carbon capture and storage (CCS)**. *Guardian.com* May 9, 2012 Wednesday Whatever happened to **carbon capture** in the fight against climate change? BYLINE: Damian Carrington
- 544- Prof Sachs said atomic energy was needed because it provided a low-carbon source of power, while renewable energy was not making up enough of the world's energy mix and new technologies such as **carbon capture and storage** were not progressing fast enough. (...) Combating climate change will require an expansion of nuclear power, respected economist Jeffrey Sachs said on Thursday, in remarks that are likely to dismay some sections of the environmental movement. (...) A group of four prominent UK environmentalists, including Jonathon Porritt and former heads of Friends of the Earth UK Tony Juniper and Charles Secrett, have been campaigning against nuclear power in recent weeks, arguing that it is unnecessary, dangerous and too expensive. Porritt told the *Guardian*: "It [nuclear power] cannot possibly deliver - primarily for economic reasons. Nuclear reactors are massively expensive. They take a long time to build. And even when they're up and running, they're nothing like as reliable as the industry would have us believe." *Guardian.com* May 3, 2012 Thursday Nuclear power is only solution to climate change BYLINE: Fiona Harvey
- 545- Some technologies that governments have been relying on to reduce emissions - such as **carbon capture and storage** - were not even off the ground yet, despite years of development. (...) On **carbon capture and storage**, the picture is even worse: the world needs nearly 40 power stations to be fitted with the technology within eight years, and so far none at all have been built. *Guardian.com* April 25, 2012 Wednesday Governments failing to avert catastrophic climate change BYLINE: Fiona Harvey

- 546- The UK has committed £60m to help poor countries **capture** carbon dioxide from burning fossil fuel and store it underground, known as **carbon capture and storage (CCS)**. Also £35m will go to small businesses to help develop innovative technologies to make homes for energy efficient, such as low energy lightbulbs. *telegraph.co.uk* April 25, 2012 Wednesday Are climate change policies a burden? BYLINE: Louise Gray
- 547- AF's model also assumed the widespread use of **carbon capture and storage**, a technology that has the potential to strip carbon dioxide from power plant exhaust but remains unproven. (...) The wind industry is booming. Last year farms with 726 megawatts of capacity - enough to power 390,000 homes - were built, a 12% increase on the year before. The rise was driven by a subsidy scheme that pays double the wholesale power price to owners of onshore plants, and triple for offshore producers. In 2010, the last year for which data was available, the scheme paid out £520m. The biggest share went to the big six utilities, who own the largest installations. Britain does not have a domestic windmill maker. The vast majority have been shipped over by Siemens, the German engineering giant, and Vestas. The Danish firm is the world's largest turbine maker but plunged to loss last year as countries that have been big supporters of the technology slashed subsidies. Britain, however, is pushing ahead. If we follow through on plans to electrify transport, British waters and countryside could be carpeted with up to 32,000 windmills. The industry's backers hit out at AF's analysis. The Department of Energy and Climate Change said its "assumptions are so flawed the conclusions are near pointless". *The Sunday Times* March 4, 2012 Sunday Wind adds £45bn to cost of climate change targets BYLINE: Danny Fortson
- 548- The estimated emission rate from an upland site at the Yale forest is roughly equivalent to burning 40 gallons of gasoline per hectare of forest per year. It also has a global warming potential equivalent to 18 percent of the carbon being **sequestered** by these forests, reducing their climate benefit of carbon **sequestration** by nearly one-fifth. *MailOnline* August 8, 2012 Wednesday Could trees be making global warming worse? BYLINE: EDDIE WRENN
- 549- Thus, iron-fertilized diatom blooms may **sequester** carbon for timescales of centuries in ocean bottom water and for longer in the sediments. (...)One estimate (from a real scientist, not one made up by me) is that CO₂ could be **sequestered** for \$2 a tonne, which rather puts that 1 billion they want to spend on a carbon **capture** coal plant into perspective. *telegraph.co.uk* July 23, 2012 Monday Governments aren't taking climate change seriously. Otherwise they'd investigate this possible solution BYLINE: Tim Worstall
- 550- One of several deals unveiled yesterday saw General Electric link up with Shenhua, the state-run Chinese coal company, with the goal of setting up a joint venture on coal gasification technology, which is more efficient than conventional power plants in burning coal and **capturing** carbon. *The Guardian* November 18, 2009 Wednesday Climate change: Countdown to Copenhagen BYLINE: Jonathan Watts
- 551- A second group of proposals involve **capturing** carbon dioxide from the atmosphere by planting artificial trees, and placing containers of algae on the side of buildings. While the schemes contained in a report by the Royal Society - Britain's leading academic institution - seem far-fetched, scientists warn they could become a necessity. *The Mirror* September 2, 2009 Wednesday GLOBAL WARMING? WE'LL BE ALL WHITE!; PLAN B TO BEAT CLIMATE CHANGE BYLINE: MIKE SWAIN
- 552- Developed by a groundbreaking Chinese firm, ENN, the greenhouse is a bioreactor that breeds microalgae, one of the fastest growing organisms on the planet, with carbon **captured** from gasified coal. China, which relies on coal for 70% of its power, is the world's biggest emitter of greenhouse gases. Almost none of the carbon dioxide is **captured**, partly because there is no profitable way of using it. (...) Algae may be the answer. The organism can absorb carbon far more quickly than trees, a quality that has long attracted scientists seeking a natural method of **capturing** the most abundant greenhouse gas. *The Guardian* June 29, 2009 Monday International: Coal-hungry China recruits algae in fight against climate change BYLINE: Jonathan Watts

- 553- Henry Waxman, the panel's Democratic chairman, said the bill represents "decisive and historic action". The panel's action boosts the likelihood that President Barack Obama will succeed in his wish that the US can attend crucial international climate talks in Copenhagen in December, having taken concrete action at home to fight global warming. Such action is widely seen as an essential , India and other developing nations into a global deal to succeed the Kyoto protocol. (...) He (Joe Braton, the US committee's ranking Republican) offered an alternative that would have scrapped the cap on greenhouse gases and pollution trading scheme, provide more incentives for nuclear energy and bolstered research into **capturing** carbon emissions from coal-burning power plants. It was defeated 35-19. *Guardian.com* May 22, 2009 Friday Obama climate change bill defies Republicans to pass key committee (my addition in parenthesis)
- 554- Second time lucky: the Government yesterday began a renewed attempt to roll out a complex, expensive and potentially vital technology for fighting global warming: **carbon capture and storage (CCS)**. (...) At least seven schemes are in the pipeline, the biggest being the Don Valley CCS Power Project in South Yorkshire which aims to **capture** the CO2 from a 650 megawatt coal plant - enough to power one million homes. (...) The technique, which involves **capturing** the carbon dioxide waste gas from power stations, liquefying it and piping it deep underground into geological formations where it can be permanently **stored**, is considered essential if climate change is to be checked in coming years, not least because many nations will continue burning large amounts of fossil fuels. *The Independent* April 4, 2012 Wednesday Government renews efforts to establish crucial global warming technology BYLINE: MICHAEL MCCARTHY
- 555- Meanwhile, the ozone **hole** over Antarctica has stopped growing, though it will not start shrinking for another decade and is unlikely to close before mid-century. *The Daily Telegraph* September 12, 2014 Friday We're **saving the ozone layer**, but climate change is a different matter; A deal to stop global warming will make CFCs look like small beer BYLINE: GEOFFREY LEAN
- 556- These images show that the 11.5million sq mile-**hole** in the layer that appears every year above Antarctica has stopped growing. (...) Experts have predicted that by 2025 the ozone **hole** will be much smaller *Express Online* September 12, 2014 Friday What climate change? **Ozone layer hole** is getting SMALLER and may shrink completely by 2025 BYLINE: John Ingham
- 557- The **hole in the ozone layer**, increases in freshwater from melting glaciers, winds and natural variability are among the theories put forward for the growth in Antarctic sea ice, which appears to be increasing at a third of the rate the Arctic's sea ice is retreating. *MailOnline* July 22, 2014 Tuesday Is Antarctic sea ice really expanding as quickly as scientists claim? BYLINE: MARK PRIGG
- 558- At the time, the **hole** in the ozone layer was topical, so environmentalists blamed the amphibian declines on ultraviolet rays getting through the supposedly **thinner ozone layer**. *The Times* June 22, 2015 Monday Meet the aliens deadlier than climate change BYLINE: Matt Ridley
- 559- Understanding that CFCs were eating the **ozone hole**, governments agreed to phase them out. They didn't wait for the "free market" to do it for them. *The Guardian* May 29, 2015 Friday Freedom and liberty should not be red flags for climate science denial, but they are BYLINE: Graham Readfearn
- 560- The 20th anniversary of the discovery of the **first "hole" in the ozone layer** on Tuesday had many climate observers focused on the Arctic, where a study published last week found that polar bears were eating more birds' eggs, perhaps due to lost hunting grounds with the disappearance of summer ice. But equally significant climate news was playing out in Antarctica, where two climate stations registered ominous new potential measurements of accelerating climate change. *The Guardian* March 31, 2015 Tuesday Antarctica records unprecedented high temperatures in two new readings BYLINE: Tom McCarthy

- 561- Is the **hole** in the ozone layer related to the climate change we are seeing today? (...) The layer in the boyzone **hole** is definitely related to climate change because all the change comes **through the hole**, and **out** onto the polar ice-cap, which then melts. *MailOnline* February 24, 2015 Tuesday Ask Lord Prescott...
BYLINE: CRAIG BROWN
- 562- The ice tells how levels of carbon dioxide, the heat-trapping gas, have fluctuated over hundreds of thousands of years. This is also the place where a **hole** in the ozone layer, from man-made refrigerants and aerosols, periodically parks for a couple months and causes trouble. It happens when sunlight creeps back to Antarctica in August, triggering a chemical reaction that destroys ozone molecules, causing a **hole** that peaks in September and then closes with warmer weather in November. *MailOnline* February 20, 2015 Friday Could Antarctica reveal mankind's fate?
- 563- Politicians have thought ahead, they have thought big and acted globally. One example is the Montreal Protocol ratified in 1987 by the UN: the Protocol on Substances that Deplete the Ozone Layer instituted a global ban on CFCs which were causing damage to the ozone layer. It worked; the large **hole** in the layer over the Antarctic will have shrunk back to its pre 1980-size within 40 years. *Independent.co.uk* December 9, 2015 Wednesday The only way Britain can help fight climate change is by appointing a Minister for the Future BYLINE: Mark Bentley
- 564- Back in 1987, when there was a huge panic over the **hole** opening up in the ozone layer over the Antarctic, 197 countries signed the Montreal Protocol, the world's first major environmental treaty, agreeing to phase out the use of chlorofluorocarbons (CFCs), used in everything from refrigerators to hairsprays, which were supposedly causing the ozone to disappear. How far this has actually been responsible for the fact that the ozone **hole** has recently been shrinking is still a matter of scientific dispute. But CFCs have been widely replaced by hydrofluorocarbons (HFCs), used in refrigeration and airconditioning, which, because they are short-lived, were viewed not to be damaging to the ozone layer. *The Sunday Telegraph* October 16, 2016 Huffing and puffing over HFCs won't cut global warming BYLINE: CHRISTOPHER BOOKER
- 565- It is the latest example of experts making alarming predictions which do not come to pass. Likewise, warnings that the **hole** in the ozone layer would never close were debunked in June. *The Daily Telegraph* October 8, 2016 Saturday The Arctic apocalypse that failed to arrive BYLINE: Sarah Knapton
- 566- A record **hole** in the ozone could open over the Arctic this spring (...) Indeed, impacts of Arctic warming include the melting of major Arctic glaciers and Greenland (containing the potential for up to 7 meters of sea level rise if it were to melt entirely), the thawing of carbon rich permafrost (which could add to the burden of atmospheric greenhouse gas emissions) and signs of worsening wildfires across the boreal forests of Alaska, to name a few. If the Arctic is this warm in January and February, then when real warmth comes later this year, these will all be areas to watch. *Independent.co.uk* February 19, 2016 Friday Global warming: Scientists are floored by what's happening in the Arctic BYLINE: Chris Mooney
- 567- An unusually **deep hole in the protective ozone layer may open over** the Arctic Circle this spring. Scientists believe lingering atmospheric pollutants and frigid air are creating arecord-sized **hole**. (...) It is not known whether climate change will make these **holes** in the ozone layer more common or severe. *Independent.co.uk* February 12, 2016 Friday Unusually deep **hole** in the ozone could open over the Arctic this spring BYLINE: Matt Payton
- 568- The world should long ago have proceeded on the precautionary principle, that is when the first warnings about melting ice caps and **holes** in the ozone layer were heard. *The Independent* September 4, 2016 Sunday US-China climate change agreement a genuine cause for celebration
- 569- Another factor is the thawing permafrost which **releases** methane and leads to warmer temperatures. (...)And a sudden catastrophe could happen if Antartica's massive Thwaites glacier, held in place by an undersea ridge, is washed free by rising seas. (...) It is estimated that that amount of ice melting will

raise seas by a colossal 216ft, which will see London and eastern England disappearing. *Daily Star* December 11, 2013 Wednesday UK UNDER WATER; England will be submerged if global warming continues BYLINE: ROSS KANIUK

- 570- These could be the slow feedbacks that will follow the thawing of the Arctic, the **release** of frozen reserves of methane and carbon dioxide in the permafrost, and the melting of polar ice into the oceans. (...) One is that it would not be far from the climate variations experienced as normal during the last 10,000 years, and secondly that it would make it more likely that the biosphere, and the soil, would be able to **sequester** a substantial proportion of the carbon dioxide **released** by human industrial civilisation. Trees are, in essence, **captive** carbon dioxide. But the warmer the world becomes, the more likely it is that existing forests-the Amazon, for example-will start to **release** more CO₂ than they absorb, making the planet progressively even warmer. (...) One is that it would not be far from the climate variations experienced as normal during the last 10,000 years, and secondly that it would make it more likely that the biosphere, and the soil, would be able to **sequester** a substantial proportion of the carbon dioxide **released** by human industrial civilisation. *Guardian.com*. December 3, 2013 Tuesday Limiting global warming to 2C would be 'disastrous' BYLINE: Tim Radford
- 571- Much the same people turn up every time to present much the same positions over much the same issues, in much the same way. For the third time in four years, Japan made a disruptive announcement at a crucial stage in an apparent attempt to derail the talks; this time the abandonment of its targets for emissions cuts in the wake of the Fukushima nuclear accident. Each year the delegates sweat through several all-night sessions, usually ending with a fudge that just about manages to ensure that the process continues. This time - although there has been a breakthrough in plans to limit deforestation, which **releases** CO₂ - the main talks have been more torpid than ever. *telegraph.co.uk* November 22, 2013 Friday China: now an example to the world on climate change? BYLINE: By Geoffrey Lean
- 572- If the extra heat **stored** in the oceans is **released** into the atmosphere, then the severity of storms will inevitably increase. In short, a warmer world will probably feature more extreme weather. *The Guardian* November 13, 2013 Wednesday G2: A new extreme: The Philippines has been hit by 24 typhoons in the past year but the power of Haiyan was off the scale, killing thousands and leaving millions homeless. BYLINE: John Vidal and Damian Carrington
- 573- For example, the **release** of large CO₂ and methane stores as a result of melting permafrost could contribute up to 30% more carbon to the atmosphere by the end of the century. *Guardian.com*. November 4, 2013 Monday Cleaner cookstoves can boost health and slow global warming BYLINE: Mark Tran
- 574- Potential knock-on effects of climate change in the oceans such as methane **releases** from the melting permafrost and coral dieback could lead to worse consequences for humans and nature than presently expected. *Independent.co.uk* October 8, 2013 Tuesday Climate change sending ocean health 'spiralling downward' faster than previously thought
- 575- Yet it, too, errs on the side of caution on Arctic ice, and takes little account of what scientists say is one of the most alarming developments: the **release** of methane from melting permafrost to reinforce the gases already warming the planet. Its conclusions are nevertheless alarming. *The Daily Telegraph* September 28, 2013 Saturday Global warming is getting deeper BYLINE: Geoffrey Lean
- 576- They (scientists) say that greenhouse gases **released** by human activity have caused global temperatures to rise by 0.89 degrees C between 1901 and 2012. However, since 1998 there has been no significant increase in global average surface temperature for the past 15 years. *telegraph.co.uk* September 27, 2013 Friday Climate change report: what does it mean for you? BYLINE: Lucy Kinder (my addition in parenthesis)
- 577- According to a draft of the "Summary for Policy Makers" dated June the scientists will argue that the evidence points to 95% certainty that climate change is occurring and is caused mainly by greenhouse gases **released** by humans - up from 90% certainty in the 2007 report. (...) The real impact of the report will not be felt until governments meet this year in Poland to discuss a global response to

warming, aiming to forge a treaty to replace the 1997 Kyoto protocol, which was rejected by the US and which placed no obligations on big developing countries such as China, now the world's biggest emitter of greenhouse gases. *The Guardian* September 21, 2013 Saturday Climate change: UN official says big business is funding global warming sceptics: Call to prepare for moves to discredit scientists: Greenhouse gas **releases** 'likely to keep increasing' BYLINE: Fiona Harvey and Graham Readfern

- 578- Trees absorb the gas from the air and build it into their trunks, roots and branches as carbon. They lessen their absorption as they grow older and **release** the **stored** carbon when they die and rot. *telegraph.co.uk* August 19, 2013 Monday European forests close to 'carbon saturation point'
- 579- Furthermore, chopping down those trees is doubly damaging to the environment because deforestation **releases** huge amounts of carbon dioxide into the atmosphere as well as removing its capacity to absorb fresh emissions. *The Independent* August 17, 2013 Saturday The world has failed us BYLINE: TOM BAWDEN
- 580- Writing in the journal *Nature*, the authors point to the effects of past droughts, such as the one in 2010 that led to the **release** of two billion tonnes of carbon from the Amazon rainforest and also hampered the forest's ability to soak up carbon. For temperate forests, a bigger risk is storms. In 1999 a superstorm in Europe toppled trees equivalent to 16 million tonnes of carbon. (...) Despite the recent flooding of New York after superstorm Sandy and the Australian heatwave, there is considerable debate among climate experts about the extent to which extreme weather is already being driven by climate change. *The Times* August 15, 2013 Thursday Extreme weather may trigger more climate change BYLINE: Tom Whipple
- 581- Greens point out that hydropower dams also cause grave environmental damage, flooding valleys and displacing people, and often silting up - while burning gas also **releases** carbon dioxide, if only about half as much as coal. *telegraph.co.uk* July 19, 2013 Friday King Coal gets a chill as the World Bank tackles global warming BYLINE: Geoffrey Lean
- 582- And human activities - including greenhouse gas **releases** from fossil fuels - must account for at least half of these extreme summer temperatures of the future, the scientists say. Australians are used to summer heat, drought and periodic bush fires as part of the continent's natural cycle, and these are often linked to a Pacific Ocean temperature phenomenon known as El Niño, dubbed "the Child" in Peru because it tends to occur around Christmas time. But there was no El Niño: if anything, the ocean heat was turned down a little in a counter phenomenon called La Niña. So the extreme heat, catastrophic flooding and devastating bushfires early this year - the southern hemisphere summer - were certainly not expected. (...) Clearly, something else was at work in the summer of 2013. Natural climatic variations were not likely to have caused the bush fires and the floods. It was possible to say, with more than 90% confidence, that human influences on the Australian atmosphere had dramatically increased the odds of extreme temperatures. *Guardian.com*. July 8, 2013 Monday Australian heatwaves 'five times more likely due to global warming' BYLINE: Tim Radford
- 583- On the other hand, a warmer ocean (and its surface temperature is going up by around a fifth of a degree every decade), together with the 30 per cent increase in acidity that has come as the industrial revolution's carbon dioxide turns into mild acid in the sea, mean that some of the great stores of the stuff, be it in the chilly waters of the deeps, or in the skeletons of corals and other creatures, are bound to be **released** into the air. (...) It's hard to put figures on the effect, but given that around a billion people drink soda, with a global average of around 100 litres each per year (the US is far in the lead) that **releases** rather less than 10 billion kilograms of the gas as the bottles or cans are opened (or, a little later, with the satisfying belch that follows a decent swig). *The Daily Telegraph* July 2, 2013 Tuesday Our fizzy seas of soda water; Humanity's obsession with fizzy drinks could slow climate change BYLINE: Steve Jones
- 584- Similarly, thawing of the permafrost lands of Alaska, Canada and Russia could **release** even more greenhouse gases, including methane, and further intensify global warming. *The Observer* May 12, 2013 National: Climate change 'will make hundreds of millions homeless' BYLINE: Robin McKie

- 585- BJORN LOMBORG'S article on climate change ("The joy of global warming", News Review, last week) contained several assertions many scientists disagree with. Lomborg states that "global warming is a problem for the future but a benefit for now". Not true, given the persistent drought in many regions of Africa, Australia, America and Russia in recent years. He relies on a particular set of cost-benefit models to evaluate the long-term effects of future warming. These underestimate the problem as they take no account of accelerating feedback effects, such as increased heat absorption due to ice melt or the **release** of frozen methane gas. *The Sunday Times* April 7, 2013 Sunday There are no benefits from global warming
- 586- There is evidence to suggest that much of this warming was driven by the **release** of gas from methane hydrates. This may have been the result of positive feedback: as the seas warmed, the clathrates began to destabilise and melt, causing further warming. (...) While the much smaller volume of methane hydrate **locked up** in the permafrost beneath shallow Arctic seas could be vulnerable - and could add significantly to global warming - it will take a very long time for extra heating to affect sediments beneath the deep ocean floor, and longer still for the greenhouse gases this **releases** to reach the atmosphere. (In the deep oceans methane gas is oxidised to carbon dioxide, which takes several hundred years to reach the surface). But this is not to say that there will be no catastrophic **release** of gas from methane hydrates buried beneath the deep sea. *Guardian.com*. March 14, 2013 Thursday Japan's gas reserves are worthless if we take climate change seriously BYLINE: George Monbiot
- 587- Last October, the Guardian disclosed that that £1.5tn sales, based on 24 billion barrels of oil equivalent, would lead to the **release** of some 10 billion tonnes of CO₂; Salmond responded that he knew oil producing nations had a "moral obligation" to deal with climate change. What he failed to do, however, was spelt out how both conclusions were compatible. *Guardian.com*. March 7, 2013 Thursday Climate change poses a far greater threat to Scotland's future oil revenues BYLINE: Severin Carrell
- 588- GLOBAL WARMING OF 1.5C COULD '**RELEASE** TRILLION TONS OF GREENHOUSE GASES'
A temperature rise of just 1.5C is likely to **release** vast amounts of greenhouse gas into the atmosphere from melting permafrost, new evidence suggests. (...) The extra levels of greenhouse gas are potentially enough to accelerate global warming. Natural ecosystems and human infrastructure would also be seriously disrupted. Governments around the world have set themselves the goal of pegging global warming at less than 2C higher than pre-industrial levels. Above this point, it is feared climate change could become impossible to control. *MailOnline* February 28, 2013 Thursday Green lobby loses the public: Most people no longer consider global warming a serious issue in a recession BYLINE: DAMIEN GAYLE
- 589- Fracking - known officially as hydraulic fracturing - involves pumping high-pressure water through underground rocks to **release** natural gas trapped deep underground. It is believed that there are vast reserves of these subterranean gas fields across the US. (...) However, fracking is also controversial. Environmentalists say it can lead to the contamination of underground water reservoirs and the pollution of the surface with chemicals used to help to **release** subterranean gas stores. They also point out that burning natural gas **releases** carbon dioxide. (...) Greenpeace says no proper analysis has been done on gas leakage from fracking sites. In particular, there is a fear that methane - which is a far more dangerous greenhouse gas than carbon dioxide - may be **escaping** from wells and adding to the warming of the atmosphere. *The Observer* February 17, 2013 World: American Association for the Advancement of Science: Fracking is only way to reach Obama's goal on climate change BYLINE: Robin McKie
- 590- Black carbon, which is **released** from diesel engines, coal-fired power stations and wood-burning stoves, has a warming effect of 1.1 Watts per square metre, which is about two thirds the warming effect of carbon dioxide, the principle man-made greenhouse gas. *Independent.co.uk* January 15, 2013 Tuesday Soot causes twice as much global warming as previously thought BYLINE: Steve Connor
- 591- At the end of the decade, though, the oceanic cycles may change. At which point, the seas might start to **release** heat, instead of soaking it up, perhaps provoking another sharp rise in global temperatures. The

underlying problem will not have changed, but the ocean's absorption will no longer be masking it. *The Independent* January 10, 2013 Thursday Climate change: no less of a problem than it was

- 592- The last major UN assessment, in 2007, predicted **runaway** temperature rises of 6C or more by the end of the century. That is now thought unlikely by scientists, but average land and sea temperatures are expected to continue rising throughout this century, possibly reaching 4C above present levels - enough to devastate crops and make life in many cities unbearably hot. *Guardian.com*. September 27, 2013 Friday Climate change will hit poor countries hardest, study shows BYLINE: John Vidal
- 593- At the heart of the problem lie the computer models which, for 25 years, have formed the basis for the IPCC's scaremongering: they predicted **runaway** global warming, when the real rise in temperatures has been much more modest. *The Daily Telegraph* September 26, 2013 Thursday Global warming believers are feeling the heat BYLINE: JAMES DELINGPOLE
- 594- Countries must get used to the idea of leaving fossil fuel reserves in the ground unexploited and unburned, one of the world's most senior diplomats has said, before a landmark report on climate science due to be unveiled on Friday by the Intergovernmental Panel on Climate Change (IPCC). The former president of Ireland and UN high commissioner for human rights, Mary Robinson, is to spearhead a new international push aimed at breaking the climate talks deadlock and silencing sceptics with an international group of senior diplomats and politicians. (...) Robienson told the Guardian that governments would have to confront the harsh reality that much of their fossil fuel reserves, and accompanying economic value, would have to be left if **runaway** emissions were not to threaten the climate. *The Guardian* September 24, 2013 Tuesday Get used to leaving fossil fuels in ground BYLINE: Fiona Harvey
- 595- Although the report does not say so, Earth would probably then be facing a **runaway** greenhouse effect. (...) Such a rise could trigger the **release** of plumes of the greenhouse gas methane from the thawing Arctic tundra, while the polar ice caps, which reflect solar radiation back into space, could disappear. *The Observer* September 22, 2013 Scientists give their starkest warning yet on climate change BYLINE: Robin McKie
- 596- For a planet receiving the same amount of solar radiation as the Earth, a **runaway** greenhouse effect is a realistic possibility. (...) To see what might happen to the Earth if it was ever caught in the grip of **runaway** global warming, it is only necessary to look next door. (...) The new study used a simplified model which did not take into account the effect of clouds. But it still suggests that under certain atmospheric conditions a stable Earth could switch to a **runaway** greenhouse state. Looking back in the Earth's history reveals past episodes of global warming, but none involving a **runaway** greenhouse effect. There is no clue to the size of any "safety margin", said the scientists. (...) Eocene atmospheric carbon dioxide levels and temperature were both higher than what is expected in the foreseeable future from man-made greenhouse gas emissions, without triggering a **runaway** effect. *Independent.co.uk* July 29, 2013 Monday Global-warming Armageddon? It may be more likely than you thought; Calculations from Canadian and US scientists show **runaway** greenhouse effect is realistic possibility BYLINE: John von Radowitz
- 597- So-called **carbon capture and storage (CCS)** should only be used as part of a mix of technologies and should be used on gas power plants where possible rather than coal. *telegraph.co.uk* April 24, 2013 Wednesday Climate change advisers says fracking can be OK BYLINE: Louise Gray
- 598- Readers of this column do not need to be reminded why it is so important for us to know whether the world is truly in the grip of **runaway** global warming, or whether this belief has all been based on a colossal misreading of the scientific evidence. *telegraph.co.uk* March 9, 2013 Saturday Look at the graph to see the evidence of global warming BYLINE: Christopher Booker
- 599- The risk that climate change could trigger a **runaway** chain reaction that would make the Earth inhospitable to life (...) The possibility that a nation or individual could unilaterally tamper with the

globe's climate may seem like the plot of a Hollywood spy thriller but, as the World Economic Forum report notes, it has already happened. *MailOnline* January 10, 2013 Thursday Could a rogue nation 'hijack' climate change? New report warns of the danger BYLINE: DAMIEN GAYLE

- 600- Constellation, one of the leading US solar power companies, will employ a strategy that includes buying certificates for biomass and wind energy and capturing methane gas **released** by landfills. *The Guardian* December 19, 2014 Friday NHL fights global warming by going carbon neutral BYLINE: Timothy Pratt
- 601- However, the role of arctic ground squirrels is thought to be tiny compared to the melting of the permafrost caused by carbon dioxide **released** into the atmosphere by human activity. (...) A separate study has also found that another rodent, the beaver, is also playing a far greater role in the **release** of climate changing gases like methane than had been previously thought. (...) Arctic ground squirrels churn up and warm soil in the Tundra, allowing carbon dioxide gas trapped in the ice to **escape** into the atmosphere. *MailOnline* December 17, 2014 Wednesday Forget humans, RODENTS are the climate villains BYLINE: RICHARD GRAY
- 602- Once drained this peat **releases** carbon dioxide into the air, and becomes vulnerable to fires set by loggers or plantation developers. *Independent.co.uk* December 12, 2014 Friday UN climate change talks finally feel like they have momentum BYLINE: Mark Lynas
- 603- Carbon dioxide **released** into the atmosphere is absorbed into ocean waters, where it dissolves and lowers the pH of the water. *MailOnline* November 28, 2014 Friday Ancient algae could reveal how life will adapt to climate change BYLINE: SARAH GRIFFITHS
- 604- Meanwhile, carbon monoxide is seen being **released** in the southern hemisphere, and during the summer, plumes of the harmful gas are **released** from fires in Africa and Australia. *MailOnline* November 18, 2014 Tuesday Global warming in action BYLINE: VICTORIA WOOLLASTON
- 605- Kingsnorth's Dark Mountain project, described as "a network of artists, writers and thinkers who basically see the world as being doomed - ecologically and economically", is hardly the message we need to hear in the week following the 2014 report of the Intergovernmental Panel on Climate Change setting out the challenging, but achievable, targets for control of carbon **release** and temperature rise; in fact, for our Earth's survival. *The Guardian* November 13, 2014 Thursday Doomsday pessimism won't help us to tackle the climate-change threat
- 606- In the process people have been displaced, livelihoods undermined, endangered animals such as orangutans have lost their natural habitat and sometimes their lives, and the draining of peatland has **released** millions of tonnes of CO2 into the atmosphere exacerbating climate change. *The Guardian* November 10, 2014 Monday Palm oil: the secret in your shopping basket BYLINE: Laura Paddison
- 607- Similarly, tree-killing pests - like the pine bark beetle, which has devastated 45 million acres of forest in western Canada and north-west America - flourish in warmer temperatures. And the drier conditions expected from climate change encourage forest fires, which **release** vast amounts of carbon dioxide. (...) And it favours faster-growing species that then die earlier (on "the live fast, die young" principle), **releasing** the carbon dioxide they have accumulated. *The Daily Telegraph* October 15, 2014 Wednesday We cannot rest on Mother Nature's laurels BYLINE: GEOFFREY LEAN
- 608- And one leading climate scientist said the paper suggests that cuts in emissions of greenhouse gases may not need to be as deep to keep global warming below what is seen as the critical increase of 2C. This casts doubt on the drive for costly anti-pollution measures such as wind farms. Climate change is widely blamed on man's burning of fossil fuels such as coal, oil and gas which **release** greenhouse gases such as carbon dioxide that trap the heat in the atmosphere. *Express Online* October 14, 2014 Tuesday Climate change DOUBT: Study shows carbon dioxide levels in atmosphere are OVERSTATED BYLINE: John Ingham

- 609- Researchers led by Baek-Min Kim from Korea Polar Research Institute found that as oceans heat up and melt the Arctic ice, warm air is **released** that destabilises polar air and sends cold blasts into the atmosphere. (...) The previous edition of the Times Atlas, published in 2011, was hit by controversy amid claims by the publishers that 15 per cent of Greenland's ice had melted in little over a decade, an assertion they were forced to admit was 'incorrect'. A reworked map of Greenland also had to be produced after scientists said numerous glaciers could be found where the atlas showed ice-free conditions and the emergence of new land. *MailOnline* October 1, 2014 Wednesday Hidden world of canyons and mountains beneath the ice caps revealed BYLINE: JONATHAN O'CALLAGHAN
- 610- This melting leads to areas of open water, which **release** heat into the atmosphere during winter months. The warmer temperatures cause the colder, polar temperatures to destabilise and emit cold blasts into the atmosphere. Due to its location, Canada and the US in particular, faced the brunt of this cold air in more recent winters. But Eurasia is likely to also see the cooling effect impacting on winters. *MailOnline* September 16, 2014 Tuesday Is global warming causing COLDER winters? BYLINE: VICTORIA WOOLLASTON
- 611- In addition, cows burp lots of methane, and their manure also **releases** this potent greenhouse gas. *MailOnline* September 5, 2014 Friday Could a healthy diet speed up global warming? BYLINE: JONATHAN O'CALLAGHAN
- 612- The location of the seeps and knowledge of the underlying geology suggests the leaking methane is being produced by microbial processes in shallow sediments. At depths of more than 2,000 feet (600 metres) in some places, the seeps are too deep to **release** methane directly into the atmosphere. However, there is the danger that if the methane stays in the water, it could oxidise into carbon dioxide. This can increase the acidity of ocean waters and reduce oxygen levels, which can be harmful to marine life. While not directly pointing a finger at climate change, the researchers indicate that global warming could be the cause of the problem. *MailOnline* August 25, 2014 Monday Hundreds of 'toxic' methane vents discovered in the Atlantic's depths - and they could be caused by global warming BYLINE: JONATHAN O'CALLAGHAN
- 613- **Just like a kitchen sponge** swells when it takes on water, the adsorbent swells slightly when it soaks up carbon dioxide in the tiny spaces between its molecules. When the pressure drops the adsorbent polymer deflates and **releases** the gas, which they can then collect for storage or convert into useful carbon compounds.(...) Another advantage of the new polymer is its ability to adsorb carbon dioxide without taking on water vapour, which can clog up other materials and make them less effective. Its low cost also makes the sponge polymer attractive. *MailOnline* August 11, 2014 Monday Does the solution to climate change lie in a giant SPONGE? BYLINE: SARAH GRIFFITHS
- 614- An urgent expedition will leave tomorrow to probe a giant crater that has appeared in gas-rich northern Siberia. (...) The cause of the hole's sudden appearance in Yamal - which translates as 'the end of the world' - in the far north of Siberia is not yet known. (...)Global warming may have caused an 'alarming' melt in the under-soil ice, **released** gas and causing an effect **like the popping of a Champagne bottle cork**, Ms Kurchatova suggests. *MailOnline* July 15, 2014 Tuesday UFO landing site? Meteorite crater? Global warming collapse? Scientists baffled by gigantic hole that has appeared in Siberia
- 615- The Amazon rainforest affects climate change because trees soak up heat-trapping carbon dioxide as they grow and **release** it when they rot or are burnt. Brazil has sharply slowed deforestation rates in recent years. *MailOnline* July 9, 2014 Wednesday Amazonian rainforest was created just 2,000 years ago by climate change that wiped out ancient farmers BYLINE: MARK PRIGG
- 616- If deep water comes to the surface it will warm and **release** carbon dioxide, as cold water holds more carbon dioxide than warm water. (...) This resulted in CO2 stored in the deep Pacific being **released** into the atmosphere, where it helped warm the planet and melt back the ice sheets that covered much of the Northern Hemisphere. *MailOnline* July 7, 2014 Monday Giant CO2 'burp' triggered end of last ice age - but it was 100 times SLOWER than man-made climate change, claim scientists BYLINE: JONATHAN O'CALLAGHAN

- 617- The utility industry, the U.S. Chamber of Commerce and 13 states led by Texas had asked the court to rule that the EPA overstepped its authority by trying to regulate greenhouse gas emissions through the permitting program. The administration failed to get climate change legislation through Congress. In 2012, a three-judge panel of the U.S. Court of Appeals for the District of Columbia Circuit concluded that the EPA was "unambiguously correct" in using existing federal law to address global warming. The agency's authority came from the high court's 2007 ruling in *Massachusetts v. EPA*, which said the Clean Air Act gives EPA power to limit emissions of greenhouse gases from vehicles. Two years later, with Obama in office, the EPA concluded that the **release** of carbon dioxide and other heat-trapping gases endangered human health and welfare. The administration used that finding to extend its regulatory reach beyond automobiles and develop national standards for large stationary sources. Of those, electric plants are the largest source of emissions. *MailOnline* June 23, 2014 Monday Justices rap EPA, but uphold global warming rules
- 618- Beyond the major issue of what is the best mix of energy sources for Britain, lie other major questions around agriculture, which causes 9% of the UK's greenhouse gas emissions. More than a third is methane **released** by livestock, and the production and use of manure and slurry. *Guardian.com*. June 12, 2014 Thursday UK chief scientist calls for urgent debate on climate change mitigation BYLINE: Ian Sample
- 619- But this type of 'climate engineering' - which involves manipulating the natural processes after emissions have been **released** - will ultimately fail to help the world reach its emissions targets. (...) The report looked at a range of possible climate-altering approaches and concluded there is no way around it; governments have to reduce the amount of carbon being **released** into the atmosphere. *MailOnline* June 4, 2014 Wednesday Geoengineering WON'T stop global warming, warns study BYLINE: ELLIE ZOLFAGHARIFARD
- 620- Scientists have long known about the carbon storage capacity of soils, the potential for carbon **sequestration**, and that carbon in soil can be released to the atmosphere through microbial decomposition. (...) Soil thousands of years old has been found to be rich in carbon And human activities could be **releasing** it into the atmosphere (...) This included changes in vegetation and a regime of wildfire that contributed to carbon **sequestration** as the soil was rapidly buried by accumulating loess. *MailOnline* May 26, 2014 Monday Is the cause of global warming underground? BYLINE: JONATHAN O'CALLAGHAN
- 621- Carbon dioxide moves constantly between land, oceans, vegetation and the atmosphere. When one of those absorbs more carbon dioxide than it **releases**, it's referred to as a carbon sink. *MailOnline* May 23, 2014 Friday Does the solution to global warming lie in Australia? BYLINE: JONATHAN O'CALLAGHAN
- 622- Carbon dioxide **released** into the atmosphere is absorbed into ocean waters, where it dissolves and lowers the pH of the water. *MailOnline* April 15, 2014 Tuesday Climate change is damaging fish brains and causing them to lose their survival instinct, researchers warn BYLINE: MARK PRIGG
- 623- During that period air enriched with CO₂ had been **released** on the fields, similar to what is expected to be present in the air by 2030. *MailOnline* April 8, 2014 Tuesday Will climate change make food less nutritious? BYLINE: JONATHAN O'CALLAGHAN
- 624- Each individual cow **releases** a whopping 400 litres of methane a day by passing wind - so is it time to adopt a no meat, no fish, no dairy, no eggs diet? *MailOnline* April 1, 2014 Tuesday Will following the A-listers and going vegan like Gwyneth, Beyonce and Anne help stop global warming? BYLINE: BIANCA LONDON
- 625- Forests store huge amounts of carbon dioxide, and widespread tree deaths threaten to accelerate climate change because dead trees not only **release** their carbon into the atmosphere but are also no longer able

to absorb new CO₂. *The Independent on Sunday* March 30, 2014 Climate change could wipe out wildlife and is 'major risk' to UK forests BYLINE: Tom Bawden

- 626- For each 1C rise in temperature, tropical regions now **release** about 2 billion extra tonnes of carbon-containing gases - such as carbon dioxide and methane - into the atmosphere, compared to the same amount of tropical warming in the 1960s and 1970s, the study found. (...) About half of the man-made carbon dioxide **released** into the atmosphere over the past 200 years as a result of fossil-fuel burning has been absorbed by either the oceans or vegetation growing on the land, such as tropical rainforests. (...) However, the terrestrial sink for atmospheric carbon is more erratic because the ability of plants to absorb carbon dioxide depends on heat and moisture, as well as human activities such as deforestation and the draining of swamps, which **releases** methane. *Independent.co.uk* January 26, 2014 Sunday Climate change: Rainforest absorption of CO₂ becoming erratic; For each 1C rise in temperature, tropical regions now **release** about 2 billion extra tonnes of carbon-containing gases BYLINE: Steve Connor
- 627- The intensity of those storms, however, is a different matter. They are essentially **releases** of energy stored in the oceans as heat, and the oceans, slowly but surely, are getting warmer. *The Times* January 8, 2014 Wednesday Storm Warning; The strength of scientific evidence linking climate change to extreme weather should neither be exaggerated nor ignored
- 628- The 2C mark is often described as the level beyond which disastrous impacts including flooding and heat-waves - and potentially **runaway** warming as natural 'feedbacks' kick in - would take place. *The Guardian* December 1, 2014 Monday Could the 2C climate target be completely wrong? BYLINE: Adam Vaughan
- 629- Ploughing through the new "Synthesis Report" put out by the UN's Intergovernmental Panel on Climate Change (IPCC), we may be reminded of one of those old gramophone records, when the needle got horribly stuck in a groove. Compiled by many of the IPCC's veteran alarmists, in yet another bid to get that "global climate treaty" that isn't going to happen in Paris next year, it wheels on all the familiar scare stories. Melting polar ice, rising sea levels, floods, droughts and hurricanes are all in there - even though these are largely contradicted not just by the actual evidence, but even by the much more cautious contents of the vast technical reports they were meant to be "synthesising". On the basis of these increasingly implausible claims, the report's authors join the growing chorus of calls for humanity to cut CO₂ emissions by 80 per cent, the cost of which, they tell us, would only require us to reduce the world's economic growth by a mere 0.06 per cent, or 1/1,666th. Their report is aptly dedicated to the memory of Stephen Schneider, a US physicist who died in 2010 after 40 years as one of the most fanatical "climate crusaders" of them all. Only by wondrous contortions do they try to get round their biggest challenge, in accounting for how global temperatures have failed to rise for 18 years, making a mockery of all those computer model predictions on which the IPCC's previous four reports relied to drive the scare. Some 40 different theories have now been offered to explain why, despite the temperature "pause", the Earth is still in the grip of **runaway** warming. *telegraph.co.uk* November 8, 2014 Saturday IPCC's 'scary' new report is needle stuck in an old groove BYLINE: Christopher Booker
- 630- The IPCC report states that the rapid rate of greenhouse emissions is pushing the world ever closer to an era of **runaway** climate change. (...)However, fossil fuel firms still spend huge sums - about \$650bn in 2013 - exploring for new oil, gas and coal to add to the stockpile, despite their declining profits. *The Guardian* April 11, 2014 Friday Combat climate change like we fought apartheid BYLINE: Damian Carrington and Suzanne Goldenberg
- 631- Far from increasing, the number and intensity of hurricanes, droughts, tornadoes and the rest have, if anything, declined, just as there is considerably more polar sea ice in the world today than its average level through all the 30 years when we have been told that the world is in the grip of **runaway** warming. *The Sunday Telegraph* January 12, 2014 Flooding chaos is down to Cameron, not climate change BYLINE: CHRISTOPHER BOOKER

- 632- This methane can then **escape** out of the lake, and once lit, could set ice on fire. *MailOnline* August 8, 2014 Friday 'We're f*****': Climate change will be catastrophic for mankind after study reveals methane leaking from the Arctic Ocean, scientist warns BYLINE: ELLIE ZOLFAGHARIFARD
- 633- The carbon budget is the amount of greenhouse gas that can still be **released** into the atmosphere without exceeding dangerous levels of climate change - the 2C target agreed by governments. *The Guardian* June 23, 2015 Tuesday A beginner's guide to fossil fuel divestment BYLINE: Emma Howard
- 634- In The speedy retribution came amid rumours in Rome that the leaking of the 191-page encyclical may have been engineered by Pope Francis's conservative enemies within the Vatican in order to undermine his authority and water down the impact of its scheduled release on Thursday. Adding fuel to the theory was the fact that Mr Magister, a long-standing "Vaticanista" or analyst of the machinations of the Holy See, is a conservative who has been critical of Pope Francis since his election two years ago. The Latin American pontiff has come up against trenchant opposition to his reforms, particularly those regarding the clean-up of the Vatican's opaque finances, and has angered some conservatives with his by-now famous remark about homosexuals - "Who am I to judge?" In the draft encyclical - a sort of open letter addressed to the world - Pope Francis blames global warming largely on man-made phenomena such as the burning of fossil fuels and the **release** of greenhouse gases. *telegraph.co.uk* June 16, 2015 Tuesday 'Dirty tricks' campaign against Pope could be behind climate change leak BYLINE: Nick Squires
- 635- The IEA is proposing four measures that would allow the world to meet that target. These include the phasing out of inefficient coal-fired power stations; a large increase in investment in renewable energy; and forcing oil and gas companies to extract their fuel resources without **releasing** methane into the atmosphere - a technically feasible feat, at a low cost, but one which most companies ignore as they are not penalised for the release of the powerful greenhouse gas. The IEA's list of proposals could achieve such a timetable. The most controversial items on the list are the phasing out of inefficient coal-fired power stations, which are used in many parts of the developing world, and the recommendation that no new ones should be built. The global energy watchdog said the reforms were necessary as a "bridging strategy" to bring down carbon output before 2020, when any agreement arising from the Paris conference would kick in. Old designs of coal plants waste much more energy and produce far more carbon per unit of electricity than more modern technology. But they are cheaper to build and so are often preferred in rapidly emerging economies, particularly in south Asia. *The Guardian* June 15, 2015 Monday Divorce growth from greenhouse gases to aid climate goals BYLINE: Fiona Harvey
- 636- Now evidence from Siberia is showing that the overall situation could be worsened, and speeded up, with the **release** of deadly gases from the melting bogs. *Express Online* May 11, 2015 Monday Carbon time-bomb in Siberia threatens catastrophic climate change BYLINE: Will Stewart
- 637- The ocean whitening would have even less effect on the permafrost in the Arctic Circle as this would still melt and **release** huge amounts of methane - a potent greenhouse gas. (...) But this type of 'climate engineering' - which involves manipulating the natural processes after emissions have been **released** - is only a quick and cheap fix, according to a new report. *MailOnline* April 29, 2015 Wednesday Turning the oceans 'white' will NOT stop sea ice from melting BYLINE: RICHARD GRAY
- 638- This is the amount of carbon dioxide that if they were burned would be **released** from the proven reserves of fossil fuel - ie the fuel we are planning to extract and use. *The Guardian* April 10, 2015 Friday Climate change: why the Guardian is putting threat to Earth front and centre BYLINE: Alan Rusbridger
- 639- The opening up of the Galilee Basin coalfields, to export resources via the reef, could result in the **release** of an additional 705m tonnes of greenhouse gases - more than Australia's annual total. *The Guardian* April 6, 2015 Monday Great Barrier Reef: new report slams government's 'weak' recovery plan BYLINE: Oliver Milman

- 640- The CO2 budget relates to the amount of CO2 that can be **released** into the atmosphere if the worst effects of climate change are to be avoided. *The Independent* April 6, 2015 Monday A climate change paradox
BYLINE: TOM BAWDEN
- 641- This is the total CO2 that would be **released** if today's proven reserves of coal, oil and gas are burned: 2,795 GT. That is the fossil fuel identified and ready to extract. (...) The carbon budget is the amount of greenhouse gas that can still be **released** into the atmosphere without exceeding dangerous levels of climate change - the 2C target agreed by international governments. *The Guardian* April 2, 2015 Thursday Everything you wanted to ask about the Guardian's climate change campaign; The Guardian is calling on the Bill and Melinda Gates Foundation and the Wellcome Trust to divest from fossil fuels. We explain here everything you need to know about the campaign and why we are doing it BYLINE: Emma Howard and Damian Carrington
- 642- If you visit the website of the UN body that oversees the world's climate negotiations, you will find dozens of pictures, taken across 20 years, of people clapping. These photos should be of interest to anthropologists and psychologists. For they show hundreds of intelligent, educated, well-paid and elegantly-dressed people wasting their lives. The celebratory nature of the images testifies to the world of make-believe these people inhabit. They are surrounded by objectives, principles, commitments, instruments and protocols, which create a reassuring phantasm of progress while the ship on which they travel slowly founders. Leafing through these photos, I imagine I can almost hear what the delegates are saying through their expensive dentistry. "Darling you've re-arranged the deckchairs beautifully. It's a breakthrough! We'll have to invent a mechanism for holding them in place, as the deck has developed a bit of a tilt, but we'll do that at the next conference." This process is futile because they have addressed the problem only from one end, and it happens to be the wrong end. They have sought to prevent climate breakdown by limiting the amount of greenhouse gases that are **released**; in other words, by constraining the consumption of fossil fuels. But, throughout the 23 years since the world's governments decided to begin this process, the delegates have uttered not one coherent word about constraining production. *The Guardian* March 10, 2015 Tuesday Keep fossil fuels in the ground to stop climate change BYLINE: George Monbiot
- 643- The last dry spell in 2010 saw the forest **release** eight billion tonnes - as much as the annual emissions of China and Russia combined. (...) Trees are absorbing up to a tenth less carbon dioxide from the atmosphere during droughts and the forests actually emit more carbon than they **capture**. *MailOnline* March 5, 2015 Thursday Droughts in the Amazon are speeding up climate change: 'Lungs of the planet' are emitting more CO2 than they **capture** BYLINE: ELLIE ZOLFAGHARIFARD
- 644- Meanwhile, rising sewage and chemical waste **released** into the oceans introduce nutrients that spur algae populations to bloom in the oceans. Any algae that isn't eaten by other marine life then decomposes, **releasing** CO2 into the water and further lowering pH levels. *The Guardian* February 23, 2015 Monday Oysters, clams and scallops face high risk from ocean acidification BYLINE: Siri Srinivas
- 645- It has been commonly assumed that forest fires might contribute to global warming by **releasing** vast amounts of carbon dioxide into the atmosphere. *MailOnline* February 17, 2015 Tuesday Are wildfires COOLING Earth? BYLINE: RICHARD GRAY
- 646- Cool air typically holds less moisture than warm air, so as the air cools, condensation occurs, and heat is **released**. When enough heat is **released**, air begins to rise even further, pulling more air behind it, which ultimately causes a thunderstorm. *MailOnline* February 3, 2015 Tuesday Global warming will NOT cause more storms BYLINE: VICTORIA WOOLLASTON
- 647- When the trees die, the **stored** carbon is **released** into the atmosphere. *Independent.co.uk* January 22, 2015 Thursday California's iconic big trees are being killed off due to climate change BYLINE: Tom Bawden
- 648- But today, the world's forests are being threatened as the demand for agriculture, beef and development grows. As many as 58,000 square miles of forest are lost each year - the equivalent of one football field

every two seconds. This has big implications for the world's climate as fallen trees **release** all of their **stored** carbon back into the air. (...) What it lacks: zero net deforestation too often discounts the unique biodiversity of natural forests, as compared to plantations - which often grow only a single type of tree species. And when natural forests are converted to plantations, carbon dioxide can still be **released** into the atmosphere. *The Guardian* January 21, 2015 Wednesday Three ways to protect our precious forests

- 649- Oil is extracted to be burnt; burning it **releases** greenhouse gases; maximising recovery means maximising greenhouse gases. *The Guardian* January 7, 2015 Wednesday Why leaving fossil fuels in the ground is good for everyone BYLINE: George Monbiot
- 650- Without that technology, the only way we are going to suck carbon dioxide out of the air is by planting billions of trees and then, when they are mature, burying them underground where they can't rot and **release** carbon dioxide back into the atmosphere. (...) True, there are some small scale experiments with "**carbon capture and storage**" - which involve sucking carbon dioxide from the chimneys of gas and coal-fired power stations and burying it underground. But the technology is showing all the signs of becoming like nuclear fusion which 30 years ago was promising to give us virtually limitless supplies of cheap energy but has never been put into practice. Exasperated by the growing cost, George Osborne recently pulled the plug on a large-scale **carbon capture and storage** scheme in Scotland. *Express Online* December 14, 2015 Monday Climate change agreement is a terrible mistake BYLINE: Ross Clark
- 651- The melting of the permafrost would **release** carbon stored for many years underground, causing the sort of "feedback loop" that has concerned climate scientists: as warming temperatures melt ice in the Arctic region, carbon and methane that has been **locked away** for thousands of years is being **released**, thereby fueling more warming and melting. The USGS has previously said that there would be a "gradual and prolonged" **release** of greenhouse gases from thawing permafrost but this is the first time the agency has quantified the **loss**. *The Guardian* December 14, 2015 Monday One quarter of Alaska permafrost could melt by 2100 - US Geological Survey; Study raises concerns over accelerating climate change as the icy mass under state's surface **releases** carbon into atmosphere BYLINE: Oliver Milman
- 652- The Nasa scientists, who had been analyzing changes in the Earth's climate since the 1970s, told a congressional committee that something called the "greenhouse effect" where heat-trapped gases are **released** into the atmosphere was causing global warming with a 99% certainty. (...) After that, things started to get a little difficult for Hansen. He claims the White House altered subsequent testimony, given in 1989, and that Nasa appointed a media overseer who vetted what he said to the press. They held practice press conferences where any suggestion that fossil fuels be reduced was considered political and unscientific, and therefore should not be uttered. (...) Hansen is just as scathing of leading Republicans who have embraced climate science denialism to the chagrin of some party elders. Leading presidential candidates Donald Trump, Marco Rubio and Ben Carson have all derided evidence that the world is warming due to human activity while Ted Cruz, another contender, has taken time out from his campaign to sit on an inquiry into climate science that has heard testimony from a rightwing radio host who has no scientific background. *The Guardian* December 13, 2015 Sunday James Hansen, father of climate change awareness, calls Paris talks 'a fraud' BYLINE: Oliver Milman
- 653- The UK **released** 0.43 tonnes of CO₂ in 2014, which was 1.2 per cent of the world total, a decrease of 9 per cent on the previous year, and 28 per cent below 1990 levels. (...) Last year China experienced an increase in emissions growth of 1.2 per cent, compared to an annual growth rate of 6.7 per cent for the previous decade. The US was the second biggest emitter in 2014, **releasing** 5.6 billion tonnes, followed by the EU and India with 3.4 billion tonnes and 2.6 billion tonnes respectively. *Independent.co.uk* December 8, 2015 Tuesday Climate change: Global carbon dioxide emissions stall for second year in a row BYLINE: Steve Connor
- 654- With each gallon of fuel producing around 21 pounds of carbon dioxide, the total **released** by planes flying to and from Paris is thought to be about 575million pounds (290,000 tons), according to rough calculations. (...) Countries will attempt to hammer out a legally-binding deal to prevent temperatures rising by more than 2C above pre-industrial levels. Current plans would put the world on track for a

potentially disastrous warming of anywhere from about 2.7C to 3.5C by 2100. (...) So far this year, 183 of 195 nations have issued long-term plans for tackling climate change, meant as building blocks for the Paris accord. But issues may arise over how to make the deal legally binding and how it would be enforced as happened in Copenhagen six years ago when talks collapsed. *MailOnline* December 1, 2015 Tuesday Let's hope the talks aren't a load of hot air BYLINE: SIMON TOMLINSON

655- China is estimated to have **released** between nine and 10 billion tonnes of carbon dioxide in 2013, nearly twice as much as the US and around two and a half times the European Union. *MailOnline* December 1, 2015 Tuesday As world leaders meet to hammer out climate change deal, Beijing chokes under cloud of poisonous smog BYLINE: JENNY STANTON and CHLOE LYME

656- With an extra 30 billion tonnes of carbon **released** each year compared with 1900, scientific models predict a further average increase of between 1.5 and 4.5 degrees by the end of the century. (...) Britain must make the case for a step-change in nuclear capacity and for a wholesale switch to natural gas as a transitional energy source that **releases** half as much carbon per unit of energy as coal. *The Times* November 28, 2015 Saturday Climate Control; Paris will host a festival of good intentions and muddled thinking on climate change next week

657- Even less is known about how trees retain and **release** their carbon over the course of years and decades. (...) Because of the drought, the air tasted subtly of smoke. A thousand fires were burning in the forest, **releasing** untold tonnes of carbon dioxide into the atmosphere. Would someone pay for that? (...) REDD+ promises to turn the situation around. Given how valuable these biological systems are - forests are "**carbon capture and storage**" technology in a cheap yet wondrous form - the idea is that we should pay for what they do. *The Guardian* November 27, 2015 Friday The incredible plan to make money grow on trees BYLINE: Sam Knight

658- This is (warming in the Arctic region), in part, because melting Arctic permafrost **releases** large amounts of the greenhouse gas methane, which accelerates climate change. *The Independent* November 24, 2015 Tuesday UK's youngest Arctic adventurer urges world to act on climate change BYLINE: TOM BAWDEN (my addition in parenthesis)

659- The **release** of methane into the atmosphere during the drilling process and the greenhouse gases when burning natural gas all contributes to climate change. (...) It seems attractive until you consider that **fugitive** emissions of methane tend to cancel out any benefit to the climate. (...) Satellite observations show that this increase is a result of gas **escaping** from production wells in the US, and peer-reviewed scientific publications show that the amount **released** is in the range of 3-15% of total production (...) The challenge is to achieve a balance of all three of these energy policy goals - to do so it's crucial that Britain establishes a long-term energy policy that accommodates a broad mix of capacity types including nuclear, gas, **carbon capture and storage**, renewables and new forms of capacity like **storage**, demand-side response and smart meters which can help consumers control and reduce their carbon footprint and energy bills at an individual and community level. *The Guardian* November 20, 2015 Friday Tackling climate change should be the UK's top energy priority

660- A crucial meeting of the Arctic Council, in Anchorage, comes amid evidence that the polar region is warming faster than any other place on Earth and that sea ice coverage there has shrunk by nearly a third since 1979. Researchers now fear that new threats to climate stability are about to be unleashed in the Arctic (...) Warming in high latitudes is causing permafrost in Siberia and northern Canada to thaw and **release** plumes of methane stored there, they say. Methane is a powerful greenhouse gas and these **releases** threaten to trigger secondary rises in global temperatures. (...) Crucially, Kahn (director of the ministry of environment and energy in Sweden) noted that the US, which has just assumed presidency of the council, has agreed to maintain this interest and, in particular, to look more closely at flaring, the burning of natural gas that cannot be processed or sold, and which has been linked to the **release** of secondary climate pollutants such as black carbon. *The Observer* October 17, 2015 Saturday Arctic powers gather for Alaska talks as pace of global warming threatens ice cap BYLINE: Robin McKie (my addition in parenthesis)

- 661- In the European Union, the emissions from heavy industry and power plants are restricted by the emissions trading scheme (ETS). Permits give emitters the right to **release** one tonne of CO₂ into the atmosphere. *The Guardian* October 8, 2015 Thursday 10 green leaders on the best ways you can fight climate change BYLINE: Emma Howard
- 662- This is the total CO₂ that would be **released** if today's proven reserves of coal, oil and gas are burned: 2,795 GT. That is the fossil fuel identified and ready to extract. (...) The carbon budget is the amount of greenhouse gas that can still be **released** into the atmosphere without exceeding dangerous levels of climate change - the 2C target agreed by international governments. *The Guardian* October 5, 2015 Monday Everything you wanted to ask about the Guardian's climate change campaign BYLINE: Emma Howard and Damian Carrington
- 663- The so-called pause refers to the fact that the temperature of Earth's surface has increased by just 0.06°C in the past 15 years. It has been used by some groups as evidence that climate change is not happening. (...) The National Oceanic and Atmospheric Administration says the PDO has gone into a positive phase when stored heat gets **released** to the atmosphere and across the globe. (...) The main variability is the Pacific Decadal Oscillation - or PDO - in which the planet's largest ocean goes through a cycle of burying heat and then **releasing** it. *MailOnline* August 17, 2015 Monday Is the global warming 'pause' over? BYLINE: ELLIE ZOLFAGHARIFARD
- 664- The **release** of greenhouses gases, and other forms of pollution, are already having their effect: the ten warmest years on record have all happened since 1998. And Obama has warned that the world must act quickly. *Independent.co.uk* August 4, 2015 Tuesday 4 charts that show Barack Obama is right to be terrified of climate change BYLINE: Andrew Griffin
- 665- Peatland is waterlogged land with a 30cm top layer of decomposing plant material. Conventional use of the land in agriculture requires draining and clearing, which **releases** locked in CO₂ back into the atmosphere and degrades the land. *The Guardian* July 20, 2015 Monday Swamp power: how the world's wetlands can help stop climate change BYLINE: Arthur Neslen
- 666- It has a reputation for being better for us and the environment, but new research suggests organic food may actually be harming the planet. (...) Scientists have found that rather than reducing the amount of greenhouse gas emissions **released**, organic farming may actually be increasing them. (...) Many people who buy organic or Fairtrade food insist the contents of their shopping basket taste better than factory-farmed meat or chemically-treated fruit and veg. But their desire to support high animal welfare standards, environmentally-sound farming and a decent wage for Third World producers may have skewed their judgement. *MailOnline* July 17, 2015 Friday Is organic farming making climate change worse? BYLINE: RICHARD GRAY
- 667- Global warming may already be taking its toll of air miles. As jet planes burn fuel and **release** carbon dioxide, the atmosphere warms and causes head winds to build up. Tail winds do too, but round trip journey times are nevertheless creeping up - and so are fuel costs. *The Guardian* July 16, 2015 Thursday Climate change costing airlines millions of dollars in extra fuel and flying time BYLINE: Tim Radford
- 668- Researchers in the Arctic Ocean have found dozens of plumes of methane gas, some of them a kilometre wide, bubbling up from the ocean floor. Methane is a far more powerful greenhouse gas than CO₂ and this massive **release** could hugely accelerate climate change, perhaps even send it spiralling beyond our control. *Independent.co.uk* July 15, 2015 Wednesday Climate change is as serious a threat as nuclear war BYLINE: Lee Williams
- 669- The researchers say that men may do more miles than women because they tend to work further from home, but equally they did more mileage in their leisure time too. This also does not take into account that men tend to buy cars with larger engines that guzzle more fuel, contributing more to the

greenhouse gases **released** into the air. *MailOnline* July 14, 2015 Tuesday Are women the key to solving CLIMATE CHANGE? BYLINE: RICHARD GRAY

- 670- Exxon decided not to develop Natuna knowing doing so would have **released** a huge amount of CO₂ - effectively a '**carbon bomb**', according to Bernstein (former scientist at Exxon). But despite that decision Exxon continued to deny the existence of man made climate change publicly, despite appeals from the Rockefellers, its founding family. According to Greenpeace, the company spent more than \$30m on think tanks and researchers that promoted climate denial over the years. *MailOnline* July 10, 2015 Friday Exxon knew of climate change in 1981, e-mail says - but it funded deniers for 27 more years BYLINE: TIM MACFARLAN
- 671- Estate owners insist they are true conservationists, spending millions of pounds maintaining the moors. But the use of fire is deeply controversial. Burning vegetation leaves peat exposed. This is a concern for conservationists. Not only does peatland provide a home for many different types of wildlife, including dragonflies and other insects, help clean water and prevent floods, it is also rich in carbon. If it is disturbed and exposed to the air, the carbon **stored** in its soil decomposes and **releases** carbon dioxide, contributing to climate change. *The Observer* July 5, 2015 Sunday Peatlands burn as gamekeepers create landscape fit for grouse-shooting BYLINE: Jamie Doward
- 672- Particles of coal fly ash have been found in rocks as far away as the Canadian Arctic. Rising temperatures might also have destabilised methane hydrates - a frozen form of natural gas - causing the kind of **runaway** feedback that terrifies some climate scientists today. Yes: the geological record suggests that fossil fuel burning might have eliminated most life on Earth. *The Guardian* May 27, 2015 Wednesday How fossil fuel burning nearly wiped out life on Earth BYLINE: George Monbiot
- 673- The powerful ranks of oil and gas industry executives had not witnessed a Damascene moment. Shell, under Van Beurden, is pursuing a strategy that seems to leave the (EURO)130bn (£94bn) Anglo-Dutch group firmly among the unconverted when it comes to stopping **runaway** climate change. *The Guardian* May 19, 2015 Tuesday The real story behind Shell's climate change rhetoric BYLINE: Terry Macalister
- 674- Our world population is responsible for increasing environmental degradation and is hastening CO₂ emissions, the results of which will lead to **runaway** climate change, increasing poverty and famine. *The Observer* May 10, 2015 Sunday Climate change: we must look to international agencies to save the world; Individuals and governments can't bring change alone
- 675- To avoid catastrophic and **runaway** consequences, the increase in global temperatures must be kept to 2C above pre-industrial levels. *The Guardian* March 25, 2015 Wednesday Keep it in the Ground campaign: six things we've learned BYLINE: Emma Howard
- 676- It's people like Naomi Klein and the left generally who are responsible for **runaway** climate change because their policies for dealing with it are too radical, says Lynas (journalist). So they frighten all those fair-minded, reasonable people in the centre and on the right into not caring a fig about it. (...) The scientific narrative has not been "captured by one, rather extreme, end of the political spectrum", but by global industries whose profits are threatened by the carbon bubble that will result if substantial fossil fuel deposits remain unexploited (the deniers) and by people who accept the scientific evidence but dwell on the apocalyptic image of a future world of **runaway** warming (the sensationalists). (...) Characteristically, for him (Lynas) it is the left that is most at fault, because "the left's global doom threats ... have made the right embrace denialism" - rather than any long-term corporate commitment to poorly controlled carbon **release**. *The Guardian* March 17, 2015 Tuesday Climate change demands immense changes to the economic system (my addition in parenthesis)
- 677- Homewood's interest in the Arctic is partly because the "vanishing" of its polar ice (and the polar bears) has become such a poster-child for those trying to persuade us that we are threatened by **runaway**

warming. *telegraph.co.uk* February 9, 2015 Monday The fiddling with temperature data is the biggest science scandal ever; New data shows that the "vanishing" of polar ice is not the result of **runaway** global warming BYLINE: Christopher Booker

- 678- Christiana Figueres, who heads up the global climate change talks, was visibly moved as she urged business leaders to take action to avoid **runaway** climate change at the World Economic Forum meeting in Davos on Thursday. Looking at her daughter sitting nearby, Figueres' eyes well up. Her desire to secure a meaningful climate deal later this year in Paris is clearly as much a personal concern as a global one. While it is incumbent on the world's politicians to secure a deal, it's apparent they need help: just yesterday, the US Senate failed to pass resolutions acknowledging that climate change is the result of human activity. *The Guardian* January 24, 2015 Businesses still aren't feeling immediately threatened by climate change BYLINE: Jo Confino
- 679- In a critical year for action to prevent **runaway** climate change, one would hope the issue would rank high on chief executives' list of business risks to worry about. *The Guardian* January 20, 2015 Tuesday How concerned are CEOs about climate change? BYLINE: Jo Confino
- 680- Or, which would be equally unpopular, we could ration these goods. Clearly, neither of these things are going to happen, so can we please stop fooling ourselves that the human race is capable of cutting greenhouse gas emissions by enough to prevent **runaway** climate change. (...) All of the really tough decisions - such as carbon taxes, country-specific limits and financial penalties - have been shelved, which will allow countries such as India, China and even the UK to carry on burning fossil fuels while paying lip-service to the need to reduce emissions. Instead the goal of 1.5C and even 2C will now rely on unproven and currently non-existent technologies such as nuclear fusion, **carbon capture with storage** or carbon negative technologies. (...) These include: divesting from renewables; privatising the Green Investment Bank; performing a monumental U-turn on the UK's £1bn **carbon capture and storage (CCS)** competition; reducing subsidies for improving energy efficiency; reducing the requirement for developers to build energy-efficient homes; making fracking easy to achieve and windfarms difficult; and continuing to subsidise fossil fuels. *The Guardian* December 14, 2015 Monday Climate change and the continual demand for economic growth
- 681- As such, today is likely to see significant horse-trading as countries slowly compromise on opposing positions they have long-insisted are non-negotiable - or else leave themselves open to the horrendous consequences of **runaway** climate change. *The Independent* December 11, 2015 Friday Fatigue and frayed tempers on second night of talks as time runs out for deal; UN Climate Change Summit BYLINE: TOM BAWDEN
- 682- Agreeing to a strong review mechanism that commits governments to increase the overall ambition of emissions cuts every five years thereafter so that **runaway** climate change can be avoided *Independent.co.uk* November 24, 2015 Tuesday Paris climate change talks: Four things you need to know about the upcoming meetings; International tensions remain but there is a new mood of cautious optimism BYLINE: Tom Bawden
- 683- In the fight against global warming, the real eco-warriors wear suits and ties; Environmentalists may not like it, but hard-headed businesses and banks are now our best defence against **runaway** climate change *telegraph.co.uk* October 30, 2015 Friday BYLINE: Geoffrey Lean
- 684- Methane produced by serpentinitisation can **escape** through cracks and faults, and end up at the ocean floor, causing a concern for future global warming. (...) Last year Dr Jason Box who claims that methane will be the main driver of climate change if it **escapes** into the atmosphere. *MailOnline* April 15, 2015 Wednesday Will methane in the Arctic speed up global warming? BYLINE: ELLIE ZOLFAGHARIFARD
- 685- Some pollutants allow heat to **escape**, but others reflect the heat back to the ground, increasing warming and leading to the "heat island" effect. *The Guardian* December 10, 2015 Thursday A view of Paris from a hot air balloon: putting pollution on the climate agenda BYLINE: John Vidal

- 686- The Greens' proposed targets are significantly tougher than those proposed by the Climate Change Authority last week – 30% of 2000 levels by 2025 and 40%-60% by 2030 – and that plan was rejected by the government as being too onerous, and by the mining industry which claimed it would slash economic growth and living standards. But they are similar to the targets proposed by the Climate Institute think tank, which says Australia should cut emissions by 40% by 2025, by 65%-75% by 2035 and achieve net-zero emissions between 2040 and 2050. (...) Milne (Green leader) set out how the Greens believed deeper cuts could be achieved; (...) with **fugitive** emissions from coal mining and coal seam gas the fastest growing source of Australian emissions, refuse to approve any new coalmines or CSG wells. *The Guardian* April 27, 2015 Monday Climate Change Authority emissions reduction targets 'too weak' BYLINE: Lenore Taylor (my addition in parenthesis)
- 687- As with carbon dioxide, Earth naturally absorbs and **releases** methane. *MailOnline* December 12, 2016 Monday Cows and rice paddies are boosting methane levels BYLINE: AFP and LIBBY PLUMMER
- 688- The effects of the melting ice could be felt as far away as the Indian Ocean as the warm weather sets off 19 global tipping points, according to the new Arctic Resilience Report. Those tipping points happen when a natural system undergoes quick or overwhelming change, leading to profound effects on nearby ecosystems that might never be reversed. In the Arctic, they include growing vegetation on the tundra that stops reflective snow and ice and so absorbs more heat, and the **release** of methane from the Arctic as it warms. *The Independent* November 26, 2016 Saturday Melting Arctic sea ice 'could trigger irreversible climate change' BYLINE: ANDREW GRIFFIN
- 689- Prominent green activist Bill McKibben is one of many green campaigners who do not entirely trust Ms Clinton. He wrote an open letter to her last year in which he praised her rhetoric on the environment, but criticised her enthusiasm for fracking - a contentious form of oil and gas production that drills into rock to **release** hydrocarbons. *i-Independent* November 7, 2016 Clinton isn't great on climate change - but Trump is a lot worse BYLINE: Tom Bawden
- 690- It (The Paleocene Eocene Thermal Maximum) lasted around two million years and it is thought that there was a massive **release** of carbon to the ocean and atmosphere causing a significant global warming. (...) Little is currently known about the source, quantity or rate of carbon **release**, or of the impact of major reorganisation in ocean circulations that took place at this time. (...) Among the theories suggested include carbon **release** from volcanoes and extraterrestrial impact on Earth. *MailOnline* October 13, 2016 Thursday Did a comet strike Earth 55 million years ago? BYLINE: SHIVALI BEST (my addition in parenthesis)
- 691- Large volumes are **released** by burning fossil fuels but they are also **released** naturally from the decay of plants and trees and from animals' digestive tracts. *The Express* September 28, 2016 Wednesday Climate change blow is blamed on windy cattle BYLINE: John Ingham
- 692- Economists have long used four factors to determine just how much carbon dioxide is **released** into the atmosphere. (...) Dr Rieder, whose book on the subject is due to be published later this year, said population control has been overlooked for years during climate change discussions. *Express Online* September 24, 2016 Saturday BABIES cause global warming, claims professor in shock new book BYLINE: Katie Mansfield
- 693- Researchers from the University of Michigan argue that the common assumption that biofuels are "carbon neutral" because burning the plants merely **releases** the CO₂ absorbed when they grow is way off the mark. They say it fails to recognise the other greenhouse gases created in the process of growing, harvesting and refining the crops. (...) The research has been criticised because it was funded by the American Petroleum Institute. "This is the same study, same flawed methodology and same fallacious result that Professor DeCicco has churned out multiple times in the past... This work was funded by the American Petroleum Institute, which obviously has a vested interest in obscuring and confusing accepted bioenergy carbon accounting practices," Geoff Cooper, senior vice-president of the

US Renewable Fuels Association, told the Detroit Free Press. *i-Independent* August 26, 2016 Biofuels 'worse than petrol' for global warming BYLINE: Tom Bawden

- 694- All the carbon dioxide we **release** by burning fossil fuels just builds up in the atmosphere. We are having to live with last century's carbon dioxide. What that says is simple: there is no such thing as a safe emission rate of carbon dioxide. (...) Then you burn the wood to run power plants while trapping, liquefying and storing the carbon dioxide that is **released**. (...) The most favoured scheme is known as BECCS: bio-energy with **carbon capture and storage**. *The Observer* August 21, 2016 Sunday 'Next year or the year after, the Arctic will be free of ice' BYLINE: Robin McKie
- 695- We can solve this problem if, rather than holding the amount of atmospheric carbon dioxide steady, it falls over time. As discussed in the above video, Earth naturally absorbs more carbon than it **releases**, so if we reduce human emissions to zero, the level of atmospheric carbon dioxide will slowly decline. Humans can also help the process by finding ways to pull carbon out of the atmosphere and **sequester** it. (...) A top-secret Cold War base buried under the ice in Greenland which was used by the United States is at risk of **releasing** nuclear waste because of global warming. *mirror.co.uk* August 16, 2016 Tuesday 'They thought it would snow forever' BYLINE: John Shammis
- 696- Overall, deforestation contributes an estimated 15 per cent of all greenhouse gases **released** into the atmosphere each year. *MailOnline* August 6, 2016 Saturday This is the country lecturing us on climate change? BYLINE: CHRIS PLEASANCE
- 697- But Radioactive coolant, thousands of gallons of sewage and diesel fuel, and tons of PCBs - a chemical coolant, banned in 1979 - were abandoned at the US Camp Century base when it was decommissioned in 1967. The Americans left the base nearly fully intact, under the assumption that it would be buried forever under accumulated snowfall. But a new, peer-reviewed study published on Thursday in *Geophysical Research Letters*, a journal of the American Geophysical Union, warns that the ice is melting faster than snow is falling on top, to replenish it. And climate change could see the material **released** into the oceans by the end of the century. *telegraph.co.uk* August 5, 2016 Friday Global warming threatens to **release** nuclear waste from Cold War base in Greenland BYLINE: Harriet Alexander
- 698- Fears global warming could **release** waste from abandoned secret Cold War military base buried in Greenland's ice *MailOnline* August 4, 2016 Thursday BYLINE: CHEYENNE MACDONALD
- 699- But the bad news was that the "positive feedback" was now confirmed, ruling out other studies that had predicted lower amounts of CO2 being **released** from the terrestrial biosphere, or not **released** at all. *The Guardian* July 29, 2016 Friday What the Earth's frozen burps tell us about global warming BYLINE: Graham Readfearn
- 700- While natural gas is far less carbon-intensive than coal or oil, it can still lead to significant emissions, particularly if methane is **released** during drilling. *The Guardian* July 28, 2016 Thursday Oil and gas industry events 'polluting' Democratic convention BYLINE: Oliver Milman
- 701- Cyclical changes in ocean temperatures over decades lead to El Niños during which stored heat is **released** from the oceans, impacting temperatures and weather around the globe. *The Guardian* June 17, 2016 Friday Shattered records show climate change is an emergency today BYLINE: Damian Carrington
- 702- A record wildfire year - such as 2015 which was the worst in Alaska for a decade - had a measurable effect on the **release** of carbon dioxide and methane, which are the main drivers of climate change. (...) When it comes to wildfires, there is a triple effect on warming. Carbon stored in trees as well as the upper layers of soil is **released** back into the atmosphere during a fire. The burn also exposes the carbon-rich permafrost beneath, making it thaw more easily. *The Guardian* June 1, 2016 Wednesday Spike in Alaska wildfires is worsening global warming. BYLINE: Suzanne Goldenberg

- 703- Scientists are testing oregano to see if it will lessen the gas they (cows) **release** (...) According to a recent UN report, farm animals **release** a total of 80 million metric tonnes of methane into the atmosphere, which is 23 times more potent at warming the planet than carbon dioxide. *MailOnline* May 18, 2016 Wednesday Can OREGANO help solve climate change BYLINE: CHARLOTTE WORRALL
- 704- The results show a solidifying belief that changes in the climate are under way, with 59% of people thinking so. A record 65% of Americans said global warming was down to greenhouse gases **released** by human activity - a 10% leap on last year. *The Guardian* May 11, 2016 Wednesday 'A tipping point': record number of Americans see global warming as threat BYLINE: Oliver Milman
- 705- Livestock emit more than one third of all **released** methane, which warms the world 20 times faster than carbon dioxide. (...) But a Vechar cow **releases** just onetenth of the level of methane emissions of a normal-sized cow, giving it a much better "methane intensity" level. *The Daily Telegraph* May 6, 2016 Friday Little cows with a big part to play in global warming BYLINE: Andrew Marszal
- 706- But in the winter and fall, life dies off, carbon is **released** and the water becomes more acidic naturally, slowing or stopping limestone growth. *MailOnline* May 4, 2016 Wednesday Global warming is turning the oceans ACIDIC and dissolving parts of the Florida Keys reef, new study finds
- 707- The Australian Conservation Foundation (ACF) is arguing that environment minister Greg Hunt unlawfully approved the mine in central Queensland, which would be the largest in Australia. They will argue the emissions **released** when the coal from the mine is burned will put the world heritage values of the Great Barrier Reef at risk by exacerbating climate change. (...) Environmental approvals of mines usually consider the emissions caused in the production of the coal - from the fuel burned by trucks and the electricity used by the equipment. But in the past they have not considered the impact of the greenhouse gasses **released** when the coal itself is burned. *The Guardian* May 3, 2016 Tuesday Activists launch fresh court challenge over Carmichael coalmine BYLINE: Michael Slezak
- 708- The whole trip would have used up to 33,193 gallons of fuel, calculated *MailOnline*, which noted that an average American - who is estimated to fly only 7,500 miles per year - **releases** fewer carbon emissions via aircraft in 12 months than Mr Sanders did for the trip to Rome. *telegraph.co.uk* April 16, 2016 Saturday Bernie Sanders takes private jet for 24-hour trip to Vatican after attacking Hillary Clinton on climate change
- 709- Morales' erroneous views seem to come from a 2015 Nasa study which found that some aerosols **released** by burning fossil fuels can temporarily cool localised areas, since they reflect some of the Sun's radiation away from the Earth before they disperse. However, the same study also asserted that the carbon dioxide **released** during the burning of fossil fuels contributes to global warming - aerosols may cool small areas temporarily, but they're not enough to cancel out the wider effects of CO2. *The Independent* April 15, 2016 Friday Nasa calls out climate change deniers on Facebook BYLINE: Doug Bolton
- 710- On average, an American flies only 7,500 miles per year, according to American Forests, 1,360 fewer miles than Sanders' round-trip Rome travel. Thus, an average American **releases** less carbon emissions via aircraft each year than Sanders did in 24 hours. *MailOnline* April 15, 2016 Friday Bernie Sanders takes a private flight to Rome to speak at the Vatican conference BYLINE: KELLY MCLAUGHLIN
- 711- Current **releases** of the carbon contained in carbon dioxide total about 10 billion tons per year. The number is growing 2.5 per cent annually, more than twice as fast as in the 1990s. (...) Humans have already put about 580 billion tons of carbon dioxide into the atmosphere, and the researchers looked at the effect of **releasing** another 1,280 to 5,120 billion tons between 2000 and 2300. *MailOnline* April 11, 2016 Monday America's national icons underwater BYLINE: MARK PRIGG

- 712- One no-no, however, was to light candles - unless they were "100 per cent beeswax or soy": normal ones, made of petroleum products, could **release** more carbon pollution than keeping the lights on. *The Independent on Sunday* March 20, 2016 Lights go out all over the world for Earth Hour BYLINE: Geoffrey Lean
- 713- Once operating, these would emit the equivalent of 47 million tons a year of carbon dioxide, a 34 per cent jump over **releases** from the entire industry in 2014. Simultaneously, new supplies of shale oil from fracking are also causing an increase in refining petroleum. Seven new refineries were proposed or permitted in the US last year, which would **release** another 5.4 million tons a year, when running. *The Independent on Sunday* March 13, 2016 'Greenhouse gases to soar with fracking' BYLINE: Geoffrey Lean
- 714- To make things simpler, climate scientists translate the target into the billions of tons of carbon dioxide that, ideally, may be **released** into the atmosphere from 2015 onwards. Even these, however, are estimates. (...) Although short-lived and **released** in smaller quantities, some of these are potentially far more potent than carbon dioxide as an influence on planetary temperatures. *The Guardian* February 25, 2016 Thursday Fossil fuel use must fall twice as fast as thought to contain global warming BYLINE: Tim Radford
- 715- The chemical can also lead to algal blooms of simple plant life which absorb carbon through photosynthesis and can offset some of the levels **released** by burning of fossil fuels. *Express Online* February 9, 2016 Tuesday SHOCK STUDY: Melting ice caps could enrich ocean life and even SLOW climate change BYLINE: Jon Austin
- 716- Avoiding the long-term swamping of many of the world's greatest cities is already difficult, given the amount carbon dioxide already **released** into the atmosphere. *The Guardian* February 8, 2016 Monday Sea-level rise 'could last twice as long as human history' BYLINE: Damian Carrington
- 717- We have two isotope systems that we can look at. One of those are oxygen isotopes and they are essentially a thermometer, they tell us about climate change. And the other isotope system we're looking at is carbon isotopes and they tell us something about carbon **release**. (...) You might have very short pulses of CO₂ **release** within them. Some of these pulses of CO₂ could look like what we're doing now in terms of amount and rate. That's an area of active research, because the estimates of individual pulses are getting better, but the estimates of how much CO₂ would be **released** associated with an individual pulse are still uncertain. *The Guardian* January 29, 2016 Friday 'If the world ends in 2100, we're probably OK' BYLINE: Howard Lee
- 718- Sellers (Piers Sellers, a climate scientist) shared his astronaut's perspective on climate change in Leonardo DiCaprio's documentary *Before the Flood*, released this fall. He told DiCaprio that seeing the earth's atmosphere as a 'tiny little onion skin' from space helped him gain a fuller understanding of the planet's precarious position in the universe. Sellers also wrote a New York Times op-ed about grappling with the meaning of his life's work after learning he had terminal cancer. (...) In both the film and the op-ed, he was optimistic, arguing that he expected human ingenuity to rescue the planet from a dire future of **runaway** global warming. *MailOnline* December 23, 2016 Friday NASA climate scientist and astronaut who shot to fame in Leo DiCaprio's global warming documentary *Before the Flood* dies of cancer aged 61 (my addition in parenthesis)
- 719- Scientists say a rise of just one degree Celsius will result in the **release** of 30 petagrams of carbon, about twice the amount emitted annually from human activities - a 'concerning' find, as the planet is expected to warm by 2 degrees by mid-century. (...) It's thought that rising temperatures will alter the ability of soils to **store** carbon, leading to the **release** of massive amounts of the greenhouse gas into the atmosphere. (...) For just one degree of warming, they say 30 petagrams of soil carbon will be **released** - with a petagram equal to 1,000,000,000,000 kilograms. (...) The findings reveal a troubling trend that could ultimately trigger **runaway** climate change. *MailOnline* December 1, 2016 Thursday The 'time bomb' under our feet: Researchers warn global warming could cause soil to **release** as much carbon as the ENTIRE US BYLINE: CHEYENNE MACDONALD

- 720- Should other major emitters such as China, India and the European Union fail to make compensatory emissions cuts the planet will likely spiral into **runaway** climate change where tens of millions of people are displaced by rising seas, food insecurity and conflict, leading to an unprecedented international humanitarian disaster. *The Guardian* November 11, 2016 Friday Trump presidency a 'disaster for the planet' BYLINE: Oliver Milman
- 721- Temperatures at the time rose by between five and nine degrees Celsius as a vast amount of carbon was **released** into the atmosphere over thousands of years - estimates range from 5,000 to 20,000 years. (...) The impact is thought to have taken place at the same time as the period of warming began because of the mysterious **release** of carbon dioxide. (...) New evidence has been found that suggests a comet strike may have caused **runaway** global warming that melted all the ice on the planet 55 million years ago. *The Independent* October 13, 2016 Thursday Comet strike once caused **runaway** global warming that melted all the ice on Earth, scientists suggest BYLINE: Ian Johnston
- 722- But he (B. Obama) warned that emissions will need to be scaled back even further, along with mooted cutbacks in aviation and HFC pollution, if **runaway** climate change is to be avoided. (...) The Paris agreement, struck last year, calls for all 195 signatories to come up with their own voluntary plans to reduce emissions. While the landmark deal is the first commitment by all countries to reduce emissions, the individual pledges are unlikely to be sufficient to stay within the 2C limit, which could be breached as early as 2050, according to recent research. Separate studies have shown the world is on course for a temperature rise of around 3.5C by the end of the century, based on the emissions cuts promised in Paris. This would cause a range of disastrous environmental consequences, including heatwaves, sea level rise, species extinctions and spread of disease. There are doubts that the US is on track even to meet its initial promise to cut emissions by 26% to 28% by 2025 by 2005 levels. In a further complication, Donald Trump, the Republican nominee for president, has promised to withdraw the US from the deal should he win power. However, the ratification locks countries into the deal for four years, so an immediate US exit wouldn't be possible. *The Guardian* October 5, 2016 Wednesday Paris climate deal a 'turning point' in global warming fight BYLINE: Oliver Milman
- 723- The phenomenon accelerates melting rate, and may have a **runaway** effect *MailOnline* June 23, 2016 Thursday 'Strawberry snow' could supercharge climate change: Researchers find colourful algae boosts melting of Arctic glaciers BYLINE: CHEYENNE MACDONALD
- 724- Clearly, neither of these things are going to happen, so can we please stop fooling ourselves that the human race is capable of cutting greenhouse gas emissions by enough to prevent **runaway** climate change. (...) Instead the goal of 1.5C and even 2C will now rely on unproven and currently non-existent technologies such as nuclear fusion, carbon **capture** with **storage** or carbon negative technologies. (...) These include: divesting from renewables; privatising the Green Investment Bank; performing a monumental U-turn on the UK's £1bn **carbon capture and storage (CCS)** competition; reducing subsidies for improving energy efficiency; reducing the requirement for developers to build energy-efficient homes; making fracking easy to achieve and windfarms difficult; and continuing to subsidise fossil fuels. *The Guardian* May 11, 2016 Wednesday Climate change and the continual demand for economic growth
- 725- Sea levels rise and fall by more than 100 metres during global ice ages, and **runaway** global warming could add another 70m to that. *The Guardian* January 15, 2016 Friday Fossil fuel burning 'postponing next ice age' BYLINE: Damian Carrington
- 726- Unless stopped, this Arctic heating will lead to a rapid **release** of the methane clathrates from the sea floor of the Arctic and herald the next phase of catastrophically intense climate change that our civilisation will not survive. (...) The scientists, who also include University of California professor James Kennett, argues that "deadly flaws" in the deal struck in the French capital last month mean it gives the impression that global warming is now being properly addressed when in fact the measures fall woefully short of what is needed to avoid **runaway** climate change. (...) This involves rapidly

growing trees and grasses faster than nature has ever done on land we don't have, then burning it in power stations that will **capture** and compress the CO2 using an infrastructure we don't have and with technology that won't work on the scale we need and to finally **store** it in places we can't find.

Independent.co.uk January 8, 2016 Friday COP21: Paris deal far too weak to prevent devastating climate change BYLINE: Tom Bawden

- 727- Methane naturally **escapes** from the sea floor in many places around the world and can stoke global warming if it reaches the atmosphere. *MailOnline* October 19, 2016 Wednesday The massive methane leak along the West Coast: Researchers hail find of 500 vents that could contribute to global warming
- 728- The process also produces methane, which **escapes** into the atmosphere. *MailOnline* May 2, 2016 Monday The farm food that could help tackle climate change: Drug makes cows less flatulent and cuts methane by almost a THIRD BYLINE: RUSS SWAN
- 729- Biomass absorbs carbon dioxide from the atmosphere and then **releases** it in a relatively brief life-cycle which should, theoretically, have a restricted long-term impact on the atmosphere. As a result, giant power stations, including Britain's Drax generators, are increasingly abandoning gas or coal as power sources and are instead turning to the burning of wood, usually in the form of pellets imported from other countries such as the United States and Canada. But burning wood to produce electricity is a relatively inefficient process. In generating exactly the same amount of electricity, wood will **release** four times as much carbon into the atmosphere as gas would do, and one and half times as much as coal. *The Observer* December 31, 2017 Sunday Burning wood for power is 'misguided' say climate experts BYLINE: Robin McKie
- 730- As humans burn more and more fossil fuels to live, they **release** carbon dioxide into the atmosphere. Plants, however, do the opposite and draw down carbon dioxide from the atmosphere to keep them alive. One might save us from the other. *The Independent* December 8, 2017 Friday Jan Ingenhousz: The man who discovered how plants keep us alive - and how they might save us BYLINE: Andrew Griffin
- 731- Two months of intense peat fires started in August 2015 to clear land for palm oil and pulp and paper plantations in Indonesia **released** an estimated 884m tonnes of carbon dioxide, more than the European Union in its entirety emitted that year. *The Observer* November 12, 2017 Sunday Congo basin's peaty swamps are new front in climate change battle BYLINE: John Vidal
- 732- They (tipping points) include the slowing down of the giant Atlantic Ocean circulation system that could dramatically warp weather worldwide, much stronger El Ninos, major decreases in ice sheets in Greenland and Antarctica, which would spike sea level rise, and massive **release** of methane and carbon dioxide from thawing permafrost that could turbo-charge warming. *The Independent* November 3, 2017 Friday White House approves report saying humans are causing global warming that starkly contradicts Trump BYLINE: Andrew Buncombe (my addition in parenthesis)
- 733- Water that was cooled after the volcanic eruption would become trapped at the surface instead of mixing deeper into the ocean, reducing the heat **released** into the atmosphere. (...) As the surface of the oceans cooled, the colder water sank, allowing warmer water to rise and **release** more heat into the atmosphere. (...) This increase in ocean stratification means that the water that was cooled after the volcanic eruption becomes trapped at the surface instead of mixing deeper into the ocean, reducing the heat **released** into the atmosphere. *MailOnline* October 30, 2017 Monday Future volcanic eruptions could lead to 'years without summer' as climate change reduces the oceans' ability to buffer impacts BYLINE: SHIVALI BEST
- 734- Annually, these tropical forests are preventing the **release** of three times as much carbon into the atmosphere as the UK emits each year. (...) However, these activities come at a cost: deforestation **releases** nearly twice as much carbon than is absorbed by intact forests. *MailOnline* October 27, 2017 Friday Tropical forests are reducing carbon emissions from tropical deforestation by a third and SLOWING the rate of global warming, study finds BYLINE: CECILE BORKHATARIA

- 735- Trump has also appointed officials such as EPA Administrator Scott Pruitt, Energy Secretary Rick Perry and Interior Secretary Ryan Zinke, all of whom question the scientific consensus that carbon **released** into the atmosphere from burning fossil fuels is the primary driver of global warming. *MailOnline* October 24, 2017 Tuesday Damage from floods, wildfires and storms caused by climate change 'will cost American taxpayers \$35billion EVERY YEAR by 2050'
- 736- As the trees in the forests die, they rot and **release** large amounts of CO2 contributing to global warming. *Express Online* October 16, 2017 Monday NASA CLAIM: Dying forests are CONTRIBUTING to global warming by emitting CO2 BYLINE: Sean Martin
- 737- With almost 100m head of cattle in the US alone, that means that 12m tonnes of gas are being **released** annually, dwarfing the efforts of the shellfish. (...) The big difference between termites and cattle is, of course, that termites - and the gases they **release** - are part of the natural ecosystem. Cattle aren't. *The Guardian* October 16, 2017 Monday Are flatulent shellfish really contributing to climate change? BYLINE: Stephen Moss
- 738- Mr Pruitt (EPA administrator) also refused to confirm - despite widespread consensus in the global scientific community - that carbon emissions **released** into the atmosphere by burning fossil fuels like coal are what cause global warming and climate change. (...) The language in the report is one more step in achieving Mr Trump's campaign promise to totally dismantle Mr Obama's environmental legacy. The President withdrew the US from the Paris Agreement on climate change in June, an accord signed by nearly 200 countries in an effort to curb greenhouse gas emissions and help poorer countries adapt to an already-changed planet. *The Independent* October 11, 2017 Wednesday Trump's environmental plan doesn't mention climate change BYLINE: Mythili Sampathkumar
- 739- Fossil-fuel companies, hydrocarbon billionaires and their allies, particularly in the west, have for years now been funding a massive and sophisticated campaign to mislead voters about the environmental harm caused by carbon pollution. They have good reason to: a landmark study released earlier this year revealed 50 corporations account for more than one-fifth of all carbon **released** into the atmosphere since the industrial revolution began. *The Guardian* September 10, 2017 Sunday The Guardian view on climate change: see you in court; It is possible to determine which nations and companies are responsible for damaging the climate. It's only a matter of time before courts decide they must pay for global warming
- 740- But carbon from different sources would have different ratios of carbon isotopes, and carbon dioxide from methane or sediments are **released** rapidly, as opposed to volcanic eruptions which **release** it slowly. *MailOnline* September 4, 2017 Monday Ancient volcanic eruptions in Antarctica sparked rapid climate change in the southern hemisphere 17,700 years ago BYLINE: CECILE BORKHATARIA
- 741- Now scientists say they have solved the puzzle, revealing that the main driver of the event was a gradual **release** of carbon dioxide through volcanic eruptions - findings, they say, that overturn a long-held view that the PETM mirrors the rapid rise in carbon emissions seen today. (...) However, carbon dioxide from the different sources would have a very different impact on carbon isotope ratios. What's more, while volcanic eruptions gradually **release** carbon dioxide over time, gases from methane deposits or sediments are **released** rapidly. (...) About 10 petagrams of carbon are currently **released** every year from fossil fuel emissions. *The Guardian* August 30, 2017 Wednesday Volcanic eruptions triggered global warming 56m years ago, study reveals; Scientists say one of the most rapid periods of warming in Earth's history was due to gradual release of CO2, warning current levels of emissions were even higher BYLINE: Nicola Davis
- 742- Carbon **released** from the soil also contributes to global warming. But the researchers suggested the figures showed the potential for soil to absorb carbon, something that could be used to reduce the level of the greenhouse gas in the atmosphere by using different agricultural techniques. *The Independent* August 30, 2017 Wednesday 133bn tonnes of carbon lost from soil 'a disaster that's adding to global warming' BYLINE: IAN JOHNSTON

- 743- The US Energy Department has been asking scientists to remove the words "climate change" and "global warming" from research proposals in a censorship row that one leading climatologist said should "send a chill down your spine". Professor Jennifer Bowen, of Northeastern University in Boston, was told in July that she and a colleague had been awarded funding to study whether the degradation of salt marshes would cause the **release** of large amounts of carbon dioxide. However she revealed on social media that she was then sent a message by an Energy Department official asking for a reference to climate change in their proposal to be removed. *The Independent* August 29, 2017 Tuesday Trump administration's censorship of climate change should 'send chill down your spine', top scientist warns BYLINE: Ian Johnston
- 744- The crisis cost Indonesia over \$16bn, according to the World Bank; **released** more than 800m metric tonnes of CO₂; and, according to one study, led to the premature deaths of 100,000 people in Indonesia, Malaysia and Singapore. (...)If climate change causes peatlands to dry out, it could mean a slow - or possibly sudden - **release** of tonnes of CO₂ into the atmosphere. Further warming, more potential **release** of CO₂: a textbook example of a positive feedback loop. (...) It accumulates and compresses, trapping the carbon the living plants had **captured** from the air. Over time, peatlands today could become coal deposits tomorrow, essentially storing carbon in perpetuity - unless someone decided to burn it for energy. *The Guardian* July 28, 2017 Friday Ultimate bogs: how saving peatlands could help save the planet BYLINE: Jeremy Hance
- 745- While more southerly areas of Siberia could thrive, the permafrost zone in the north could turn into a gargantuan swamp if warming continues. (...) While this would **release** greenhouse gases, now frozen, warmer temperatures would mean forests encroaching northward into the tundra so stemming the seepage. *mirror.co.uk* July 20, 2017 Thursday Climate change will see SIBERIA become the go-to place to live in just two generations say boffins; BYLINE: Will Stewart
- 746- A single cow **releases** between 70 and 120 kg of methane a year. The greenhouse gas is thought to be 25 times more damaging to the environment than carbon dioxide over a one hundred year period. *The Independent* July 19, 2017 Wednesday Irish farmers to create seaweed eating 'supercows' in bid to fight climate change BYLINE: Harry Cockburn
- 747- The accord is composed of individual goals expressed by every country to cut greenhouse gas emissions. A critically controversial portion of the agreement in America is the inclusion of a fund, paid for by advanced nations formerly including the US, to help developing countries to invest in cleaner energy sources instead of relying on dirty sources like coal that **release** huge amounts of carbon dioxide. *The Independent* June 18, 2017 Sunday US states to fight climate change after Donald Trump pulls out of Paris agreement BYLINE: CLARK MINDOCK
- 748- But companies selling wood pellets as fuel, which are thought to be green because they **release** less carbon dioxide, are making the problem worse by killing trees that could temper the problem. *MailOnline* June 1, 2017 Thursday The trendy wood pellet stoves that are BAD for the planet: BYLINE: TAMMY HUGHES
- 749- The call for action will sting European leaders, who have presided over a carbon trading scheme since 2005 that currently charges major polluters just (EURO)6 (£5.20) for every tonne of carbon they **release** into the atmosphere. *The Guardian* May 29, 2017 Monday Sky high carbon tax needed to avoid catastrophic global warming BYLINE: Phillip Inman
- 750- Trump signs order overhauling Obama's attempts to slow climate change. The calculations suggested it would result in the **release** of an additional three billion tons of carbon dioxide every year, melting ice sheets more quickly, raising sea levels and triggering more extreme weather. (...) In another development, Trump's rejection of the Paris Agreement would cede the US's lead on confronting climate change to other nations, most notably China and India. *The Independent* May 28, 2017 Sunday Donald Trump seems happy to destroy the planet. BYLINE: Andrew Buncombe

- 751- If the Earth were a piece of furniture, then it wouldn't pass its fire safety check. Wildfires occur when grass, bushes, trees and even peatlands catch fire in rural or semi-rural areas. Globally they may be to blame for as much as 15 per cent of greenhouse gas emissions each year. They are also as dirty as a diesel engine - and **release** huge amounts of material into the atmosphere. *i-Independent* May 23, 2017 Scorched earth prophecy BYLINE: Mark Piesing
- 752- The associated **release** of greenhouse gases like methane and carbon dioxide adds to global warming, causing more permafrost to melt in a vicious upward spiral. *The Independent* April 10, 2017 Monday Global warming to melt an area of permafrost the size of India each degree higher BYLINE: Ian Johnston
- 753- Permafrost, mostly found in high-latitude regions like the Arctic, stores large quantities of carbon dioxide and methane, which are **released** into the atmosphere if the soil melts and decomposes. *MailOnline* April 10, 2017 Monday Global warming will melt an area of permafrost bigger than AUSTRALIA for every degree hotter it gets BYLINE: REUTERS and SHIVALI BEST
- 754- The centerpiece for this reduction was the clean power plan, billed in 2015 as the strongest action ever on climate change by a US president but criticised by some for targeting coal-fired power plants, which **release** more carbon and fine particulate material than other fossil fuels. *The Guardian* March 29, 2017 Wednesday 'Climate change is real' BYLINE: Jamiles Lartey
- 755- Somewhere between warming of 3C and 4C, it is thought significant feedback loops would start to kick in, such as the **release** of vast amounts of methane from the Siberian tundra, which is already causing concern. *The Independent* March 21, 2017 Tuesday Last year's weather proves climate change is real with 'no room for doubt' BYLINE: Ian Johnston
- 756- Scott Pruitt, Donald Trump's head of the US Environmental Protection Agency, has dismissed a basic scientific understanding of climate change by denying that carbon dioxide emissions are a primary cause of global warming. Pruitt said on Thursday that he did not believe that the **release** of CO₂, a heat-trapping gas, was pushing global temperatures upwards. *The Guardian* March 9, 2017 Thursday EPA head Scott Pruitt denies that carbon dioxide causes global warming BYLINE: Oliver Milman
- 757- Temperatures, lifted both by man-made greenhouse gases and a natural El Nino event that **released** heat from the Pacific Ocean last year, beat the previous record in 2015, when 200 nations agreed a plan to limit global warming. *MailOnline* March 9, 2017 Thursday Carbon dioxide is NOT main cause of global warming says new environmental protection boss - in defiance of scientific consensus and his own agency
- 758- His (Pruitt's) comments contradicted the Environmental Protection Agency of which he is Administrator. On its website the agency says: "Carbon dioxide is the primary greenhouse gas that is contributing to recent climate change." It says the burning of fossil fuels **releases** "large amounts of CO₂ causing concentrations in the atmosphere to rise". *telegraph.co.uk* March 9, 2017 Thursday Donald Trump's environmental protection chief Scott Pruitt 'not convinced' carbon dioxide causes global warming BYLINE: Nick Allen
- 759- Companies which fall under the remit of the scheme have to hand in an allowance for every tonne of carbon they **release**. *The Independent* March 6, 2017 Monday Brexit may 'derail' EU fight against climate change and greenhouse gas emissions BYLINE: SHEHAB KHAN
- 760- The House has already passed legislation that would eliminate a BLM rule curbing the **release** of methane, a potent greenhouse gas, from oil and gas operations on federal land. *The Independent* February 21, 2017 Tuesday Trump's new executive orders will cut Obama's climate change policies BYLINE: Juliet Eilperin and Steven Mufson

- 761- In addition, when Arctic permafrost ground melts, it **releases** methane, amplifying the greenhouse effect in the atmosphere just like CO₂. *MailOnline* February 15, 2017 Wednesday Could we REFREEZE the Arctic using giant pumps? Bizarre £400 billion plan may help tackle climate change BYLINE: TIM COLLINS
- 762- But careful assessment of the evidence shows that the primary cause of the global warming recorded in recent decades is the increase in carbon dioxide and other pollution being **released** from power stations, industry, cars, planes, farms and the clearance of forests. Since 1850, there has been a 20-fold increase in the global use of energy. Most of it has come from burning coal, oil and gas, which **releases** carbon dioxide into the atmosphere. *MailOnline* January 21, 2017 Saturday HRH the Climate Change avenger BYLINE: SIMON WALTERS
- 763- So while more carbon will be absorbed by the extra plant material, more will be **released** back into the atmosphere by the increasing number of wildfires. *The Independent* January 10, 2017 Tuesday Global warming leads to wildfire 'death spiral' in alpine areas, say scientists BYLINE: IAN JOHNSTON
- 764- A rise of 2C has frequently been cited as a "tipping point" that must be avoided to prevent **runaway** effects leading to widespread drought, extreme weather and dangerous increases in sea level. *mirror.co.uk* August 1, 2017 Tuesday Scientists predict 90% chance Earth will be heated to 'tipping point' for climate change BYLINE: John von Radowitz
- 765- **Runaway** global warming is, without a doubt, a nightmare scenario for humanity. (...) One of the most feared of these feedback loops is the vast amount of organic material currently trapped in permafrost, which would **release** methane and other greenhouse gases in large amounts given the right conditions. *The Independent* July 19, 2017 Wednesday Thawing permafrost poses even greater global warming threat than previously thought BYLINE: Ian Johnston
- 766- There are 25 million people facing severe food shortages in east Africa because of drought. Temperatures there have risen by up to three degrees. It goes years without raining. Millions of people starving to death isn't an accident: it is the logical inevitability of the society we have created. Generally, people don't engage because of a vague hope that, somehow, it will all be grand. (...)Someone will invent an app. And yet, experts continue to remind us of how high the stakes are in this insane game of poker. Only recently, one such group warned that we have three years to stop **runaway** climate change taking hold *The Times* July 4, 2017 Tuesday Clock is ticking towards end of the world Eoghan Rice
- 767- Trump's decision risks destabilising the Paris deal, with remaining participants faced with the choice of trying to make up the shortfall in emissions cuts or following the US's lead and abandoning the agreement. In 2015, nearly 200 countries agreed to curb greenhouse gas emissions in order to prevent the **runaway** climate change that would occur should temperatures spiral 2C or more above the pre-industrial era. *The Guardian* June 2, 2017 Friday Paris agreement: Europe and China vow to keep fighting global warming BYLINE: Daniel Boffey, Oliver Milman and David Smith
- 768- As Trump's healthcare and travel ban fiascos show, doing is a lot harder than tweeting. So while his climate assault is unlikely by itself to condemn the world to **runaway** global warming, it will make it tougher to tame. *The Guardian* March 28, 2017 Tuesday Trump's order signals end of US dominance in climate change battle BYLINE: Damian Carrington
- 769- Environment said to face a dark future as EPA begins its radical shakeup; Trump administration's zeal for deregulation seen by environmentalists as a recipe for fossil fuel cronyism, **runaway** climate change and toxic water crises *The Guardian* March 11, 2017 Saturday BYLINE: Oliver Milman
- 770- The team used a middle ground scenario for global warming - not worst-case **runaway** carbon pollution and not dramatic cuts in emissions of heat-trapping gases - and ran different computer

simulations to see what would happen. *MailOnline* January 18, 2017 Wednesday The number of 'perfect' weather days will be reduced due to climate change, researchers warn

- 771- The result could be catastrophic. A further jump in temperatures could trigger events that would accelerate global warming: by **releasing** plumes of the greenhouse gas methane from the thawing Arctic tundra and destroying polar ice caps that play a role in reflecting solar radiation back into space. Global warming could then start to spiral out of control. *The Observer* September 22, 2013 Climate scientists dismiss sceptics with stark warning
- 772- The planet is 'f**cked' after scientists found huge plumes of deadly methane **escaping** from the seafloor. (...) This is according to Dr Jason Box who claims that methane will be the main driver of climate change if it **escapes** into the atmosphere. (...) The scientist, based at the Geological Survey of Denmark and Greenland, tweeted the provocative statement after a Swedish study found methane leaking beneath the Arctic. *MailOnline* November 6, 2014 Thursday Is infrared energy melting the Arctic? BYLINE: ELLIE ZOLFAGHARIFARD
- 773- As the otters have declined, the number of urchins has risen, to the point that in some places they have grazed the vast kelp forests that once thronged the coastal waters of the western seaboard of the Americas until almost nothing remains. Not only has this caused the collapse of the coastal ecosystem, but it has also caused the **release** of more carbon dioxide into the atmosphere, as the carbon stored in the kelp has been oxidised. (...) And it's not just whales. When plant plankton are attacked by the small animals that eat them, some of them **release** a chemical called dimethyl sulphide. (...) Separate research, in the Gulf of Maine, estimates that whales and seals, by defecating at the surface and recycling nutrients there, would, before their numbers were reduced by hunting, have been responsible for **releasing** three times as much nitrogen into those waters as the sea absorbed directly from the atmosphere. *The Guardian* December 12, 2014 Friday Why whale poo matters BYLINE: George Monbiot
- 774- Most of the coal is destined for Asia and India, where it will be burned, **releasing** more greenhouse gases to warm the oceans and the atmosphere. *Guardian.com*. January 31, 2014 Friday Death by sludge, coal and climate change for Great Barrier Reef? BYLINE: Graham Readfearn
- 775- Palm oil cultivation often involves clearing rain forests to make huge plantations. According to the WWF, this is often achieved burning down forests, **releasing** massive amounts of greenhouse gases into the atmosphere. Two years ago, France tried to levy a 300% tax on the oil, which senators said was both fattening and dangerous to the planet. However, this bid was unsuccessful, leaving the French to enjoy their favourite chocolate spread without breaking the bank. Will you continue eating Nutella? *mirror.co.uk* June 18, 2015 Thursday Does Nutella cause global warming? BYLINE: Jasper Hamill
- 776- The fjord's ability to store carbon comes from their shape. Carbon dioxide is absorbed by plants on land that create soil and sediment which is swept down to the coast by rivers and streams. As fjords tend to be unusually deep - carved out by the movement of glaciers - the sediment is quickly locked away in an environment that is extremely low in oxygen. This prevents bacteria from breaking down the sediment and **releasing** the carbon back into the atmosphere. *MailOnline* May 5, 2015 Tuesday Could FJORDS help solve global warming? BYLINE: RICHARD GRAY
- 777- The downside to hydropower is that it requires consistent rainfall. Though the dams in Costa Rica are now full, just months ago the country was suffering one of the worst droughts in its history. This forced Costa Rican utility companies to burn fuel to generate power, **releasing** greenhouse gases and causing rate rises. *The Guardian* March 30, 2015 Monday The truth behind Costa Rica's renewable energy BYLINE: Lindsay Fendt
- 778- The dead trees decay, slowly **releasing** much of their stored carbon to the atmosphere. *The Guardian* March 18, 2015 Wednesday Amazon's trees removed nearly a third less carbon in last decade BYLINE: Karl Mathiesen

- 779- Australia experienced its third-warmest year on record in 2014, with 2013 its warmest year on record. The heat experienced in 2013 was "unlikely" to have been caused by natural variability alone, the report stated, with such temperatures now five times more likely due to humans **releasing** greenhouse gases into the atmosphere. (...) Cutting emissions would also help head off the worst of climate change, with nations set to convene in Paris later this year for crunch talks aimed at agreeing emissions reductions beyond 2020. *The Guardian* January 27, 2015 Tuesday Climate change will hit Australia harder than rest of world BYLINE: Oliver Milman
- 780- If we are to do anything to protect our grandchildren, we must confront this history of political paralysis. The problem is that the modern world and modern wealth are built by burning coal, oil and gas, thereby **releasing** carbon dioxide *The Sunday Times* October 11, 2015 Sunday Keep cool and carry on BYLINE: Bryan Appleyard
- 781- Now locals, scientists and environmental activists fear that a storm surge, typhoon or other cataclysmic event brought on by climate change could tear the concrete mantle wide open, **releasing** its contents into the Pacific Ocean. *The Guardian* July 13, 2015 Monday This dome in the Pacific houses tons of radioactive waste - and it's leaking BYLINE: Coleen Jose, Kim Wall and Jan Hendrik Hinzel
- 782- By avoiding **releasing** carbon from fossil fuel reserves, the emissions are estimated to be at least 80pc lower than from natural gas. *The Daily Telegraph* November 28, 2016 Monday From black bags to green gas BYLINE: Emily Gosden
- 783- It is also could trigger a number of 'tipping points' such as the melting of permafrost in the northern tundra, **releasing** vast amounts of methane, a potent greenhouse gas, that would send the temperature spiralling upwards. *The Independent* November 3, 2016 Thursday UN paints apocalyptic picture of famine, war and disease unless world wakes up to dangers of climate change BYLINE: Ian Johnston
- 784- The 2-degree target was established as a threshold to avoid the worst impacts of climate change. But the Paris deal also set an aspirational goal of limiting warming to 1.5 degrees C (2.7 degrees F), a demand from the most vulnerable countries, such as low-lying island nations that may not survive the sea-level rise associated with 2 degrees of warming. To have a shot at 1.5 degrees C, the world needs to cut annual emissions by an additional 15 billion-17 billion tons. (...) The 2-degree target is relative to before the industrial revolution, when scientists say humans started altering the climate system by **releasing** greenhouse gases into the atmosphere, primarily carbon dioxide from fossil fuels. (...) Temperatures have already gone up by about 1 degree C since then. *MailOnline* November 3, 2016 Thursday Climate change crisis as UN warns 'huge' emissions cuts are still needed to meet Paris Agreement goals
- 785- For what it's worth, a lot of work suggested the "hiatus" was a result of an extended La Niña-like period in what is called the Pacific decadal oscillation, in which heat from the atmosphere was being stored just under the surface in the Pacific Ocean. That process now looks as though it has reversed, **releasing** the heat and causing a sharp temperature rise. *The Guardian* September 14, 2016 Wednesday Debunking Malcolm Roberts: the case against a climate science denier BYLINE: Michael Slezak
- 786- One possible explanation of the phenomenon is abnormal heat that caused permafrost to thaw, **releasing** gases. *Express Online* July 21, 2016 Thursday WATCH: Freaky footage of earth 'bubbles' as global warming 'causes leaking methane gas' BYLINE: Zoie O'Brien
- 787- Even those who use a scheduled flight will be responsible for **releasing** seven tons of CO₂ - leading green campaigners to ask why the event could not have been held in Hollywood or in St Tropez during May's Cannes Film Festival, when many of the guests would have been there anyway. (...) Each guest flying 12,000 miles from LA will **release** seven tons of CO₂ *MailOnline* July 3, 2016 Sunday What planet are you on, Leo? DiCaprio flies his LA friends 6,000 miles around the world so they can listen to his speech on GLOBAL WARMING BYLINE: RICHARD SIMPSON

- 788- Three degrees of warming would have a devastating impact on the world. For example, the Indian monsoon, which was a week late this year and is essential for billions of people, would likely fail, the Amazonian rainforest would dry out and life in much of South America would become increasingly difficult because of the searing heat and smoke from wildfires, and the west coast of the US - already suffering from severe droughts - would suffer from rampant wildfires and a lack of water to fight them. It would also, Mr Lynas (journalist) warned, cross a number of "tipping points" that would speed up the rate of climate change with wildfires **releasing** vast amounts of carbon dioxide into the atmosphere. (...) New York City would experience regular flooding, extreme Atlantic storms would hit the UK, Spain and France while countries around the Mediterranean would start to develop new deserts. Vast numbers of people would be forced to move as large areas of Africa in particular become uninhabitable, leading to conflict and war. *The Independent* June 30, 2016 Thursday Paris summit pledges 'will not prevent catastrophic global warming' BYLINE: IAN JOHNSTON (my addition in parenthesis)
- 789- This (ice melting) will slow down or even close the system of the ocean currents that provides heat throughout the planet, allowing some of it to **escape** into space. *MailOnline* March 22, 2016 Tuesday New York and London could be underwater within DECADES BYLINE: STACY LIBERATORE (my addition in parenthesis)
- 790- The researchers looked at the effect of **releasing** another 1,280 to 5,120 billion tons (of carbon dioxide) between 2000 and 2300. (...) Last year, researchers revealed more than 400 US cities could be obliterated by rising sea levels, and they created an interactive map to reveal the full extent of the crisis. The interactive map looks at various different post-2100 sea levels that could change in this century. This could spell the end for Miami and New Orleans. *MailOnline* February 8, 2016 Monday Man-made climate change will last 10,000 YEARS BYLINE: ELLIE ZOLFAGHARIFARD (my addition in parenthesis)
- 791- Instead, natural climate cycles led to more of the trapped heat being stored in the oceans (which already absorbed most the heat), some of which El Niño is now **releasing**. *The Guardian* January 21, 2016 Thursday 2015 smashes record for hottest year, final figures confirm BYLINE: Damian Carrington
- 792- Perhaps most ominous is the fact that a positive feedback loop appears to be in play. As the Amazon dries, Nobre (one of Brazil's leading climatologists) says, tropical forest will gradually shift to savanna, **releasing** carbon dioxide into the atmosphere and further adding to global warming. (...) But, says Carl Pope, climate advisor to the former New York mayor Michael Bloomberg, if climate change is to be addressed, it must be led by big cities like New York, which **release** nearly 70% of the global emissions but also have the capacity to create solutions. *The Guardian* June 23, 2017 Friday From heatwaves to hurricanes, floods to famine BYLINE: John Vidal
- 793- The beetles attack trees that may already be weakened by warmer, drier conditions, leading to more severe pest outbreaks and tree deaths. This in turn provides more fuel for forest fires, **releasing** more planet-warming carbon dioxide. *The Guardian* March 30, 2017 Thursday Climate change: global reshuffle of wildlife will have huge impacts on humanity BYLINE: Damian Carrington
- 794- For example, the melting of ice to reveal darker land or water means more of the sun's energy is absorbed as heat. Melting ice is also **releasing** trapped greenhouse gases like methane from the Arctic tundra. (...) So while more carbon will be absorbed by the extra plant material, more will be **released** back into the atmosphere by the increasing number of wildfires *The Independent* January 9, 2017 Monday Global warming is creating a wildfire 'death spiral' in alpine areas BYLINE: Ian Johnston
- 795- The study suggests a possible way scientists could create clouds to help cool the Earth, although such geo-engineering is controversial. Amines are also used in **carbon-capture** at power stations and factories, so this might be a spin-off benefit. *The Independent on Sunday* October 13, 2013 Cloudy with a chance of ... climate change BYLINE: Ian Johnston

- 796- In other words, the IPCC has finally confirmed that to meet the agreed global climate target, the vast majority of the remaining fossil fuel reserves either need to be left in the ground or burned only with some form of carbon **capture**. (...) Thanks to the new report, however, virtually every government in the world has been forced to consider and recognise that most of the world's fossil fuel reserves need to be left untouched, either forever or at least until we can **capture** the carbon. *Guardian.com*. October 7, 2013 Monday UN climate change panel: two graphs that tell the real story of the IPCC report BYLINE: Duncan Clark
- 797- Some people think that **carbon capture and storage** - removing carbon from the atmosphere and squirrelling it away underground - could allow us to halt the warming of the planet without fundamentally changing our way of life. (...) Energy from the sun arrives as visible and ultraviolet light, which is absorbed by the Earth. Some of this energy is **released** from Earth again as heat. Greenhouse gases in the atmosphere trap this heat and bounce it back towards the Earth's surface. Laboratory experiments show that carbon dioxide can absorb and then emit heat, while satellite observations reveal that the amount of heat being **released** into the atmosphere is changing. (...) Carbon dioxide is known to be a greenhouse gas, and is also known to be **released** into the atmosphere by the burning of fossil fuels. CO2 levels are currently higher than at any point in the past 800,000 years, offering convincing evidence that man is warming the planet. (...) However, some levels still remain highly controversial. For example, the models used to draw up the latest report do not take into account the effects of methane **released** from the sea beds or the Arctic permafrost as it melts, because it is still not possible to say exactly how strong its effect will be. Questions also exist over how strongly, if at all, climate change is affected by variations in radiation given off by the Sun and by aerosols which are **released** by the burning of fossil fuels and have a cooling effect by deflecting solar radiation away from Earth. *telegraph.co.uk* September 27, 2013 Friday Climate change report: environmentalists guide to climate change. BYLINE: Nick Collins
- 798- Her (Environmental Protection Agency chief Gina McCarthy's) announcement clears the way for the federal government to demand new pollution standards that require coal-burning power plants - those built in future years - to **capture** and quarantine at least 40 per cent of their carbon emissions. *MailOnline* September 24, 2013 Tuesday Obama declares a 'war on coal' with landmark EPA rules on plants just days after leaked report showed there has been no global warming since 1998 BYLINE: DAVID MARTOSKO (my addition in parenthesis)
- 799- The countries also agreed to work together to develop carbon **capture** technologies, increase energy efficiency in buildings, promote smarter grids and improve reporting of greenhouse gas emissions. *Guardian.com*. July 10, 2013 Wednesday US and China to extend co-operation in effort to curb climate change BYLINE: Suzanne Goldenberg
- 800- Obama will also propose new energy efficiency standards for buildings and appliances by the end of the decade, as well as an expansion of solar and wind energy projects on public lands, the officials said. The president would also announce \$8bn in loan guarantees for carbon **capture** projects and other technologies. Obama is highly unlikely, however, to touch on one of the biggest environmental decisions ahead of him - the Keystone XL tar sands pipeline. Obama claimed climate change was one of his core issues in his inauguration address. He stoked expectations even further in his State of the Union address in February, telling Congress to act on climate change - or he would. Since then, however, there have been mixed signals from the White House on climate change. The White House delayed a number of environmental rules, and Obama told supporters at a number of fundraisers that the politics of climate change were hard. *Guardian.com*. June 25, 2013 Tuesday Obama to unveil first-ever US climate change strategy BYLINE: Suzanne Goldenberg
- 801- Carbon **capture** is not merely a way of snatching the carbon dioxide from the air and burying it. Berners-Lee and Clark (computer scientists) almost endorse nuclear power (why is the French example of decarbonising 80% of their electricity generation by means of nuclear power in the 1980s accorded so little attention and respect?) and they have sensible ideas about agriculture and deforestation, neglected but important sources of carbon dioxide. Above all, they advocate **carbon capture and storage**, which, as they say, is a way of making the oil, gas and coal industries "part of the solution" by exploiting their vast knowledge of piping large quantities of stuff around the world. *The Guardian* June 1, 2013 Saturday Review: NON-FICTION: The climate change conundrum BYLINE: Peter Forbes (my addition in parenthesis)

- 802- Equally, there are signs that low-carbon technology - new generation wind, tide and wave devices and **carbon capture and storage** systems - is beginning to be adopted in many nations. *The Observer* May 12, 2013 Leading article: CLIMATE CHANGE: Swift political action could still avert a carbon crisis
- 803- A chance discovery that sea urchins use nickel ions to harness carbon dioxide from the sea to grow their exoskeleton could offer a way to **capture** tons of CO₂ before it goes into the atmosphere. Using the nickel nanoparticles suspended in water vats, factories and power stations could **capture** the CO₂ as it is emitted, converting it into chalk. *The Daily Telegraph* February 5, 2013 Tuesday Urchin inspires plan to fight global warming
- 804- At the moment, pilot studies for **Carbon Capture and Storage (CCS)** systems propose the removal of CO₂ by pumping it into holes deep underground, but it is both costly and has a long term risk of the gas leaking back out - possibly many miles away from the original downward source. But now scientists have discovered that sea urchins use nickel ions to harness carbon dioxide from the sea to grow their exoskeleton - or shell. It could be a way to **capture** tonnes of CO₂. Using the nickel nanoparticles suspended in water vats at factories, power stations would **capture** the CO₂ as it is pumped through, converting the gas into the chalk. *telegraph.co.uk* February 5, 2013 Tuesday Sea urchin could hold key to tackling climate change
- 805- Coal plants will either have to switch over to cleaner burning natural gas, **sequester** the CO₂ from their stacks, a tricky and expensive operation, or close up shop. *Guardian.com*. June 25, 2013 Tuesday President Obama is talking big on climate change, but will he act? BYLINE: Richard Schiffman
- 806- But the measures needed to stick to that limit are extreme: in practice it requires an end to the burning of coal, oil and gas before the end of this century, unless new technologies can be developed to **capture** their emissions. *telegraph.co.uk* December 13, 2014 Saturday Frantic efforts to save Lima climate change talks BYLINE: Emily Gosden Lima and Harriet Alexander
- 807- As well as its use in **carbon capture and storage**, the new ice may help when it comes to pumping natural gas, which often comes with clathrates. *MailOnline* December 11, 2014 Thursday Is ICE the solution to climate change? BYLINE: ELLIE ZOLFAGHARIFARD
- 808- Slashing emissions to within 2C warming limits would require a vast expansion of controversial renewable energy such as wind and solar farms and phasing out burning fossil fuels unless their emissions could be **captured**. Critics dismiss the goals as unrealistic and costly. *telegraph.co.uk* November 30, 2014 Sunday One year to save the planet from climate change disaster BYLINE: Emily Gosden
- 809- The recent landmark report by the UN Intergovernmental Panel on Climate Change (IPCC), signed off by 194 governments, placed strong emphasis on a potential technology called bioenergy **carbon capture and storage** (BECCS) as a way to pull CO₂ from the atmosphere. (...) Both Watson and Rayner (scientists) said the international goal of keeping warming below the "dangerous" level of 2C would only be possible with some form of geoengineering and that research into such technology should continue. *The Guardian* November 26, 2014 Wednesday Reflecting sunlight into space has terrifying consequences BYLINE: Damian Carrington (my addition in parenthesis)
- 810- **Carbon capture and storage (CCS)** - the nascent technology which aims to bury CO₂ underground - is deemed extremely important by the IPCC. (...) Observers played down the moves made by some countries with large fossil fuel reserves to weaken the language of the draft IPCC report written by scientists and seen by the Guardian, saying the final report was conservative but strong. However, the statement that "climate change is expected to lead to increases in ill-health in many regions, including greater likelihood of death" was deleted in the final report, along with criticism that politicians sometimes "engage in short-term thinking and are biased toward the status quo". *The Guardian* November 6, 2014 Thursday IPCC: rapid carbon emission cuts vital to stop severe impact of climate change BYLINE: Damian Carrington

- 811- By 2100 fossil fuel power generation would be "almost entirely phased out" unless power plants were fitted with "**carbon capture and storage**" (CCS) technology to bury carbon dioxide emissions in the ground. *The Daily Telegraph* November 3, 2014 Monday 'Greens hindering the global warming fight' BYLINE: Emily Gosden
- 812- In the long term, burning gas for power will only help to tackle climate change if power plants are fitted with "**carbon capture and storage**" (CCS) technology to trap and bury the harmful emissions. "What a 2C scenario means is the phase out of fossil fuel without CCS entirely, [at the] latest in the next few decades," Mr Edenhofer said. However, the viability of carbon **capture** is not yet proven. *The Daily Telegraph* April 14, 2014 Monday Fracking 'could help to avoid climate change' BYLINE: Emily Gosden
- 813- Ambitious plans could also involve growing crops that first absorb CO2 and are then used to fuel power stations fitted with carbon **capture** technology - actively taking emissions out of the atmosphere. *The Sun* April 14, 2014 Monday Global warming; CLIMATE CRISIS ON RISE BYLINE: EMILY BEAMENT
- 814- Almost all power stations burning fossil fuels would have to be fitted with carbon **capture** systems by the end of the century to avoid "catastrophic" climate change, the (IPCC) report said. (...) Climate change sceptics said that the report showed that the cost of cutting emissions outweighed the cost of damage that would be done by climate change up to 2080. Benny Peiser, director of the Global Warming Policy Foundation, a climate sceptic lobby group, said that it would be ignored by policy makers. *The Times* April 14, 2014 Monday Shale gas could help avoid climate change BYLINE: Ben Webster (my addition in parenthesis)
- 815- The technology would work by using a little-tested system called BECCS -Bio-energy with **Carbon Capture and Storage**. (...) The resulting emissions would then be **captured** at the plant and then **stored** underground. *MailOnline* April 13, 2014 Sunday The world must shift to solar and wind power rapidly to avoid catastrophic global warming BYLINE: BEN SPENCER
- 816- In the longer-term, burning gas for power will only be compatible with tackling climate change if power plants are fitted with '**carbon capture and storage**' (CCS) technology to trap the harmful emissions and bury them underground. *telegraph.co.uk* April 13, 2014 Sunday Fracking can be part of the solution to global warming BYLINE: Emily Gosden
- 817- Experts could be able to 'suck' carbon dioxide out of the air by using an experimental system called BECCS -Bio-energy with **Carbon Capture and Storage**. (...) The resulting emissions would then be **captured** at the plant and then **stored** underground. (...) The technology would work by using an experimental system called BECCS - Bio-energy with **Carbon Capture and Storage**. (...) The resulting emissions would then be **captured** at the plant and then **stored** underground. The net effect of that process would result in CO2 being removed from the air. (...) The British Government is already exploring options for **capturing** carbon from coal and gas-fired plants and hopes to get 13 gigawatts of fossil fuel power with carbon **capture** systems online by 2030. (...) The British Government is already exploring options for **capturing** carbon from coal and gas-fired plants and hopes to get 13 gigawatts of fossil fuel power with carbon **capture** systems online by 2030. But it is sceptical about the potential of the 'carbon negative' technology involved with the BECCS system. *MailOnline* April 11, 2014 Friday Could we SUCK UP climate change? Excess carbon dioxide could be absorbed by crops and stored in disused mines BYLINE: BEN SPENCER
- 818- Despite a faltering history, the UK's £1billion **carbon capture storage** project made some headway last month as £100 million was secured for testing the technology at two existing power plants. *Independent.co.uk* March 20, 2014 Thursday The 2014 budget shrunk from climate change. BYLINE: Alex Rodin

- 819- CO₂ is central to the process of photosynthesis, the mechanism by which plants create energy from sunlight, CO₂ and water. Higher levels of CO₂ in the atmosphere mean the leaves of plants can **capture** more of it, resulting in an increase in the biomass of the plant. *The Times* March 20, 2014 Thursday Farmers reap harvest from climate change BYLINE: Ben Webster; Hannah Devlin
- 820- Once **captured** the gas can either be buried underground or used as a feedstock for industrial processes that effectively recycle the carbon in a closed loop. *MailOnline* February 26, 2014 Wednesday Geoengineering could have 'catastrophic consequences' BYLINE: ELLIE ZOLFAGHARIFARD
- 821- Airport expansion would be a non-starter, as would any more money on **carbon capture and storage**, and the oxymoronic idea of "clean coal". *The Guardian* February 17, 2014 Monday Comment: Miliband must back climate change words with deeds BYLINE: John Harris
- 822- Other engineering solutions will need to include systems for preventing carbon dioxide from being emitted by power plants, a process known as **carbon capture and sequestration**. *The Observer* November 26, 2014 Wednesday Six vital steps world leaders must agree to take to protect Earth BYLINE: Robin McKie
- 823- WHAT IS CARBON SEQUESTRATION (...) This process is similar to the process known as carbon **sequestration**. Natural carbon **sequestration** is the process on Earth that manages the carbon dioxide expelled by animals, plants and humans. (...) There are also artificial carbon **sequestration** schemes that involve manually trapping this carbon dioxide in the ground. One proposed method is ocean **sequestration**, in which carbon dioxide is placed deep in the ocean, forming lakes of the gas. (...) Another method is geological **sequestration** where the carbon dioxide is pumped into underground chamber, or into areas full of magnesium and calcium. (...) This process is similar to what's known as carbon **sequestration**. Natural carbon **sequestration** is the process on Earth that manages the carbon dioxide expelled by animals, plants and humans. (...) There are also artificial carbon **sequestration** schemes that involve manually trapping this carbon dioxide in the ground. One proposed method is ocean **sequestration**, in which carbon dioxide is placed deep in the ocean, forming lakes of the gas. (...) Another method is geological **sequestration** where the carbon dioxide is pumped into underground chamber, or into areas full of magnesium and calcium. *MailOnline* August 5, 2014 Tuesday Could ants solve GLOBAL WARMING? BYLINE: VICTORIA WOOLLASTON
- 824- But environmentalists have roundly condemned the project, saying it carries a significant risk of groundwater pollution and would generate large quantities of carbon dioxide, which could only be mitigated by "carbon **capture**" technology, as yet unproven at a large scale. *The Independent on Sunday* June 14, 2015 'Ocean fracker' sought minister's aid to fund plan BYLINE: Cahal Milmo
- 825- Meanwhile, Spencer Dale, the group chief economist at BP, said the oil and gas industry believed that **carbon capture and storage (CCS)** was a vital technology to help beat climate change although he admitted there were technical challenges. Dale also questioned whether a major increase in CCS would happen without government backing. "Is there a market failure here that [means] you need some kind of public investment?" he said. The BP review showed that the amount of proven oil and gas reserves found by the industry was twice as much as in 1980. The company dismissed the idea that BP might have "stranded assets" which could not be burned if the 2C limit is to stay intact, saying that the major stock-listed companies owned a tiny percentage of the world's total reserves. *The Guardian* June 10, 2015 Wednesday BP boss widens transatlantic rift in energy industry over climate change BYLINE: Terry Macalister
- 826- Successive governments have micro-managed the electricity market since 2008 with a host of mechanisms to boost renewable energy and decarbonise the power market by 2030. (...) These culminated in the electricity market reforms in the 2013 Energy Act, steered by former Lib Dem energy secretary Ed Davey, that were designed to guarantee a long-term price for low-carbon generation, including renewables, nuclear and **carbon capture and storage**, and protect them from the vagaries of the wholesale electricity market. (...) With the Conservatives' general election victory, the picture has changed. With a majority government and a Tory energy secretary, the Conservatives could take a less

interventionist approach. The government has already said it will end subsidies for onshore wind power and rely on the market to bring down prices. But is less intervention better? *The Guardian* June 4, 2015
Thursday Should governments intervene in energy markets? BYLINE: Terry Slavin

- 827- The letter from the European energy companies is an unusual departure for the big energy firms, which usually prefer to work behind closed doors. The six energy bosses said they have written to the United Nations Framework Convention on Climate Change, the body that convenes the international talks between 196 nations. Their letter echoes the views of Van Beurden, who recently told the Guardian that hydrocarbons would be needed for "years to come". However, the Shell chief executive accepted that not all the world's fossil fuel resources can be burned unless some way is found to **capture** their emissions. *The Guardian* June 1, 2015 Monday Europe's energy big six say gas must help in the fight against climate change
BYLINE: Jennifer Rankin
- 828- Furthermore, the provinces do not all agree on climate strategy. To the east of Alberta, Saskatchewan is also standing up for its oil industry. Premier Brad Wall pointed out at the Quebec meeting that Canada accounts for under 2% of global emissions. Moreover his province is working to reduce them, having invested \$1.3bn in a carbon **capture** system, on the Boulder Dam coal-fired power plant, which traps 90% of the associated emissions. (...) Relations between the two echelons of government are clearly tense, each blaming the other for delays setting targets for after 2020. The priority of the federal government is economic growth, which depends on capitalising on Canada's oil reserves Singled out on account of its poor performance on emissions abatement, after it withdrew from the Kyoto protocol in 2011, Canada will be hard put to achieve the modest target it subsequently set: a 17% reduction by 2020 on 2005 emissions. *The Guardian* May 1, 2015 Friday Canada's provinces try to exert climate change pressure on Harper government
BYLINE: Anne Pélouas
- 829- The fossil fuel plants we still rely on for more than two-thirds of the electricity we need will be allowed to survive only if they are fitted with '**carbon capture and storage**', to pipe away their 'carbon emissions' to be buried in holes under the sea - a hugely expensive technology which is pure wishful thinking, since it has never yet been made to work commercially, and would treble the cost of electricity even if it was viable. *MailOnline* April 29, 2015 Wednesday The pottiest and costliest mistake of our times
BYLINE: CHRISTOPHER BOOKER
- 830- Along with their expansion of renewables, the Greens said they would implement a policy of stopping any new nuclear renewable developments (including scrapping the already approved plans for the Hinkley Point C station) and ban fracking for shale gas. Both of these are seen by their advocates as energy sources required for the transition away from coal and eventual decarbonisation. Gross (the director of Imperial College's Centre for Energy Policy and Technology) said the Greens position on these energy sources was defensible. "We could do it without nuclear, I don't see nuclear as being essential to decarbonisation and I think fracking is an irrelevance," he said. But if their emissions reduction targets were to remain feasible, Gross said the £24bn billpayers are set to pay for Hinkley would have to be redirected towards **carbon capture and storage technology (CCS)** or developing ways to store energy from the fluctuating supply from renewable sources. Both technologies are currently in their infancy. *The Guardian* April 15, 2015 Wednesday Is the Green party's climate change plan realistic?
BYLINE: Karl Mathiesen (my addition in parenthesis)
- 831- Experts say the most likely winners are companies like Greencollar, that gather up land-clearing permits from farmers who promise not to clear the land, so the farmer and the company get paid for the emission reduction from avoided deforestation, and companies that **capture** methane from places like garbage dumps. Those same companies were selling their abatement to polluters under the old ETS and its carbon farming scheme. By now the old carbon price would have been floating close to the European price of about \$10 a tonne. Norton Rose Fulbright partner Elisa de Wit said she expected next week's auction price to be between \$10 and \$20 a tonne. Same abatement - as far as it goes - similar price, except we pay instead of the companies doing the polluting. Manufacturers, miners and electricity generators (that together produce more than 60% of Australia's emissions) won't have to reduce their emissions under Direct Action and may in fact be able to increase them, which could

cancel out the emissions reductions the government is spending billions trying to achieve. *The Guardian* April 10, 2015 Friday Australia's climate change 'debate' all talk and no action BYLINE: Lenore Taylor

- 832- You urge the adoption of **carbon capture and storage (CCS)**, which Shell has, yes, pioneered. But you offer no proposal to overcome the main obstacle, the extra costs it imposes *The Guardian* March 31, 2015 Tuesday Open letter to Shell's Ben van Beurden from John Ashton BYLINE: John Ashton
- 833- Carbon **capture** technology is one solution that offers more than a glimmer of hope for the hydrocarbons industry and the green lobby to coexist in harmony. For example, a recent report by the Energy Technology Institute claims that up to 50m tonnes of CO₂ emissions could be feasibly **captured** in the UK by 2030 if **carbon capture and storage** was introduced on a wide scale. In Scotland, Royal Dutch Shell is moving ahead with the world's first industrial-scale carbon **capture** project at Peterhead. The plant will eventually provide power for 500,000 homes with emissions **stored** in the depleted reservoir of the Goldeneye gas field in the North Sea. One other major carbon capture project is on the drawing board in the UK in Yorkshire but it will have the potential to be game-changing if the technology can be perfected to work in larger consuming countries such as China and India. *The Daily Telegraph* March 28, 2015 Saturday The answer to global warming will be found in Delhi, not Paris BYLINE: Andrew Critchlow
- 834- That is a fifth of the 2,795 GT that would be **released** if all the world's proven oil, coal and gas reserves were burned. Therefore four-fifths of the fossil fuel must stay in the ground. (...) And that's not all: although fossil fuel combustion is the main source of CO₂, we also **release** the same gas by clearing forests and producing cement. The more of our carbon budget we eat through in these other ways, the less will be left for burning fossil fuels. (...) And that's not to mention any disruptive carbon **capture** technologies that might come along to help us burn more of the fuel without cooking the climate. *The Guardian* March 26, 2015 Thursday How much of the world's fossil fuel can we burn? BYLINE: Duncan Clark
- 835- Our challenge is to develop and deploy the technology to deliver this energy in as low-carbon a way as possible, probably using some combination of efficiency, renewables, next-generation nuclear and carbon **capture**. We need to pour vastly more resources into R&D, and put a significant international price on carbon. *The Guardian* March 12, 2015 Thursday We must reclaim the climate change debate from the political extremes BYLINE: Mark Lynas
- 836- The joint statement in Britain cited climate change as one of the most serious threats facing the world. "Acting on climate change is an opportunity for the UK to grow a stronger economy, more efficient and more resilient to risks ahead," it said. The parties pledged to seek a "fair, strong, legally binding" global climate deal in Paris later this year that would ensure temperatures did not rise more than 2C above pre-industrial times. The statement promised an accelerated transition to a "low-carbon economy" and to end the use of coal plants that don't use technology to **capture** their carbon emissions.(...) The Coalition, Labor and the Greens have all officially stated that they support the mainstream scientific position that human activity is influencing the climate. The Coalition and Labor both support a minimum 5% reduction in greenhouse gas emissions by 2020, based on 2000 levels. *The Guardian* February 16, 2015 Monday Nobel laureate asks Australia to follow UK example on bipartisan climate deal BYLINE: Oliver Milman
- 837- In what might be seen as a surprising move in the run-up to the general election, the three party leaders have pledged to work "across party lines" to agree cuts to the UK's carbon emissions. They have also signed up to seeking a "fair, strong, legally binding" international climate deal, set to be negotiated in Paris at the end of the year, to limit global temperature rises to below 2C - the level beyond which "dangerous" climate change would be expected. And they pledged to move to a low carbon economy, ending the use of coal without technology to **capture and store** its emissions for power generation. *i-Independent* February 14, 2015 UK leaders unite in quest to solve climate change BYLINE: Emily Beament

- 838- Designs for this range from assisting natural processes that lock carbon away - reforestation, planting crops that replenish soil carbon and fertilising the oceans with iron - to technologies that remove carbon from the air and then **store** it underground - bioenergy and **carbon capture and storage (Beccs)**. (...) Power stations that burn plants for energy would be fitted with devices to **capture** the carbon released. This would be pumped underground and **stored** for eternity. (...) The compounds **released**, known as aerosols, absorb and scatter sunlight and affect the brightness of clouds. (...) Power stations that burn plants for energy would be fitted with devices to **capture** the carbon released. This would be pumped underground and **stored** for eternity. *The Guardian* February 11, 2015 Wednesday Is geoengineering a bad idea? BYLINE: Karl Mathiesen
- 839- A fourth Republican, John Hoeven of North Dakota, who proposed but eventually voted against one of the climate votes, supported carbon **capture** technology, a spokesman said. All the other senators were no-shows including John McCain of Arizona and Lindsey Graham of South Carolina who have in the past sponsored bills to put economy-wide limits on carbon pollution through cap-and-trade measures. Both of those attempts ended in defeat. But there were signs that the Republican wall of denial about climate change was beginning to come down, said Brian Schatz, a Hawaii Democrat who put forward one of the climate change votes in the Senate last month. *The Guardian* February 3, 2015 Tuesday Republicans finally admitted climate change is real BYLINE: Suzanne Goldenberg
- 840- Australia is pressing ahead with huge new coalmining projects, just as a new study has calculated that more than 80% of the world's current coal reserves must remain in the ground to avoid dangerous climate change. (...) But the Minerals Council of Australia (MCA) disputed the findings of the report, stating that the Intergovernmental Panel on Climate Change made it clear last year that **carbon capture and storage** technology would ensure that fossil fuels could remain widely used. *The Guardian* January 7, 2015 Wednesday Australia accelerates coal mine projects in the face of study that finds it should stay buried BYLINE: Oliver Milman
- 841- The Conservative government has faced widespread criticism over a series of environmental decisions - on issues such as fracking, **carbon capture and storage**, the green investment bank and onshore wind - that scientists and campaigners say undermine its commitment to limit emissions and tackle climate change. *The Guardian* December 20, 2015 Sunday Ed Miliband aims for cross-party coalition on climate change BYLINE: Matthew Taylor
- 842- The odds do not look good. MPs on the select committee's panel was caustic about the Chancellor's decision to scrap £1bn of funding for **carbon capture and storage** technology, which removes CO2 from the atmosphere. *Independent.co.uk* December 16, 2015 Wednesday Amber Rudd needs to protect green initiatives from cuts
- 843- The Government recently cancelled a programme of so-called '**carbon capture**' and **storage** technology on the grounds that it is unproven and hideously, prohibitively expensive. It would be cheaper to re-forest the entire country. *MailOnline* December 15, 2015 Tuesday Tell Sid, we're not cooking with gas anymore! BYLINE: RICHARD LITTLEJOHN
- 844- The UK government recently scrapped its £1bn **CCS** project. In the US, industry has for years used aspects of carbon **capture** technologies to prime old oil and gas wells. *The Guardian* December 14, 2015 Monday Climate expert calls for decarbonisation tech to help meet Paris targets; Hans Joachim Schellnhuber pushes for afforestation and advances to **carbon capture and storage** projects to limit global warming BYLINE: Suzanne Goldenberg
- 845- Leading scientists, business leaders and politicians condemned the Government for scrapping a project that could have played a key role in limiting CO2 emissions. Ministers were criticised for hindering Britain's attempts to become greener through a series of "damaging" subsidy cuts since taking office. These, said opponents, would make it harder for the UK to hit its climate change targets. But critics were most incensed at George Osborne's decision at last month's Spending Review to scrap a £1bn pilot project to develop a key new technology to **capture** CO2 emissions and pipe them into giant

underground storage facilities. This technology - known as **carbon capture and storage (CCS)** - is yet to be proven on a large scale but is seen as essential if the world is to have any chance of meeting the climate change targets agreed in Paris. *i-Independent* December 14, 2015 Government 'a national disgrace' for scrapping carbon **capture** project; CLIMATE CHANGE BYLINE: Tom Bawden

- 846- Ministers were criticised for hindering Britain's attempts to become greener through a series of "damaging" subsidy cuts since taking office. These, said opponents, would make it harder for the UK to hit its climate change targets. But the critics are most angry about George Osborne's decision in last month's Autumn Statement to scrap a £1bn pilot project to develop a new technology to **capture** CO2 emissions and pipe them into giant underground storage facilities. This technology - known as **carbon capture and storage (CCS)** - is yet to be proven on a large scale but is seen as essential if the world is to have any chance of meeting the climate change targets agreed in Paris. *The Independent* December 14, 2015 Monday Government criticised for scrapping project intended to limit CO2 emissions BYLINE: TOM BAWDEN
- 847- In addition to emissions pledges from more than 175 countries, the climate change deal includes a tough new target of keeping global warming below 1.5C - compared to 2C before - and a goal to effectively eliminate carbon emissions in the second half of this century. This would require any emissions that were produced to either be **captured** at source and disposed of or else to be offset, for example by planting vast numbers of trees. *Independent.co.uk* December 13, 2015 Sunday COP21: Hitting the climate change targets agreed in Paris 'will cost \$16.5trn' BYLINE: Tom Bawden
- 848- There might be ways to "cheat" the system and bring down emissions without ruining the global economy. The most advanced of these is a new technology being developed that would **capture** the CO2 as it came out of the power-plant chimney and pipe it underground. But the technology - known as **carbon capture and storage (CCS)** - has yet to be proven on a large scale and suffered a major setback at the Autumn Statement when George Osborne scrapped a £1bn pilot project. *The Independent* December 12, 2015 Saturday 'Emissions are going to have to be reduced to zero pretty soon' BYLINE: TOM BAWDEN
- 849- That's the headline on a story by Fiona Harvey and myself today, on how top scientists, former ministers and diplomats, and business figures view the UK's international climate reputation after a string of cuts to renewable energy subsidies, energy efficiency programmes and a £1bn carbon **capture** project. *The Guardian* December 10, 2015 Thursday Paris talks: negotiators edge towards new draft climate deal BYLINE: Adam Vaughan
- 850- The industry is the biggest single contributor to greenhouse gas emissions and is telling negotiators it can **capture** those gases from coal burning on a large scale - a promise the industry has been making for a decade or so with no result. *The Guardian* December 9, 2015 Wednesday Will the Paris climate deal spell out the end of the fossil fuel era? BYLINE: Graham Readfearn
- 851- The job of government on climate change is to ensure attractive and stable conditions for investment in the low-carbon transition. In recent months our government has hit the brakes on onshore wind and solar energy, on energy efficiency and on community renewable schemes. Its plan to sell off the Green Investment Bank will destroy a crucial financing mechanism. Its trashing of a 10-year effort to make the UK a leader in **carbon capture and storage** blew away more than £100m in imminent investment from China. Its surreptitious edging away from its 2020 renewables target casts doubt on all its climate promises. *The Guardian* December 9, 2015 Wednesday Britain can't preach on climate change while it dismantles its green economy BYLINE: John Ashton
- 852- Britain is second only to Denmark in tackling climate change, according to a global assessment, which contradicts claims by green groups that David Cameron has backtracked on the issue. Britain is the highest ranking large economy in the annual Climate Change Performance Index (CCPI), which ranks the 58 countries that produce more than 90 per cent of global emissions. Britain overtook Sweden this year and is closing on Denmark. Friends of the Earth this week accused Mr Cameron of hypocrisy for calling for a strong global deal on climate change while cancelling green projects at home. The

government cut subsidies for onshore wind and solar power and axed a £1 billion fund for a **carbon capture and storage** project. *The Times* December 9, 2015 Wednesday Britain ranks among best in tackling climate change BYLINE: Ben Webster

- 853- Negative emissions rely on us sucking the carbon out of the atmosphere. One of the great hopes for this potentially game-changing technology is the **capture and storage** of carbon emissions from fuels derived from plants. This leads to a net loss of carbon from the atmosphere. The technology for this is still very much in a developmental phase, with no guarantee of long term viability. *The Guardian* December 2, 2015 Wednesday Should we be aiming to keep global warming to 1.5C, not 2C? BYLINE: Karl Mathiesen
- 854- George Osborne reinforced that message in last week's autumn statement, which it emerged soon afterwards included the withdrawal of all support for **carbon capture and storage**, essential if fossil fuels like shale gas are to be used safely. *The Guardian* December 2, 2015 Wednesday The Guardian view on the climate change summit: there is no planet B
- 855- The UK led the way on climate change legislation, agreeing the world's first legally binding emissions cuts - and pretty ambitious ones at that. But critics point out that that was back in 2008 under Labour and that since taking office in May, the Tories have made a series of announcements that have undermined the UK's credibility on green issues and raised questions about whether the country will be able to meet emissions targets. And last week, the government cancelled a £1bn programme to develop carbon **capture and storage** technology, regarded as crucial in limiting climate change. *The Independent* December 1, 2015 Tuesday Obama: If we don't strike climate deal in Paris, it will be too late BYLINE: TOM BAWDEN
- 856- But India's solar-powered grids, wind farms or even coal-powered fire stations that **capture and store carbon (CCS)** will not be built by the British, any more than those in the rest of Africa and Asia. *The Observer* November 29, 2015 Sunday Innovation will save our warming planet - so where is the investment? BYLINE: Will Hutton
- 857- The sheer scale of renewable project cancellations came to light a day after the Government scrapped a £1bn pilot project to develop **carbon capture and storage** technology. This aims to **capture** the carbon dioxide emitted by coal and gas power stations and pipe it underground. *The Independent* November 27, 2015 Friday Green power plants 'will not be built' after subsidies axed BYLINE: TOM BAWDEN
- 858- THE Government broke a manifesto pledge as it scrapped £1 billion of funding to develop "**carbon capture**" technology at power plants. The backtrack came days before the Paris Climate Change Conference and six months before the Government was due to award the cash to one of two competing bids. *The Sun* November 26, 2015 Thursday £1BN GREEN FUND FALL
- 859- And if gas is to be the core of energy supply beyond 2030, when electricity is supposed to become carbon free, then serious money needs to go into developing carbon **capture and storage**. **CCS** merited just one mention in Ms Rudd's (UK Home Secretary) speech. *The Guardian* November 18, 2015 Wednesday The Guardian view on Paris, terror and climate change: shaping the future; It is hard for France's capital to look beyond the terror attack, but the decisions taken at the UN climate change conference may in the end matter more (my addition in parenthesis)
- 860- Anthony Hopley, the group's chief executive, said these companies still have time to adapt to the new world order and take the lead in renewable energy, **storage** technology and carbon **capture** - and some, such as Shell, are doing so - but they cannot avoid the issue *telegraph.co.uk* October 28, 2015 Wednesday Fossil fuel companies risk plague of 'asbestos' lawsuits as tide turns on climate change BYLINE: Ambrose Evans-Pritchard
- 861- Every option - **carbon capture and storage** to reduce coal-fired power stations' emissions, expanding wind and solar power, developing other renewables such as tidal power, cutting consumption and bringing new nuclear capacity on stream - each has its own daunting problems, although some look a

lot cheaper to fix than others *The Guardian* September 22, 2015 Tuesday The Guardian view on Hinkley Point C: overcomplicated, overpriced and overdue; Nuclear power may be necessary to limit climate change, but this is the wrong nuclear option

- 862- During his Question Time response, Turnbull also listed "clean coal" and "**carbon capture**" as viable responses to the problem. Turnbull considered "clean coal" in his 2010 speech, but the Turnbull of old struck a sceptical tone, saying that "despite all of the money and all of the hope that has been put into **carbon capture and storage** there is still, as of today, not one industrial scale coal fired power station using **carbon capture and storage**". Since 2010, the coal industry has managed to get only one commercial CCS electricity plant up and running - SaskPower's Boundary Dam project in Canada (the CO₂ emissions from the plant are **captured** and sold to oil drillers to be pumped underground to push more crude to the surface, which seems to defeat the object of the exercise). *The Guardian* September 18, 2015 Friday Is new Australian prime minister Malcolm Turnbull already a climate change turncoat? BYLINE: Graham Readfearn
- 863- Environmental concerns over palm oil production tend to focus on rainforest felling and the plight of the orangutan. But palm oil companies are now starting to grapple with a lesser-known issue that could make a significant difference in the quest to curb climate change. The rapid expansion of palm oil cultivation has resulted in the creation of vast wastewater lagoons beside plantations in countries such as Indonesia and Malaysia, the world's two dominant producers. (...) Only a small amount of this methane is currently being **captured**, but several palm oil businesses are starting to realise there is a more environmentally and financially sustainable use for wastewater than simply leaving it to fester. REA Holdings, a British-based firm that owns three palm oil mills in Indonesia's East Kalimantan province, installed methane **capture** at two of its mills in 2012, with plans currently being drawn up for the third. To **capture** the methane, huge polyetharane sheets are placed over the lagoons. (...) Other firms are seeing the potential, too. Indonesian company PT Musim Mas, headquartered in Singapore, is installing methane **capture** in its eight mills in Kalimantan and Sumatra, with an initial outlay of between \$3-4m. (...) The main hurdle - aside from upfront costs - has been a perceived lack of government backing. But Persey (Head of Sustainability at REA Holdings) believes this is changing in Indonesia, with new regulations stipulating that the government must buy any renewable energy produced by palm oil mills. A further rule on mandatory methane **capture** may follow. (...) She argues that initiatives such as methane **capture** can't hide the significant volumes of greenhouse gases companies **release** into the atmosphere. (...) Taylor (scientist) says further government help will be required given the collapse in price of the UN's clean development mechanism, an emissions reduction credit system that has helped fund several methane **capture** projects. (...) These murky ponds, containing the brown-hued detritus from processed palm oil fruit, **release** a huge amount of methane into the atmosphere - a gas so potent it traps around 34 times as much heat as carbon dioxide. (...) She argues that initiatives such as methane **capture** can't hide the significant volumes of greenhouse gases companies **release** into the atmosphere. *The Guardian* September 16, 2015 Wednesday The palm oil plantations powering communities and tackling climate change BYLINE: Oliver Milman (my addition in parenthesis)
- 864- The Task Force on Shale Gas, which is funded by the UK's shale gas industry but operates independently, found that climate change targets could still be met even with an increase in the use of gas, which is less carbon-intensive than coal. But the report also found that if gas is to be used for another four decades, as envisaged by the group, then much more effort must be put into **carbon capture and storage** technologies. (...) Green campaigners warned, however, that if the UK were to pursue fracking, it would lead to an increase in net fossil fuel use. *The Guardian* September 16, 2015 Wednesday Shale gas fracking should go ahead in UK BYLINE: Fiona Harvey
- 865- One of Britain's best known climate sceptics, Lord Ridley, has teamed up with a prominent environment campaigner to force fossil fuel companies to fast-track a new technology to **capture** CO₂ emissions from the air and pump them underground. (...) In a highly unusual show of unity between opposing sides of the climate-change debate, Lord Ridley and Baroness Worthington are pushing for a new law demanding that oil, gas and coal producers greatly increase their efforts to develop effective **carbon capture and storage (CCS)** technology, after making little progress over the past decade. (...)

This would force producers and importers of fossil fuels to **capture** a portion of the CO₂ generated when they are burnt and pipe it underground - with depleted North Sea oil fields making ideal **storage** facilities, the amendment argues. And if the fossil fuel companies cannot **capture and store** the carbon - initially a very small portion that will rise over time - they must pay somebody else to do it, Lord Oxburgh said. *Independent.co.uk* September 14, 2015 Monday Lord Ridley: Prominent climate change sceptic backs calls to fast-track new green technology BYLINE: Tom Bawden

- 866- The process is cheap because the raw materials are essentially free. It is also quick, producing an effective "**carbon capture**" material in less than a day - a fraction of the time it takes to make other **carbon capture** materials. *Independent.co.uk* September 2, 2015 Wednesday Leftover coffee 'can help fight global warming' BYLINE: Tom Bawden
- 867- Investment in renewable alternatives, such as wind, hydro and solar power, together with mandatory new **carbon-capture** equipment are expected to cost the electricity industry \$8.4bn, although the EPA claims this will be dwarfed by \$34-\$54bn in wider environmental benefits. *The Guardian* August 4, 2015 Tuesday Obama unveils sweeping cuts to power plant emissions BYLINE: Dan Roberts
- 868- The Obama administration has trumpeted "**carbon capture**", where carbon dioxide emissions are injected into old oil fields to enhance recovery and **store** the carbon dioxide there permanently. But **carbon capture and storage** is costly. Moreover, natural gas is suddenly cheap. And utilities have been turning to natural gas, especially since oil and gas companies have started using fracking techniques to tap vast natural gas resources locked in shale rock. *Independent.co.uk* August 3, 2015 Monday Clean Power Plan BYLINE: Joby Warrick, Steven Mufson
- 869- Unless more money can be found, key projects such as **carbon capture and storage**, as well as the future of new offshore wind farms, could be placed in jeopardy. *Independent.co.uk* July 15, 2015 Wednesday Government faces multi-billion pound black hole in budget to pay for clean energy supplies - which could mean your electricity bill rises BYLINE: Oliver Wright
- 870- The World Bank and Bank of England have already warned of the serious risk climate action poses to trillions of dollars of fossil fuel investments and the G20 is investigating the risks. The think-tank Carbon Tracker has estimated that over \$1tn (£0.6tn) of oil investments and \$280bn of gas investments would be left uneconomic if the world's governments succeed in their pledge to limit global warming to 2C. (...) Edenhofer (economist) warned of a " global coal renaissance ", particularly in fast-growing poor nations. He said six of the 10 fastest growing carbon emitters are from sub-saharan Africa, led by Congo, Benin and Angola. He said that, even if technology to **capture and store** carbon on a large scale is developed, two-thirds of all coal resources and a third of all oil and gas would have to be kept in the ground to limit climate change to 2C. Without **carbon capture and storage**, 90% of coal and two-thirds of oil and gas would have to remain buried. *The Guardian* July 9, 2015 Thursday Fossil fuel firms risk wasting billions by ignoring climate change BYLINE: Damian Carrington (my addition in parenthesis)
- 871- He (Matthew Spencer, Green Alliance's director) said the department could ditch a key part of its capital spending - £1bn on its books for a demonstration **carbon capture and storage (CCS)** plant - but that would mean jettisoning one of the "three legs" of UK energy policy, which are renewable energy, nuclear and **CCS**. The analysis comes three days after the government's statutory climate advisers warned that there was doubt in how government policies would help meet the UK's post-2020 carbon targets. *The Guardian* July 3, 2015 Friday Decc faces 90% staff budget cuts that risk UK's climate plans BYLINE: Adam Vaughan
- 872- President Hollande talked of the need for carbon **sequestration**, developing new clean technologies, and finding ways to be more energy efficient. Business leaders from across the world, meeting in Paris for a preparatory conference before the UN convenes later this year, congratulated the French president and called for a strong international agreement on the climate. But there were clear signs that a compromise will be hard to reach. The chief executive of Statoil, Eldre Saetre, said a carbon price was

needed to encourage companies to reduce greenhouse gas emissions. *The Guardian* May 20, 2015 Wednesday
François Hollande calls for 'miracle' climate agreement at Paris talks BYLINE: Fiona Harvey

- 873- Restoring the water cycle in our environment - by **sequestering** carbon in our soil - will not only make our food supply more secure. It can also help moderate changes in climate. *The Guardian* March 17, 2015 Tuesday There are ways to tackle climate change: now we must find the will
- 874- Wildlife, trees and plants were analysed according to five functions they performed in the ecosystem: pollination, pest control, decomposition, carbon **sequestration** and species often recognised as being of cultural value, which included species such as birds, butterflies and bees. (...) Species that support decomposition, carbon **sequestration** and that are considered to be of cultural value are at less risk, with 8%, 10% and 14% in those respective groups in decline. *The Guardian* December 8, 2015 Tuesday Wildlife decline threatens UK's biodiversity BYLINE: Emma Howard
- 875- Year by year, the loss of forests contributes an estimated 17 per cent of all greenhouse gas emissions: more than every mode of transport. Conversely, the ability of trees to **store** carbon dioxide in natural sinks - "carbon **sequestration**" - means that tropical forests alone may remove about a fifth of the chief cause of global warming. *The Independent* November 27, 2015 Friday We can't see the wood for the tree BYLINE: BOYD TONKIN
- 876- The win-win scenarios occur when government policy unlocks emissions reductions across all sectors - with electricity, industrial emissions and transport delivering 40% to 75% of cost-effective national abatement by 2050 and land-based carbon **storage** (or **sequestration**) supplying 30% to 40% of total abatement in the "strong" and "very strong" scenarios. (...) Direct Action originally required 100-year pledges for carbon **sequestration** projects but has since reduced that to 25 years for soil carbon. *The Guardian* November 4, 2015 Wednesday Reducing carbon emissions now will safeguard Australian way of life BYLINE: Lenore Taylor
- 877- US President-elect Donald Trump recently appointed climate-change sceptic Scott Pruitt as head of the Environmental Protection Agency. (...) He (Bill Gates) also announced he was planning to increase his personal investments in carbon **capture** technologies, next-generation nuclear, new kinds of batteries and other types of research in the field. *The Independent* December 12, 2016 Monday Bill Gates announces \$1bn investment fund for clean energy technology BYLINE: Jon Sharman
- 878- Britain was among the 197 nations to sign a statement in Marrakech reaffirming the goals agreed in Paris. The statement was designed partly as a response to US president-elect Donald Trump, who says he will withdraw America from the Paris deal. Matthew Bell, chief executive of the CCC, said meeting such targets would be transformative for Britain, and might include replacing natural gas with hydrogen for cooking and heating. "Heat accounts for 40% of the nation's emissions," he said. Bell also foresees a network of **carbon capture and storage** plants that strip CO₂ from power station and factory emissions so they can be pumped underground. *The Sunday Times* November 20, 2016 Sunday Climate change curbs could force diesel lorries off the road BYLINE: Jonathan Leake
- 879- The latest world energy outlook from the conservative International Energy Agency shows that under the scenario necessary to meet the existing Paris targets (still not enough to limit warming to 2C), fossil fuels decline from 67% of the energy mix to 24%, and 16% of that 24% is **carbon capture and storage**, the viability of which remains uncertain. *The Guardian* November 18, 2016 Friday On climate change policy, neither time nor Trump are on Turnbull's side BYLINE: Lenore Taylor
- 880- The money will be used to find ways to improve the energy efficiency of transport and industry; reduce leaks of methane, a potent greenhouse gas, from oil and gas installations; and develop a viable system of **carbon-capture-and-storage**, which could slash emissions for power plants to just a few per cent. *The Independent* November 5, 2016 Saturday Climate change pledge by major oil firms dismissed as 'drop in the ocean' BYLINE: IAN JOHNSTON

- 881- **Carbon capture and storage (CCS)**: This technology would see CO₂ being sucked out of the atmosphere and pumped underground to be stored. It is regarded as one of the most feasible geo-engineering techniques but has yet to be successfully deployed at large scale. George Osborne scrapped a £1bn project to develop the technology last year. *i-Independent* November 4, 2016 geo-engineering 'is our only hope' on climate change BYLINE: Tom Bawden
- 882- Shell and BP are among ten of the world's biggest oil and gas producers to unveil an £800m investment in the fight against climate change. The new fund will focus on ways to reduce the cost of **carbon capture and storage** technology, which involves collecting carbon dioxide emissions from fossil-fuel-burning plants and storing them in underground caverns. This prevents the harmful gasses from entering the atmosphere and contributing to global warming. The companies - which make up the Oil and Gas Climate Initiative - have described the move as an 'unprecedented' level of collaboration. But it comes as the oil and gas sector faces mounting pressure to help fight global warming, and the sum is small compared with the £277bn spent globally on clean energy last year. *MailOnline* November 4, 2016 Friday Shell and BP among ten of world's biggest oil and gas producers to unveil £800m investment in fight against climate change
- 883- Despite agreeing on highly ambitious climate targets, policymakers and negotiators show limited awareness of this technological dependence: none of the INDCs mentions negative emissions or carbon removal and very few have plans for advancing **carbon capture and storage (CCS)**. (...) Second, negative emissions technologies such as carbon **capture and storage** and other large-scale climate change mitigation strategies have been subject to intense criticism, mostly due to the pressure on land that is needed for food and shelter for a growing world population. (...) Hydrogen has the advantage of using the existing gas network, but is as yet untested. The hydrogen could be produced using spare renewable electricity, from biofuels or from fossil fuels. The latter would only be low carbon if emissions were **captured and stored** but ministers abruptly cancelled its flagship **carbon capture and storage** policy in November 2015. The CCC said hydrogen should receive similar research support to the £250m the government is already giving to small modular nuclear reactors. *The Guardian* October 13, 2016 Thursday UK must focus on carbon removal to meet Paris goals BYLINE: Damian Carrington
- 884- A growing trend towards protectionist policies around the world could threaten progress on tackling climate change, resources giant BHP Billiton has warned. (...) Dr Wild was speaking in London as BHP presented investors with an update on how different climate change scenarios could affect its portfolio. It has calculated that rising global temperatures would reduce demand for coal but boost that for gas. BHP is also investing in technology such as **carbon capture and storage**, and batteries that can store energy from solar power. *telegraph.co.uk* October 10, 2016 Monday Protectionism threatens climate change action, warns BHP Billiton BYLINE: Jon Yeomans
- 885- At the Paris Climate Summit last year, world leaders agreed to try to limit global warming to as close to 1.5C above pre-industrial levels as possible - amid concerns the 2C target may not be safe enough. But in the same year the level of warming reached 1C after an astonishing 0.15C rise in just three years. Droughts, floods, wildfires and storms are all set to increase as the world warms, threatening crops and causing the extinction of species. The new report warned the 1.5C target had "almost certainly already been missed". Even if all the pledges to cut emissions made by countries at Paris are fulfilled, the average temperature is set to reach that level in the early 2030s and then 2C by 2050, they said. (...) The experts called for drastic changes to the way the world produces and uses energy with a switch to electric cars among steps that should be taken quickly. They also said **carbon capture-and-storage (CCS)** of emissions from fossil fuel power stations and industrial plants could be part of the solution if the system could be made to work. *The Independent* September 30, 2016 Friday Humans to experience effects of global warming by 2050 BYLINE: IAN JOHNSTON
- 886- At the Paris Climate Summit last year, world leaders agreed to try to limit global warming to as close to 1.5C above pre-industrial levels as possible - amid concerns the 2C target may not be safe enough. But

in the same year the level of warming reached 1C after an astonishing 0.15C rise in just three years. Droughts, floods, wildfires and storms are all set to increase as the world warms, threatening crops and causing the extinction of species. The new report warned the 1.5C target had "almost certainly already been missed". Even if all the pledges to cut emissions made by countries at Paris are fulfilled, the average temperature is set to reach that level in the early 2030s and then 2C by 2050, they said. (...) The experts called for drastic changes to the way the world produces and uses energy with a switch to electric cars among steps that should be taken quickly. They also said **carbon capture-and-storage (CCS)** of emissions from fossil fuel power stations and industrial plants could be part of the solution if the system could be made to work. *The Independent* September 29, 2016 Thursday Most people alive today set to witness dangerous global warming in their lifetime BYLINE: Ian Johnston

- 887- The only means of reconciling governments' climate change commitments with the opening of new coal mines, oilfields and fracking sites is **carbon capture and storage**: extracting carbon dioxide from the exhaust gases of power stations and burying it in geological strata. (...) The most popular proposal is to combine the **capture and storage** phantasm with biofuel plantations covering an area between one and three times the size of India, then harvesting the material they grow, burning it in power stations and burying the emissions. (...) All this nonsense is a substitute for a simple proposition: stop digging. There is only one form of **carbon capture and storage** that is scientifically proven, and which can be deployed immediately: leaving fossil fuels in the ground. *The Guardian* September 27, 2016 Tuesday No fracking, drilling or digging BYLINE: George Monbiot
- 888- So-called '**carbon capture**' techniques include extracting the gas from the air, liquefying it and **storing** it underground. *MailOnline* August 7, 2016 Sunday 'The world will miss climate targets' BYLINE: PRESS ASSOCIATION and RYAN O'HARE
- 889- **Storing** CO2 in underground rock reservoirs necessitates an impermeable cap rock to ensure it won't **escape**. (...) There have long been concerns that the dilute acid, which forms when the CO2 dissolves in water, might corrode the rocks above and allow it to **escape**. (...) **Storing** CO2 in underground rock reservoirs necessitates an impermeable cap rock to ensure it won't **escape**. (...) According to the study, the process of **carbon capture and storage (CCS)** may be a viable solution to reduce emissions from coal and gas-fired power stations. This method involves the **capture** and compression of carbon dioxide, which is then pumped into reservoirs deep underground. (...) The Cambridge-led researchers say this form of **storage** may be far more secure than previously thought, indicating that the process of **carbon capture and storage (CCS)** may be a viable solution to reduce emissions from coal and gas-fired power stations. This method involves the capture and compression of carbon dioxide, which is then pumped into reservoirs deep underground. (...) As carbon emissions continue to threaten Earth's future climate, it's become increasingly necessary to find new methods to manage and maintain CO2, rather than **releasing** it into the atmosphere. *MailOnline* July 28, 2016 Thursday Burying CO2 DOES work: Researchers find global warming gas can be stored safely for 100,000 years BYLINE: CHEYENNE MACDONALD
- 890- The government's cancellation of a pioneering £1bn competition **to capture and store** carbon emissions may have pushed up the bill for meeting the UK's climate targets by £30bn, according to a report from the UK's official spending watchdog. The National Audit Office (NAO) report, published on Wednesday, says the move has delayed by a decade the deployment of **carbon capture and storage (CCS)** technology in the UK, which takes emissions from power stations and industry and buries them so they do not contribute to global warming. *The Guardian* July 20, 2016 Wednesday Treasury cut to carbon **capture** will cost UK £30bn, says watchdog; Government says carbon **storage** technology not cost-efficient, while critics say U-turn will double cost of tackling climate change BYLINE: Damian Carrington
- 891- In July 2015 Ms Leadsom (British Conservative politician) supported applying the climate change levy on electricity generated from renewable sources, while in March this year she voted against developing a strategy for **carbon capture and storage** for the energy industry. *The Independent* July 14, 2016 Thursday New Environment Secretary backs fox hunting BYLINE: Jon Stone (my addition in parenthesis)

- 892- The Government has acknowledged a shortfall in its policy plans and is due to set out a new strategy later this year. The CCC urged the Government to continue to offer financial support for onshore wind and solar farms as they were "the cheapest forms of low-carbon electricity generation". If ministers exclude these technologies in favour of more expensive alternatives, they should make clear that consumers were bearing additional costs as a result of the decision and not due to the intrinsic costs of meeting the carbon targets, Mr Bell said (DUP Minister). He also called on the Government to "urgently" set out a new approach for developing **carbon capture and storage** technology after ministers scrapped a £1bn competition last year. *The Daily Telegraph* July 1, 2016 Friday UK's policies over carbon reductions 'falling short' BYLINE: Emily Gosden (my addition in parenthesis)
- 893- Some of the strongest criticism in the CCC report was of the government's abandonment of a £1bn competition to spur the development of **carbon capture and storage technology (CCS)**, which will be needed to trap and bury emissions. The CCC and others have warned that tackling climate change will cost twice as much without **CCS**. *The Guardian* June 30, 2016 Thursday UK lacks policies to meet more than half its carbon emissions cuts BYLINE: Damian Carrington
- 894- Cameron, who pledged in 2010 to lead the "greenest government ever", has faced concerted criticism over a series of reversals to green policies, including cuts to renewable energy subsidies and energy efficiency programmes. In November, the government cancelled its £1bn competition for **carbon capture and storage (CCS)** technology, despite the project being in the Conservative party's election manifesto. *The Guardian* June 24, 2016 Friday David Cameron denies 'backsliding' on the environment BYLINE: Damian Carrington
- 895- Once upon a time, Cameron said **carbon capture and storage (CCS)** was "absolutely critical" for cutting carbon emissions. Now he says it's too expensive, and his government binned a £1bn competition to fund a trial **CCS** plant. *The Guardian* June 24, 2016 Friday Ten years after 'hug a husky', what is David Cameron's green legacy BYLINE: Adam Vaughan
- 896- The gas can be **stored** underground and is sometimes injected in depleted oil wells, but concerns have been raised about monitoring it and preventing it from **escaping**. (...) Even more surprisingly, after only two years scientists found 95 per cent of the gas was **captured** and converted, far quicker than initial predictions, which suggested the **carbon capture and storage (CCS)** process could take thousands or even hundreds of thousands of years. *The Independent* June 10, 2016 Friday Climate change breakthrough as Iceland turns carbon dioxide into stone; 'Carbon **capture** can contribute significantly to reducing carbon dioxide emissions' BYLINE: Alexandra Sims
- 897- One of the methods to battle climate change, in addition to reducing fossil fuel emissions, is to **capture** carbon dioxide from the air or power plants. (...) However, carbon **capture** however can be expensive - especially the **capturing** part. (...) Scientists have found a quick way - but not a cheap one - to turn heat-trapping carbon dioxide gas into harmless rock. (...) The acidic mixture dissolved the rocks' calcium magnesium and formed limestone, **a permanent natural jail** for the heat-trapping gas. *MailOnline* June 10, 2016 Friday Icelandic project turns carbon dioxide into STONE in global warming breakthrough
- 898- In Paris last December, world governments forged a historic agreement to hold global warming to no more than 2C above pre-industrial levels, by mid-century. This will require steep emissions cuts, which were not specified in the accord, but most governments have put in place national targets running to 2025 or 2030 that will require most of the reductions experts say are needed to meet the Paris target. Birol (Executive director of the International Energy Agency) called on governments to provide greater incentives for key emissions-reducing technologies, such as electric vehicles, greater energy efficiency, and renewable power. He added that technology for **carbon capture and storage (CCS)** was running well behind where it needed to be in terms of implementation, if the Paris targets are to be met. *The Guardian* June 1, 2016 Wednesday Make building standards top priority for tackling climate change BYLINE: Fiona Harvey (my addition in parenthesis)

- 899- Cameron has, in effect, shut down the development of onshore windfarms and large-scale solar power, and now wants businesses to invest in gas instead. The only way in which more gas burning could be reconciled with our climate change commitments is to **capture** and bury the carbon dioxide it produces. But seven days after the government announced its dash for gas, it dumped its **carbon capture and storage** competition, ensuring that its contradictions are now impossible to resolve. *The Guardian* April 11, 2016 Monday On climate change this government is indifferent to life, in love with death BYLINE: George Monbiot
- 900- The White House said in a conference call with reporters on Friday afternoon that Obama would seek more funds for research into battery storage, electric cars, and cleaner fuels. The budget will also seek substantial funding for research into nuclear reactors and **carbon capture and storage** technology - both technologies favoured by Republicans. *The Guardian* May 11, 2016 Wednesday Obama using final budget request to push for action against climate change BYLINE: Suzanne Goldenberg
- 901- Once upon a time, Cameron said **carbon capture and storage (CCS)** was "absolutely critical" for cutting carbon emissions. Now he says it's too expensive, and his government binned a £1bn competition to fund a trial **CCS** plant. *The Guardian* April 20, 2016 Wednesday Ten years after 'hug a husky', what is David Cameron's green legacy? BYLINE: Adam Vaughan
- 902- And if gas is to be the core of energy supply beyond 2030, when electricity is supposed to become carbon free, then serious money needs to go into developing **carbon capture and storage. CCS** merited just one mention in Ms Rudd's speech. *The Guardian* April 11, 2016 Monday The Guardian view on Paris, terror and climate change
- 903- The carbon would then be disposed of using **carbon capture and storage** technology, for example by pumping it into a disused North Sea gas field, while the hydrogen would be transported to households and businesses in Leeds. *telegraph.co.uk* April 9, 2016 Saturday UK homes could be heated by hydrogen under plan to tackle global warming BYLINE: Emily Gosden
- 904- Combating climate change successfully will require massive investments in technologies to **capture and store** carbon dioxide, new research has found. (...) Carbon disposal consists chiefly of the burial of carbon dioxide in underground caverns, known as **carbon capture and storage (CCS)**, but also includes possible methods of dissolving carbon dioxide in the oceans and other means of eliminating carbon from the air. (...) Indira Mann, of the Scottish **Carbon Capture and Storage** trade association, said the technologies involved in **CCS** were more mature than many critics said, and would open up new economic opportunities for the UK. (...) Prof Allen said that reducing greenhouse gas emissions by other means, such as renewable energy generation, was important but would not get the world to its target of **releasing** no excess greenhouse gases into the atmosphere. That goal of 'net zero emissions' was enshrined in last December's Paris climate deal. *The Guardian* April 5, 2016 Tuesday Massive carbon **capture** investment 'needed to slow global warming'; Carbon disposal technologies are needed because incremental emissions cuts are not enough to fight climate change, says Oxford University climate scientist BYLINE: Fiona Harvey and Kylie Noble
- 905- The Bank of England and World Bank have warned of the risks to the global economy of climate change and the G20 has asked the international Financial Stability Board to investigate the issue. In January, the World Economic Forum said a catastrophe caused by climate change was the biggest potential threat to the global economy in 2016. (...) Investors have also been warned about investing in new coal and gas fired power stations after 2017 by a second new study. The research shows that, to meet the 2C target, no new carbon-emitting power stations can be built anywhere in the world unless they are later closed down or retrofitted with **carbon capture and storage** technology. *The Guardian* April 4, 2016 Monday Climate change will wipe \$2.5tn off global financial assets BYLINE: Damian Carrington
- 906- Unlike the US, where climate change is a politically polarising issue, in the UK there is cross-party agreement about the need to drive down the emissions that drive global warming. (...) The cutting of a pioneering £1bn **carbon capture and storage** competition last year was one of the worst things the

government had done, as well as hasty cuts to solar power subsidies, he (E. Miliband) said. *The Guardian* March 22, 2016 Tuesday Ed Miliband: Tories far too able to 'do wrong things' on climate change; Former Labour leader deeply critical of government cuts to green policies, such as cancelling **carbon capture and storage** competition BYLINE: Adam Vaughan

- 907- In practice, the announcement last year meant the company would run its coal-fired power stations through to the end of their life, including Loy Yang A, the country's biggest-emitting generator, which produces 15m tonnes of CO₂ each year. But it also meant AGL wouldn't extend the life of those plants or invest in any others unless they had **carbon capture and storage**. Critics said the move was merely window-dressing, arguing the closure of coal-fired power stations by mid century was inevitable. And it meant the country's biggest polluter would continue running the most polluting power station until the middle of the century - something that seems at odds with a target of 2C of warming. *The Guardian* February 23, 2016 Tuesday AGL boss: regardless of climate science BYLINE: Michael Slezak and Martin Farrer
- 908- Negative emissions can refer to **carbon capture and storage** technology powered by biomass, geo-engineering of the atmosphere and oceans, or CO₂ removal that sucks emissions out of the air. *The Guardian* February 15, 2016 Monday Europe's climate change goals 'need profound lifestyle changes' BYLINE: Arthur Neslen
- 909- The White House said in a conference call with reporters on Friday afternoon that Obama would seek more funds for research into battery storage, electric cars, and cleaner fuels. The budget will also seek substantial funding for research into nuclear reactors and **carbon capture and storage** technology - both technologies favoured by Republicans. *The Guardian* February 6, 2016 Saturday Obama using final budget request to push for action against climate change BYLINE: Suzanne Goldenberg
- 910- The CCC also issued a stern warning on the future of **carbon capture and storage (CCS)** technology. (...) Last year, the government scrapped a long-standing competition offering at least £1bn in funding for CCS. The future of the fledgling technology in the UK is now in doubt. *The Guardian* January 28, 2016 Thursday No need to tighten UK carbon budget in light of Paris deal BYLINE: Fiona Harvey
- 911- In November, the government cancelled its £1bn competition for **carbon capture and storage (CCS)** technology, despite the project being in the Conservative party's election manifesto. *The Guardian* January 13, 2016 Wednesday David Cameron denies 'backsliding' on the environment BYLINE: Damian Carrington
- 912- Why did you scrap the **carbon capture and storage** investment despite promising to put £1bn into it? (...) Two MPs have already said they want to ask Cameron about carbon **capture and storage** technology. Here is my colleague Rowena Mason's preview story. (...) David Cameron is to be questioned about his broken pledge to spend £1bn developing carbon **capture** technology when he appears before a Commons committee. Before his appearance before the liaison committee at 4pm on Tuesday, the prime minister was accused of double standards for abandoning a commitment to hold a competition to encourage the development of **carbon capture and storage (CCS)**, which could lead to decarbonisation of coal and gas, at the same time as professing to be serious about tackling climate change. *The Guardian* January 12, 2016 Tuesday Cameron questioned by MPs about Syria, climate change and flooding BYLINE: Andrew Sparrow
- 913- One of the key talking points will be to examine the justification for the controversial decision to axe support for **carbon capture and storage (CCS)** technology. *telegraph.co.uk* January 12, 2016 Tuesday David Cameron grilled on Syria and climate change at Liaison Committee; David Cameron is questioned by MPs on Syria and climate change, with accusations of breaking pledge on developing £1bn carbon **capture** technology
- 914- The green claims are in part because of timber's ability to **sequester** carbon. When trees are growing, they suck carbon dioxide out of the air. When they're processed into building materials, much of that CO₂ stays locked in and will remain there for the lifespan of the building. The potential savings are enormous. In a 2014 Ted Talk, Canadian architect Michael Green said a 20-storey timber building would **sequester** 3,150 tons of CO₂, compared with 1,215 tonnes of CO₂ emissions for a

concrete building, a net difference of 1,935 tons, which is equivalent to removing about 900 American cars from the road for a year. *The Sunday Times* November 20, 2016 Sunday Award-winning artisans branch out and make wood a growth industry BYLINE: JEFF COLLEY

- 915- An international aspiration to cap the rise to 1.5C, seen as crucial to the viability of low-lying nations, already appears to be slipping out of reach. As-yet undeveloped technology, such as geo-engineering of landscapes, **carbon capture** from power plants or direct removal of CO₂ from the atmosphere, may be required even if emissions are radically cut. (...) Radiocarbon dating of soils, when combined with previous models of carbon uptake, has shown the widely assumed potential for carbon **sequestration** to combat climate change has been overestimated by as much as 40%. *The Guardian* September 22, 2016 Thursday Soil carbon storage not the climate change fix it was thought BYLINE: Oliver Milman
- 916- One sector that is lagging on energy efficiency is industry, but technology to **capture** and bury CO₂ from plants is being tested and ways to clean up cement-making are also being explored. *The Guardian* November 8, 2017 Wednesday The seven megatrends that could beat global warming BYLINE: Damian Carrington
- 917- But the biggest worry is the very limited support for **carbon capture and storage**, the technology that takes emissions from fossil fuels and buries them under the ground. *The Guardian* October 12, 2017 Thursday UK climate change masterplan BYLINE: Damian Carrington
- 918- There is also £120m of funding for research on **carbon capture and storage (CCS)**. However, that is a fraction of the £1bn government competition on the technology that was axed two years ago. *The Guardian* October 12, 2017 Thursday Draughty homes targeted in UK climate change masterplan BYLINE: Adam Vaughan
- 919- The Government said it will spend £100m on technology that enables the **capture** of emissions and carbon dioxide on a national scale. (...) The Government is legally bound by the UK's Climate Change Act, passed by Parliament in 2008, to set budgets geared towards achieving its 2050 target. In 2016, the energy and power sector recorded its biggest annual fall since 1990. In June, renewable energy supplied over half of the UK's power for the first time in history. *The Independent* October 12, 2017 Thursday UK Government pledges £2.5bn to tackle climate change BYLINE: Shafi Musaddique
- 920- They range from cleaner diesel engines to **methane-capture** infrastructure. (...) Aggressive measures to curtail the use of fossil fuels and emissions of so-called short-lived climate pollutants such as soot, methane and HFCs would need to be accompanied by active efforts to extract CO₂ from the air and **sequester** it before it can be emitted. *MailOnline* September 15, 2017 Friday The chance of 'catastrophic' climate change completely wiping out humanity by 2100 is now 1-in-20 BYLINE: TIM COLLINS
- 921- Giant biological machines could be created to do this by growing vegetation which absorbs carbon, then burning the resulting biomass in power stations that **capture** the emissions (...) The world would have to bring about a "complete shift" to an energy system based on renewables, nuclear, hydrogen, and bioenergy-with-**carbon-capture-and-storage**. (...) However their models showed direct air **capture** and other methods to reduce greenhouse gases could bring temperatures back down to within the Paris targets. *The Independent* August 21, 2017 Monday World has missed chance to avoid dangerous global warming - unless we start geo-engineering the planet BYLINE: Ian Johnston
- 922- A widely shared article by David Wallace-Wells in *New York* magazine last month sketching out some worst-case scenarios included an interview with pioneering climate scientist Wally Broecker, now 84, who no longer believes even the most drastic reductions in carbon emissions are sufficient to avert disaster. Instead, he puts his hopes in **carbon capture** and geoengineering. Others oppose anything that smacks of a techno-fix, believing the very idea that human ingenuity can get us out of this mess is yet another form of denial. The human reaction - or lack of one - to climate change is a subject of interest in itself. The novelist Amitav Ghosh wrote *The Great Derangement*, a book about why fiction writers mostly ignore the subject, and argued that the profound alteration of Earth's climate is difficult to think

about. Wallace-Wells, in New York magazine, refers to "an incredible failure of imagination". Politics, supposed to help us make sense of the world, has sometimes been more hindrance than help: is climate change really an inconvenient truth, because it means we have to give up eating beef and taking long-distance flights, or a too-convenient truth for anti-capitalists who want to bring down the financial system? *The Guardian* August 18, 2017 Friday We saved the whale. BYLINE: Susanna Rustin

- 923- Other more expensive methods, such as burning biomass in power plants fitted with **carbon-capture-and-storage** or devices that can remove carbon from the air directly, might also be necessary and would become increasingly needed if steps were not taken soon. (...) If it was to be fitted with **carbon-capture-and-storage (CCS)**, it would create the type of negative emissions system envisaged in the paper. Drax was involved in the White Rose project to build a £1bn CCS plant but pulled out after cuts to renewable energy subsidies by the Government. *The Independent* July 18, 2017 Tuesday Carbon dioxide must be removed from the atmosphere to avoid extreme climate change BYLINE: Ian Johnston
- 924- A central paradox - and to sceptics, the ultimate hypocrisy - of this city's environmental self-branding is that, at heart, Rotterdam's economy continues to rely on the fossil fuel industry. How the port eventually transitions to a greener economy, authorities concede, is the greatest challenge they face, along with climate change. They describe plans for immense wind farms in the North Sea and strategies to **capture** heat from fuel-burning factories to warm the greenhouses that supply the country's agricultural yield. The Netherlands exports nearly \$100bn (£786bn) a year in agricultural products, second only to the United States. *The Independent* June 29, 2017 Thursday The Dutch have solutions to rising seas BYLINE: Michael Kimmelman
- 925- Other measures included helping to develop a **carbon capture and storage** system, looking for ways to remove carbon from the atmosphere, having a contingency plan to delays to planned project - "for example of new nuclear power plants" - and the tight regulation of fracking operations to ensure a rapid response to leaks. *The Independent* June 29, 2017 Thursday Government's own environment experts slam its 'unjustifiable' lack of action on climate change BYLINE: Ian Johnston
- 926- A Swiss company has opened what is believed to be the world's first 'commercial' plant that sucks carbon dioxide from the atmosphere, a process that could help reduce global warming. And its "super-ambitious" vision is to **capture** one per cent of annual global carbon emissions by 2025, which would involve building hundreds of thousands of the devices. (...) The **captured** gas is currently being sold, appropriately enough, to a greenhouse that grows fruit and vegetables. (...) The European Union and some other countries around the world have put a price on carbon for some major emitters, but environmentalists have complained it is too low and fails to reflect the true cost. *The Independent* June 23, 2017 Friday Swiss firm Climeworks begins sucking carbon dioxide from the atmosphere in fight against climate change; Company's 'super ambitious' plan is to **capture** one per cent of annual emissions by 2025 BYLINE: Ian Johnston
- 927- The new podcast interview with Butler traverses the Finkel review and Labor's likely response, and the party's attitude to coal - both in supporting research into **carbon capture and storage** technology, and the Adani coalmine. *The Guardian* June 22, 2017 Thursday Adani mine 'not a positive thing for Australia' BYLINE: Katharine Murphy
- 928- ARPA-E has attracted a fair share of criticism in recent years: The Heritage Foundation, a conservative think tank, has argued that too many of the agency's early grants went to companies that had previously received private investment for similar technologies, suggesting that the agency was not always filling a need by pursuing high-risk areas of research. And in his 2018 fiscal year budget, Trump proposed abolishing ARPA-E, which currently spends about \$300 million per year, arguing that "the private sector is better positioned to advance disruptive energy research." (...) To the contrary, the panel said in its evaluation that the agency had made vital progress in nudging forward research on projects like advanced carbon **capture** and grid-scale battery storage. *The Independent* June 14, 2017 Wednesday Donald Trump's plan to scrap key climate change research institute condemned by energy scientists BYLINE: Brad Plumer

- 929- The government carefully floats the idea of a low-emissions energy target - not dissimilar to the existing renewable energy target, which could be reasonable policy but could also be risible if the emissions benchmarks allow it to cover what the minerals' industry PR likes to refer to as "low-emissions" coal-fired power without insisting its emissions be **captured** and **stored**. *The Guardian* June 3, 2017 Saturday It's way past time to speak truth to climate arguments this stupid BYLINE: Lenore Taylor
- 930- This week the government also began to prepare the ground for the Finkel review by announcing it would change the rules governing the Clean Energy Finance Corporation to allow investments in **carbon capture and storage** - to make the government's so-called "green bank" more technology-neutral in its outlook. *The Guardian* June 2, 2017 Friday Climate Change Authority tells government to adopt emissions intensity trading scheme BYLINE: Katharine Murphy
- 931- The funds from OGCI are meant to go towards four key areas: **carbon capture and storage (CCS)**, natural gas, industrial energy efficiency, and transportation energy efficiency. (...) The technology allows companies to extract and burn fossil fuels, but instead of releasing them into the atmosphere **CCS-enabled facilities "capture"** the carbon emissions and **store** them, usually in containers underground. *The Independent* May 19, 2017 Friday World's biggest oil companies urge Donald Trump to stay in Paris climate change agreement BYLINE: Mythili Sampathkumar
- 932- The Obama rule requires oil and gas companies operation on federal or tribal lands to actively identify leaks and then fix them. The rule also puts a limit on the allowable amount of venting and flaring and tells producers to **capture** natural gas. *The Independent* May 11, 2017 Thursday Republicans fail to cut an Obama climate change rule to reduce greenhouse gases BYLINE: Clark Mindock
- 933- Drax, Britain's biggest power station, is already burning millions of tonnes of American wood pellets a year but none of the CO₂ is **captured** during combustion and a report said the impact on the climate was worse than burning coal. (...) The Intergovernmental Panel on Climate Change said in 2014 that "widespread" use of bioenergy with **carbon capture and storage (Beccs)** would probably be needed to stop the world warming by 2C, the limit that all countries have agreed should not be exceeded to avoid the worst effects of climate change. (...) **Beccs** will require huge subsidies, including funds to fit power stations with the new technology. In 2015, the government cancelled a £1 billion competition for **carbon capture and storage** demonstration projects. *The Times* April 21, 2017 Friday Fast-growing trees may be answer to climate change BYLINE: Ben Webster
- 934- Deep in the jagged red mountains of Oman, geologists are drilling in search of the holy grail of reversing climate change: an efficient and cheap way to remove carbon dioxide from the air and oceans. They are coring samples from one of the world's only exposed sections of the Earth's mantle to uncover how a spontaneous natural process millions of years ago transformed CO₂ into limestone and marble. As the world mobilizes to confront climate change, the main focus has been on reducing emissions through fuel efficient cars and cleaner power plants. (...) In all, 16 industrial projects currently **capture and store** around 27 million tons of CO₂, according to the International Energy Agency. (...) They hope to answer the question of how the rocks managed to **capture** so much CO₂ over the course of 90 million years - and to see if there's a way to speed up the timetable. *MailOnline* April 13, 2017 Thursday Scientists seek holy grail of climate change in Oman's hills
- 935- However attempts to **capture** emissions from coal-fired power plants in a cost-effective way, so they do not contribute to global warming or pollute the atmosphere, are still ongoing. Mr Trump has talked about trying to promote this 'clean coal'. *The Independent* March 16, 2017 Thursday Donald Trump proposes huge EPA budget cut to stop environment agency researching climate change BYLINE: Ian Johnston
- 936- Shell is already the biggest provider of renewable energy in the US through its wind farms. It is planning to invest \$1bn a year in green technologies, and **carbon capture and storage**. *The Daily Telegraph* March 10, 2017 Friday Brace for fall in oil use BYLINE: Ambrose Evans-Pritchard

- 937- The plan sets out that by 2032, Scotland will have a fully decarbonised electricity sector able to remove CO₂ from the atmosphere with the use of technologies such as carbon **capture and storage**, with 80 per cent of domestic heat provided by low-carbon heat technologies. *telegraph.co.uk* January 20, 2017 Friday Scottish drivers face pollution charges in battle against climate change
- 938- The acceleration of tree size growth could be beneficial - **sequestering** more carbon and providing more ecosystem services for cities such as reduced storm water runoff. (...) Across the other zones, accelerated tree size growth means increased Carbon **sequestration** and earlier provision of many ecosystem services - such as air pollution reduction and reduction in storm water runoff. *MailOnline* November 16, 2017 Thursday Climate change is 'turbocharging' the growth of trees in cities - and it could help reduce storm water flooding BYLINE: CECILE BORKHATARIA
- 939- For much of the past 20 years, indigenous groups have been a disgruntled, fractious presence on the fringes of climate talks who were primarily portrayed as victims, but this has gradually changed along with a growing body of research showing that respect for the territorial rights of communal land is one of the most cost-effective ways of **sequestering** carbon. *The Guardian* November 15, 2017 Wednesday Indigenous groups win greater climate recognition at Bonn summit BYLINE: Jonathan Watts
- 940- Previous studies have proposed that the ancient environmental event was caused by the **release** of carbon from frozen methane buried in rock. (...) An unexpected finding was that enhanced organic matter burial was important in ultimately **sequestering the released** carbon and accelerating the recovery of the Earth's ecosystem without massive extinctions. *MailOnline* August 30, 2017 Wednesday Volcanic eruptions may have driven a major global warming event 56 million years ago that triggered the evolution of primates BYLINE: TIM COLLINS
- 941- The measures, which have the strong support of Russia, include such techniques as cooling the Earth by spraying sulphate aerosols into the stratosphere to reflect sunlight, or fertilising the oceans with iron to create **carbon-capturing** algal blooms. *Independent.co.uk* October 1, 2013 Tuesday Plan to use financial markets to halt climate change is 'doomed' BYLINE: Tom Bawden
- 942- The human suffering likely from uncontrolled greenhouse gas emissions may have been "grossly underestimated" because of weaknesses in scientific methods predicting the future, according to Lord Stern of Brentford. The author of the influential Stern review on the economics of climate change says in a new report that computer models could be "profoundly misleading" because many fail to include risks of ice sheets melting, rainforests collapsing and vast amounts of methane being **released** from the seabed. (...) A spokesman for Lord Stern said it was a coincidence that his report was released as the Intergovernmental Panel on Climate Change (IPCC) prepared to launch a "Summary for Policymakers" to guide political decisions about cutting emissions. (...) He (Lord Stern) also said that the full range of technologies, from nuclear and renewables to methods for **capturing and storing** carbon from power stations, would be needed to address the problem and that energy efficiency measures would play a significant role. *The Times* September 25, 2013 Wednesday Climate change forecasters 'failed to see human costs' BYLINE: Ben Webster (my addition in parenthesis)
- 943- Its (IPCC) report also examines carbon dioxide removal, with ideas such as sowing the seabed with iron to stimulate the growth of plankton that would then absorb carbon, as well as **capturing** carbon dioxide from the air and **storing** it in either land or sea. (...) Sulphate particles, or aerosols, injected into the stratosphere could also reflect sunlight - but the report highlights concerns over the potential stratospheric ozone depletion this may cause. *Independent.co.uk* September 22, 2013 Sunday Salt the clouds to save the planet: UN's climate change panel considers ways to reduce greenhouse gas emissions BYLINE: Chris Stevenson (my addition in parenthesis)
- 944- There are a couple of startup companies looking at what chemical processes might be the best ones for **capturing** CO₂. [For] storage there are already demonstration projects globally. (...) How would we

capture CO2? *The Observer* November 6, 2014 Thursday Geoengineering: the ethical problems with cleaning the air
BYLINE: Nicola Davis

- 945- The balloon can also be used for other applications such as **capturing** carbon dioxide from the burning of fossil fuels, enriching the oxygen content in air for efficient combustion engines, hydrogen gas production and processes to generate plastic. (...)The material, which has tiny holes invisible to the human eye, is highly porous so it **captures** harmful chemicals as they pass. (...) So new low-cost technologies are said to be needed to give industry the incentive to **capture** it. *MailOnline* September 4, 2014 Thursday Could this 'skin' stop global warming? Membrane **captures** greenhouse gases - but lets oxygen pass through BYLINE: VICTORIA WOOLLASTON
- 946- Announced Wednesday were eight joint projects aimed at **capturing and storing** carbon and setting up more efficient power distribution networks. They also agreed to raise fuel efficiency standards for cars and trucks and to study gas use in industrial boilers. *MailOnline* July 10, 2014 Thursday China, US closer on North Korea, climate change
- 947- Grow crops that absorb carbon dioxide, then burn them for energy, while **capturing** the carbon-dioxide emissions. *i-Independent* April 14, 2014 World must end 'dirty' fuel use to avoid disaster, warns the UN BYLINE: Emily Beament, Oliver Wright
- 948- Beijing and Washington launched a climate change discussion last year, promising progress in five areas: reducing vehicle emissions; advanced electric power grids; **capturing and storing** carbon emissions; gathering greenhouse gas data; and building efficiency. *MailOnline* February 17, 2014 Monday John Kerry warns climate change is 'the world's most fearsome weapon of mass destruction'
- 949- Most of the money has been spent helping Britain adapt to cope with the effects of global warming, such as by investing in research projects and giving advice on how to deal with water shortages, soil erosion, and extreme weather. The rest is being spent on curbing the extent of climate change, for example by monitoring and **capturing** methane emissions which contribute to global warming and ensuring carbon emissions from agriculture comply with UN and EU regulations. *Independent.co.uk* January 27, 2014 Monday Exclusive: Climate scepticism blamed as Owen Paterson slashes spending on global warming BYLINE: Tom Bawden
- 950- The Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC) is working with cities including Rio de Janeiro and São Paulo on the Municipal Solid Waste (MSW) initiative which aims to reduce methane and air pollution through the dissemination and implementation of best practice waste management policies and strategies such as closing open dumps and **capturing** landfill gas. *The Guardian* April 7, 2015 Tuesday Everyone praises green Copenhagen. BYLINE: Francesca Perry
- 951- It (the US report on geoengineering) would involve **capturing** carbon dioxide from the atmosphere and pumping it underground at high pressure - similar to technology that is only now being tested at a small number of coal plants. Sucking carbon dioxide out of the air is much more challenging than **capturing** it from a power plant - which is already prohibitively expensive, the report said. But it still had a place. (...) The interventions would do nothing to reduce the greenhouse gas emissions that are in the atmosphere - but merely mask some of the symptoms. It would do nothing to right ocean chemistry, which was thrown off kilter by absorbing those emissions. *The Guardian* February 10, 2015 Tuesday Geoengineering should not be used as a climate fix yet BYLINE: Suzanne Goldenberg (my addition in parenthesis)
- 952- According to Flannery (scientist), this means that our best bets for saving the planet may lie in ground coffee beans, seaweed, silicate roofing and cement, all of which can be used to **capture and store** carbon. (...) This is a new possibility, but a group of South Korean researchers has recently found a way of using old coffee grounds to **capture** atmospheric methane. (...) Many of the chemical processes, such as creating carbon fibres or carbon-absorbing cement, often require more energy than

they are currently able to save. But if the planet really is in as much danger as many climate change scientists tell us, then we may need all the coffee beans and seaweed we can get our hands on. *The Sunday Times* November 29, 2015 Sunday Seaweed and cement, a planet-saving recipe; Innovative, even bizarre, ways of **capturing** carbon offer mankind its best hope of beating global warming BYLINE: Josh Glancy (my addition in parenthesis)

- 953- The sheer scale of renewable project cancellations came to light a day after the Government scrapped a £1bn pilot project to develop **carbon capture and storage** technology. This aims to help the climate by **capturing** the carbon dioxide emitted by coal and gas power stations and pipe it underground. *Independent.co.uk* November 26, 2015 Thursday Renewable energy: Many green power plants planned for UK 'will not be built' BYLINE: Tom Bawden
- 954- Supporters told us they wanted to hear more about the positive climate stories - the new technologies that are **capturing** the sun's energy even more efficiently; the rapid drops in the price of renewable energy; the currently off-grid communities in Africa that are developing clean power; the smart technology helping homeowners to use less energy. *The Guardian* October 12, 2015 Monday A story of hope: the Guardian launches phase II of its climate change campaign; With crucial climate talks on the horizon, Keep it in the ground turns its focus to hope for the future - the power to change and the solar revolution. BYLINE: James Randerson
- 955- Another \$200m went to ensure that garbage dumps, mines and livestock operations that were already **capturing** the potent greenhouse gas methane kept on doing what they were already doing. *The Guardian* September 25, 2015 Friday The inconvenient truth about Direct Action comes from Tumbull himself BYLINE: Lenore Taylor

NEW - Materialisation scenarios

NEW - TRANSFORMED HOUSE scenarios:

- 1- In fact, life on Earth owes its existence to the **greenhouse effect**. *The Guardian* December 5, 2002 Global warming is good for you
- 2- But the United Nations Environment Programme states that the largest contributor to the **natural greenhouse effect** is water vapour, which is not directly affected by human activity. They are talking about things like clouds. *The Sunday Telegraph* August 25, 2002, Hot air won't save the world New Age guff about 'alternative lifestyles' will not protect us from climate change. BYLINE: Austin Williams
- 3- Carbon dioxide traps heat from the sun and keeps the earth warm - the **natural greenhouse effect**. *The Observer* May 12, 2002 ESCAPE: ECO TOURISM: Global warming: the future BYLINE: Joanna Walters
- 4- Professor Bill Harriman's conclusions are a dramatic shift from the traditional assumptions that ancient shifts in the levels of the **greenhouse gases** carbon dioxide and methane were **the work of nature, not humans**. *The Times* December 11, 2003, Thursday Humans began global warming 8,000 years ago BYLINE: Elaine Monaghan
- 5- Contrarians will, rightly, question how much of **the greenhouse effect** is due to **natural** causes but the world community is, for once, more or less united. *The Guardian* December 12, 2005 Monday Leading article: Global warming: Climate improves at Montreal
- 6- Contrails are clouds of tiny ice particles that reflect light and heat. They have opposing effects on the Earth's **natural greenhouse effect**. They tend to **trap** more heat leaving the ground than they reflect

back into space. *The Independent* June 15, 2006 Thursday Night flights much worse for global warming BYLINE: Steve Connor

- 7- Scientists fear the destruction of the ozone layer and **greenhouse gases** such as carbon dioxide could raise global temperatures and melt the polar ice caps. The resulting rise in sea level would flood most low-lying areas in the world, including much of Britain. On the postcards Edinburgh Castle becomes a tiny island and the Millennium Dome in Greenwich has just the top of its frame poking out of the sea. *Sunday Mirror* November 24, 2002, Sunday AWASH YOU WERE HERE; GLOBAL WARMING POSTCARD WARNING BYLINE: Rupert Hamer
- 8- Who, other than President Bush, would dare to dispute the reality of global warming? With such hard evidence visible to all, it seems patently obvious that **man-made greenhouse gases** are causing a catastrophic change to the world's climate. *The Independent* March 20, 2002, Wednesday CLIMATE OF CHANGE IS HERE FOR GOOD BYLINE: Steve Connor
- 9- Carbon dioxide, the main **greenhouse gas** for which **industrial man is blamed**, accounts for only a minute proportion of the atmosphere. *DAILY MAIL* February 25, 2002 The great global warming con-trick BYLINE: Melanie Phillips
- 10- The simple answer, in scientific terms, is to reduce dramatically the **man-made greenhouse gases** released into the atmosphere. *The Guardian* January 29, 2002 Global warning: Debate: Time to make a difference: Industrialised and developing countries don't necessarily agree about global warming BYLINE: Paul Brown
- 11- WHEN the booming industrial revolution began, **polluting** the world's atmosphere with **greenhouse gasses** [sic]- mostly CO₂ - some scientists warned that we were fazing a drastic climate change. *The Express* October 22, 2001 CLIMATE CHANGE COULD BE A FACTOR IN RISING VIOLENCE
- 12- THE WORLD is 90 per cent certain to experience a potentially catastrophic global warming over the next century **caused by man-made emissions of greenhouse gases**, scientists say. (...) However, even rapid attempts to mitigate the effects of global warming were unlikely to have an impact for many years. *The Independent* July 20, 2001, Friday CATASTROPHIC CLIMATE CHANGE '90% CERTAIN' BYLINE: Steve Connor
- 13- What is the Climate Change Convention? An agreement made by more than 150 countries at the Earth Summit in Rio in 1992 to limit man-made emissions of **greenhouse gases** to stop the atmosphere overheating. What are **greenhouse gases**? The main ones are carbon dioxide, methane, and nitrous oxide. They prevent the reflected heat of the sun's rays escaping back into space, **like the glass in a greenhouse**. (...) But is that enough to solve the problem? Nowhere near. There is already enough **additional greenhouse gas** in the atmosphere to alter the climate, but we can stave off the worst if we cut **man-made greenhouse gas production** by 60% to 80% as soon as possible. The temperature will then stabilise at 5C higher than now. *The Guardian* July 14, 2001 The heat is on for a solution in Bonn BYLINE: Paul Brown
- 14- The (IPCC) report comes as politicians prepare to meet in Bonn next week to revive the issues of the failed Kyoto treaty on climate change. The U.S. has refused to sign the treaty to reduce industrial gases

and Japan and Australia are still to sign. (...) The report states that existing manmade emissions of **greenhouse gases** will continue to **affect** climates for many more generations, with **the effects already visible**. *DAILY MAIL* July 12, 2001 New fear on global warming BYLINE: Myranda Mowafi (my addition in parenthesis)

- 15- The area of greatest doubt relates to the accuracy of the computer models used by climate researchers in gauging the effect of pumping out millions of tons of **greenhouse gases from factories, cars and homes in the industrial world**. (...) One of the most difficult areas is distinguishing between natural variation in climate - an inherently "chaotic" system - and changes resulting from the man-made emissions of **greenhouse gases**. Computer models have attempted to tease apart the natural "forcing" of **the greenhouse effect from man-made, or anthropogenic influences**. A positive "radiative forcing", such as that caused by an **increasing concentration of greenhouse gases** in the atmosphere, tends to warm the Earth's surface. *The Independent* July 12, 2001, Thursday GLOBAL WARMING REPORT: THE DOUBTS - EFFECT OF POLLUTION WILL LAST FOR GENERATIONS BYLINE: Steve Connor

- 16- In a report published today by the United Nations Intergovernmental Panel on Climate Change (IPCC), hundreds of the world's leading scientists give their unqualified support to the view that global warming is real and that the release of **man-made greenhouse gases** is largely **responsible**. (...) Existing man-made emissions of **greenhouse gases** will continue to **affect** climate for generations to come (...) Other important **greenhouse gases** - which help to **trap** solar heat in the atmosphere - have also increased. *The Independent* July 12, 2001, Thursday GLOBAL WARMING REPORT: CLIMATE CHANGE - INDUSTRIAL POLLUTION CAUSE OF CLIMATE INSTABILITY BYLINE: Steve Connor

- 17- The White House is increasingly aware that the administration's brusque rejection of Kyoto, a 1997 international accord to curb **the build-up of greenhouse gases** in the atmosphere - coupled with Mr Bush's withdrawal of a campaign pledge to cut carbon dioxide emissions - has been a public relations disaster both at home and abroad. *The Guardian* June 9, 2001 Bush flies into a firestorm BYLINE: Julian Borger and Ian Black

- 18- Withdrawal by the US from Kyoto tolls a death knell for the treaty, because although it accounts for only 4 per cent of the **world's population**, it is responsible for 25 per cent of the emissions of gases that **cause the greenhouse effect**. *The Observer* April 1, 2001 Global warming: The President who bought power and sold the world BYLINE: Ed Vulliamy

- 19- The White House's stance represents a serious defeat for Ms Whitman and the treasury secretary, Paul O'Neill, who said last month that **the accumulation of greenhouse gases** was "a very big problem" and that the emissions controls laid down in the Kyoto treaty did not go far enough. *The Guardian* March 29, 2001 Bush kills global warming treaty BYLINE: Julian Borger

- 20- Mr Bush's move came as scientists found the first direct evidence that **the greenhouse effect has become significantly stronger** over the past 30 years, causing the global warming detected by climatologists. **Greenhouse gases**, such as CO₂, now play a far greater role in trapping solar radiation - which would otherwise be reflected by the Earth back into space - than a generation ago, the study found. (...) Although the scientists are confident that they have measured **the worsening greenhouse effect**, they admit that the data fall short of definitive proof that it is the result of increases in man-made pollutants. (...) The scientists, led by Professor John Harries of Imperial College, London, found that over the past 30 years the ability of **greenhouse gases**, notably CO₂, to **trap** the Sun's heat has

increased measurably, possibly because **greenhouse gases** have increased over that time. *The Independent* March 15, 2001, Thursday BUSH DROPS PLEDGE ON CARBON DIOXIDE EMISSIONS BYLINE: Mary Dejevsky, Steve Connor And Michael Mccarthy

- 21- But as **greenhouse gas pollution** increases, the bill is likely to rise more dramatically, to pounds 200bn per year by 2050. *The Guardian* February 3, 2001 Fears of insurance no-go zones as global warming claims rise BYLINE: Paul Brown
- 22- There is as yet no consensus on what constitutes dangerous climate change, or at what level **greenhouse gas concentrations** should be stabilised to avoid it. *The Guardian* November 24, 2004 Society: Environment: Clean air act: Steps must be taken fast if climate change is to be tackled BYLINE: David King
- 23- TONY Blair was under growing pressure last night to make fighting global warming as high a priority as combating terrorism amid new evidence that climate change is accelerating dramatically. American researchers have found that **concentrations of the main greenhouse gas**, carbon dioxide, have risen at an unprecedented rate for two years running. *The Express* October 12, 2004 GLOBAL WARMING IS OUT OF CONTROL BYLINE: John Ingham
- 24- This growth is what most scientists believe is causing the earth's atmosphere to warm up, as the increasing CO2 retains more and more of the sun's heat in the atmosphere, **like the panes of a greenhouse**. *The Independent* October 11, 2004, Monday SURPRISE CO2 RISE MAY SPEED UP GLOBAL WARMING BYLINE: MICHAEL MCCARTHY
- 25- GLOBAL WARMING: HOW FEEDBACK' CAN SUPPRESS THE EARTH'S ABILITY TO **REMOVE GREENHOUSE GASES** *The Independent* October 11, 2004, Monday BYLINE: MICHAEL MCCARTHY
- 26- The lungs would consist of vast colonies of bacteria and other microbes that are able to **scrub the atmosphere of greenhouse gases** such as carbon dioxide and methane. *THE DAILY TELEGRAPH* September 29, 2004, Wednesday Can these bugs save the planet? BYLINE: Roger Highfield
- 27- Ten of the past 14 years have been the hottest recorded, and this is linked by scientists to a rapid rise in levels of **greenhouse gas concentrations** in the atmosphere - which according to ice core samples tested in the Antarctic, are the highest in 440,000 years and still rising. Almost all climate scientists, atmospheric chemists and oceanographers say the **greenhouse effect has arrived** and that we should expect more droughts, hurricanes, flash floods, forest fires and giant storms. The kind of extreme weather that happened once in 100 years, they say, could soon take place every 20 years. *The Guardian* August 27, 2004 G2: In Pictures: The planet goes haywire BYLINE: John Vidal
- 28- The discovery has been made by Sheffield and Bristol researchers who were investigating Earth's ancient **greenhouse crisis**. (...) Molecule for molecule, these gases are much more effective at **trapping** solar heat than carbon dioxide. *The Observer* July 11, 2004 Global warming: it really started 50 million years ago BYLINE: Robin McKie

- 29- Analysis of the core has already suggested that the next ice age lies 15,000 years in the future. But the prospect of a stable climate has been thrown into doubt by human activity causing global warming. The ice also shows that **today's greenhouse gas concentrations** in the atmosphere are by far the highest for at least 440,000 years. (...) So far bubbles of air in the ice core have been examined for **greenhouse gas concentrations** for its first 440,000 years. *The Times* June 10, 2004, Thursday Hot news from 740,000 years ago tells us to get ready for catastrophic climate change BYLINE: Mark Henderson
- 30- The only real solution to replacing the burning of fossil fuels such as coal, oil and gas that is causing **the greenhouse effect**, he (J. Lovelock) said, was a massive and immediate expansion of nuclear power. *The Independent* May 24, 2004, Monday GURU WHO TUNED INTO GAIA AND GAVE FIRST CLIMATE CHANGE WARNING BYLINE: MICHAEL MCCARTHY (my addition in parenthesis)
- 31- What can be done? The problem has been caused by **the build-up of greenhouse gases by human activities**. *The Guardian* January 8, 2004 Leading Article : Global warming: The death of species
- 32- The bottom line, as Weart quietly makes clear, is that the world really is warming further and faster than ever recorded; that **concentrations of greenhouse gases** really are rising every year (...) IT IS almost two centuries since the French mathematician Jean Baptiste Fourier discovered that the Earth was far warmer than it had any right to be, given its distance from the Sun. He concluded that some gases **trapped** heat in the atmosphere. And that if there were **more gases**, our world would warm further. Fourier had discovered **the greenhouse effect**. What a shame that George W Bush still doesn't get it. *The Independent* November 12, 2003, Wednesday UNHEEDED PROPHETS OF CLIMATE CHANGE BYLINE: FRED PEARCE
- 33- The break-up of the ice shelf - floating ice attached to land - shows a relatively rapid temperature rise. The ice, which formed a cap at the end of the 20-mile long Disraeli fjord, was the largest remaining piece of an ice shelf that once ran the length of Ellesmere Island. (...) However, in April 2000, satellite images showed the beginnings of cracking from the eastern side of Ward Hunt Island into the fjord, and by 2001 it had split along its length, then widened in 2002 to 85 yards in some places. The researchers said its disintegration seemed to have been prompted by a century-old local warming trend, and a more recent rapid rise in temperatures. They were not certain it was linked to the **man-made warming** apparently caused by **rising concentrations of greenhouse gases**, but it was one of many signs the Arctic is seeing enormous climatic changes. *The Independent* September 24, 2003, Wednesday CLIMATE CHANGE BLAMED AS LARGEST ARCTIC ICE SHELF BREAKS IN TWO AFTER 3,000 YEARS BYLINE: MICHAEL MCCARTHY
- 34- The name arises because, **like glass in a greenhouse**, gases such as carbon dioxide and water vapour let solar energy in to warm the Earth but also **trap** some of the planet's heat which would normally escape. *THE DAILY TELEGRAPH* August 20, 2003, Wednesday It might get even hotter... BYLINE: Roger Highfield
- 35- Figures reveal that 2005 was the northern hemisphere's hottest. For the entire globe it was the second warmest since records began in 1861, confirming fears that **greenhouses gases are stoking earth's atmosphere**. *The Mirror* December 17, 2005 Saturday ENDANGERED; CAN YOU IMAGINE A WORLD WITHOUT THEM? BYLINE: FROM RYAN PARRY
- 36- The latest study, published today, reveals for instance that **the rise in man-made greenhouse gases** may already be responsible for an increase in drought conditions and risk of famine in eastern Africa.

(...) Richer countries have a responsibility to do something about climate change by stabilising **the rise in greenhouse gas** emissions that they are primarily responsible for, he said. (...) Lord May warns G8 environment ministers that without a definition of target **concentrations of greenhouse gases**, discussions about national emissions targets are nothing more than an academic dispute. *The Independent* October 24, 2005, Monday CLIMATE CHANGE 'COULD RUIN DRIVE TO ERADICATE POVERTY' BYLINE: STEVE CONNOR

- 37- Hurricane modellers Tom Knutson and Bob Tuleya concluded in a major study last year that the potential energy available to hurricanes might increase by 20 per cent in **a high-greenhouse gas world**. (...) A second and bigger source of uncertainty is how many more billions of tons of **greenhouse gases humans will pour into the atmosphere** by burning fossil fuels over the coming decades. *The Independent* September 19, 2005, Monday YOUR PLANET: THE STORM APPROACHES; PART ONE: FACING THE FACTS: DOES CLIMATE CHANGE REALLY THREATEN THE BYLINE: MARK LYNAS
- 38- Since 1978, Britain's soil is estimated to have released an extra 13 million tons of carbon dioxide a year, which is more than the 12.7 million tons a year saved by cleaning up industrial pollution during that period. (...) Scientists believe the findings have major scientific and political implications for the Kyoto treaty on climate change which is aimed at limiting the amount of **man-made carbon dioxide "the major greenhouse gas "** into the atmosphere. *The Independent* September 8, 2005, Thursday VICIOUS CIRCLE OF CO2 EMISSIONS IS SPEEDING UP CLIMATE CHANGE BYLINE: STEVE CONNOR
- 39- If the situation continues as it has done over the past 50 years, and **man-made greenhouse gases continue to rise** as predicted, computer models suggest there will be no sea ice at all at the North Pole by the summer of 2080. *The Independent* August 19, 2005, Friday GLOBAL WARMING: THE INUIT WERE THE FIRST TO HIGHLIGHT ALASKA'S DEVASTATION BYLINE: STEVE CONNOR
- 40- As the Gleneagles communique makes clear, all G8 nations, including the United States, accept that **greenhouse gases from human activities** are causing climate change, and that these emissions need to be reduced. It is now up to governments to set aside their wrangling over whether the Kyoto Protocol targets are too tough and to agree a path to long-term cuts in emissions at the meeting of the UN Framework Convention on Climate Change in Montreal at the end of November. *THE DAILY TELEGRAPH* August 04, 2005, Thursday No cause for rejoicing over report on climate change
- 41- THE G8 agreed to disagree on enough of the climate change agenda to produce a deal that Tony Blair could hail as the start of a new US-backed drive to tackle **the build-up of greenhouse gases**. *The Times* July 9, 2005, Saturday More talk but no action yet on climate change BYLINE: Giles Whittell
- 42- M Chirac presented the deal as a victory for French negotiation last night, listing his five conditions at a press conference. They were a recognition of the reality of climate change and human responsibility for it, a call for urgent action **to slow the build-up of greenhouse gases**, two references to Kyoto in the communique, an undertaking to negotiate a long-term climate-change strategy at the United Nations and to launch a G8 dialogue on market mechanisms for cutting carbon emissions. *The Times* July 8, 2005, Friday A climate change agreement that everyone can love BYLINE: Giles Whittell
- 43- Climate change is real, global warming is occurring and there is strong evidence that **man-made greenhouse gases are implicated in a potentially catastrophic increase** in global temperatures, the

statement says. (...) In a veiled reference to President Bush's reluctance to accept climate change by claiming that the science is unclear, the academies emphasise that action is needed now to reduce **the build-up of greenhouse gases**. (...) The national academies warn that even if greenhouse gas emissions can be stabilised at existing levels, the climate would continue to change as it slowly responds to the extra carbon dioxide. *The Independent* June 8, 2005, Wednesday G8 SCIENTISTS TELL BUSH: ACT NOW " BYLINE: STEVE CONNOR

- 44- The principle is that every person should have **an equal right to emit greenhouse gases**, but the rich nations that **pollute more than their fair share** would have the right to buy permissions to pollute from poorer countries. *The Guardian* May 16, 2005 Drowning by numbers: Blair must convince Bush that carbon trading provides the best chance of dealing with climate change BYLINE: Larry Elliott
- 45- Current scientific belief is that in all that time **concentrations of greenhouse gases** have not been as high as they are now, but the proof should be in these new ice cores. *The Guardian* April 23, 2005 900,000-year-old ice may destroy US case on Kyoto could end global warming doubt BYLINE: Barbara McMahon and Paul Brown
- 46- Many say that the discovery by scientists that there is an unequivocal link between **man-made greenhouse gases and a dramatic heating** of the Earth's oceans, as reported to the American Association for the Advancement of Science, is unlikely to change that. *The Independent* February 19, 2005, Saturday GLOBAL WARMING: WHY BUSH ADVISERS FIGHT THE EVIDENCE ON CLIMATE CHANGE BYLINE: RUPERT CORNWELL
- 47- Tomorrow, after 13 years of negotiation, the Kyoto protocol on climate change comes into force. No one believes that this treaty alone - which commits 30 developed nations to reduce their greenhouse gas emissions by 4.8% - will solve the problem. It expires in 2012 and, thanks to US sabotage, there has so far been no progress towards a replacement. It paroled the worst offenders, the US and Australia, and imposes no limits on the gases produced by developing countries. The cuts it enforces are at least an order of magnitude too small to **stabilise greenhouse gas concentrations** at anything approaching a safe level. *The Guardian* February 15, 2005 Comment & Analysis: Mocking our dreams: The reality of climate change is that the engines of progress have merely accelerated our rush to the brink BYLINE: George Monbiot
- 48- Earth looks as if it is about to overheat. Temperatures are rising, ice sheets are melting and **all the evidence points towards a greenhouse future**. (...) But more recently, the idea of a **greenhouse world** has become a dinner-party conversation topic and suddenly everyone is interested in ways of preventing **the Earth from turning into a sauna**. (...) An increase in the high-level, wispy, cirrus clouds would actually have the opposite of the desired effect: making the Earth warmer as they **trap** more heat in. *The Guardian* February 10, 2005 Life: Clouds could clear way to saving planet BYLINE: Kate Ravilious
- 49- Yet global warming is one of this year's big topics of debate for the World Economic Forum annual meeting in this Swiss Alpine resort, and despite mounting scientific evidence that it may already be too late to **halt and correct the build up of greenhouse gases**, there appears to be some cause for optimism. *The Independent* January 31, 2005, Monday DAVOS MAKES RUNNING ON CLIMATE CHANGE BYLINE: JEREMY WARNER
- 50- David Stainforth of Oxford University, the chief scientist of the latest study, said processing the results showed the Earth's climate is far more sensitive to **increases in man-made greenhouse gases** than

previously realised. (...) Attempts to control global warming, based on the Kyoto treaty, concentrated on stabilising the emissions of greenhouse gases at 1990 levels, but the scientists warned that this might not be enough. *The Independent* January 27, 2005, Thursday GLOBAL WARMING IS TWICE AS BAD AS PREVIOUSLY THOUGHT' BYLINE: STEVE CONNOR

- 51- Around 30 of them (climate models) have been built in scientific institutions, and they calculate the rate at which the planet will warm because of the continuing increase in emissions of **industrial waste gases**, such as carbon dioxide (CO₂), which retain the sun's heat in the atmosphere **as a greenhouse would do**. (...) NUGEM cannot provide perfect predictions of events many years hence. But it may give warnings that will be crucial in the world's response to global warming, the biggest challenge the planet has faced. And it is a lot better than chicken entrails. Or even the Delphic oracle. *The Independent* January 17, 2005, Monday WORLD'S MOST POWERFUL COMPUTER TO HELP EXPERTS PREDICT CLIMATE CHANGE BYLINE: MICHAEL MCCARTHY
- 52- **The greenhouse effect is fast approaching the point of no return**, he (Oliver Postgate, animator) warns bleakly. Without strict rationing to drastically reduce energy consumption, the Earth will end in panic, chaos and violence. *Daily Mail* November 2, 2006 Thursday Could Bagpuss save the world? BYLINE: DAVID JONES (my addition in parenthesis)
- 53- The rise in temperature attributable to these **so-called anthropogenic greenhouse gases** is comparatively small, but as the atmosphere becomes warmer it can support more water vapour and this, in turn, magnifies the increase in temperature. *The Sunday Telegraph* October 29, 2006 Sunday The temperature is as likely to go down as up Is global warming happening? BYLINE: PHILIP EDEN
- 54- Scientists reckon **the concentration of greenhouse gases** in the atmosphere has reached 380 parts per million - having moved between 180 and 280 during the half million years before the industrial revolution. These levels are now rising fast - at 2 ppm per year. (...) If that happens, **the concentration of greenhouse gases** could easily be three times the maximum pre-industrial levels. *The Sunday Telegraph* October 8, 2006 Sunday Arnie, not Dubya, has it right on climate change BYLINE: Liam Halligan
- 55- **When you add the concentrations of CO₂ and the other greenhouse gases together**, you get a figure known as "CO₂ equivalent". *The Guardian* September 21, 2006 Thursday Comment & Debate: The threat is from those who accept climate change, not those who deny it BYLINE: George Monbiot
- 56- A recent study by the International Energy Agency reckoned that the speedy introduction of best practice in energy conservation and in substitutes for fossil fuels would not be enough to prevent some continuing rise in **the atmospheric concentration of greenhouse gases**. The trouble is, our living standards are inextricably related to our use of energy, and especially to fossil fuel. Of course, we can increase energy from re-newables such as wind and solar power. But these account for about only 2 per cent of world electricity generation today - whereas coal accounts for about 40 per cent. Coal will dominate, especially in China and India, for the foreseeable future. Carbon capture and storage is going to be essential here, but the technology has hardly begun to be used commercially. *The Independent* September 5, 2006 Tuesday We must start adapting to climate change BYLINE: FRANCES CAIRCROSS

- 57- Professor Paul Crutzen, who won a Nobel Prize in 1995 for his work on the hole in the ozone layer, believes that political attempts to **limit man-made greenhouse gases** are so pitiful that a radical contingency plan is needed. (...) Such an idea is so controversial that some scientists opposed its publication in the peer-reviewed scientific press, fearing that it may encourage the view that it is easier to treat the symptoms rather than the causes of climate change. *The Independent* July 31, 2006 Monday Scientist publishes 'escape route' from global warming BYLINE: Steve Connor
- 58- Optimists suggest that such conditions might be what awaits us **in a greenhouse world**. There are celestial reasons why that might not happen, but that era, and its abrupt ending, may still offer important lessons about our future climate in the 21st century. *The Independent* June 5, 2006 Monday Welcome to our future; Why deserts will inherit the Earth Few places on Earth are less hospitable, less suited to human life than the Sahara desert. BYLINE: Fred Pearce
- 59- Richard Lindzen, professor of atmospheric sciences at Massachusetts Institute of Technology, will this week receive in Sweden the Leo prize for independent thinking. He stands out against what he describes as "climate change alarmism". (...) On the central facts of the global-warming case, Lindzen notes the mean global surface temperature has increased by only 0.6 degrees (centigrade) in a century, during a time in which greenhouse-gas emissions in the industrial countries increased sharply. The sensitivity of the climate to greenhouse gases, he suggests, is a lot less than the alarmists suggest. As a rough rule of thumb, he argues, a doubling of **greenhouse-gas concentrations** in the atmosphere might result in a rise of 0.5C in average temperatures, while a quadrupling produces a 1C increase. (...) This is a long way from the projections of the hugely influential Intergovernmental Panel on Climate Change (IPCC), which saw temperatures going up by as much as 5.8C by 2100, with sea levels rising sharply as the polar icecaps melt. This should not be taken to mean there is no such thing as global warming. It does mean we should be sceptical about more alarmist statements, and seriously challenge the lack of precision in officially endorsed projections. It matters hugely if global temperatures rise by 6C over the next 100 years. It doesn't matter much if they rise by between 0.5C and 1C. I don't expect London and New York to be under water by 2100, or the Lake District turned into a tropical rainforest. The climate-change lobby, and the politicians who have signed up to it, argue on the basis of the precautionary principle. Things might not be as bad as they say, but to get people to act, you have to stoke it up a bit. And just in case it is as bad, you have to act anyway. *The Sunday Times* April 30, 2006 Getting far too heated over global warming BYLINE: David Smith
- 60- The other cause is **a build-up of greenhouse gases**, particularly carbon dioxide and methane, which **trap** more heat in our atmosphere. (...) The third and final question is: can we do anything about all this? In some ways no: the climate is already changing and existing **concentrations of greenhouse gases** are likely to make it change more in the next decades. What happens beyond that depends on how much humans reduce their share of the problem - and what is done to protect the most vulnerable from the consequences. (...) **The greenhouse effect** is also a natural process which works by trapping heat into the Earth's atmosphere, enabling life to flourish. *The Observer* March 12, 2006 Greening the company car: Today's hottest topic in the history of our world BYLINE: Juliette Jowit
- 61- James Zachos, professor of earth sciences at the University of California, Santa Cruz, said the speed of **the present buildup of greenhouse gases** is far greater than during the global warming after the demise of the dinosaurs. (...) Although carbon can be released suddenly and naturally into the atmosphere from volcanic activity, it takes many thousand of years for it to be removed permanently by natural processes. The ocean is capable of removing carbon, and quickly, but this natural capacity can be quickly overwhelmed, which is probably what happened 55 million years ago. *The Independent* February 17, 2006 Friday Global warming '30 times quicker than it used to be' BYLINE: Steve Connor

- 62- Sir David King said **concentrations of greenhouse gases** were already at a level where the warning signs were flashing red: a comment that starkly illustrates the impending clash between economic orthodoxy and environmental sustainability. (...) But are these developments really positive? Orthodox economics says they are, because they raise the real incomes of consumers. But, according to Sir David's analysis, they are potentially very bad indeed. Currently, **greenhouse gas concentrations** in the atmosphere are around 380 parts per million, compared with around 220 ppm during the last ice age. *The Guardian* February 6, 2006 Monday Financial: Winds of climate change are about to make their impact felt in many a boardroom BYLINE: Larry Elliott
- 63- There is currently a very serious imbalance between production of **greenhouse gases and their removal** by the oceans and vegetation. *The Times* December 21, 2007, Friday We must acknowledge global warming, and act
- 64- FLYING into Churchill, the weather seems cold enough. If minus 5C means the **greenhouse effect is upon us**, heaven knows what it was like before. *Daily Mail* December 8, 2007 Saturday DOOMED? DON'T YOU BELIEVE IT BYLINE: DAVID JONES
- 65- We must agree that **concentrations of greenhouse gases** should not be allowed to rise above 400-450 parts per million, CO2 equivalent. *The Guardian* December 3, 2007 Monday What breakthrough would best advance the fight against climate change? BYLINE: Isabel Hilton
- 66- In its annual human development report, the UN said the international community would need to invest two-thirds of what is currently spent globally on arms to prevent **a buildup in greenhouse gases** that would trigger a rise in temperatures of more than 2C. (...) The UN said that avoiding an increase in global temperature of more than 2C would require rich countries to cut emissions by at least 80% by 2050, with a cut of 30% by 2020. Emissions from developing countries would need to peak around 2020, with cuts of 20% by 2050. The scale of the cuts demanded by the UN is far in excess of those currently being considered by policymakers. *The Guardian* November 28, 2007 Wednesday National: Climate change report: Findings: Crops hit, more water shortages, higher sea levels, bigger disease risk BYLINE: Larry Elliott and Ashley Seager
- 67- The outcome, the UN said, would be **greenhouse gas concentrations** rising from 660 parts per million to 750ppm by 2050, giving possible global temperature increases of 4-5C, well above the 450ppm and 2C rise that experts say must be the limit. (...)The report criticises the government's renewable obligation scheme as having only achieved "mixed results" in boosting alternative energies and says the government should move to a "feed-in tariff" system which has been used so successfully in many other countries, particularly Germany. Higher fuel taxes and vehicle excise duty should be implemented as a way of curbing use, particularly of more polluting cars. *Guardian.com* November 27, 2007 UN attacks British blueprint to tackle climate change
- 68- The chaos of Britain's weather, caused by our unique position sandwiched between a great ocean and the Continent, will mean that even in **the greenhouse world** of the late 2000s, Winston Churchill's maxim that Britain was one of the few places where one could enjoy the outdoors every day of the year will still apply. *Daily Mail* October 18, 2007 Thursday WILL WE EVER HAVE ANOTHER HURRICANE? BYLINE: Michael Hanlon

- 69- Authors Dennis Avery and Fred Singer looked at the work of more than 500 scientists and argue that these experts are doubtful the phenomenon is caused by **man-made greenhouse gases**. (...) The pair spent months analysing scientific reports for their book, *Unstoppable Global Warming: Every 1,500 Years*, to counter claims made by former U.S. Vice President Al Gore in his film *An Inconvenient Truth*. *Daily Mail* September 14, 2007 Friday Global warming? It's natural, say experts BYLINE: Barry Wigmore
- 70- For years, ever since the first supercomputers began producing models predicting climate chaos if **we continued to pour greenhouse gases into the atmosphere**, sceptics dismissed those prognostications as just that; as scaremongering speculation - the sport of doomsayers. *The Independent* August 28, 2007 Tuesday The world is warming before our eyes
- 71- Their prediction of a global average temperature rise of three degrees Celsius this century, with continued greenhouse-gas emissions, was almost exactly the same as that contained in their 1990 report. But the level of confidence behind the prediction has increased markedly. Scientists said there was more than a 90 per cent probability that the rise in temperatures is **man-made**, the result of **our greenhouse-gas emissions**. *The Daily Telegraph* July 28, 2007 Saturday Apocalypse now? BYLINE: Charles Clover
- 72- Claims that increased solar activity is the cause of global warming - rather than **man-made greenhouse gases** - have been comprehensively disproved by a detailed study of the Sun. *The Independent* July 11, 2007 Wednesday Solar activity 'not the cause of global warming' BYLINE: Steve Connor
- 73- Greater **concentrations of greenhouse gases will trap more heat** and raise the Earth's surface temperature. Some radiation is **absorbed** and re-emitted in all directions by **greenhouse gas molecules**. *The Mirror* July 6, 2007 Friday SO WHAT EXACTLY IS GLOBAL WARMING?
- 74- The plan promises the state will 'integrate climate change policy into other interrelated policies'. But the broad blueprint also says developed nations bear the most **blame for filling the atmosphere with greenhouse gases**. *Daily Mail* June 5, 2007 Tuesday China makes global warming promise
- 75- Coming out of the meeting early yesterday, delegates said science appeared to have trumped politics - especially opposition from China, which wanted to condone a **greater build-up of greenhouse gases in the atmosphere** before action would be taken. *The Daily Telegraph* May 5, 2007 Saturday World given deadline on climate change BYLINE: Charles Clover and Sebastien Berger
- 76- The greenhouse gases, such as carbon dioxide, whose emissions growth is causing the atmosphere to warm, can be brought under control, said the economists of the UN's Intergovernmental Panel on Climate Change (IPCC) - but only if governments act decisively. (...) The report focuses on the feasibility of making the cuts in emissions necessary to **stabilise greenhouse gas in the atmosphere at a level** where the temperature rise would be halted, and says, it can be done. (...) **Stabilisation of greenhouse gas concentrations** at a range of levels can be achieved, the report says, and this can be done "by deployment of ??? technologies that are currently available and those that are expected." But it adds: "This assumes that appropriate and effective incentives are in place." *The Independent* May 5, 2007 Saturday Climate change can be halted if governments act now, concludes UN BYLINE: Michael McCarthy

- 77- But China wanted to retain the right to pump out **greenhouse gases that would result in temperatures increasing** by more than 2C. It was objecting to any wording that would mean it should impose a cap on its emissions, slow its economic growth or spend large amounts on clean technologies in the future. (...) Total **concentrations of greenhouse gases** in the atmosphere would have to rise no higher than 534 parts per million - compared with an estimated 430ppm today. *The Daily Telegraph* May 4, 2007 Friday China at war over climate change BYLINE: Charles Clover
- 78- The aim of preventing more than 2C of warming has been adopted overtly by the UN and the European Union, and implicitly by the British, German and Swedish governments. All of them say they are hoping to confine **the concentrations of greenhouse gases in the atmosphere** to a level that would prevent such a rise. (...) The average global temperature is affected by **the concentration of greenhouse gases** in the atmosphere. (...) A paper published last year by the climatologist Malte Meinshausen suggests that if **greenhouse gases reach a concentration** of 550 parts per million, carbon dioxide equivalent, there is a 63-99% chance (with an average value of 82%) that global warming will exceed two degrees. (...) A recent paper in the journal *Climatic Change* emphasises that the sensitivity of global temperatures to **greenhouse gas concentrations** remains uncertain. *The Guardian* May 1, 2007 Tuesday Comment & Debate: The rich world's policy on greenhouse gas now seems clear BYLINE: George Monbiot
- 79- This week's talks could see similar scenes, particularly as it deals with the political hot potato of how world governments should act together to bring down emissions. The US has lobbied for research into futuristic technology such as giant sunlight-blocking mirrors in space as "insurance", an idea which the draft summary dismisses as "largely speculative, uncosted and with potential for unknown side effects". The report says that taking "optimal" mitigation measures might by 2030 stabilise **greenhouse-gas concentrations** in the atmosphere at 445 to 534 parts per million, up from an estimated 430 ppm today. *The Guardian* April 28, 2007 Saturday Environment: UN: we have the money and know-how to stop global warming BYLINE: David Adam
- 80- China, which is the world's biggest producer and user of coal, is expected to overtake the United States as the world's largest carbon dioxide emitter within the next several years. (...) China says that richer countries are responsible for the **accumulated greenhouse** emissions and should take the lead in cleaning up the problem. *Morning Star* April 24, 2007 Tuesday World - Chinese report sees global warming threats
- 81- **The Eocene greenhouse event** fascinates scientists not just because of its effects, which also saw a major mass extinction in the seas, but also because of its likely cause: methane hydrates. (...) It is also important to realise that the early **Eocene greenhouse** took at least 10,000 years to come about. **Today we could accomplish the same feat** in less than a century. (...) The precise cause remains unclear, but what is undeniable is that the end-Permian mass extinction was associated with **a super-greenhouse event**. *The Guardian* April 23, 2007 Monday G2: Six steps to hell BYLINE: Mark Lynas
- 82- And a third of the planet's animals and plants could be wiped out. The doomsday scenario is the bleakest yet from scientists, who **blamed man-made greenhouse gases**. *The Sun* April 7, 2007 Saturday Global warming 'will kill billions' BYLINE: Michael Lea
- 83- When politicians and journalists declare that the science of global warming is settled, they show a regrettable ignorance about how science works. We were treated to another dose of it recently when the

experts of the Intergovernmental Panel on Climate Change issued the Summary for Policymakers that puts the political spin on an unfinished scientific dossier on climate change due for publication in a few months' time. They declared that most of the rise in temperatures since the mid-20th century is very likely due to **man-made greenhouse gases**. *The Sunday Times* February 11, 2007 An experiment that hints we are wrong on climate change BYLINE: Nigel Calder

- 84- Campaigner Gore has already persuaded Virgin boss Sir Richard Branson into offering a \$25million (GBP 13million) prize to any scientist who invents a way of **removing greenhouse gases from the atmosphere**. *Sunday Express* February 11, 2007 REVEALED: CONCERTS TO SAVE PLANET; Inside Al Gore's rock star climate change summit BYLINE: Chris Goodman
- 85- The cash will go to the first person to find a method to **extract greenhouse gases** that are already in the atmosphere as breakthrough experts believe would greatly reduce climate change. *Daily Mail* February 10, 2007 Saturday Cure global warming and win a Pounds 13m prize
- 86- Brushing aside suggestions that it was hypocritical for an airline boss to talk about climate change, Sir Richard said he wanted to spur the "world's brightest brains" to develop ways to **remove greenhouse gases** from the atmosphere and "possibly save mankind itself". (...) Backed by the former US vice-president Al Gore and senior scientists, including Jim Hansen of Nasa, Sir Richard said the prize would go to the first proposal that the judges agreed would **remove greenhouse gases** equivalent to at least a billion tonnes of carbon dioxide a year from the atmosphere, in a cost-effective and environmentally friendly way. *The Guardian* February 10, 2007 Saturday Branson offers \$25m reward to fight global warming BYLINE: David Adam
- 87- So what about global warming? The Intergovernmental Panel on Climate Change estimates that increased **concentrations of greenhouse gases** in the atmosphere will lead to a man-made warming of 1.5C to 5.8C above 1990 levels by the end of this century. One warm British winter does not herald global climate change, but it is probably not a good sign. *The Guardian* January 9, 2007 Tuesday G2: Whats happened to winter? BYLINE: Patrick Barkham
- 88- Take global warming. Aircraft pump out carbon dioxide and other **greenhouse gases** high in the atmosphere, where they do more **damage**. *Independent on Sunday* August 26, 2001, Sunday WE REGRET TO ANNOUNCE THAT THE FLIGHT TO MALAGA IS DESTROYING THE PLANET BYLINE: Geoffrey Lean
- 89- **Greenhouse warming** has the potential to cause very serious environmental damage and social upheaval. *The Times* April 14, 2001, Saturday Clear thinking on climate change
- 90- The hardest-hitting survey ever of the effects of climate change used studies by 700 of the world's top scientists. It concluded that **rising temperatures caused by the emission of greenhouse gases** would cause famine, epidemics and the extinction of species throughout the world over the next century. (...) Environmental groups said governments must act urgently to cut the amount of carbon dioxide - the main greenhouse gas - released into the atmosphere. Jennifer Morgan, of conservation group WWF, said: "It is time for governments such as the United States to get serious about reducing their carbon dioxide emissions". The report is the second of four to be published this year as governments around the world attempt to come to an international agreement on tackling climate change. (...) The IPCC, which has been studying the impact of climate change since 1990, published a report last month

which said the Earth's atmosphere was warming faster than initially thought. Environmentalists hope the new reports will also encourage governments to try harder after they failed at a meeting in The Hague in November to agree on reducing greenhouse gas emissions. But steps to tackle global warming have still been very slow because the US will not to commit itself to firm targets to reduce emissions. *The Express* February 20, 2001 GLOBAL WARMING DOOMS US ALL TO DEVASTATION BYLINE: SHAMIM CHOWDHURY

- 91- A pollution **clean-up** will be partly to blame for such a temperature rise. A reduction in emissions of sulphur dioxide, which causes acid rain, has increased **the impact of greenhouse gases**. (...) These gases **trap** the sun's heat whereas sulphur dioxide cools the atmosphere. *The Express* January 23, 2001 SCIENTISTS CALL ON WORLD TO TACKLE GLOBAL WARMING AS THE EARTH'S TEMPERATURE SOARS BYLINE: JOHN INGHAM
- 92- As industry gets **cleaner**, this effect is diminishing and carbon dioxide and other **greenhouse gases** now have no countervailing force. *The Times* January 22, 2001, Monday Global warming 'will be twice as bad' BYLINE: Nigel Hawkes
- 93- Jurassic Park author pours cold water on global warming: Michael Crichton's new techno thriller fantasises a world free of **the pall of greenhouse gases** *The Guardian* December 11, 2004 BYLINE: Patrick Barkham
- 94- This is an entirely praiseworthy piece of entirely American science: no other country has done anything like it for anything like as long. It is the world's clearest picture of **the greenhouse gas threat**, and it is the very length of the data time-series which allows the present anomaly in the figures to stand out so clearly. *The Independent* October 12, 2004, Tuesday NOW, MORE THAN EVER, IT IS IMPERATIVE TO CONFRONT AMERICA OVER CLIMATE CHANGE
- 95- At this very same moment in history, the world started worrying about **the greenhouse effect and its potential dangers for mankind**. *DAILY MAIL* September 15, 2004 Global warming? No. Just hot air from politicians BYLINE: MICHAEL HANLON
- 96- Professor Lovelock, 84, was speaking at the Gaia Conference at Dartington Hall in Devon, which has brought together 50 of the world's experts on climate change to discuss the **possible crisis caused by warming and greenhouse gases**. His theory that only a massive expansion of nuclear power, which produces virtually no carbon dioxide, can now check a runaway global warming scenario has attracted strong criticism. Tony Juniper, director of Friends of the Earth, said: "Climate change and radioactive waste both pose deadly long-term threats, and we have a moral duty to minimise the effects of both, not to choose between them." *The Independent* June 4, 2004, Friday ENVIRONMENT GURU TELLS CLIMATE CHANGE EXPERTS TO GO NUCLEAR NUCLEAR POWE TELLS CLIMATE CHANGE EXPERTS: GO NUCLEAR BYLINE: TED DAVENPORT
- 97- Professor Lovelock, who achieved international fame as the author of the Gaia hypothesis, the theory that the Earth keeps itself fit for life by the actions of living things themselves, was among the first researchers to sound the alarm about **the threat from the greenhouse effect**. *The Independent* May 24, 2004, Monday ONLY NUCLEAR POWER CAN NOW HALT GLOBAL WARMING' BYLINE: MICHAEL MCCARTHY

- 98- ALMOST four million British homes face being flooded because of global warming. (...) Chief Scientific Adviser Sir David King demanded a tough and speedy response from the Government. He wants ministers to step up efforts to reduce the **levels of lethal greenhouse gases** that are behind disastrous climate changes resulting in more storms, floods, droughts and heatwaves. *The Mirror* April 23, 2004, Friday FLOODY HELL; GLOBAL WARMING COULD SINK 3.6M HOMES BYLINE: BOB ROBERTS
- 99- As we swelter in the heat wave, seeking ways of keeping cool, a strange rumbling sound is heard. What can it be? Is it an approaching thunderstorm, of the kind that usually ends a heat wave in Britain? No, it is the sound of massed cheering, mingled with shrill screams of delight from all the climatologists and environmentalists of the world. (...) At last! They cry exultantly. We told you so! Global warming is here! Now will you take notice? Leave your cars to rust in the garage, or abandon them by the wayside. You've seen nothing yet. The sun will get still hotter and the hole in the ozone layer will grow larger, as you go on pumping out **your deadly greenhouse gases!** (...) Vineyards will occupy the Scottish Highlands, but that will be no consolation. They will all be burned to a frazzle as the heat increases. In many parts of the world, rising sea levels will sweep away all human settlements and enormous tidal waves will complete the job. In other parts, falling sea levels will destroy all present means of livelihood. (...) Repent before it is too late. It is probably too late anyhow, but repent all the same. (...) What if it rains all next month and there is snow in October? No problem. It will prove that a new ice age is on the way. Soon vast glaciers will cover the whole of Europe. *THE DAILY TELEGRAPH* August 08, 2003, Friday Climate Change BYLINE: Peter Simple
- 100- That means the 1997 eco-deal at Kyoto on emissions - which Mr Bush has refused to ratify - will be extended beyond its 2012 expiry date. And it paves the way for major polluters like China and India to begin limiting **their greenhouse gases which threaten to destroy the planet.** *The People* December 11, 2005, Sunday CLIMEDOWN!; US IN LAST-DITCH GLOBAL WARMING DEAL BYLINE: NIGEL NELSON
- 101- The environment secretary, Margaret Beckett, arrived at climate talks in Montreal yesterday insisting that compulsory binding targets were the only meaningful way to tackle climate change. Mrs Beckett criticised the US administration's reliance on voluntary action and technology to reduce **greenhouse gas pollution** and said a worldwide agreement for when the first phase of the Kyoto protocol expires in 2012 was urgently needed. (...) Negotiators are also seeking a broader consensus on the need for all countries, including the US, to take action. The Canadian hosts yesterday issued a draft joint statement that calls on nations "to engage in discussions to explore and analyse approaches for long-term cooperative action to address climate change." *The Guardian* December 7, 2005 Beckett urges binding targets to fight climate change BYLINE: David Adam
- 102- Rapidly expanding industrial economies such as China and India must be bound to meeting environmental targets, in the same way that the Kyoto protocol legally binds 141 countries to cutting **pollutant greenhouse gases.** (...) Biofuels, which are made from crops do not add to the emissions of CO2. They are 'carbon neutral' because the CO2 they produce when burnt was **absorbed** from the atmosphere by the crops used to make them. *The Independent* December 3, 2005 Saturday CLIMATE CHANGE: Ten things that the government can do...
- 103- This coincided with an increase in surface-water temperatures in the southern Indian Ocean. This is evidence that **greenhouse gases may already be responsible** for droughts and famines in eastern Africa. He (Lord May) also echoed Prince Charles's claim that global warming is the greatest single threat to the world today. We should not delude ourselves that Europe will be immune from the

effects of climate change. *The Independent* October 28, 2005, Friday ANOTHER VOICE DRAWS ATTENTION TO THE DANGER (my addition in parenthesis)

- 104- SURELY after the recent hurricanes President George W Bush must now take heed of scientists' warnings about global disasters being linked to **the "greenhouse effect"**. *The Express* September 26, 2005 BUSH CAN NO LONGER IGNORE THREAT OF GLOBAL WARMING
- 105- Gordon Brown, the Chancellor, revealed this week that the World Bank is expected to play a frontline role in the fight against global warming by offering financial incentives to developing countries to **cut their greenhouse emissions and adopt 'clean' technologies**. (...) One source said that the G8 was determined to make a gesture, adding that the US was happy to comply with the demands of other countries in the wake of its resolution of its dispute with the World Trade Organisation over cotton subsidies. Oil prices featured prominently in discussions yesterday after hitting \$ 62 a barrel this week, despite expectations that the leaders would appeal for more stable prices and more freedom for oil companies to invest in oil-rich countries. *The Independent* July 8, 2005, Friday US AND FRANCE CLOSE TO DEAL ON CLIMATE CHANGE BYLINE: PHILIP THORNTON
- 106- Does the US object? - No. President Bush accepts that **greenhouse gases are a problem** that have to be dealt with long term. He is keen to move the discussion "beyond Kyoto" *The Times* July 5, 2005, Tuesday Leaders blow hot and cold on tackling climate change BYLINE: Tom Baldwin and David Charter
- 107- While CO₂ and other gases **trapped** infrared radiation and so heated the atmosphere, warmer air holds more water vapour, itself **the most potent contributor to the greenhouse effect**. So, if atmospheric CO₂ levels increased, water vapour would ensure the warming effect was seriously magnified. (...) Still, few saw **the greenhouse effect and the warming it would bring** as being a problem. At the time, computer models were suggesting modest increases, perhaps 2C in hundreds of years. *The Guardian* June 30, 2005 Heat: How we got here BYLINE: Ian Sample
- 108- And nothing is going to slow the world economy more, and inhibit our control of the **greenhouse gas problem**, than a world recession. *The Guardian* June 15, 2005 G2: Inside story: 'The boat is sinking' BYLINE: Aida Edemariam
- 109- Cities are also starting to feel the effects of climate change. **Thanks to greenhouse gases** already in the atmosphere, the earth is now "committed" to 30-40 years of rising temperatures, and the **concentration** of asphalt and air pollution in built-up areas makes them especially vulnerable. *The Guardian* May 4, 2005 Comment & Analysis: Capitals of smog: Our cities need to unite to tackle climate change BYLINE: Tristram Hunt
- 110- Scientists at BP are working with officials from the Department of Trade and Industry (DTI) on plans to bury millions of tonnes of carbon dioxide (CO₂) under the bed of the North Sea. The aim? To try to reduce the amount of **harmful greenhouse gases** we emit into the atmosphere which lead to global warming. (...) BP is by no means the only oil major currently investigating the benefits of carbon sequestration. *The Sunday Telegraph* May 01, 2005, Sunday Greenhouse gases buried at sea BYLINE: Sylvia Pfeifer

- 111- With the prospect of an earth made infertile from over- production and mass reliance on chemicals, coupled with an atmosphere **polluted by greenhouse gases** there seems little to celebrate. *The Independent* March 21, 2005, Monday THIS ROCK DUST GROWS THESE BIG VEGETABLES (AND MIGHT SAVE US FROM GLOBAL WARMING) BYLINE: PAUL KELBIE
- 112- The CBI doesn't reject arguments about the potential **damage caused by greenhouse gases**, but has pleaded for more time to adapt, especially while fuel costs are high and the manufacturing recovery is fragile. *The Observer* March 6, 2005 Business: 'Denial lobby' turns up the heat: The vocal minority sceptical of the threat of global warming are now targeting the UK BYLINE: Conal Walsh
- 113- The EU has also brought in a number of measures. The UK's current boom in recycling is a direct result of an EU scheme to increase recycling of biodegradeable rubbish. This is the rubbish such as paper and organics that, when piled into landfills, produces methane, a far more **potent greenhouse gas** than CO 2. *The Guardian* February 3, 2005 Life: Kyoto issue: Cover story: What is this Kyoto thing all about anyway? BYLINE: Paul Brown
- 114- Environmentalists hope the move might encourage the U.S. government to cut back on its emissions of carbon dioxide and **'greenhouse' gases that are warming** the atmosphere. *Daily Mail* December 28, 2006 Thursday Climate change makes polar bears a 'threatened species'
- 115- The recommendation by the interior secretary, Dick Kempthorne, that the bears be added to the list of threatened species, marks a reversal by the administration from its reluctance to acknowledge the consequences of climate change. It would bar US government agencies from any activity that would jeopardise polar bears or their hunting grounds, and could potentially require the administration to compel US industries to curb their carbon dioxide output. The move was hailed as a victory for environmental organisations which have increasingly resorted to the US courts to try to bring America in line with other countries on global warming. Mr Kempthorne tried to downplay the decision, telling reporters it did not amount to a recognition of the **dangers of greenhouse gas** emissions. *The Guardian* December 28, 2006 Thursday International: Bush backtracks on global warming with plan to protect polar bears BYLINE: John Vidal, and Suzanne Goldenberg
- 116- Awareness has, therefore, come late and at a cost. **Greenhouse gases** in the atmosphere mean that the **Earth will warm** for much of this century whatever we do. *The Times* December 15, 2006, Friday How the world woke up to global warming BYLINE: David Nicholson-Lord
- 117- Global warming has begun to change the way microscopic plant life in the oceans **absorbs** carbon dioxide from the atmosphere - a trend that could lead to **a dramatic increase in the heating power of the greenhouse effect**. *The Independent* December 7, 2006 Thursday Climate change is killing the oceans' microscopic 'lungs' BYLINE: Steve Connor
- 118- Anecdotal observations are backed by scientists who are recording in Nepal some of the fastest long-term increases in temperatures and rainfall anywhere in the world. At least 44 of Nepal's and neighbouring Bhutan's Himalayan lakes, which collect glacier meltwater, are said by the UN to be growing so rapidly they they could burst their banks within a decade. Any climate change in Nepal is reflected throughout the region. Nearly 400 million people in northern India and Bangladesh also depend on rainfall and rivers that rise there. "Unless the country learns to adapt then people will suffer

greatly," says Gehendra Gurung, a team leader with Practical Action in Nepal, which is trying to help people prepare for change. In projects around the country the organisation is working with vulnerable villages, helping them build dykes and set up early warning systems. It is also teaching people to grow new crops, introducing drip irrigation and water storage schemes, trying to minimise deforestation which can lead to landslides and introducing renewable energy. (...) But Nepal as a country needs help adapting to climate change, says Mr Gurung. Its emissions of **damaging greenhouse gases** are negligible, yet it finds itself on the front line of change. *The Guardian* December 2, 2006 Saturday Christmas appeal: Nepals farmers on the front line of global climate change BYLINE: John Vidal

- 119- The Taiga is receding as temperatures rise - leaving bare tundra in its wake, Permafrost used to seal up the tundra for most of the year but it is increasingly melting, releasing its vast store of methane a **greenhouse gas 20 times more potent** than carbon dioxide. *Sunday Mirror* November 5, 2006 MELTDOWN; EXCLUSIVE: MAN BEHIND THE BBC'S PLANET EARTH REVEALS THE DEVASTATING COST OF GLOBAL WARMING BYLINE: NIGEL BLUNDELL
- 120- Such an increase would be of the same scale as that experienced since the last Ice Age: left unchecked, **greenhouse gases could trigger a rise of ten degrees Celsius** by 2100. *Daily Mail* October 31, 2006 Tuesday Are we prepared for global warming pain?
- 121- The ecology lobby and the scientific establishment seem very sure indeed. They believe the current global warming is being caused by the massive amounts of carbon dioxide and other **greenhouse gases that have belched from factories, power stations and machines since the Industrial Revolution**. I grant you that it's a very plausible theory, and I'm inclined to believe that there may be at least a little truth in it. But it's certainly not the only one. Even if greenhouse gases do cause global warming and it's still an if they have had plenty of other sources since time immemorial, from erupting volcanoes to billions of animals breaking wind (no, really, the digestive systems of horses and cattle, in particular, produce colossal amounts of methane). *Daily Mail* September 29, 2006 Friday Why am I sceptical about global warming? BYLINE: TOM UTLEY
- 122- Sir Richard - Britain's ninth richest person with a GBP 3bn fortune - said the money will be used for research into cutting **harmful greenhouse gases**. That includes finding **cleaner** energy sources to wean the world off oil and coal - like using corn to make biofuel. The promise is also a shrewd business move because campaigners often attack the airline industry for polluting the atmosphere. *Daily Star* September 22, 2006 Friday I'LL SAVE PLANET; Branson's GBP 2bn pledge to fight global warming BYLINE: GARY NICKS
- 123- Warmer seas causing more **violent hurricanes and typhoons are almost certainly the result of greenhouse gas emissions**, they (scientitsts) conclude they are caused, ultimately, by the carbon dioxide from the power station that provides your electricity, from the exhaust of the car you drove to work this morning. *The Independent* September 12, 2006 Tuesday THE GATHERING STORMS BYLINE: Michael McCarthy and Abigail Townsend (my addition in parenthesis)
- 124- Other **threats** lurk on the horizon. We know that there are trillions of tonnes of methane, a **virulent greenhouse gas**, trapped in permafrost and in sediments beneath the ocean bed. *The Guardian* August 30, 2006 Wednesday Society: Environment: Global meltdown BYLINE: Fred Pearce

- 125- There are many **greenhouse gases** but the contemporary focus is on carbon dioxide, which is a by-product of burning fossil fuels. CO2 is not **the most damaging greenhouse gas but it is the most plentiful** and increasingly so. (...) Layers of gas allow the sun's rays in but bounce back the sun's reflected rays. So the atmosphere warms up, **just like the air in a greenhouse, where glass plays the same role**. The industrial revolution has put in place **additional layers of greenhouse gases**, and this explains the sharp rise in global temperatures. *The Independent on Sunday* August 6, 2006 Global warming: 100 years of living dangerously BYLINE: Bill Robinson
- 126- The melting 129,000 years ago was driven by natural processes. This time **greenhouse gas emissions have been warming the planet** since the industrial age. *The Guardian* March 24, 2006 Friday Science: Climate change: Melting point: scientists forecast metre rise in sea levels this century BYLINE: Ian Sample
- 127- Research commissioned by The Independent reveals that the **accumulation of greenhouse gases in the atmosphere** has now crossed a threshold, set down by scientists from around the world at a conference in Britain last year, beyond which really dangerous climate change is likely to be unstoppable. (...) The Government's conference on Avoiding Dangerous Climate Change, held at the UK Met Office in Exeter a year ago, highlighted a clear threshold in **the accumulation of greenhouse gases** such as carbon dioxide (CO2) in the atmosphere, which should not be surpassed if the 2 degree point was to be avoided with "relatively high certainty". *The Independent* February 11, 2006 Saturday **Greenhouse gases** are already past threshold that spells **disaster** BYLINE: Michael McCarthy
- 128- They have long been thought of as the antidote to **harmful greenhouse gases**, sufferers of, rather than contributors to, the effects of global warming. But in a startling discovery, scientists have realised that plants are part of the problem. *The Guardian* January 12, 2006 Thursday Science: Global warming: blame the forests: Research identifies plants as source of methane: Climate scientists shocked by new findings BYLINE: Alok Jha
- 129- The waste cities produce is a problem that taxes municipal coffers and poses hazards to the local environment and human health all over the world. Left to rot in landfill sites, the methane given off - one of **the most potent of greenhouse gases** - has a huge impact on the health of the planet as well. *The Guardian* December 5, 2007 Wednesday Street smarts: Cities rise to climate challenge: Waste: Watts in your rubbish? BYLINE: Terry Slavin
- 130- Earlier this year, scientists warned that wormeries - the trendy composting bins which use worms to break down food scraps - release high levels of nitrous oxide, one of the most **potent greenhouse gases**. And six months ago the Government quietly shelved its campaign for 'real nappies' after research showed the washing and laundering of cloth nappies meant they were as bad for the environment as disposables. *Daily Mail* December 1, 2007 Saturday How that wind turbine could make climate change worse! BYLINE: David Derbyshire
- 131- The report is critical of all developed countries for their performance so far on cutting emissions. But it singled out the UK government for failing to show enough ambition in its plan to **combat greenhouse gases**, citing the upward trend in emissions from the energy and transport sectors and the lack of progress in developing renewable sources of energy. *The Guardian* November 28, 2007 Wednesday National: Climate change report: Cut carbon by up to third to save poor, UN tells west BYLINE: Larry Elliott and Ashley Seager

- 132- But yesterday's cautiously worded report, which was agreed by the US government, also provides ample evidence that climate change is well under way, and is accelerating. It concludes that the warming is now "unequivocal" and "evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level". (...) But emissions of all the **"greenhouse gas" pollutants** that cause global warming increased 70 per cent between 1970 and 2004 alone, it reports, adding that levels of carbon dioxide, the most important one, in the atmosphere now "exceed by far" anything that the Earth has experienced in the past 650,000 years. (...) The missing element, virtually everyone agrees, is political will from governments. Next month they meet in Bali to start negotiations on a new treaty to replace the current provisions of the Kyoto Protocol, which run out in 2012. The timetable is desperately tight; time lags in the process of getting a new treaty ratified by the world's governments means that it will have to be agreed by the end of 2009 - and there is no sign of anything on the horizon. *The Independent on Sunday* November 18, 2007 A world dying; Our acid oceans; But can we unite to save it? Geoffrey Lean
- 133- ALMOST a third of the **world's species will face extinction if greenhouse gas emissions continue to rise**, a United Nations report will say this week. (...) The environmental group WWF, formerly the Worldwide Fund for Nature, says "vital facts" have been cut from the summary as a result of the influence of government officials from countries opposed to taking radical action. These facts include a warning of more destructive hurricanes, the warming of the upper Pacific Ocean and the loss of glaciers in the Alps. *The Daily Telegraph* November 12, 2007 Monday Climate change to threaten a third of wildlife BYLINE: Charles Clover
- 134- It seems a surprising suggestion. Can it be true that what we put on our dinner plates could have an effect on global warming? It appears so. The report, which aims to be the most comprehensive study of the subject yet completed, claims a vegetarian diet including cheese, butter and milk would probably not noticeably reduce carbon emissions because dairy cows are a major source of the biggest **greenhouse gas pollution** from livestock - the methane released when cattle burp. *The Observer* November 11, 2007 Why eating less meat could cut global warming BYLINE: Juliette Jowit
- 135- Local managers have been told to reduce their **greenhouse gas pollution** by improvements in productivity, waste heat recovery, more efficient motors and lighting, plus biofuels and wind energy schemes. *The Guardian* November 5, 2007 Monday The green list: Green or greedy? BYLINE: Terry Macallister
- 136- Such a disaster would not necessarily mean the end of humanity, but it could kill off more than half of all the animal and plant species on Earth, provoking a survival crisis. British scientists have uncovered the first strong evidence of a close coupling between the Earth's climate and extinctions. Matching marine and terrestrial species diversity against temperature estimates, they found that the range is relatively small during **warm "greenhouse" climate phases** and extinction rates are relatively high. (...) Climate change predictions for the future fall within the range of **the warmest greenhouse phases** associated with mass extinction events in the fossil record, said the scientists. *Morning Star* October 24, 2007 Wednesday Britain - Global warming could trigger 'mass extinction'
- 137- But HCFCs are even **more dangerous as greenhouse gases**, up to 1,700 times more powerful than carbon dioxide in warming up the planet. *The Independent on Sunday* September 23, 2007 Bush takes lead on global warming action

- 138- The 21 members of APEC (Asia-Pacific Economic Cooperation) are holding their annual summit in Sydney this week. With the world's top three **greenhouse gas polluters** (China, the US and Russia) present, climate change is high on the agenda. *The Independent* September 7, 2007 Friday Will APEC's climate-change deal amount to anything more than hot air?
- 139- The overall trend in warming is driven by **greenhouse gas emissions but this warming effect** will be broadly cancelled out over the next few years by the changing patterns of ocean temperatures. *The Daily Telegraph* August 10, 2007 Friday We can't hold back global warming, say scientists BYLINE: Roger Highfield
- 140- There are now about twice as many Atlantic hurricanes forming each year compared with a century ago and the rise has generated an intense debate over whether this is due to natural variability or man-made global warming. A study by scientists at the US National Centre for Atmospheric Research in Boulder Colorado has found that natural variability cannot explain the increase. Instead, they have attributed the rise to warmer sea-surface temperatures **caused by greenhouse gases**. *The Independent* July 30, 2007 Monday Global warming blamed for increase in hurricanes BYLINE: Steve Connor
- 141- The Commons environmental audit committee is expected to say that the government's target for cutting **damaging greenhouse gas** emissions had failed to keep up with the latest scientific evidence. *Morning Star* July 30, 2007 Monday Britain - Climate change policy 'incoherent,' say MPs
- 142- At least half of the extra rainfall and possibly up to 85% is caused by **the impact of greenhouse gas** emissions, the scientists conclude. (...) As waters of the Severn, Avon and Thames continue to rise, the Environment Agency described conditions in central England as the "worst floods in modern times". Tens of thousands of homes have lost power and water supplies, and river levels are not expected to reach their peak in the cities of Gloucester and Oxford until today. Gordon Brown, who flew over the flood region yesterday, used his first monthly press conference since arriving at Number 10 to make the clear link between global warming and the flood devastation. *The Guardian* July 24, 2007 Tuesday Floods: Climate change: Human activity linked to heavier rainfall BYLINE: James Randerson
- 143- The methane emissions from both ends of cattle and sheep are causing so much concern in government that it has ordered researchers to find ways to cut down on the emissions from livestock, which account for about a quarter of the methane -**a greenhouse gas 20 times more powerful at driving global warming** than carbon dioxide -pumped into the atmosphere in Britain. Each day every one of Britain's 10 million cows pumps out an estimated 100-200 litres of methane. *The Times* July 10, 2007, Tuesday How to stop cows burping is the new field work on climate change BYLINE: Lewis Smith
- 144- Leaders of the G8 nations - the US, Canada, Britain, France, Germany, Italy, Russia and Japan - agreed at their summit in the German coastal town of Heiligendamm that **harmful greenhouse gas emissions** should stop rising, "followed by substantial global emissions reductions." *Morning Star* June 8, 2007 Friday Britain - Campaigners reject G8 climate-change agreement
- 145- The science on climate change is clear: human emissions of carbon dioxide and other **greenhouse gases are rapidly warming the planet**. *The Guardian* June 1, 2007 Friday Climate change: Action plan or stalling tactic?

- 146- Emissions of carbon dioxide and other **damaging greenhouse gases** are rising globally, and many gloomy scenarios have been painted about the possible consequences, including drought and floods. *Daily Mail* May 28, 2007 Monday Time to turn talk into action over climate change
- 147- Leading scientists and policy-makers have been meeting in Germany over the past two weeks to lay the foundations for a new international agreement - a "son of Kyoto", the landmark protocol designed to reduce **harmful emissions of greenhouse gases**. The negotiations came after economists from the Intergovernmental Panel on Climate Change (IPCC) reported earlier this month that **greenhouse gas emissions, which are causing the atmosphere to warm**, can be brought under control - but only if governments act decisively. *The Independent* May 19, 2007 Saturday As Blair leaves Washington, US hardens stance on climate change BYLINE: Daniel Howden
- 148- Less than a week after the world's scientists warned there may be just eight years to act on **greenhouse gas pollution** to avoid the worst of global warming, the aviation industry has announced record increases in the number of flights worldwide. *The Guardian* May 9, 2007 Wednesday Flights reach record levels despite warnings over climate change BYLINE: David Adam
- 149- **Greenhouse gases are air pollutants** under the landmark environmental law, Justice John Paul Stevens said in his majority opinion. (...) The lawsuit was filed by 12 states and 13 environmental groups that had grown frustrated by the Bush administration's inaction on global warming. *Morning Star* April 3, 2007 Tuesday World - US Supreme Court deals blow to Bush on global warming
- 150- This, plus the carbon pushers' proxy ownership of key seats at the political table - not least in the current White House administration - has kept us addicted to the fuels that cause most of **the greenhouse problem**, and meant that the survival technologies remain pitifully neglected, despite their enormous potential. (...) The second and third assessments narrowed the uncertainties. By 1995 the IPCC's scientists - who must operate on consensus when writing their reports - were persuaded that they could see the first faint imprint of human **enhancement of the greenhouse effect**, in the pattern of rising temperatures around the globe. *The Guardian* February 3, 2007 Saturday Mayday alert for the world BYLINE: Jeremy Leggett
- 151- One of the strangest things blamed on global warming is that the sky seems to be falling down. The highest layers of the Earth's atmosphere are cooling, contracting and moving closer to the ground. The problem is most marked in the highest level, the thermosphere, extending from roughly 100km to 650km (60 miles to 400 miles) above the Earth. The temperature there has fallen rapidly, by about 5 to 10C (9 to 18F) a decade. **Although greenhouse gases cause global warming** at the Earth's surface, they have the opposite effect in the upper atmosphere, where they help to radiate heat out to space, cooling it down. *The Times* January 31, 2007, Wednesday Thermosphere turns cool as global warming drags BYLINE: Paul Simons
- 152- Scientists have previously estimated that reflecting less than 1% of sunlight back into space could compensate for **the warming generated by all greenhouse gases** emitted since the industrial revolution. Possible techniques include putting a giant screen into orbit, thousands of tiny, shiny balloons, or microscopic sulphate droplets pumped into the high atmosphere to mimic the cooling effects of a volcanic eruption. The IPCC draft said such ideas were "speculative, uncosted and with potential unknown side-effects". The US submission is based on the views of dozens of government officials and is accompanied by a letter signed by Harlan Watson, senior climate negotiator at the US

state department. It complains the IPCC draft report is "Kyoto-centric" and it wants to include the work of economists who have reported "the degree to which the Kyoto framework is found wanting". *The Guardian* January 27, 2007 Saturday US answer to global warming BYLINE: David Adam

- 153- We have already experienced a temperature rise of 0.7C since 1900 and **the inertia in the climate system from greenhouse gases** already emitted means we will be extremely lucky to get away with a 1C or 2C rise. *The Guardian* January 27, 2007 Saturday Climate change: Four scenarios Increasing risk
- 154- Natural climate change has not stopped, and it never will. But we have **superimposed onto it a great blast of greenhouse gases of our own**, with far stronger effect. *The Independent* January 25, 2007 Thursday The last gasp of the global warming deniers BYLINE: JOHANN HARI
- 155- The Rolling Stones do it, the Scissor Sisters do it even the Prime Minister does it when he is on official business. They are all carbon offsetting, the fast-growing way of cutting **harmful greenhouse gases**. (...) Inevitably, carbon offsetting has its critics. Many argue it simply gives rich people an excuse to carry on polluting when they should be changing their behaviour. *Mail on Sunday* January 14, 2007 Join Wood in the forest and tackle global warming BYLINE: TOM MCGHIE
- 156- The gas is methane, which is actually far **more potent a greenhouse gas** than carbon dioxide (the one produced by burning fossil fuels). And a munching cow produces tens of litres a day of this stuff from you know where. *Daily Mail* January 8, 2007 Monday A LOAD OF HOT AIR?; From flatulent cows to gasguzzling cars and planes, global warming is being attributed to everything but the most obvious cause... BYLINE: MICHAEL HANLON
- 157- The gas is methane, which is actually far **more potent a greenhouse gas** than carbon dioxide (the one produced by burning fossil fuels). And a munching cow produces tens of litres a day of this stuff from you know where. *Daily Mail* January 5, 2007 Friday A LOAD OF HOT AIR?; The Lib Dems this week blamed flatulent cows for global warming. Greens blame cars and planes. BYLINE: MICHAEL HANLON
- 158- Hundreds of local councils across the UK are ignoring the threat of climate change and taking no action to address the rising carbon emissions of their residents, a Guardian survey suggests. Only a handful of councils polled said they were taking significant steps to tackle **greenhouse gas pollution**, with half admitting they had no plans to encourage more environmentally friendly behaviour. *The Guardian* January 3, 2007 Wednesday Councils ignore threat of climate change BYLINE: David Adam
- 159- Oil, petrol and coal produce carbon dioxide when they burn. **This acts as an invisible atmospheric insulator, trapping the sun's heat like the panes of a greenhouse**. *DAILY MAIL* August 8, 2002 UNFROZEN IN TIME BYLINE: Michael Hanlon
- 160- Two-thirds of the polar bear population live in Canada and the rest in Alaska, Russia, Norway and Greenland. The biggest of the world's eight species of bear, they are not currently listed as endangered. But signs that the creatures are in difficulty have been seen in the Hudson Bay region of Canada. (...) But the report said global warming, **caused by greenhouse gases** from fossil fuels **trapping** heat in the atmosphere, could dramatically shrink the thickness and extent of the polar ice, erasing the bear's habitat. *DAILY MAIL* May 17, 2002 Polar bears in peril as Arctic ice cap melts Global warming threat to the white hunters of the North BYLINE: James Chapman

- 161- Now one leading global warming sceptic has warned that current policies could even lead to the environment being harmed. (...) A recent UN study points the finger of blame firmly at humans, saying **greenhouse gases from factories, power stations, coal fires and cars are trapping heat** in the atmosphere. *DAILY MAIL* February 25, 2002 This global warming myth, by scientists
- 162- Forests have long been seen as an effective way of absorbing **the 'greenhouse gases'** such as carbon dioxide, which are thought to **trap** the sun's heat in the atmosphere. *DAILY MAIL* May 25, 2001 Planting trees will not stop global warming say scientists BYLINE: James Chapman
- 163- The oceans cover 72% of the Earth's surface. They **absorb** huge amounts of heat from the sun and serve as a "**memory**" of the climate system. (...) That day, a British report in Nature confirmed **the build-up of greenhouse gases** - because of burning of fossil fuels - could be detected from space. But in the past year there has been other evidence of dramatic climate change. A team from Ohio State University found that glaciers on Mount Kilimanjaro in Tanzania and in the Peruvian Andes were melting so fast they could disappear in 10 to 20 years. British scientists predicted a rise of up to 6C in air temperature in the next century - enough to reduce the north polar ice cap each summer to a couple of large floes drifting in a clear ocean. *The Guardian* April 13, 2001 Warmer seas reveal climate change BYLINE: Tim Radford
- 164- With a loss of sea ice and ice shelves, reduced albedo, or reflective power, causes a change in the **absorption** of heat and carbon dioxide, which means more warming. *The Guardian* March 20, 2002 Antarctica sends 500 million billion tonne warning of the effects of global warming BYLINE: John Vidal
- 165- The phenomenon is blamed on the burning of fossil fuels like coal, oil and gas which release **greenhouse gases that trap** the sun's heat in the atmosphere. *The Express* October 8, 2004 STAND BY FOR MORE VOLATILE WEATHER AS THREAT OF GLOBAL WARMING GROWS BYLINE: John Ingham
- 166- The icecap has shrunk by 15% to 20% in the past 30 years and the trend is set to accelerate, with the Arctic warming almost twice as fast as the rest of the planet, due to a **build-up of heat-trapping gases**. *The Guardian* November 3, 2004 Global warming 'will leave Arctic ice-free' BYLINE: Jamie Wilson
- 167- Carbon dioxide released by the burning of coal, oil and gas, and by **manmade greenhouse gases fuels global warming by trapping heat** that would normally dissipate into space. *DAILY MAIL* October 11, 2004 Global warming fear as levels of CO soar BYLINE: ANIL DAWAR
- 168- Carbon dioxide, mostly from the burning of coal, oil and gas, **traps** heat that otherwise would radiate into space. Temperatures increased by 0.6C over the 20th century and international scientists have concluded that most of the warming was probably due to **man-made greenhouse gases**. *THE DAILY TELEGRAPH* October 11, 2004, Monday Global warming clock begins to tick faster BYLINE: Charles Clover
- 169- In a dramatic reversal of its previous position, the White House this week conceded that emissions of carbon dioxide and other **heat-trapping gases** were the only likely explanation for global warming. *The Guardian* August 27, 2004 Bush U-turn on climate change wins few friends BYLINE: Gary Younge

- 170- The big problem on the global warming issue is no longer the science. Everyone agrees that gases like methane, carbon dioxide and oxides of nitrogen are **trapping** heat in the atmosphere. They are important to the planet: without a certain amount of carbon dioxide in the atmosphere, the Earth would be too cold for life. Carbon dioxide levels fluctuate with global climate and have done for millions of years. *The Guardian* April 29, 2004 Life: The Primer: This is what we know about global warming ...so why haven't we done anything about it yet? BYLINE: Paul Brown and Tim Radford
- 171- So many species are already destined for extinction because it takes at least 25 years for the **greenhouse effect - or the trapping** of the sun's rays by the carbon dioxide, methane and nitrous oxide already added to the air - to have its full effect on the planet. Deserts, grasslands and forests are already changing to make survival impossible. *The Guardian* January 8, 2004 Under threat: An unnatural disaster BYLINE: Paul Brown: Environment correspondent
- 172- Although not as dangerous to the ozone layer as chlorofluorocarbons, the three gases targeted - hydrofluorocarbon (HFCs), perfluorocarbon and sulphur hexafluoride - have a "high global warming potential" because they **trap** more heat and last longer in the atmosphere. *The Guardian* August 13, 2003 EU drive to fight global warming BYLINE: Andrew Osborn
- 173- Global warming is widely **blamed on** the burning of fuels like coal and oil, which release **greenhouse gases** such as carbon dioxide. They **trap** the sun's heat, forcing up temperatures. *The Express* June 18, 2003 SCIENTISTS SAY GLOBAL WARMING COULD LEAD TO MASS EXTINCTION; WE'RE DOOMED BYLINE: John Ingham
- 174- At least the doomsters have noticed that it makes no difference if the Arctic melts, since it's already floating. They still find reasons to be miserable, arguing that because snow reflects sunlight back into space, if it turns to water, more heat will be **absorbed**, accelerating global warming. *THE DAILY TELEGRAPH* November 22, 2004, Monday Global warming can be bad or good news - it depends on what you want to see BYLINE: NEIL COLLINS
- 175- The latest research confirms the picture of an increasingly mild polar world. Alaskan glaciers are in retreat. The Arctic Ocean icepack has thinned by more than 30% in the past three decades and has been shrinking by an area equivalent to the Netherlands each year during the same period. (...) The scientists also warn that once the ice sheet has melted it might not return. Icy regions stay cold because ice reflects light and heat, whereas rock and blue water **absorb** warmth. *The Guardian* April 8, 2004 Global warming may melt Greenland's ice, scientists warn BYLINE: Tim Radford
- 176- Once snow and ice begin to melt, the reflectivity of the earth's surface decreases, allowing more of the sun's heat to be **absorbed**. This in turn melts more ice and snow, further reducing the planet's albedo (reflective power), allowing still more warming, and so on. *The Guardian* February 14, 2004 Weekend: MELTDOWN: Alaska is a huge oil producer and has become rich on the proceeds. BYLINE: Mark Lynas
- 177- SOOT pouring out of lorries and chimneys is accelerating global warming by blackening snow and ice around the planet, making it **absorb** rather than reflect heat, a report today says. (...)Levels of soot are highest over China and India, where coal and biofuels are burned in households,

and over Europe and North America where a lot of diesel is used. *THE DAILY TELEGRAPH* December 23, 2003, Tuesday Sooty ice blamed for global warming BYLINE: Roger Highfield

- 178- Levels are highest over China and India, where coal and biofuels are burnt for domestic use, and Europe and North America, where the major source is diesel fuel. Soot warms the Earth by darkening snow and ice, causing it to **absorb** rather than reflect sunlight. The scientists said high soot emissions might be substantially contributing to earlier spring melts. *The Independent* December 23, 2003, Tuesday GLOBAL WARMING MADE WORSE BY SOOT, STUDY SAYS BYLINE: JOHN VON RADOWITZ
- 179- But it's not just new trees that are important. For some time, scientists have known that something, somewhere on the earth's surface is **absorbing** massive amounts of carbon dioxide from the air. Each year humans produce between 8 and 9bn tonnes of carbon, about half of which stays in the atmosphere and another quarter of which is **absorbed** by the oceans. What happens to the remaining 2bn tonnes or so of carbon? It's secured somewhere, in what is known to scientists, rather pleasingly, as the missing sink. It's almost certainly **absorbed** by trees and vegetation - but where? (...) All of which helps to explain why new findings that parts of the Amazon jungle in fact release, and **not absorb**, carbon dioxide will be causing quite a stir in Milan. *The Guardian* December 4, 2003 Life: Would planting more trees save us from global warming BYLINE: David Adam
- 180- Bamber said the effect on summer tourism would be disastrous. He warned that the disappearance of snow could intensify global warming and damage to the mountains, because once snow is replaced by darker, matt surfaces, such as grey ice and rubble, heat and light once reflected into space are **absorbed**. (...)A hiker reads a notice, above, warning of the dangers of climbing in the Mont Blanc range, where the hot weather has increased the risks of rockfalls. Inset, climbers marooned on the Matterhorn last month after rockfalls had made the mountain unclimbable. *The Observer* August 17, 2003 The World: Weather meltdown: Record heatwave closes Mont Blanc to tourists BYLINE: David Rose
- 181- The scientific evidence that runaway climate change has become a reality is now irrefutable. Due to the rapidly increasing **carbon content of our atmosphere**, more of the sun's heat is being **trapped** by our planet. The 10 hottest years since records began have all occurred since 1990. As a result, the polar ice caps are melting at an unprecedented rate and sea levels are rising. *The Independent* December 3, 2005 Saturday Global warming and the need for all of us to act now to avoid catastrophe
- 182- Even since Bush was re-elected last November there has been opinion shift across the country. The Union of Concerned Scientists in the US described his stand at Gleneagles as "stubborn and irresponsible". They say there is still time for Bush to show leadership, and they contrast his efforts with those of fellow Republican, governor Arnold Schwarzenegger's "bold initiative last month to cut California's heat-trapping pollution 80% by 2050". They also point to the fact that two weeks ago a majority of the US senate called for mandatory limits on global warming emissions, and more than 150 US mayors pledged to cut their cities' **heat-trapping** pollutants to 1990 levels. For a president said to be heavily influenced by the oil and coal lobby, the advocacy for economy-wide carbon regulation by General Electric, Ford, Cynergy, Exelon and DuPont could be an awkward counterweight. (...) This is because there is a 30-year lag between carbon dioxide getting into the atmosphere and the warming due to the **greenhouse effect catching up**. *The Guardian* July 14, 2005 Life: Cover story: America feels the heat BYLINE: Paul Brown

- 183- And that is no bad thing - within limits. **If there were no greenhouse gases, our world would be an uncomfortable place**, as the pioneering British physicist John Tyndall realised almost 150 years ago. Were it not for **heat-trapping gases** like carbon dioxide, solar radiation would be reflected straight back into space. (...) But we are increasing amounts of these gases and that is likely to have straightforward consequences. More and more energy that was previously lost to space will be **trapped** in the atmosphere. (...) And what they found was disturbing. In the part of the infra-red spectrum trapped by carbon dioxide, they found less and less radiation was leaking out into space from our planet. In other words, carbon dioxide - from energy plants, factories, cars and planes - appears to be **trapping** more and more heat in the atmosphere in a way that is exactly predicted by theory. (...) So what, you might ask? Well, it is known that sunlight beats down on our planet and bounces back into space in the form of infrared radiation. However, **greenhouse gases** like carbon dioxide **absorb** some of that energy, hold it and then radiate some of it back to the Earth. The effect is to heat up the atmosphere. *The Observer* June 26, 2005 Turning the Tide: Planet in Peril: Condemned to death by degrees if we fail to act BYLINE: Robin McKie
- 184- The gases take 50 years to rise into the upper atmosphere - where they **trap** heat, leading to the global warming which has been blamed for recent freak weather. With eco-business Future Forests, we are campaigning for our readers to cut the energy they use, which will also save pounds on electricity and gas bills. *Sunday Mirror* June 26, 2005, Sunday SUNDAY MIRROR CAMPAIGN TO SAVE THE PLANET: YEW CAN HELP BYLINE: SUSIE BONIFACE
- 185- When fossil fuels are burnt in cars or power stations they release carbon dioxide. This **traps** the sun's heat, warming up the atmosphere and the surface of the planet. *The Express* June 9, 2005 HOW THE DIRE EFFECTS OF CLIMATE CHANGE WILL BE COMING YOUR WAY SOON BYLINE: George Monbiot
- 186- Worse, the atmosphere's **carbon content**, which **traps** solar heat, is destined to rise no matter what action is taken today. *The Observer* May 1, 2005 Whoever we choose, our planet is the vital issue: Politicians fiddle as the world burns, but when Britain hosts the G8 summit in July, climate change must top the agenda
- 187- This is because ripening corn and other staples would reflect more sunlight back into space, and release more moisture into the air, while dark forests would **absorb** sunlight and send thermometers soaring. *The Guardian* December 9, 2005 Science: Climate change theory barks up wrong tree, study shows BYLINE: Tim Radford
- 188- Sea ice reflects up to 80 per cent of the sunlight that hits it, whereas uncovered water **absorbs** the sun's energy, which means that the ocean waters are warming, making the regrowth of ice more difficult, and perhaps impossible. *The Independent* September 29, 2005, Thursday LEADING ARTICLE: THE ENVIRONMENT MR BLAIR'S U-TURN ON CLIMATE CHANGE IS DISASTROUS
- 189- Hurricanes in the Atlantic-Caribbean sector derive their energy from the warmth and moisture **absorbed** from the tropical ocean. Broadly speaking, they only develop where the sea surface temperature is above 79F (26C). *THE DAILY TELEGRAPH* September 24, 2005, Saturday Rita not due to climate change BYLINE: PHILIP EDEN
- 190- Climate-change denial has gone through four stages. First the fossil-fuel lobbyists told us that global warming was a myth. Then they agreed that it was happening, but insisted that it was a good

thing: we could grow wine in the Pennines and take Mediterranean holidays in Skegness. Then they admitted that the bad effects outweighed the good ones, but claimed that climate change would cost more to tackle than to tolerate. Now they have reached stage four. They concede that climate change would be cheaper to address than to neglect, but maintain that it's now too late. This is their most persuasive argument. Today the climatologists at the Snow and Ice Data Centre in Colorado will publish the results of the latest satellite survey of Arctic sea ice. It looks as if this month's coverage will be the lowest ever recorded. The Arctic, they warn, could already have reached tipping point - the moment beyond which the warming becomes irreversible. As ice disappears, the surface of the sea becomes darker, **absorbing** more heat. Less ice forms, so the sea becomes darker still, and so it goes on. (...) Methane has 20 times **the greenhouse warming effect** of carbon dioxide. *The Guardian* September 20, 2005 It would seem that I was wrong about big business BYLINE: George Monbiot

191- The temperature of the Earth depends on a balance between incoming energy from the Sun and the energy that bounces back into space. Carbon dioxide **absorbs** heat that would otherwise be lost to space. Some of this energy is re-emitted back to Earth, causing additional heating of the planet. *The Observer* June 19, 2005 Focus: The warming planet: How carbon causes global warming BYLINE: JENNY BIRD

192- It also means that as the Earth spins more slowly it **absorbs** more heat from the sun - causing global temperatures to rise. *Sunday Mirror* May 29, 2005, Sunday GLOBAL WARMING NO SPIN BYLINE: TOM PRENDEVILLE

193- Increased **greenhouse gases in the air trap more heat** in the lower atmosphere, but the stratosphere far above the Earth is getting colder. *The Guardian* April 27, 2005 Ozone layer most fragile on record BYLINE: Paul Brown

194- And that is not all. Over the past thousand years, indeed for the past million years, global levels of carbon dioxide - which **traps** infra-red radiation and causes atmospheric heating - have remained between 200 and 300 parts per million. But they have now leapt to 380ppm in the past 150 years. *The Observer* January 30, 2005 GLOBAL WARMING: How we put the heat on nature BYLINE: Robin McKie and Mark Townsend

195- Fred Singer, a former director of the US Weather Satellite Service, told the conference that the Intergovernmental Panel on Climate Change (IPCC) had overestimated the risk posed by carbon dioxide, the **greenhouse gas that scientists think warms** the atmosphere by **trapping** heat. (...) Last month the Scientific Alliance published a joint report with the George C Marshall Institute, a group funded by ExxonMobil, which it claimed "undermined" theories of climate change. *The Guardian* January 28, 2005 Climate change impact disputed BYLINE: David Adam

196- How would this come about? The oceans have **absorbed** half the carbon dioxide, the main cause of global warming, so far emitted by humanity. This forms dilute carbonic acid, which attacks corals and shells. *Independent on Sunday* February 6, 2005 SPECIAL REPORT: GLOBAL WARMING: APOCALYPSE NOW BYLINE: GEOFFREY LEAN

197- Because the global climate is largely driven by the heat **locked up** in the oceans, a rise in sea temperatures could have devastating effects for many parts of the world. *The Independent* February 19, 2005, Saturday THE FINAL PROOF: GLOBAL WARMING IS A MAN-MADE DISASTER BYLINE: STEVE CONNOR

- 198- The greenhouse effect and climate change are not recent concepts. A century ago a remarkable English physicist, John Tyndall, recognised the power of water vapour and carbon dioxide to change the Earth's climate. In 1863 Tyndall published a scientific paper explaining how these atmospheric gases readily **absorbed** heat radiation leaving the Earth's surface, helping to **trap** the heat on land and sea. *The Times* December 4, 2006, Monday Victorian physicist who foresaw global warming BYLINE: Paul Simons
- 199- Speaking at the start of the main session of the UN climate change conference in the Kenyan capital, Nairobi, Mr Annan described **the build-up of heat-trapping greenhouse gases** as an "all-encompassing threat" to the world. (...) Australia, which is the world's second biggest per-capita **greenhouse gas polluter**, has softened its stance in recent days, with the prime minister, John Howard, saying he would consider an international carbon trading system - a vital element of Kyoto - to try to slow down global warming. *The Guardian* November 16, 2006 Thursday Annan attacks big polluters on emissions BYLINE: Xan Rice
- 200- The protocol obliges 35 industrial nations to reduce emissions of greenhouse gases by 5 per cent below 1990 levels by 2012. The US and Australia are the only major industrialised countries to have rejected that target. US President George W Bush asserts that it would harm the US economy and it should have required cutbacks by poorer countries as well. Scientists attribute at least some of the past century's 0.6°C rise in global temperatures to the atmospheric **accumulation** of carbon dioxide and other **heat-trapping** gases. *Morning Star* November 16, 2006 Thursday World - Annan slams climate change deniers
- 201- By polluting our skies, we're **trapping** more of the sun's heat, **just as a glass window does in a greenhouse**. And so the world grows hotter. *The Mirror* October 30, 2006 Monday SO WHAT ON EARTH CAN WE DO ABOUT GLOBAL WARMING? BYLINE: ROS WYNNE-JONES
- 202- Emissions of **greenhouse gases** such as carbon dioxide **trap** heat in the atmosphere, warming the surface. *The Guardian* October 11, 2006 Wednesday Water for millions at risk as glaciers melt away BYLINE: David Adam
- 203- According to scientists, **global warming is partly caused by 'greenhouse gases' which trap** heat close to the earth. These are given out naturally but are also the result of human pollution and the burning of fossil fuels like coal and petroleum. They include carbon dioxide, methane and nitrous oxide, which are released by cars, modern industry and agriculture. Their concentration in the atmosphere has risen by more than 30 per cent since 1800. After carbon emissions caused by human activity, deforestation is the second biggest cause of carbon dioxide in the atmosphere. (...)At the moment, it is predicted that average temperatures around the world will rise between 1.4C and 5.8C in the next 100 years. *Daily Mail* September 19, 2006 Tuesday England's overheating; Rising temperatures blamed on manmade climate change BYLINE: EMILY COOK
- 204- The science is not complicated. Gases like carbon dioxide sit in the atmosphere and prevent heat from the earth escaping - **just as a greenhouse traps heat**. *The Mirror* September 19, 2006 Tuesday YOUR PLANET NEEDS YOU; PLEA OVER GLOBAL WARMING

- 205- The thicker that layer becomes, the more heat gets **trapped** in, so raising the Earth's temperature. *The Guardian* September 13, 2006 Wednesday Comment & Debate: An inconvenient truth: beware the politician in fleece clothing: Al Gore's film delivers a stunning lesson on global warming. BYLINE: Jonathan Freedland
- 206- The results, echoed by studies at 100 other sites in the north Siberia region, are alarming because methane is far more effective at **trapping** heat than carbon dioxide and is therefore potentially much more dangerous to the planet. (...) The revelations about Siberia's methane add to these worries. Methane is produced in soil by bacterial decomposition and normally released into the air. However, in the permafrost regions of Siberia and the Arctic the gas gets **locked** into the frozen soil, and over the millennia this has built up to create a vast reservoir of the gas. In addition to the methane built up, it is also known that vast amounts of carbon dioxide are **locked** in the planet's frozen zones. In total, it is estimated there could be as much as 450 billion tonnes of methane and carbon dioxide **trapped** in the world's permafrost. *The Observer* September 10, 2006 Siberian thaw to speed up global warming BYLINE: Robin McKie and Nick Christian
- 207- Rising CO 2 **concentrations** in the atmosphere are also causing oceans to acidify. Since the beginning of the industrial revolution a third of the CO 2 released by fossil fuel burning has been **absorbed** by the oceans. *The Guardian* December 7, 2006 Thursday Science: Extinctions in the future: Explainer: Global warming BYLINE: James Randerson
- 208- Oceans around the world are becoming more acid as a result of the increased **concentration** of carbon dioxide being **absorbed** at the sea surface. Computer models suggest that the increased acidity of British coastal waters will surpass the maximum acidity of existing levels. *The Independent* November 29, 2006 Wednesday Climate change already affecting UK's marine life BYLINE: Steve Connor
- 209- Some scientists believe we are approaching the point of no return, where the process feeds upon itself. For as the white ice - which reflects heat - melts, it will be replaced by dark water, and this **absorbs** heat. So the ocean will get even warmer, causing even greater melting, until all the ice is gone. At the same time, as *The Independent* on Sunday exclusively reported last year, glaciers in Greenland are melting even faster than in Antarctica. In the past two years alone, the rate of loss has grown by 250 per cent. *The Independent on Sunday* October 22, 2006 Cracking up; Ice turning to water, glaciers on the move - and a planet in peril BYLINE: Geoffrey Lean
- 210- Arctic sea ice acts like an **insulating lid** on the northernmost ocean, reflecting sunlight and preventing the water from **absorbing** heat and warming up. *The Independent* October 4, 2006 Wednesday Global warming devastates sea ice in Arctic Circle BYLINE: Steve Connor
- 211-Emissions of the waste gas carbon dioxide (CO2) from energy, industry and transport - from anywhere, in fact, where the fossil fuels coal, oil and gas are burnt - are pouring into the atmosphere around the world, and causing it to **trap** more and more of the sun's heat, **like the panes of a greenhouse**. *The Independent* January 16, 2006 Monday Accelerating global warming; Cause and effect
- 212- Astronomers and scientists believe the clouds, consisting of tiny ice particles and **trapped** space debris in the upper atmosphere, are forming more often as the Earth heats up. While temperatures rise on the Earth's surface, the upper atmosphere is cooling and producing more icy particles and more of the telltale clouds, which have been described as resembling 'ripple marks in the sand'. The clouds

are becoming so numerous that they are dropping lower in the atmosphere, resulting in them being spotted not just in the polar regions, but as far south as northern Italy and Spain. *Daily Mail* August 1, 2006 Tuesday Are these clouds over Dundee the key to global warming? BYLINE: KURT BAYER

- 213- In Siberia permafrost peatbogs are thawing, starting the release of massive quantities of **trapped** methane. In Alaska graves dug in once permanently frozen ground are spilling open. *The Independent* July 19, 2006 Wednesday A primer in climate change for doubters
- 214- The pollutants, known as aerosols, reduced sunshine levels by **absorbing** and scattering solar radiation and promoting the formation of clouds that reflected radiation back into space. (...) A 6% increase in the amount of solar radiation reaching earth would have a powerful impact on climate, especially when added to the **warming effect of greenhouse gases** which have already raised global temperatures by about 0.6C. *The Sunday Times* March 26, 2006 Brighter sun adds to fears of climate change BYLINE: Jonathan Leake
- 215- The greatest fear is that an environmental "positive feedback" has kicked in, where global warming melts ice which in itself causes the seas to warm still further as more sunlight is **absorbed** by a dark ocean rather than being reflected by white ice. *The Independent* March 14, 2006 Tuesday Climate change 'irreversible' as Arctic sea ice fails to re-form BYLINE: Steve Connor
- 216- Another possibility is that there was a sudden release of massive amounts of methane and carbon dioxide that had been **locked away** in the deep ocean in a frozen form known as ocean gas hydrates. Even today, it is estimated that there is more carbon **locked away** as ocean gas hydrates than all of the oil and gas reserves of the world combined. *The Independent* August 10, 2006 Thursday Arctic thawed in prehistoric global warming BYLINE: Steve Connor
- 217- The UK, the EU and much of the developing world want to launch an attempt to arrest the **build-up of heat-trapping gases** in the atmosphere. *The Independent* December 14, 2007 Friday EU leads last-gasp effort to salvage climate-change deal
- 218- Beijing, which some believe has surpassed the US as the world's top emitter of carbon dioxide and other **heat-trapping** gases, also questioned the fairness of binding cuts when its per capita emissions are about one-sixth of Washington's. *Morning Star* December 8, 2007 Saturday World - China places onus on West to lead fight over global warming
- 219- The two-week meeting follows a report by a Nobel-prizewinning UN network of scientists that concluded that the level of carbon and other **heat-trapping greenhouse gas** emissions must stabilise by 2015 and decline from there. (...) The Kyoto pact required 36 industrial nations to reduce greenhouse gases emitted by power plants and other industrial, agricultural and transport sources. It set relatively small target reductions averaging 5 per cent below 1990 levels by 2012. A new agreement must be concluded within two years to give countries time to ratify it and to ensure a smooth, uninterrupted transition. But much of what will happen behind closed doors in Bali will revolve around nuances, with debates over words such as "commitment" versus "mandatory." *Morning Star* December 3, 2007 Monday Feature - Global solutions BYLINE: Ann Douglas

- 220- The retort has come from the two developing world giants that they have played no part in creating the **build-up of heat-trapping gases** in the atmosphere and cannot be expected to stymie their own economic growth to sort the problem out. *The Independent* December 1, 2007 Saturday Businessmen back urgent action to halt climate-change emissions BYLINE: Daniel Howden
- 221- Figures from the GCP, summarising the latest findings from the United Nations, and building on estimates contained in the Stern Report, show deforestation accounts for up to 25 per cent of global emissions of **heat-trapping gases**, while transport and industry account for 14 per cent each; and aviation makes up only 3 per cent of the total. (...) And yet there is no agreement on placing a value on the vastly more valuable land in developing countries. More than 50 per cent of the life on Earth is in tropical forests, which cover less than 7 per cent of the planet's surface. *The Independent* May 14, 2007 Monday Burning forests 'is main agent of climate change' BYLINE: Daniel Howden
- 222- THERE are already three million people in the UK with ASTHMA. But this number is likely to rise as global warming causes the air to become contaminated with toxic gases that have become **'trapped'** within the atmosphere. *Daily Mail* March 27, 2007 Tuesday Never mind the polar bears, global warming could give you malaria BYLINE: DIANA APPELYARD
- 223- Critics have focused on the way the report treats future generations, which will be most affected by decisions we make today because it takes time for the **heat trapped** by our carbon emissions to build up. Much of what is going to happen over the next 30 or 40 years is already determined. *The Guardian* March 17, 2007 Saturday Stern consequences: This week's ambitious climate change bill demands big cuts in carbon emissions. BYLINE: David Adam
- 224- Sea ice reflects most of the sunlight that strikes it. However, once it melts, the dark ocean surface, which **absorbs** sunlight, becomes exposed. This causes waters to warm and increases the melt rate. If the sea ice were to disappear, the Earth would **absorb** more solar energy, which could accelerate global warming. *The Daily Telegraph* September 22, 2007 Saturday Climate change fears as Arctic sea ice 'melts to all-time low' BYLINE: Martin Beckford
- 225- Two years ago, an authoritative study predicted there could be as little as 10 years before this "tipping point" for global warming was reached, adding a rise of 0.8 degrees had already been reached with further rises already **locked** in because of the time lag in the way carbon dioxide - the principal **greenhouse gas** - is **absorbed** into the atmosphere. *The Independent* September 19, 2007 Wednesday 'Too late to avoid global warming,' say scientists
- 226- Ice reflects solar energy. But if it starts to disappear, heat is **absorbed** by the dark seas and rock below ice floes and glaciers. The Arctic then gets warmer and even more protective ice covering is lost - so melting accelerates dangerously. *The Observer* September 16, 2007 Arctic thaw opens fabled trade route BYLINE: Robin McKie
- 227- The Southern Ocean is responsible for soaking up the annual CO2 contribution of the UK and the Netherlands combined, but the study shows that the ocean is **absorbing** the same quantity of the gas as it was 24 years ago. Scientists had expected the amount of CO2 **absorbed** would increase in line with rising levels in the atmosphere. The change is due to increased winds over the ocean linked to climate change and the depleted ozone layer. (...) More mixing brings colder water up from the depths

which is **saturated** with CO₂, so that it cannot accept any more from the atmosphere. *The Guardian* May 18, 2007 Friday CO₂ sponge losing ability to soak up extra emissions BYLINE: James Randerson

- 228- Generally, it is assumed that deforestation contributes to global warming. Trees and plants take carbon dioxide, the leading greenhouse gas, from the atmosphere to use in photosynthesis and "breathe out" oxygen. The new study found that trees in snowy parts of the world actually warm the Earth, because their dark canopy **absorbs** sunlight that would otherwise be reflected back into space. (...) Trees in icy areas increase the planet's **absorption** of sunlight by shading reflective snow, adding more to global warming than they take away by **removing** carbon dioxide from the atmosphere. Planting trees and protecting forests is one of the accepted strategies for combating climate change. Tropical forests had the opposite effect. They helped to keep the planet at an even temperature. *The Daily Telegraph* April 10, 2007 Tuesday Felling trees may help reduce global warming, study finds BYLINE: Roger Highfield
- 229- Cities will be warmer because of the "urban heat island effect", where buildings **absorb** warmth and increase night temperatures. *The Mirror* March 30, 2007 Friday BRUM LIKE IT HOT; CITY TO BE 'WORST HIT BY GLOBAL WARMING' BYLINE: MIKE SWAIN
- 230- Some offset companies have been accused of buying carbon rights for trees that have already been planted or would have been planted anyway. (...) Recent research in America has also suggested that planting trees in northern climes can contribute to climate change by **absorbing** the sun's heat, rather than allowing the earth's surface to reflect it. (...) Then there is the moral imperative, which simply and compellingly says: just avoid activities that are particularly harmful to the environment. Don't fly; take those holidays in Britain. Or go by ship to Australia, or train to Italy. And don't drive to work, if a bike journey will take you there as easily. *The Independent* January 11, 2007 Thursday Does carbon offsetting really help in the fight against climate change? BYLINE: CAHAL MILMO
- 231- Together, **the heating of the Earth by greenhouse gases** has grown by 22.7 per cent since 1990. (...) World heading for carbon **saturation** *The Independent on Sunday* December 2, 2007 Rich countries blamed as greenhouse gas emissions hit record
- 232- The problem with the seas was identified earlier this year in the Southern Ocean, where winds driven by climate change are bringing **carbon-saturated** waters to the surface, which are unable to **absorb** any more carbon. Droughts, a further by-product of climate change, are suggested as a reason why land is **absorbing** less carbon. *The Times* October 23, 2007, Tuesday Increases in CO₂ mean climate change 'will be tougher to combat' BYLINE: Lewis Smith
- 233- Now the research team has found the vast Southern Ocean, which is the earth's biggest carbon sink, accounting for about 15 per cent of the total **absorption** potential, has become effectively CO₂-**saturated**. (...) This will not just be fatal for polar bears, which need the ice in order to hunt seals. It will replace a huge, bright white surface which reflects much of the sun's radiation (the ice) with a dark one (the sea) which will **absorb** it - thus contributing to a warming planet. (...) The level of the gas it is **absorbing** has remained static since 1981 - but in that time the amount emitted has grown by 40 per cent, so it has stopped keeping pace and much more CO₂ is left over to **trap** the sun's heat. *The Independent* May 18, 2007 Friday Earth's natural defences against climate change 'beginning to fail' BYLINE: Michael McCarthy

- 234- This causes the ocean to warm further, triggering the loss of still more summer ice, the exposure of more open water and the **absorption** of more sunlight and heat, a vicious cycle or 'positive' feedback that would inevitably cause an irreversible loss of sea-ice if left unchecked. (...) The decline was constant, but in recent years it appears to have accelerated, dramatically so this summer, suggesting a sort of feedback mechanism may have kicked in, adding to **the extra melting caused by man-made greenhouse gases and global warming**. *The Independent* September 16, 2005, Friday GLOBAL WARMING: ARCTIC'S CYCLE OF DECLINE IS WORST SINCE LAST ICE AGE
- 235- The issue of global warming is gaining in profile daily, as both the media and world leaders recognise the need for urgent action. However, questions about climate change were being raised by scientists as far back as the 19th century. The story starts in 1827 with the French mathematician Fourier. He coined the term "greenhouse effect" and provided an explanation for the relatively small temperature difference between daytime and night-time on the Earth - and the development of a climate that was, among other things, suitable for human beings. Then, in 1860, British scientist John Tyndall measured the atmosphere's **absorption** of radioactive energy, and discovered that it was the minority gases, carbon dioxide and water vapour, that produced **the greenhouse effect**, not nitrogen or oxygen. *The Guardian* February 3, 2005 Life: Last word: A chemist ahead of his time BYLINE: David King
- 236- For instance, as temperature rises in response to a forcing, the air carries more water vapour, the most important **greenhouse gas**; and polar ice melts, increasing heat **absorption**. Up goes the temperature again. (...) Why haven't air or sea temperatures turned out as the UN's models predicted? Because the science is bad, the "consensus" is wrong, and Herr Professor Ludwig Boltzmann, FRS, was as right about energy-to-temperature as he was about atoms. *The Sunday Telegraph* November 5, 2006 Sunday DON'T BELIEVE IT The sun is warmer now than for the past 11,400 years The Stern report last week predicted dire economic and social effects of unchecked global warming. BYLINE: Christopher Monckton
- 237- What can a film that has helped make Al Gore sexier than Paris Hilton possibly be about? A partial list of its contents would include **the greenhouse gas effect**, the proliferation of carbon dioxide, the convection energy of hurricanes, the paradoxical flood-drought syndrome, melting methane in Siberia, the history of the Ice Age and the physics of solar ray **absorption**. It becomes no clearer why this film is having such an impact when you learn that it largely takes the form of a souped-up Powerpoint presentation. But it's riveting largely because of the conviction and energy with which Gore delivers the presentation that is its backbone. Since his defeat by some hanging chads and the US Supreme Court in 2000, Gore has been touring the country and the world, giving a passionate, expertly documented multimedia presentation on global warming, in halls and on campuses, mainly to invited audiences. This campaign is personal and impassioned. He has given the presentation, by his own admission, more than 1,000 times. *The Observer* February 5, 2006 Review: Cover story: Al Gore: the second coming: Last week Al Gore was the toast of the Sundance Film Festival BYLINE: Geraldine Bedell
- 238- But things were changing: Britain **baked** for weeks and the ritual denials rang ever more hollow. (...) In one way, Alaska has only itself to blame. Its oil wells produce nearly a million barrels of crude a day to help feed America's 200 million cars, whose exhausts then pump out the **greenhouse gases which are causing the problem** in the first place. *The Observer* October 5, 2003 Review: At the end of our weather BYLINE: Mark Lynas
- 239- Will we freeze or **bake**? (...) BRITISH scientists are fighting climate change by reducing the **harmful greenhouse gases** produced by flatulent cows. *The Sunday Times* December 4, 2005 War on climate change targets flatulent cows BYLINE: Toby McDonald

- 240- Scaring temperatures in sub-Saharan Africa were responsible for the worst famine for 20 years. Thousands of children starved to death as food supplies dwindled and locust swarms destroyed the harvest. As Africa baked, monsoon rains drenched low-lying areas of India. Flooding in Mumbai and across the Maharashtra province led to 1,050 deaths. A further 5,000 are believed to have died from cholera as water supplies became contaminated. (...) If the Amazon burned it would generate vast amounts of carbon, only **adding to the greenhouse gases that already imperil the planet**. *Sunday Express* October 16, 2005 PREPARE FOR HOTTEST YEAR EVER BYLINE: Stuart Winter
- 241- Climate changes naturally in slow, inexorable cycles over millennia. It is simply egotism on the part of human beings to assume that our puny emissions have any effect at all. At first, this sounds persuasive. Aren't we tiny? Isn't the world huge? I put this to Geoff Jenkins, Britain's leading climatologist, based at the Hadley Centre. He replied: 'Of course it is true that many factors affect the climate, from changes in the sun to volcanoes. But levels of carbon are a key factor as well.' Everyone agrees there is **a natural greenhouse effect**, he explains. It's simple: carbon and water vapour in the atmosphere **trap** heat, and they keep us about 3C warmer. (...) Today, by contrast, there is a near-complete scientific consensus that man-made global warming is happening and could be disastrous. The evidence is not patchy and partial, as the 'global cooling' scientists always admitted theirs was; it is massive and overwhelming. (...) The deniers then take a different tack: in the 1970s, they say, climatologists were warning about the dangers of a 'new Ice Age'. Now they say we'll **boil**. Isn't the truth that they don't know? (...) There are countless myths, and it would take a whole issue of *The Independent* to debunk them all. The climate-change deniers are rapidly ending up with as much intellectual credibility as creationists and Flat Earthers. *The Independent* April 25, 2005, Monday THE SHAME OF THE CLIMATE-CHANGE DENIERS BYLINE: JOHANN HARI
- 242- The rest of the emissions have been left in the air to **aggravate the Earth's natural greenhouse effect**, so raising global average temperatures. (...) So the message is clear: frozen peat bogs that turn into heat-**absorbing** lakes release methane, which means a **stronger greenhouse effect** and higher temperatures, leading to more permafrost melting. The cycle was clearly documented in 2006 but just how strong this positive feedback turns out to be has yet to be fully determined. (...) The once-frozen peat bogs of Siberia - bigger than France and Germany combined - began to "**boil**" furiously in the summer of 2006 as methane bubbled to the surface. *The Independent* December 29, 2006 Friday Our worst fears are exceeded by reality BYLINE: STEVE CONNOR
- 243- So is that what we have to look forward to - a miserable choice between being **boiled** alive and massive state intervention in the collective interest of preventing it? *The Independent* October 21, 2006 Saturday Climate change: taking responsibility BYLINE: JEREMY WARNER
- 244- Until now global warming studies have been limited to general statements about the likely rise in the Earth's average temperatures caused by **the build-up of greenhouse gases** in the atmosphere. These studies predicted that warming would be a boon for the wine industry. (...) THE LUSH vines of California are among the most iconic images of America, with the perfect climate between the **baked** Central Valley and the cool Pacific coast enabling the area take its place as one of the great success stories of the boom in new-world wines. *The Observer* July 30, 2006 The last of California's summer wine? BYLINE: Juliette Jowit
- 245- If parts of the planet are becoming **like a furnace** because of global warming, then the Arctic is best described as the world's **air-conditioning unit**. The frozen North plays a crucial role in cooling the rest of the planet while reflecting some of the sun's heat back into space. *i-Independent*

August 24, 2017 Breaking the ice; Sailing through the Northwest Passage was a near-impossible voyage, but global warming allowed Frank Jordans and his crewmates to cross the Arctic in record time BYLINE: Frank Jordans

- 246- With the trees gone, the soil will **bake** in the sun and the rainforest could become desert. *The Independent on Sunday* July 23, 2006 Amazon rainforest 'could become a desert' BYLINE: Geoffrey Lean and Fred Pearce
- 247- That continents have been frozen or **baked** before is no consolation to millions facing famine, flooding and disease. *The Observer* February 19, 2006 Leading article: It's the wrong time to blow cold on global warming
- 248- To read Lovelock and others is to sense a reincarnation of medieval hell. If we do not cease our sinful ways, they wail, we and our descendants will be damned to unspeakable torment in **fiery furnaces**. There was something of Hieronymus Bosch about Attenborough's programme. *The Sunday Times* May 28, 2006 Global warming might not be so bad, if we keep our cool BYLINE: Simon Jenkins
- 249- Nor is it politically correct to mention that the scientists say we are going to both freeze and **boil**. After the heatwave summer of 2003, Nature magazine published a report saying that 40C (104F) summers would become the norm rather than the exception in years to come. *Daily Mail* January 31, 2006 Tuesday A scorched Earth? Let's stay cool BYLINE: MICHAEL HANLON
- 250- That may seem sensible and obvious: after all, if the council's job is to fret about threats to global security then the threats don't come much bigger than the risk that we might be **boiling** the planet. But, incredibly, the body had never talked about global warming before - and they were not keen to start yesterday. *The Guardian* April 18, 2007 Wednesday There is now no doubt that global warming is a security threat to us all BYLINE: Jonathan Freedland
- 251- Produced by using fossil fuels, **these gases form a blanket round the Earth trapping heat**. *The Express* April 26, 2002 END OF THE SNOWMAN AS GLOBAL WARMING IS SET TO TAKE HOLD QUICKER THAN WE THOUGHT BYLINE: John Ingham
- 252- These gases, released by burning fossil fuels, **form a blanket round the world which traps** the sun's heat. *The Express* January 8, 2004 THIRD FACE EXTINCTION IF GLOBAL WARMING RAISES THE TEMPERATURE BY 3C BYLINE: John Ingham
- 253- The charge is that through industrialisation and an increasing dependency upon the internal combustion engine, we have pumped so much carbon dioxide, methane and nitrous oxide into the skies that **we have created a blanket in the upper atmosphere** which, while permitting the heat of the sun to reach us, retains that heat instead of allowing it to evaporate naturally. *Mail on Sunday* August 17, 2003 Why 'global warming' is a lot of hot air BYLINE: STEWART STEVEN
- 254- These emissions act as a **giant insulation blanket suspended above the earth's surface**. Warmth, in effect, cannot escape, heating up the atmosphere through the so-called '**greenhouse effect**' and increasing its moisture-carrying capability. *The Observer* January 5, 2003 FOCUS: CLIMATE CHANGE: Whatever happened to the weather? BYLINE: Mark Townsend

- 255- Other **greenhouse gases add to the warming**: methane, released by fuels and paddy fields; nitrous oxides, mainly from fertilisers; and a few manufactured chemicals. Now at last, the world is beginning to try to restrain them, before climate change runs out of control. (...)Thanks to us, **concentrations of the gas** are higher than they have been at any time in the past 650,000 years, and they are rising. Carbon dioxide in the atmosphere **traps** some of the energy that reaches Earth from the sun, preventing it from escaping back into space; thus, **like an invisible blanket**, it warms the planet. We know this happens because natural levels of the gas keep in enough heat to make the world habitable - without it, ours would be a freezing planet. It is little more than common sense that adding more carbon dioxide will make **the blanket thicker**, heating the world up more. *The Independent on Sunday* November 12, 2006 Carbon footprints; News analysis: CLIMATE CHANGE; In the future we may each have our own personal emissions allowance. BYLINE: Geoffrey Lean
- 256- We are rapidly **cloaking the world in a blanket trapping the fierce heat** of the sun. The ice caps are melting, the sea level is rising, and the sinister risk of abrupt climate change threatens our very existence. *The Guardian* November 6, 2006 Monday the giving list BYLINE: Paul Dickinson
- 257- But if that is the good news, here comes the bad: floods, malaria, shark attacks, sweltering summers and worsening drought. Rainfall will decline in the summer and the increased deluges in winter will struggle to replenish thirsty reservoirs because much of the water will run off the **baked** ground. Rapid changes in temperature will confuse wildlife and a white Christmas will be a distant dream. (...) They use giant computer programs, evolved from those that make weather forecasts, to work out how **the atmosphere will react to the blanket of carbon dioxide** we humans are steadily **wrapping around** the planet. *The Guardian* July 22, 2006 Saturday Special report: Global warming: Drought, gales and refuges: what will happen as UK hots up BYLINE: David Adam
- 258- A **thicker blanket of carbon dioxide wrapped around** the planet means summers will be an average 3C hotter than today in the south-east and up to 1.5C warmer in the north of Scotland. Winters will be at least 1.5C warmer across the country, with the effects felt most strongly at night. *The Guardian* July 22, 2006 Saturday Special report: Global warming: What's in store if we don't act now
- 259- The IPCC's removal of the upper temperature estimation is posited on new predictions about how the atmosphere would react to **the carbon blanket wrapped around it**. Three previous reports assumed that a doubling of carbon dioxide in the atmosphere would increase average global temperature by between 1.5 and 4.5C. Since then, computer models have foreseen increases as high as 11C, and some scientists wanted the conservative IPCC to raise the upper end of the range. Others said such a move would be misleading and alarmist. According to sources who have seen it, the draft assumes a doubling of carbon dioxide would cause a likely temperature rise of between 2C and 4.5C, but says higher increases are possible. But climate scientists remain divided about the likelihood of the worst-case scenario being realised. *The Guardian* February 28, 2006 Tuesday Science: UN scientists issue dire warning on global warming BYLINE: David Adam
- 260- So what can Britain expect as **the blanket of greenhouse gases around the planet thickens?** Overall, there will be a shift towards a more Mediterranean-style climate. *The Guardian* May 21, 2007 Monday Weather: The heat is on BYLINE: David Adam
- 261- Humans, by burning fossil fuels, have liberated several billions of tonnes of carbon dioxide (CO₂) into the Earth's atmosphere. CO₂ acts **as a thermal blanket on the Earth**, and so our planet

warms up. *Daily Mail* April 23, 2007 Monday The snows of Kilimanjaro - which AREN'T melting - and inconvenient questions about global warming BYLINE: MICHAEL HANLON

- 262- Since 1990, while politicians have argued about what should be done, **the blanket of greenhouse gases** that keeps the planet above the temperatures of space has increased by seven per cent, says the report. The radiative forcing potential - **the amount the blanket can warm the planet** - has increased 30 per cent. (...) The Kyoto Protocol is the main plan for capping emissions of greenhouse gases but it has been critically weakened since the US, the leading source of the gases, pulled out in 2001. Emissions by many backers of Kyoto are far over target. In December, talks on a successor to Kyoto, will begin in Bali. *The Daily Telegraph* February 3, 2007 Saturday Official: global warming is all our fault BYLINE: Charles Clover
- 263- The pre-Columbian Indians used biochar to make the poor soils of the rainforest - which otherwise quickly become exhausted - productive for harvest after harvest. It is still there today, many hundreds of years later, forming islands of black fertile earth in the otherwise unpromising ground. But it is now being widely cited as a possible solution to global warming by scientists shocked at how climate change is taking place much faster than predicted and convinced that the world must now start not just rapidly to reduce CO2 emissions, but **to get the greenhouse gas out of the air**. *The Independent on Sunday* December 7, 2008 Ancient skills 'could reverse global warming' BYLINE: Geoffrey Lean
- 264- The common view of the IPCC is that it consists of 2,500 of the world's leading scientists who, after carefully weighing all the evidence, have arrived at a "consensus" that world temperatures are rising disastrously, and that the only plausible cause has been rising levels of CO2 and **other man-made greenhouse gases**. In fact, as has become ever more apparent over the past 20 years -not least thanks to the evidence of a succession of scientists who have participated in the IPCC itself - the reality of this curious body could scarcely be more different. It is not so much a scientific as a political organisation. Its brief has never been to look dispassionately at all the evidence for man-made global warming: it has always taken this as an accepted fact. Indeed only a comparatively small part of its reports are concerned with the science of climate change at all. The greater part must start by accepting the official line, and are concerned only with assessing the impact of warming and what should be done about it. *The Sunday Telegraph* August 31, 2008 The 'consensus' on climate change is a catastrophe in itself BYLINE: Christopher Booker
- 265- There are many reasons why it is not quite as simple as that. My rudimentary understanding of the science of climate change is that **concentrations of greenhouse gases** have been **building up over many decades**, and you can't simply turn them off like a tap. *The Guardian* August 25, 2008 Monday Economics: Climate change: Can a dose of this ... solve this...? BYLINE: Larry Elliott
- 266- It was not **human-produced greenhouse gases** which were causing the climate to warm, Mr Durkin (film director) alleged, but solar activity, and in support of his case he produced a series of graphs and a number of scientists who backed his theory. (...) Ofcom said serious allegations were made against the IPCC without the UN body being given a proper opportunity to respond and it also found the programme to be in breach of the impartiality code by alleging that the climate change policies of Western nations were holding back development in poorer countries, without putting forward an alternative view. The broadcast angered Britain's science community, from the Royal Society down, who accused Mr Durkin of distorting evidence and playing fast and loose with the facts. *The Independent* July 22, 2008 Tuesday C4's climate change documentary 'was unfair but not misleading' BYLINE: Michael McCarthy (my addition in parenthesis)
- 267- Hansen's speech to Congress on June 23 1988 is seen as a seminal moment in bringing the threat of global warming to the public's attention. At a time when most scientists were hesitant to speak

out, he said evidence of **the greenhouse gas effect** was 99% certain, adding "it is time to stop waffling". *The Guardian* June 23, 2008 Monday Sue fuel firm CEOs, urges climate change pioneer BYLINE: Ed Pilkington

- 268- Nine ways in which the Earth could be tipped into a potentially dangerous state that could last for many centuries have been identified by scientists investigating how quickly global warming could run out of control. (...)The scientists warn that climate change is likely to result in sudden and dramatic changes to some of the major geophysical elements of the Earth if global average temperatures continue to rise as a result of the predicted increase in emissions of **man-made greenhouse gases**. *The Independent* February 5, 2008 Tuesday Scientists identify 'tipping points' of climate change BYLINE: Steve Connor
- 269- Carbon dioxide is the chief **greenhouse gas produced by human activity**. It is produced when we burn fossil fuels: oil, gas and coal. The level of carbon dioxide in the atmosphere is measured in parts per million (ppm). (...) The Earth's climate has always varied, so the term climate change is now generally used to describe the changes **caused by human activity** - specifically, **greenhouse emissions** such as carbon dioxide and methane, which **build up in the atmosphere and trap heat**. (...) **As human activity increases the concentration of these gases in the atmosphere** far beyond their natural levels, much more **heat is trapped**. Hence, the term climate change is often used interchangeably with global warming. (...) Only **an increased greenhouse effect** caused by higher amounts of **heat-trapping** gases in the atmosphere can explain it. *Guardian.com* February 1, 2008 Climate change
- 270- We need to pay the tropical rainforest nations to halt further deforestation; develop carbon capture, and storage and fit it to power stations, particularly the many planned coal-fired stations around the world; and research ways of **removing greenhouse gases** from the atmosphere. *The Express* December 29, 2009 Tuesday Let's all rise to challenge of tackling climate change
- 271- Tuvalu puts forward radical proposal to limit emissions and **stabilise greenhouse gas concentrations**. China and India block the move. (...) (It is the emissions of carbon dioxide from the coal and oil and gas we burn in power stations and cars, and also of the CO₂ which comes from deforestation, that are **trapping** the sun's heat in the atmosphere - **acting like the panes of a greenhouse** - and causing world temperatures to rise.) *The Independent on Sunday* December 20, 2009 So, what does this accord add up to? BYLINE: Michael McCarthy
- 272- And even that scenario could plausibly push temperatures above 2.5C, depending on exactly how the carbon cycle and atmosphere respond to the **build-up of greenhouse gases**. *Guardian.com* December 15, 2009 Tuesday Can we halt runaway climate change? Not likely BYLINE: Duncan Clark
- 273- Two years ago, the Intergovernmental Panel on Climate Change issued a report by 152 scientists from 30 countries that said global temperatures are increasing and that **man-made greenhouse gases** are the likely cause. (...) Carbon dioxide and other gases such as methane make up a tiny part of the atmosphere but are key to keeping in the world's heat, rather **like the glass of a greenhouse**. As the gases increase, more **heat is trapped**, causing the "**greenhouse gas effect**". *The Daily Telegraph* December 7, 2009 Monday What is global warming and is it really all our fault? BYLINE: Louise Gray
- 274- Lord Stern, the Government's adviser, has warned that 10 billion tons of **greenhouse gases must be taken out of the atmosphere** by 2020. So far, agreement is in place for only half that - but the chances of a deal at Copenhagen appear slim. *The Sunday Telegraph* December 6, 2009 Half of voters sceptical about climate change BYLINE: Patrick Hennessy
- 275- According to the government adviser Sir Nicholas Stern, 10bn tonnes of **greenhouse gas emissions must be taken out of the atmosphere** by 2020. So far agreement is in place for only half of that amount. *The Guardian* December 5, 2009 Saturday Front: Brown attacks 'flat-earth' climate change sceptics BYLINE: Damian Carrington, Suzanne Goldenberg

- 276- This is a classic cherry pick. Although the global mean surface temperature has consistently risen for the last century, coinciding with the rapid growth of **manmade greenhouse gases**, 1998 (as you can see from the helpful scienceblogs.com graph below) was an anomaly caused by "the strongest El Nio of the past century". *telegraph.co.uk* December 3, 2009 Thursday Climategate: global warming denial and the terrifying case of Mr Strangelove (BA) BYLINE: Will Heaven
- 277- Early in the industrial age, such scientist-thinkers as Joseph Fourier and John Tyndall pondered the consequences of the massive burning of carbon-based fuels. They understood that water vapour, carbon dioxide and other minor constituents of the atmosphere warm the surface of the Earth, allowing life to exist and prosper. They reasoned that by increasing the **atmospheric concentration of these greenhouse gases**, we would increase the warming effect. (...) Changes in climate threaten food and water supplies, as well as world security. We need to manage these risks and reduce their likelihood. Yet most of us are utterly dependent on fossil fuel energy. This is why the problem is so difficult and generates such controversy. The negotiations in Copenhagen this month, and into the future, are critical. *The Times* December 3, 2009 Thursday Is Man largely responsible for global warming?
- 278- Investigating how often decades with a neutral warming trend occurred in computer-modelled simulations of climate change, they found that despite continued **increases in greenhouse gas concentrations**, a single-decade hiatus in warming occurred relatively often. (...) This is the situation facing the international community as it gathers in Copenhagen to try to broker a deal to bring carbon emissions under control. If ever there was a case for leadership from the top, it is now; the politicians must act on what the scientists are telling them, even if many of the voters cannot yet see the urgency. But perhaps that generalised insight is coming. It is true that July this year was wet, as were July 2008 and July 2007; but although we may have forgotten, July 2006 was the hottest month ever recorded in Britain in our 350-year-old temperature record, and to bet against a coming July being equally hot or hotter, perhaps even July 2010, is a bet that might well be lost. Yes, global warming happens in the future. But that future is a lot closer than you think. *The Independent* December 2, 2009 Time to confront the invisible enemy that threatens us all BYLINE: Michael McCarthy
- 279- Meanwhile, the scientists have for the first time detected a failure of the Earth's natural ability to absorb man-made carbon dioxide released into the air. They found significant evidence that more **man-made CO2 is staying in the atmosphere to exacerbate the greenhouse effect** because the natural "carbon sinks" that have **absorbed** it over previous decades on land and sea are beginning to fail, possibly as a result of rising global temperatures. (...) It is clear that China, having overtaken the US as the world's biggest carbon emitter, must be central to any new climate deal, and so the communique from the Chinese and US leaders issued yesterday was widely seized on as a sign that progress may be possible in the Danish capital next month. Presidents Hu and Obama specifically said an accord should include emission-reduction targets for rich nations, and a declaration of action plans to ease greenhouse-gas emissions in developing countries - key elements in any deal. *The Independent* November 18, 2009 Wednesday World on course for catastrophic 6° rise BYLINE: Steve Connor and Michael McCarthy
- 280- If the **concentrations of greenhouse gases** and aerosols stabilised at the levels found at the turn of the century, we would still expect **global temperatures to reach 1.4C** above pre-industrial levels by 2100. *The Times* November 14, 2009 Saturday Changing the Climate; A large proportion of the British public does not yet believe that climate change is made by man
- 281- Climate change sceptics are likely to seize on these records as evidence that **man-made greenhouse gases** are having less impact than many scientists have claimed. *The Times* October 6, 2009 Tuesday Explorers' logbooks prove a welcome bounty for climate-change doubters BYLINE: Ben Webster
- 282- This would be enough to **cancel out the greenhouse effect** caused by carbon dioxide emissions. The ships would be unmanned and directed by satellite to locations with the best conditions

for increasing cloud cover. They would mainly operate in the Pacific, far enough from land to avoid interfering with rainfall. *The Times* August 7, 2009 Friday Cloud ships on course to save world; 'Sci-fi' idea offers hope of global warming remedy BYLINE: Ben Webster ; Hannah Devlin

- 283- Once they are in the atmosphere, most **greenhouse gases stay there** for centuries and at the moment at least we know of no way of **getting them out**. *Guardian.com* May 23, 2009 Saturday Climate change and the everyday
- 284- The decades leading up to the 1940s were unusually warm; those from the mid-1940s to the mid-1970s unusually cold. The warmists might care to ask themselves why the period 1945-75 was unusually cold, when **massive increases in man-made greenhouse gases** took place during both that period and the warmer decades before 1945. *The Sunday Telegraph* December 26, 2010 Global warming theory doesn't fit the climate
- 285- Called geoengineering, it involves **removing greenhouse gases** from the sky. *The Sun* November 30, 2010 Tuesday Travelling bear back; MEXICO HOSTS BIGGEST GLOBAL WARMING CONFERENCE BYLINE: BEN JACKSON
- 286- In Britain especially, people are less worried about global warming because of a run of cold winters, including snow this weekend. But this is a short-term trend. More than 190 countries are meeting in Cancun, Mexico, for climate change talks later this month to discuss the best way to bring down emissions so that the rise in global temperatures remains below 3.6F (2C). (...) Indeed the true rate of warming caused by **man-made greenhouse gases** could be greater than ever. (...) At the moment the global temperature rise is 1.4F (0.8C) above pre-industrial levels. 1.4F The rise in temperatures around the world since the Industrial Revolution *The Daily Telegraph* November 26, 2010 Friday Now global warming is slower... thanks to pollution BYLINE: Louise Gray
- 287- In August 2008 the New Economics Foundation estimated that humanity had 100 months to **stabilise concentrations of greenhouse gases in the atmosphere**, after which the risk of uncontrollable climate change will become unacceptably high. With the failure of the Copenhagen talks and the controversy surrounding the leaked University of East Anglia emails hugely damaging the case for action, four activists, one academic and a journalist discuss the media's role in reporting climate change. *Morning Star* November 23, 2010 Tuesday Feature - The media and climate change BYLINE: Ian Sinclair
- 288- The investigation, which ran from 2004 to 2007 when the solar activity cycle was decreasing, found there was a rise in ozone that may have resulted in a corresponding increase in temperatures, which would have been indirectly due to the Sun rather than to **increases in man-made greenhouse gases**, the scientists said.(...) Although there is an 11-year solar cycle, the overall activity of the Sun has risen slightly over the past century, leading some climate "sceptics" to suggest the Sun rather than carbon dioxide is causing global warming. However, the authors of the latest study, published in *Nature*, said solar activity could account for at most about 10 per cent of the extra warming this century. But if the new findings can be supported, it would mean this greater solar activity may have kept global warming in check by lowering temperatures slightly and counteracting the influence of greenhouse gases. *The Independent* October 7, 2010 Thursday Ozone study dims Sun's global warming role BYLINE: Steve Connor
- 289- **The Greenhouse Effect has turned in to a big basket**, no matter what bad thing it is, just chuck it in. *telegraph.co.uk* August 11, 2010 Wednesday What the Chinese really think of 'Man Made Global Warming' BYLINE: James Delingpole
- 290- Last week more evidence was published to support the established case for **man-made global warming**. Research, led by the US National Oceanic and Atmospheric Administration, drew on data from 11 possible indicators of climate and found that each one suggested warming consistent with

expected effects of **rising concentrations of greenhouse gases**. (...) The data in this study were not included in the 2007 UN Intergovernmental Panel on Climate Change report that has been the main target of attack by climate change deniers. The IPCC's authority was badly damaged by "climategate" - the leak of emails between scientists at the University of East Anglia, purporting to show a conspiracy to suppress inconvenient data. In fact, as subsequent inquiries have shown, the emails proved at worst a cavalier and somewhat arrogant attitude on the part of scientists to critics of their work and a secretive, siege mentality in response to climate deniers. The actual scientific case for global warming was unscathed. And yet, somehow the whole affair had a disproportionate effect in stifling public urgency over climate change. It did not help that the Copenhagen summit, shortly afterwards, billed in advance as the vital last chance opportunity for global action, resulted in an opaque compromise cobbled together at the eleventh hour mainly so heavyweight politicians in attendance could claim to have done some kind of deal. *The Observer* August 1, 2010 CLIMATE CHANGE: We must restart the fight against global warming

- 291- Over time, the IPCC has mounted an unanswerable case. A series of reports, in 1992, 1995, 2001 and 2007, have furnished further evidence for the basic contention of the first assessment report in 1990: that emissions resulting from human activities are substantially increasing the **atmospheric concentrations of the greenhouse gases**, resulting on average in an additional warming of the Earth's surface. *The Times* July 19, 2010 Monday Research Interests; Research into climate change needs to be independent and beyond reproach
- 292- We constantly hear that the warmest years on record have all occurred in the most recent decades, and of course, we are led to believe this must be **a result of the ongoing buildup of greenhouse gases**. *telegraph.co.uk* July 5, 2010 Monday How come we now have to go to the Chinese for the truth about global warming? BYLINE: James Delingpole
- 293- While Western countries may be prepared to sign up to swingeing emissions cuts, Lord Lawson believes emerging nations, such as India and China, will never agree to them. It is arrogant of rich nations, such as Britain, to ask them to adopt a policy that might limit economic growth, he says. He acknowledges that the world has grown warmer in the past 100 years, and that it is likely that **man-made greenhouse gases** "played a part" in that warming. *The Daily Telegraph* June 29, 2010 Tuesday 'We cannot go on relying on expensive foreign fuel' BYLINE: Louise Gray
- 294- Developing countries have strongly supported Kyoto because it commits them to do nothing, at least initially, while getting rich countries to take on legally binding emissions targets. The poorer countries see this as a just reflection of the fact that **most of the man-made greenhouses gases in the atmosphere were put there** by countries such as the US and Britain, which should therefore be the first to take action. *The Independent* April 1, 2010 Thursday UK pushes for twin-track deal on climate change BYLINE: Michael McCarthy
- 295- Professor Schneider, one of the first scientists to warn about **the rise in man-made greenhouse gases**, said that by far the most frequent questions he gets asked right now concern the stolen East Anglia emails, even though they do not alter the basic science of climate change. "Nothing scientifically has changed because of any of this. The only changes are political and perceptual," he said. *The Independent* February 5, 2010 Friday Shoot the messenger - not the message
- 296- Those happy souls you see dancing through the icicles? They're the ones who believe that humans are now off the hook for climate change, **even as greenhouse gases continue to accumulate in our air**. (...)What we do know with crystal clarity is that **the atmosphere's load of greenhouse gases is increasing** by more than 10 million tonnes every year. The tepid agreements out of Copenhagen are unlikely to change that trend any time soon. *The Guardian* January 7, 2010 Thursday Comment: Scapegoat for the snow: The cold snap has little to do with climate change. Arctic oscillation is the probable culprit BYLINE: Robert Henson

- 297- Figures pointed to **record increases and levels in greenhouse-gas concentrations**, and the rising number of livelihoods wrecked by climate change. (...) Divisions within the UN Framework Convention on Climate Change (UNFCCC) are in flux, analysts and negotiators say, pitching rich against poor, rich against rich and poor against poor. (...) Wealthy countries that are parties to the Kyoto Protocol are baulking at demands to renew their emissions-cutting vows beyond 2012. Such a move, they argue, would be folly so long as China, which as a developing country has no specified targets under Kyoto, and the United States, which abandoned the treaty in 2001, are not bound by similar constraints. *telegraph.co.uk* November 28, 2011 Monday Rifts emerge as UN climate talks open.
- 298- The point is that, just like the entirely similar batch that were released in 2009 by the same hackers who, somewhere down the line, will be linked to the fossil fuel industry - well come on, ask yourself, who else is going to organise this - what they don't do is in any way undermine the case that **the greenhouse gases that human society is pouring into the atmosphere** in vast and ever-increasing amounts (currently increasing at 6 per cent a year) will cause the atmosphere to warm, with potentially disastrous consequences for mankind. *Independent.co.uk* November 23, 2011 Wednesday Michael McCarthy: These leaks do nothing to undermine the case for man-made global warming; CO2 concentration has increased by 23 per cent since 1958 - do you think this will have no consequence? BYLINE: Michael McCarthy
- 299- From just a few individuals working in the field 20 years ago, today there are hundreds of groups and institutions proposing experiments. They fall broadly into two camps: one aims to **remove greenhouse gases from the air** and store them underground; the other, more controversially, tries to cool the Earth down by reflecting sunlight from the atmosphere or space in a process known as solar radiation management. *The Observer* July 10, 2011 Green v greed: the race to cool the planet: As UN talks fail to cut carbon emissions, big business and entrepreneurs are striving to find lucrative 'techno-fixes' to combat global warming. BYLINE: John Vidal
- 300- THE controversy over global warming hotted up last night after US scientists revealed that the Earth's temperature declined over the past decade. They said a surge in the use of coal-fired power stations in China may have helped cool the climate by pumping sulphur into the atmosphere. But they also warned that **the buildup of greenhouse gases** such as carbon dioxide from fossil fuels like coal and oil means that respite will be short-lived - particularly as China is cleaning up its power stations and sulphur quickly drops out of the air. The paper in the US Proceedings of the National Academy of Science comes amid continuing cracks in the consensus over climate change. Standstill Global warming has long been blamed for the gradual melting of glaciers and scientists have warned over a rise in sea levels as a result. *The Express* July 5, 2011 Tuesday So much for global warming as Planet Earth gets colder BYLINE: John Ingham
- 301- Dr Stott had his colleagues have already carried out studies of the 2003 heatwave in Europe, in which up to 35,000 people died of heat-related illnesses, as well as the devastating UK floods in 2000 which cost £1.3bn in insurance claims and destroyed 10,000 homes following the wettest autumn in England and Wales since records began in 1766. In both cases, the scientists found that **the contribution of man-made greenhouse gases** to global warming substantially increased the risk of such extreme events occurring. Also this year, an unprecedented number of tornadoes across the southeastern US and the flooding of major rivers such as the Mississippi and Missouri led many people to question whether they were exacerbated by global warming. In the past scientists would have been reluctant to link single weather events such as these with climate change, but Dr Trenberth believes this is wrong. *Independent.co.uk* July 1, 2011 Friday Extreme weather link 'can no longer be ignored' BYLINE: Steve Connor
- 302- Dr Stott had his colleagues have already carried out studies of the 2003 heatwave in Europe, in which up to 35,000 people died of heat-related illnesses, as well as the devastating UK floods in 2000 which cost £1.3bn in insurance claims and destroyed 10,000 homes following the wettest autumn in England and Wales since records began in 1766. In both cases, the scientists found that **the contribution of man-made greenhouse gases** to global warming substantially increased the risk of such extreme events occurring. Also this year, an unprecedented number of tornadoes across the southeastern US and the flooding of major rivers such as the Mississippi and Missouri led many people

to question whether they were exacerbated by global warming. In the past scientists would have been reluctant to link single weather events such as these with climate change, but Dr Trenberth believes this is wrong. *Independent.co.uk* July 1, 2011 Friday Scientists seek link between climate change and extreme weather BYLINE: Steve Connor

- 303- The global food system is also a significant contributor to climate change. Agriculture accounts for 17-32% of all **human-induced greenhouse gases**. Two of the key drivers of emissions are fertiliser use and livestock. *The Guardian* June 1, 2011 Wednesday Front: Special report: Food security: Climate change: Harsh effects of global warming BYLINE: Felicity Lawrence
- 304- Agriculture now accounts for between 17% and 32% of all **human-induced greenhouse gases**. Two of the key drivers of emissions are fertiliser use and livestock, both of which are set to increase. *Guardian.com* May 31, 2011 Tuesday Global food crisis: Climate change imperils Guatemala's food security BYLINE: Felicity Lawrence
- 305- The catastrophic floods of autumn 2000, in which river levels reached 400-year highs and left 10,000 homes under water across England and Wales, were most likely the result of global warming. It is the first time scientists have been able to plot with any confidence the link between the **extreme weather with man-made greenhouse gases**. *i-Independent* February 17, 2011 Global warming 'caused worst floods for 400 years' BYLINE: Jonathan Brown
- 306- The floods of autumn 2000, which left 10,000 homes under water, were most likely the result of global warming. It is the first time scientists have been able to plot with any confidence a **link between extreme weather and man-made greenhouse gases**. *i-Independent* February 17, 2011 ENVIRONMENT Proof of floods and global warming link
- 307- THE CATASTROPHIC floods of autumn 2000, which saw river levels reach 400-year highs and left 10,000 homes underwater across England and Wales, were most likely the result of global warming. It is the first time scientists have been able to plot with any confidence the link between the **extreme weather with man-made greenhouse gases**. *The Independent* February 17, 2011 Thursday British floods 'were the result of climate change' BYLINE: Jonathan Brown
- 308- The government's failure to tackle climate change is "reckless and short-sighted" with just 50 months remaining to prevent a critical threshold in the fight against global warming being breached, environmental campaigners warn today. In a letter to the Guardian, they say global warming remains one of the greatest threats to human progress but condemn the fact it has dropped down the political agenda. (...) The campaigners say the lack of action comes against a backdrop, this year, of a record loss of sea ice, **greenhouse gas concentrations** above the Arctic at their highest point for possibly 800,000 years, and crop-wrecking droughts in the US. (...)The UK and the EU have set the 2C mark as a line the world should not cross. *The Guardian* October 1, 2012 Monday Government 'reckless' on global warming, warn campaigners BYLINE: Haroon Siddique
- 309- About 25 different aspects of climate change have been formally attributed to **man-made greenhouse gases** in dozens of formal studies. But these are generally broad and non-specific, such as more heatwaves in some regions and heavy rainfall in others. *Independent.co.uk* August 5, 2012 Sunday Heatwaves are proof of global warming
- 310- 'Converted' climate change sceptic says humans 'almost entirely the cause' of global warming; Richard Muller, a prominent US climate change sceptic, has "changed his mind" and now believes **man-made greenhouse gases are responsible for global warming**. *telegraph.co.uk* July 31, 2012 Tuesday
- 311-The link between extreme events which have occurred recently and the **build-up of the greenhouse gases** is best represented by the "loading the dice" analogy - as the world warms, the likelihood of

occurrence (frequency), intensity, and/or geographic extent of many types of extreme events is increasing. (...) According to computer simulations of climate, the likelihood that such an event would occur was about doubled by **the buildup of the greenhouse gases**. (...) As for the willingness of scientists to make such statements: as the climate signal due to **the ever-increasing greenhouse effect strengthens and emerges more and more** from the noise in the system *Guardian.com* July 3, 2012 Tuesday Is it now possible to blame extreme weather on global warming? BYLINE: Leo Hickman

- 312- A scientific conundrum that has puzzled climate experts for years may have been solved with the publication of research showing how an increase in carbon dioxide levels in the atmosphere contributed to rising temperatures millions of years ago. The paper, published on Wednesday in the journal *Nature*, has wide-ranging implications for climate science, because the question of whether a rise in carbon dioxide leads to an increase in temperature - or whether rising temperatures lead to an increase in carbon dioxide - has been seized on by climate sceptics eager to disprove a link between atmospheric carbon and global warming. It also suggests that imminent "runaway" climate change - whereby our actions in pumping **greenhouse gases into the atmosphere contribute to melting permafrost or sea changes** that release stores of methane - is a real possibility. *Guardian.com* April 4, 2012 Wednesday Study suggests rising CO2 in the past caused global warming BYLINE: Fiona Harvey
- 313- We can also make less emissive industry (fix the 3-4 link), **remove greenhouse gases** from the atmosphere (reduce 4), geoengineering that cools the planet (reduce 5) or adapt to a changed world (handle 6). *Guardian.com* March 14, 2012 Wednesday Bioengineer humans to tackle climate change BYLINE: Leo Hickman
- 314- What matters is that we know beyond peradventure that carbon dioxide is a **greenhouse gas, and an increase in its atmospheric concentration will warm the atmosphere**, and this increase is now proceeding at a frenzied rate. *Independent.co.uk* November 26, 2011 Saturday Michael McCarthy: Climate change isn't a left-wing cause - the Iron Lady knew that; BYLINE: Michael McCarthy
- 315- At a high-level academic conference on global warming at Exeter University this summer, climate scientist Kevin Anderson stood before his expert audience and contemplated a strange feeling. He wanted to be wrong. Many of those in the room who knew what he was about to say felt the same. His conclusions had already caused a stir in scientific and political circles. Even committed green campaigners said the implications left them terrified. (...) The region, the largest frozen peat bog in the world, had begun to melt for the first time since it formed 11,000 years ago. Scientists believe the bog could begin to release billions of tonnes of methane locked up in the soils, **a greenhouse gas 20 times more potent than CO2**. *The Guardian* December 9, 2008 Tuesday International: Climate change: The science: As ministers and officials gather in Poznan one year ahead of the Copenhagen summit on global warming, the second part of a major series looks at the crucial issue of targets: Too late? BYLINE: David Adam
- 316- This, it (scientific report) says, means that **greenhouse gas pollution** in the UK should fall by 80% by 2050 and by 31% by 2020. (...) It agrees that to deliver a reasonable chance of preventing more than two degrees of warming, **greenhouse gases in the atmosphere need to stabilise** at a maximum of 450 parts per million, carbon dioxide equivalent (ppmCO₂e). (...) The difference between the two reports comes down to this: Turner assumes that greenhouse gases can rise to 500 ppmCO₂e before falling back to 450. The other paper shows that this is a dangerous assumption. Not only does this mean that the cut comes far too late but, far from falling back, the enhanced levels in the atmosphere are likely to trigger more emissions as the biosphere starts producing more greenhouse gases than it absorbs. We cannot afford to overshoot. (...) My reading of the new projections suggests that to play its part in preventing two degrees of global warming, the UK needs to cut greenhouse gases by roughly 25% from current levels by the end of 2012 - a quarter in four years. But how the heck could this be done? Here is a list of measures that could be enacted almost immediately. They require no economic or technological miracles; but they do demand that the government is brave enough to govern. *The Guardian* December 2, 2008 Tuesday Comment & Debate: Long, detailed, impressive - but futile in the face of runaway climate change BYLINE: George Monbiot (my addition in parenthesis in the first sentence)

- 317- People **polluting the atmosphere with greenhouse gases** causing global warming will result in Ireland being changed sooner than we think says Five Minutes To Midnight? *The Mirror* November 29, 2008 Saturday DOOMED: COASTLINES WASHED AWAY, TOWNS AND CITIES FLOODED, INFECTIOUS DISEASE SPREADING, CROPS AND WILDLIFE WIPED OUT BYLINE: BY MICHELLE O'KEEFFE
- 318- The Bush withdrawal set back the international effort by nearly a decade - years in which it became increasingly clear that the **warming of the atmosphere being caused by greenhouse gas emissions** was proceeding much faster than UN scientists thought it would. *The Independent* November 20, 2008 Thursday Obama brings America in from the cold; In a landmark speech, the next president ends US isolationism over climate change Obama pledges to revive Kyoto Protocol BYLINE: Leonard Doyle and Michael McCarthy
- 319- The first evidence that millions of tons of a **greenhouse gas 20 times more potent** than carbon dioxide is being released into the atmosphere from beneath the Arctic seabed has been discovered by scientists. The Independent has been passed details of preliminary findings suggesting that massive deposits of sub-sea methane are bubbling to the surface as the Arctic region becomes warmer and its ice retreats. Underground stores of methane are important because scientists believe their sudden release has in the past been responsible for rapid increases in global temperatures, dramatic changes to the climate, and even the mass extinction of species. *The Independent* September 23, 2008 Tuesday The methane time bomb; BYLINE: Steve Connor
- 320- However, Chris Lamb, head of marketing for pig industry group BPEX , said: the meat industry had been unfairly targeted and was working hard to find out which activities had the biggest environmental impact and reduce those. Some ideas were contradictory, he said - for example, one solution to emissions from livestock was to keep them indoors, but this would damage animal welfare. 'Climate change is a very young science and our view is there are a lot of simplistic solutions being proposed,' he said. Last year a major report into the environmental impact of meat eating by the Food Climate Research Network at Surrey University claimed livestock generated 8 per cent of UK emissions - but eating some meat was good for the planet because some habitats benefited from grazing. It also said vegetarian diets that included lots of milk, butter and cheese would probably not noticeably reduce emissions because dairy cows are a major source of methane, **a potent greenhouse gas released** through flatulence. *The Observer* September 7, 2008 INSIDE: UN says eat less meat to curb global warming BYLINE: Juliette Jowit
- 321- HOUSEHOLDERS are paying more than £50 extra a year for electricity thanks to climate change policies, campaigners claim. But the Government's 'preoccupation' with green policies is said to have made only small reductions to **harmful greenhouse gases**. (...) Families paid an average bill of £557 for gas in the same year - £16.71 of which was said to be due to green initiatives. Price rises are also due to the Government's 'renewables obligation', which forces electricity suppliers to find an increasing amount of energy from renewable sources *Daily Mail* July 30, 2008 Wednesday Climate-change policies 'are putting £50 on electric bills'
- 322- The scientific projections envisage rainfall continuing to decline in a country that is already one of the hottest and driest in the world. It says that about 50% of the decrease in rainfall in south-western Australia since the 1950s has probably been **due to greenhouse gases**. Yesterday, Australia's agriculture minister, Tony Burke, described the report as alarming and said: "Parts of these high-level projections read more like a disaster novel than a scientific report." *The Guardian* July 7, 2008 Monday International: Climate change report like a disaster novel, says Australian minister: Scientists predict 10-fold increase in heatwaves: **Greenhouse gases blamed for** half of rainfall decrease BYLINE: Barbara McMahon
- 323- Since leaving the White House, Mr Gore has gone on to become one of the world's leading voices for **combating the greenhouse gases blamed for** global warming and climate change. *The Daily Telegraph* April 3, 2008 Thursday I would give Gore global warming role, says Obama BYLINE: Alex Spillius

- 324- The Bangkok conference involves 2,000 delegates from governments and non-governmental organisations of 163 countries. On Monday, it launched a 21-month process which aims to conclude a new climate change deal to replace the Kyoto Protocol, which expires in 2012, to rein in carbon dioxide and other **greenhouse gases that are widely blamed for the rise in world temperatures**. Delegates from island nations in the Caribbean and South Pacific recounted how they are being hit by worsening floods, rising seas and cyclones linked to climate change. And they explained that they do not have the money they need to build sea walls or relocate threatened villagers. *Morning Star* April 3, 2008 Thursday World - Poor countries call for climate change funds
- 325- There is no scientific consensus on these points. Some scientists refute the notion of CO2 being either **a pollutant or a "greenhouse" gas**. As to the opposing views - the "deniers" of the claim refer to identifiable historical evidence, while the GW enthusiasts rely on computer modelling forecasts. *The Express* December 22, 2009 Tuesday Suspect agenda driving climate change backers
- 326- Danish Prime Minister Lars Lokke Rasmussen told delegates the presence of so many leaders meant "an opportunity the world cannot afford to miss". He added: "A deal is within our reach." Meanwhile, the Met Office released figures showing that the first decade of the century has been by far the warmest in records dating back 160 years, with 2009 set to be the fifth warmest year. It said similar results were revealed in independent analyses by America's National Climatic Data Center and NASA. And in America the Environmental Protection Agency yesterday ruled **greenhouse gases endanger health** and must be regulated. *The Express* December 8, 2009 Tuesday A load of hot air! BYLINE: John Ingham
- 327- Danish Prime Minister Lars Lokke Rasmussen told delegates the presence of so many leaders meant "an opportunity the world cannot afford to miss". He added: "A deal is within our reach." Meanwhile, the Met Office released figures showing that the first decade of the century has been by far the warmest in records dating back 160 years, with 2009 set to be the fifth warmest year. It said similar results were revealed in independent analyses by America's National Climatic Data Center and NASA. And in the US the Environmental Protection Agency yesterday ruled **greenhouse gases endanger human health** and must be regulated. *The Express* December 8, 2009 Tuesday Global climate change talks cost the Earth BYLINE: John Ingham
- 328- Of particular concern is the uncertainty over emissions of the **potent greenhouse gas** nitrous oxide. *The Guardian* December 8, 2009 Tuesday National: Climate change: Alternative energy: Nitrous oxide concerns hit high hopes for biofuels BYLINE: Alok Jha
- 329- Because it hangs around for only a day or so - carbon can stay in the atmosphere for centuries. Methane, which, although smaller in quantity, is far **more potent in its greenhouse effect**, lasts for about 10 years. (...) **Without the greenhouse effect**, Earth would have a temperature below freezing. *The Independent* on Sunday December 6, 2009 What on Earth? BYLINE: David Randall
- 330- Australia is a small **greenhouse gas polluter** in global terms, but one of the worst per capita because it relies for electricity on abundant reserves of coal, of which it is the world's largest exporter. *The Guardian* December 2, 2009 Wednesday International: Australia's new opposition leader vows to block law to temper climate change BYLINE: David Adam and agencies
- 331- Despite nearly two weeks of **frantic brandishing of the "smoking gun"**, there is still no evidence of the alleged **bullets** that would constitute an overturning of 200 years of climate research. **The greenhouse effect still exists and the Earth is still warming**. *Guardian.com* December 2, 2009 Wednesday Climate change denial is the new article of faith for the far right
- 332- Other research shows that frozen methane (**a potent greenhouse gas**) may bubble up out of the melting Siberian permafrost in volumes that would raise global temperatures by several degrees. And that melting ice could interrupt the north Atlantic ocean circulation, which would alter global

weather patterns and ultimately switch off the Asian monsoon season. (...) Global leaders need to think about this lack of certainty as they gather in Copenhagen to discuss what to do about climate change. For, as we fill the atmosphere with **heat-trapping greenhouse gases**, the blunt truth is that the good times are over. That era of climate stability is coming to an end. *The Guardian* November 30, 2009 Monday Copenhagen 2009: Why Copenhagen matters BYLINE: Fred Pearce

- 333- Mr Obama will take to the summit a US commitment to make substantial cuts in **greenhouse gas pollution** over the next two decades, removing one of the greatest obstacles to a deal in Copenhagen. (...) Until yesterday the US, the world's biggest polluter after China, had been the only developed nation not to announce emissions targets before the conference. Mr Obama's intended presence and the targets were welcomed in Europe after weeks of lobbying by governments, including Britain, for him to attend. *The Times* November 26, 2009 Thursday Scotland Oh, yes he can BYLINE: Tim Reid
- 334- BRITAIN should brace itself for more tropical-style deluges of the kind that wreaked havoc on Cockermonth, according to climate experts. They warn that, although no single event can be attributed to climate change, the warming of the atmosphere **caused by greenhouse gases** means such disasters will become more frequent.(...) Some fear that is already happening. From the 1960s until the 1990s, floods were a rarity in Britain. It meant that when floods struck across the Midlands in 1998, the country was unprepared. A subsequent government inquiry led by Peter Bye criticised the Environment Agency, then just two years old, and called on it to set up an early warning system. That system was tested to the limit when floods struck again in 2000, hitting communities stretching from Sussex to Wales. A further inquiry found that many of the flooded areas were linked to uncontrolled development on flood plains. That led to new planning controls. *The Sunday Times* **November 22, 2009** Tropical-style storms to follow climate change BYLINE: Jonathan Leak
- 335- The revelation that ministers have failed in their campaign to persuade the public that the **greenhouse effect** is a serious threat requiring urgent action will make uncomfortable reading for the Government as it prepares for next month's climate change summit in Copenhagen. *The Times* November 14, 2009 Saturday Voters sceptical on climate change BYLINE: Ben Webster ; Peter Riddell
- 336- The revelation that ministers have failed in their campaign to persuade the public that the **greenhouse effect is a serious threat** requiring urgent action will make uncomfortable reading for the Government as it prepares for next month's climate change summit in Copenhagen. *The Times* November 14, 2009 Saturday Climate change is not our fault, say most voters BYLINE: Ben Webster; Peter Riddell
- 337- The only problem with Lord Stern's proposal, it seems to me, is over methane and nitrous oxide. **These greenhouse gases are far more harmful** to the atmosphere than carbon dioxide, and the 1.3 billion flatulent cows that we currently keep on the planet produce an awful lot of them. *The Times* October 28, 2009 Wednesday Is it time to cut out meat? BYLINE: Alex Renton
- 338- Let's suppose, however, that our political leaders are not mistaken in taking the view that the threat to mankind does come from **the greenhouse effect and its consequences**. *The Independent* October 13, 2009 Tuesday Here's another phoney war: the one on climate change BYLINE: Dominic Lawson
- 339- The chamber has since clarified its position, saying it wants public hearings on the degree of **public danger caused by greenhouse gases**, rather than on climate science in general. Many US companies fear that unless they support "cap-and-trade" proposals in Congress, they could face much more severe measures. The US environmental protection agency could invoke powers to regulate carbon as a harmful emissions under an existing law, the clean air act. Responding both to public opinion and to the long-term economic implications of inaction, more than 30 large US corporations have joined an alliance called the US Climate Action Partnership, which presses for swift legislation on

emissions. *Guardian.com* September 29, 2009 Tuesday US firms quit Chamber of Commerce over climate change position
BYLINE: Andrew Clark

- 340- I'm afraid my friends in the Green party and their hangers-on are responsible for pushing the belief that all freak weather phenomenon can **be attributed to greenhouse [sic] gasses**. *The Mirror* June 26, 2009 Friday GLOBAL WARMING FEARS DON'T HOLD MUCH WATER BYLINE: PAT FLANAGAN
- 341- The bill in its current form would force polluting industries to steadily reduce their emissions of carbon and **the other greenhouse gases that cause global warming**. *The Guardian* June 3, 2009 Wednesday International: Obama ready to use his personal popularity to force through sweeping climate change bill BYLINE: Suzanne Goldenberg
- 342- However, there is a more important issue at stake. Until now, scientists, journalists and politicians have dominated the debate about **the threat of greenhouse warming**. Many have fought well and brought a proper sense of urgency to the debate. However, it will be our writers, artists and playwrights who will finally delineate the crisis and explore in human terms what lies ahead. Only then can we hope to come to terms with our endangered world. *The Guardian* May 17, 2009 Sunday Comment: Writers and artists are getting warmer BYLINE: Robin McKie
- 343- This latter effect could, ultimately, have a particularly destructive impact. Scientists have calculated that if industrial emissions of carbon dioxide and **other greenhouse gases eventually produce a global temperature increase** of around 4C, there is a risk that Greenland's ice covering could melt completely. (...) The result will be the appearance of the super-surge, a climatic double whammy that will savage low-lying regions that include Britain's south-eastern coastline, in particular East Anglia and the Thames Estuary, along with cities such as London, Portsmouth and Hull, which are rated as being particularly vulnerable to sea-level rise. (...) But this approach represents an abrogation of national duty to many people - particularly those whose homes will be destroyed, individuals such as Martin George, former chairman of the Broads Society. *The Observer* March 8, 2009 National: UNDER THREAT...: Scientists to issue stark warning over dramatic new sea level figures BYLINE: ROBIN MCKIE, Additional research by Lisa Kjellsson
- 344- The director of Nasa's Goddard Institute for Space Studies in New York is clearly a doting grandfather as well as an internationally revered climate scientist. Yet his pictures are more than mere expressions of familial love. They are reminders to the 67-year-old scientist of his duty to future generations, children he now believes are **threatened by a global greenhouse catastrophe** that is spiralling out of control because of soaring carbon dioxide emissions from industry and transport. *The Observer* January 18, 2009 'We have only four years left to act on climate change - America has to lead' BYLINE: Robin McKie
- 345- The iron feeds algae, which blooms and sucks up damaging carbon dioxide (CO₂), then sinks, locking away **the harmful greenhouse gas** for hundreds of years. *Mail on Sunday* January 4, 2009 Sunday Will green algae save the world from global warming? BYLINE: Jo Macfarlane
- 346- After a fortnight's negotiations in the Mexican "super-resort" on the Caribbean coast, in which prospects of success often seemed bleak, the 15,000 delegates bridged their differences in the early hours of yesterday with a comprehensive deal, which was announced to thunderous applause and cheering. They signed off a new framework in which all countries - and not just the rich nations, as previously - now have official, UN-recognised goals to cut their **emissions of the greenhouse gases that are causing the atmosphere to warm** (with this year likely to prove the warmest in the 150-year-old instrumental record). (...) Some environmentalists criticised the deal because, in the emissions cuts it prescribes, it does not yet go far enough to keep warming to a two-degree rise. Yet there was widespread recognition that Cancun's restoration of momentum to the negotiation process, in the wake of the Copenhagen "car crash", was an achievement of great significance. *The Independent* on Sunday December 12, 2009 World agrees cap on global warming and deforestation; Special report UN climate change talks in Cancun Against all expectations, nearly 200 nations have breathed new life into attempts to save the planet BYLINE: Michael McCarthy

- 347- There is an obvious distinction between natural change over thousands or millions of years, and human-driven change, which is new. The latter is not now in serious doubt: the only question is by how much. As has been widely pointed out, **the increase in greenhouse gases is likely to lead to accelerated warming of the Earth**, probably by at least 3C by the end of this century. For humans, the likely consequences reach far and wide. *The Times* December 6, 2010 Monday The political climate may be right for change BYLINE: Crispin Tickell
- 348- But to be on course for keeping the temperature increase to two degrees or less, they would need to come down to 44 gigatonnes. That leaves a gap of five gigatonnes that would have to be filled by other measures beyond the most ambitious announcements to date. This could be done in a variety of ways, including slashing subsidies on fossil fuels, reducing at present uncontrolled emissions from ships and aircraft, and addressing **other causes of climate change**, such as black carbon - puffed out by diesel engines and inefficient Third World cooking stoves, and itself one of the world's major causes of illness and death, particularly among children - and HFCs, **greenhouse gases** that replaced the ozone-destroying HCFCs. (...) Let me explain. Despite the failure of last year's Copenhagen climate summit to come up with a formal agreement to reduce **pollution by greenhouse gases** - or even to make much progress towards one - some 80 countries, responsible for 80 per cent of the world's emissions, were stimulated by it to announce new targets for controlling them. *telegraph.co.uk* November 24, 2010 Wednesday Cancun climate change conference: it's time for politicians - and the EU - to buck up BYLINE: Geoffrey Lean
- 349- By running advanced climate models while their PCs are idle, participants will estimate how often heatwaves, floods and hurricanes will strike in the next few decades. The initiative will also indicate how much of the blame for these events **can be attributed to greenhouse gas emissions** caused by humans. *The Guardian* November 17, 2010 Wednesday Global warming scientists to harness power of home PCs BYLINE: Damian Carrington
- 350- Schneider was a pioneer in the development of computer models that combine processes like ocean dynamics and cloud changes to study and predict climate change. He also carried out research into the impact of climate change on the distribution of plant and animal species and studied **the damage greenhouse gases** cause to the ozone layer. (...) In recent years he had become involved in working with economists on the likely costs of stabilising the world's climate, developing policy options for mitigating and adapting to climate change and researching whether it is possible to identify a "tipping point" that could announce more rapid climate change. Schneider had the rare gift of being able to explain the complexities of climate science to the public in simple terms and, as befits the author of *Science as a Contact Sport* (2007), was combative in challenging the climate sceptics. *The Daily Telegraph* July 22, 2010 Thursday Professor Stephen Schneider; Obituaries Scientist whose work on global warming attracted abusive emails and a place on a 'death list'
- 351- The science, as defined by the IPCC reports, comes in many layers. No-one really disagrees with the basic physical proposition that CO2 is **a greenhouse gas (GHG), and that GHGs warm the planet**. *telegraph.co.uk* July 14, 2010 Wednesday Some common sense on global warming BYLINE: James Delingpole
- 352- Release of even a fraction of stored gas could trigger abrupt climate warming as methane is a **greenhouse gas about 30 times more potent** than carbon dioxide. *The Guardian* March 5, 2010 Friday Climate change: After emails and errors, fightback begins to prove global warming is caused by humans BYLINE: Alok Jha
- 353- The IPCC used data from the weather stations to support claims that **greenhouse gases had already caused a 0.7C (1.5F) rise in temperature**, and warned that further warming of up to 6C (10.8F) by 2100 could have devastating effects. The panel has been under pressure since the hacking of emails from the climate change unit at the University of East Anglia, which appeared to show that data used to bolster the IPCC's claims had been manipulated. The UN body was also forced to admit it had made a mistake in asserting that Himalayan glaciers could disappear by 2035. *The Daily Telegraph* February 15, 2010 Monday Global warming data skewed by heat from planes and buildings BYLINE: Heidi Blake

- 354- But as I predicted, you have been unable to give such assurances, never mind provide scientific backing for dismissing **the dangers posed by greenhouse gases**. (...) Robin McKie has been science editor of the Observer for 28 years. He was originally doubtful about claims that carbon emissions are linked to global warming, but his discussions with scientists over the past decade have convinced him of **the dangers posed to our planet by greenhouse gases**. *The Observer* February 7, 2010 Focus: Debate: Climate science: 'I reject your dogmatic claim that global warming means disaster' BYLINE: Robin McKie and Benny Peiser
- 355- Each methane molecule is about 70 times more potent in terms of **trapping heat** than a molecule of carbon dioxide. *Independent.co.uk* December 14, 2011 Wednesday Methane discovery stokes new global warming fears Shock as retreat of Arctic releases greenhouse gas BYLINE: Steve Connor
- 356- For the past two years, ever since the disappointing Copenhagen climate summit, the 194 negotiating nations have stood indecisively at just such a junction. In one direction leads a steep and rugged pathway to a global agreement - legally binding on developed and developing countries alike - to cut emissions of the **greenhouse gases that cause global warming**. *The Daily Telegraph* December 12, 2011 Monday Durban deal gives the world a chance BYLINE: GEOFFREY LEAN
- 357- The new figures on global carbon dioxide emissions for 2010 from the US Department of Energy make sobering, not to say chilling, reading. They show that, although much of the world may be facing a financial, economic and industrial crisis, the remorseless growth of the **greenhouse gases that cause global warming** continues unchecked. *Independent.co.uk* November 5, 2011 Saturday Leading article: Chilling facts on global warming
- 358- Professor Robert Watson, chief scientist at the Department for Environment, Food and Rural Affairs (Defra), said the **greenhouse gases already emitted into the atmosphere meant a likely global temperature rise** of about 1C on top of the 0.8C increase so far recorded. A further rise of 2C could follow if, as seems likely, there is no global treaty on cutting emissions. (...) The government is to warn householders that global warming has become unstoppable - and call on them to protect their properties against the heat, floods and water shortages that scientists predict will accompany temperature rises of up to 4C by mid-to-late century. The measures needed could range from the simple, such as growing plants up the sides of houses for insulation, to the radical, such as installing flood defences, heat pumps, water collection systems and even window screens to keep out invasive biting insects. One idea is to encourage people to install garden ponds and plant trees, to aid cooling. The practical new approach is set out in a government report, the Climate Change Risk Assessment, being circulated in Whitehall before its publication this winter. The shift in policy towards adapting the country follows the collapse of global talks on a treaty to reduce greenhouse gases. The latest figures show global emissions are now equivalent to 50 billion tons of CO2 each year and are rising faster than ever, at about 5.8% a year. *The Sunday Times* September 25, 2011 Dig a pond, cool down Britain BYLINE: Jonathan Leake
- 359- But as the human numbers grow, so do the cities, and so does the pressure for economic growth, and so does **the burden of greenhouse gases**. *The Guardian* September 12, 2011 Monday Leading article: Climate change: Summer in the city
- 360- Not only is little of the gas removed from surface waters by this method; but, because the iron mops up oxygen, it stimulates the production of methane, **a potent greenhouse gas**. The technique is likely both to damage life in the oceans and cause more global warming than it cures. (...) Painting buildings white to ensure that the earth **absorbs** less of the sun's heat. Safe. Useless. Expensive. *Guardian.com* September 2, 2011 Friday A balloon and hosepipe as the answer to climate change? It's just pie in the sky BYLINE: George Monbiot

- 361- It seems like an environmental no-brainer. As populations increase, cities grow, and water supplies grow ever scarcer in the world's drier regions, more and more municipalities are tending to recycle wastewater after treatment in sewage works to irrigate parks and other green urban space. What could be wrong with that? Well, quite a lot, actually, according to a new study, which concludes it could increase global warming. The research, published in the current issue of the Journal of Environmental Quality concludes that the practice emits three times as much nitrous oxide - **a greenhouse gas about 300 times more potent** than carbon dioxide - as treating the sewage-laden water and discharging it to a river or the sea in the usual way. *telegraph.co.uk* September 1, 2011 Thursday Green technology accelerates global warming BYLINE: Geoffrey Lean
- 362- There's plenty more I could say on all the points Porritt (environmentalist and writer) raises, but I've already gone on for far too long. My point is that abandoning nuclear power at a time of **escalating greenhouse gas emissions is far more dangerous** than maintaining it. *Guardian.com* August 8, 2011 Monday Greens must not prioritise renewables over climate change BYLINE: George Monbiot (my addition in parenthesis)
- 363- The belching of cows produces methane, one of the **greenhouse gases blamed for global warming**. *The Daily Telegraph* March 29, 2011 Tuesday Dairy farmers bring wind of change to cows that add to global warming BYLINE: Louise Gray; Nick Collins
- 364- Democrats have attempted to get Republicans to confront the science on climate change, in an effort to halt moves to block regulation of **greenhouse gas pollution**. But it's not clear that the appeal to reason worked. *Guardian.com* March 8, 2011 Tuesday Democrats roll out climate change big guns, Republicans remain immune BYLINE: Suzanne Goldenberg
- 365- They (scientists) found that, in nine out of 10 cases, **man-made greenhouse gases increased the risks** of flooding (...) One paper, shows that rising **concentrations of greenhouse gases** in the atmosphere have caused an intensification of heavy rainfall events over some two-thirds of the weather stations on land in the northern hemisphere. (...) This is probably as solid a signal as simulations can produce, and it gives us a clear warning that more global heating is likely to cause more floods here. None of this should be surprising. (...) We still can't say that any given weather event is definitely caused by man-made global warming. But we can say, with an even higher degree of confidence than before, that climate change makes extreme events more likely to happen. *Guardian.com* February 16, 2011 Wednesday Climate change and extreme flooding linked by new evidence BYLINE: George Monbiot (my addition in parenthesis)
- 366- Greenland is a big, bold take on the most fashionable "ishew" of our time: **climate change, previously known as global warming, previously known as the greenhouse effect**... When anything keeps changing its name - Windscale/Sellafield, St Petersburg/Leningrad, Jordan/ Katie Price - you know something fishy is going on. The question is, what? *The Sunday Times* February 6, 2011 It really doesn't cut any ice BYLINE: Christopher Hart
- 367- These were allowances for **destroying dangerous greenhouse gases** used as refrigerants called hy-drofluorocarbons. It costs 7p to eradicate gases equivalent to one tonne of carbon dioxide and the resulting offsets could be sold on the market for about (EURO)11, giving a total return of more than 99pc. *The Sunday Telegraph* January 30, 2011 THE GREAT CARBON TRADING SCANDAL BYLINE: Rowena Mason
- 368- The issue was a key unknown in the landmark 2007 report from the Intergovernmental Panel on Climate Change, which pinned **the blame for climate change firmly on greenhouse gas** emissions from human activities. However, the impact of rising sea temperatures on melting ice sheets is still uncertain, meaning it remains difficult to put an upper limit on potential sea level rises. Understanding the risk is crucial because about 70% of the world's population live in coastal regions, which host many of the world's biggest cities, such as London, New York and Bangkok. *The Guardian* January 27, 2011 Thursday 'Hidden plumbing' slows melting ice sheet: Distinct channels reduce speed of Greenland glacier Research does not lessen risks of global warming BYLINE: Damian Carrington

- 369- Professor Corinne Le Quéré of the University of East Anglia, a lead author of previous IPCC reports as well as AR5, said that nothing has changed in terms of the overall view that **global warming is exacerbated by greenhouse gas emissions** and that the influence of solar activity was small. (...) Bob Ward of the Grantham Research Institute on Climate Change at the London School of Economics, another IPCC reviewer, said that Rawls has tried to misrepresent the IPCC by cherry picking quotes out of context to support the idea that solar activity and cosmic rays have influenced the climate. (...) The IPCC said that it regrets the unauthorised release of the draft report by one of many hundreds of reviewers who have all undertaken to keep the details confidential. *Independent.co.uk* December 17, 2012 Monday Bid to heap blame on sunspots for climate change has backfired BYLINE: Steve Connor
- 370- Yet the 1990 report did not foresee the eruption and deposits from Mount Pinatubo, a volcano on the island of Luzon in the Philippines in June 1991. It was also unable to predict the collapse of Soviet Bloc heavy industry or the rapid expansion of many Asian economies including China and India and strong growth in South America. All these factors have had a significant impact on global climate. It was the overwhelming impact of existing **greenhouse gas warming** that prevented these "external forcings" from undermining the accuracy of the 1990 forecast, said the two researchers whose IPCC evaluation is reported in the journal *Nature Climate Change*. *The Daily Telegraph* December 10, 2012 Monday Global warming prediction accurate
- 371- Speaking at the opening of ministerial discussions at the United Nations climate conference in Doha, the Qatari capital Ed Davey said that he "completely agreed" with an assessment made by Lord Stern of Brentford, the economist and academic, that the world was being "recklessly slow" in **combating greenhouse emissions**. But his statement was criticised for appearing to be at odds with an announcement expected from the Treasury this week of the building of up to 30 more gas power stations, with environmental groups accusing George Osborne, the Chancellor, of preparing to undermine the Climate Secretary behind his back. *The Times* December 5, 2012 Wednesday Minister says climate change battle is too slow but defends rise in gas power stations BYLINE: Tom Whipple
- 372- The conference in Qatar's capital, Doha, marks the beginnings of talks aimed at constructing a comprehensive new agreement to cut carbon dioxide and other **greenhouse gas emissions that are causing the warming** that will be legally binding on all countries of the world. *The Independent* December 3, 2012 Monday We are losing climate change race BYLINE: MICHAEL McCARTHY
- 373- Most deposits are below the sea floor off the continental shelf or under permafrost. Shallow pockets of methane hydrate release **the potent greenhouse gas** into the atmosphere and that process is exacerbated by climate warming. (...) Methane is 20 times more effective at **trapping** heat in the atmosphere than CO₂, though not as long-lived. *MailOnline* November 12, 2012 Monday Revealed: The \$29million Alaskan science project that could make energy from ICE - but experts warn it could 'unleash climate change monster'
- 374- Margaret Thatcher, a scientist by training, was admirably far-sighted on this subject, warning 24 years ago of **the danger greenhouse gases** posed to the planet. By painting his party green, Cameron was true to her legacy. *The Guardian* October 29, 2012 Monday Comment: Tory retreat on climate change is senseless BYLINE: Ian Birrell
- 375- In the high-stakes game of climate change, there is no get-out-of-jail-free card. We cannot continue to burn the fossilised carbon stored underground for tens of millions of years as oil, coal and gas and hope that it will not end up in the atmosphere to **exacerbate the greenhouse effect and global warming**. *Independent.co.uk* October 19, 2012 Friday A technology that goes one better than carbon capture could be crucial in fighting climate change BYLINE: Steve Connor
- 376- German, US and Australian scientists report in *Nature Climate Change* today that the double **menace of increasing greenhouse gas emissions** and rising ocean acidity could spell the end for most

of the world's coral reefs. *The Guardian* September 17, 2012 Monday Leading article: Climate change: All that is solid melts into water

- 377- Unfortunately, the chemicals increasingly being employed in their place, HFCs, are themselves exceptionally **potent greenhouse gases**, and their rise threatens to undo all the progress made in tackling global warming so far. *The Daily Telegraph* September 15, 2012 Saturday Global warming: the heat's back on BYLINE: Geoffrey Lean
- 378- The record minimum was announced just two days after the Royal Dutch Shell's drilling ship, the Noble Discoverer, took advantage of reduced sea ice and started sailing from Alaska to the Chukchi Sea, in anticipation of final US government approval for oil exploration in the region. Scientists have already observed a link between disappearing sea ice and the release of methane, **a greenhouse gas that is more than 20 times more potent** than carbon dioxide, from beneath the Arctic Ocean. *Independent.co.uk* August 28, 2012 Tuesday A new low for global warming: Sea ice retreats to furthest point on record BYLINE: Steve Connor
- 379- Methane is a particularly powerful **greenhouse gas and rising levels of it in the atmosphere are only likely to accelerate global warming**. And with the disappearance of sea ice around the shores of Greenland, its glaciers could melt faster and raise sea levels even more rapidly than at present. *The Observer* August 12, 2012 Thinner, smaller and weaker: summer Arctic sea ice could vanish in a decade BYLINE: Robin McKie
- 380- About 1,800 companies listed on the London Stock Exchange, including some of the biggest corporate names in the world such as BP, Tesco and Tate & Lyle, will have to publish their emissions of carbon dioxide and **other greenhouse gasses blamed for** climate change from April next year. *The Guardian* June 20, 2012 Wednesday Rio+20 conference: UK firms set to reveal CO2 figures: Tackling climate change BYLINE: Juliette Jowit
- 381- **The adverse effects of greenhouse gases** are therefore 'external' to the market, which means there is usually only an ethical - rather than an economic - incentive for businesses and consumers to reduce their emissions. *Guardian.com* May 21, 2012 Monday Why do economists describe climate change as a 'market failure'? BYLINE: Duncan Clark
- 382- Methane is a **potent** greenhouse gas - and this unpredictable effect makes the climate puzzle even more complex. *MailOnline* April 24, 2012 Tuesday Global warming puzzle becomes even MORE complex BYLINE: ROB WAUGH
- 383- All this may do something to help, but the scientists involved seem to ignore the none-too-comforting fact that nitrous oxide (N₂O) - one of the main breakdown products of the excess fertiliser - is **a greenhouse gas several times more potent** than CO₂. That, as every well-briefed journalist knows, means that it cannot possibly offer any kind of threat. *telegraph.co.uk* January 3, 2012 Tuesday If carbon dioxide isn't a worry, nitrous oxide could not possibly offer any threat... right? BYLINE: By Steve Jones
- 384- This is a meeting (Copenhagen Summit) about chemicals: the **greenhouse gases insulating the atmosphere**. *The Guardian* December 15, 2009 Tuesday Comment: This is bigger than climate change. BYLINE: George Monbiot (my addition in parenthesis)
- 385- Extra carbon dioxide in the atmosphere enhances **a natural process known as the greenhouse effect. Greenhouse gases**, such as carbon dioxide, **absorb heat** and release it slowly. Without this process, Earth would be too cold for life to survive. (...) What is more, methane has a nasty sting in its tail. Although it only hangs around in the atmosphere for about 10 years, it is far **more potent as a greenhouse gas, trapping** about 20 times as much heat as carbon dioxide. *The Guardian* April 28, 2008 Monday The Earth: Climate change: the facts: The subject of global warming has become impossible to ignore. BYLINE: Kate Ravillious

- 386- The country was exempted from mandatory requirements to reduce such **heat-trapping gases** under the 1997 Kyoto Protocol climate pact because it was classified as a developing country. *Morning Star* March 22, 2008 Saturday World - S Korea leader calls for co-operation with North on tackling climate change
- 387- **Human-produced greenhouse gases will trap** enough sunlight to power a 40-watt lightbulb for every 40 square metres on Earth. *The Times* January 28, 2008, Monday Let's hope talk on climate change is not just hot air
- 388- But even more intriguing to me was Al Gore's optimism. He expounded lucidly the real danger now presented to the habitability of the earth from the **warming caused by greenhouse gas emissions**, and instanced a litany of dire effects already being observed, from the rapid melting of the glaciers of the Himalayas, upon which 1.4 billion people depend directly for their water, to the rising acidity of the oceans, produced by the increasing volume of CO₂ they are being **forced to absorb**. *The Independent* December 15, 2008 Monday A sliver of cheer on climate change BYLINE: Michael McCarthy
- 389- While ice reflects the sun's heat, the open ocean **absorbs** more heat and the melting accelerates warming in other parts of the world. *Morning Star* September 16, 2008 Tuesday WWF demands action on climate change
- 390- The polar regions are experiencing the most dramatic increase in average temperatures due to global warming and scientists fear that as more sea ice is lost, the darker, open ocean will **absorb** more heat and raise local temperatures even further. (...) Polynyas **absorb** heat from the sun and eat away at the edge of the sea ice. *The Independent* June 27, 2008 Friday Polar scientists reveal dramatic new evidence of climate change
- 391- In addition, the melting can encourage feedback mechanisms that amplify the **warming effects of greenhouse gases** in the atmosphere: ice and snow reflect sunlight, so less of them means more heat is **absorbed** by the Earth. *The Guardian* April 18, 2008 Friday Climate Change: Greenland's disappearing lakes leave giant ice sheets largely unmoved BYLINE: Alok Jha
- 392- As it does so, the dark waters exposed **absorb** more radiation than white sea ice and amplify the warming effect. The critical point is an increase of 0.5C to 2C - which could already have passed *The Guardian* February 5, 2008 Tuesday National: Global meltdown: scientists isolate areas most at risk of climate change BYLINE: Ian Sample
- 393- Increasing the amount of sunlight reflected back from land, called its albedo, could offset the damaging effects of the loss of Arctic ice, where the shiny white polar cap is being steadily replaced by darker water, which **absorbs** more heat. *Guardian.com* January 8, 2008 Shiny crops could slow global warming, scientists say
- 394- Were global carbon emissions to be cut by half today, any mitigating effects on climate change would take at least two decades to appear. In the short term, we are **locked** into global warming, so efforts to "climate-proof" the nations set to be hit hardest is one of the biggest tasks facing the international community. *The Independent* March 11, 2008 Tuesday Climate change 'hits minorities hardest' BYLINE: Daniel Howden
- 395- CO₂ in the atmosphere **traps** heat and leads to warming, temperatures are rising and this correlates with the highest CO₂ for thousands of years. Thousands of peer-reviewed papers from scientists have established this link. *Morning Star* December 21, 2009 Monday Feature: Climate change - Addicts taking us to the abyss

- 396- Water vapour is a major **natural greenhouse gas**. Always has been. (...) But **greenhouse gases are still accumulating**. Once natural cycles move back to a warming phase, global warming will go into overdrive. (...) We know winters are cold and summers are warm. Always. And it's like that with **greenhouse gases**. Physicists have known for 200 years that gases like carbon dioxide **trap** heat. *The Daily Telegraph* December 8, 2009 Tuesday How robust is the science predicting global warming? BYLINE: Fred Pearce
- 397- The 10-day summit, which gathers members of the UN Framework Convention on Climate Change, aims to hammer out a blueprint for tackling **man-made greenhouse gases, blamed for trapping solar heat** and disrupting the Earth's climate system. *Morning Star* December 8, 2009 Tuesday World - Third World 'must get financial help'
- 398- Climate change is widely blamed on the burning of fossil fuels which release **greenhouse gases** such as CO₂ into the atmosphere, where they **trap** the sun's heat. (...) The talks at Copenhagen are expected to find ways to reduce greenhouse gas emissions globally.(...) Governments are also keen on putting their hands as deep as possible into our pockets. *The Express* December 2, 2009 Wednesday THE BIG CLIMATE CHANGE 'FRAUD' BYLINE: John Ingham
- 399- 1860s: IRISH boffin John Tyndall shows that molecules of gases like water vapour and carbon dioxide **trap** heat and wrote that increasing levels of these gases in the atmosphere "could have produced all the mutations of climate". *The Sun* November 5, 2009 Thursday CENTURIES OF NEGLECT; GLOBAL WARMING CRISIS
- 400- The air we breathe has been growing more humid over the past few decades. Warmer air contains more water vapour, the invisible moisture that gives the feeling of humidity. More worrying, water vapour is also a **greenhouse gas, so it traps** solar heat in the atmosphere, stoking up the warming effect of man-made climate change. *The Times* October 31, 2009 Saturday Barbecue autumn is about to end with gales and heavy rain BYLINE: Paul Simons
- 401- In the atmosphere, CO₂ **traps** solar energy and increases air and sea temperatures to a point that kills coral. *The Sunday Times* October 25, 2009 Freezer to preserve threatened coral BYLINE: Jonathan Leake
- 402- Green campaigners are rightly concerned with environmental degradation. There is copious evidence of global warming due to man-made emissions of carbon dioxide and other gases that **trap** heat. The pace of glacial retreat and a rise in sea levels confirm it. *The Times* August 21, 2009 Friday 'Save the planet' sounds a lovely idea but ...; ... if we try to deal with climate change by turning our backs on economic growth, the poor will pay the heaviest price BYLINE: Oliver Kamm
- 403- The Obama administration yesterday declined to protect polar bears from the single greatest threat to their survival - the melting of sea ice by global warming. The decision brought immediate protests from wildlife and environmental groups. The interior secretary, Ken Salazar, said he would not overturn one of the most controversial last-minute rules of the George Bush era. The rule had denied protection to the polar bear because Bush did not want to regulate the industries that emit greenhouse gases. (...) But he said existing wildlife legislation, which was crafted in the 1970s, was not equipped to deal with threats to the polar bear from **heat-trapping pollution** occurring miles away from its Arctic home. *The Guardian* May 9, 2009 Saturday International: US rejects call to protect polar bears from global warming BYLINE: Suzanne Goldenberg
- 404- This decade will be the warmest recorded in 160 years, say meteorologists. At the same time, rising sea levels are poisoning fresh water wells in Bangladesh, droughts are becoming longer and more frequent in east Africa, and coral reefs are dying as oceans **absorb** more and more carbon dioxide and become increasingly acidic. *The Observer* December 20, 2009 National: Copenhagen; Analysis: Why I believe all is not lost – yet BYLINE: ROBIN McKIE

- 405- Such an effect could trigger a chain of reactions through entire ecosystems, from whales to fish and shellfish, with huge implications for economies and wildlife. It could even stop the sea **absorbing** as much carbon dioxide as it does now, accelerating global warming. *The Sunday Times* December 13, 2009 If climate change doesn't grab you, meet its evil twin BYLINE: CHARLES CLOVER
- 406- The process of acidification - by which carbon dioxide emitted into the atmosphere as pollution is **absorbed** by water and converted into carbonic acid - is taking place in seas and oceans around the world. *The Daily Telegraph* October 5, 2009 Monday Climate change turning Arctic seas to acid BYLINE: Matthew Moore
- 407- Today, the planet is one million kilometres farther away from the sun during the northern hemisphere's summer solstice than it was in 1BC. This natural cooling effect will continue for 4,000 more years. Previous research has shown that temperatures over the past century rose nearly three times as fast in the Arctic as elsewhere in the northern hemisphere. This is due to an effect called Arctic amplification, whereby highly reflective sea ice and snow melt to reveal darker land and sea water, which **absorb** sunlight and warm up more quickly. *Guardian.com* September 3, 2009 Thursday Global warming has made Arctic summers hottest for 2,000 years
- 408- Painting buildings white can also help reduce the amount of solar radiation **absorbed** by the Earth, keeping it cool. *DAILY MAIL* August 27, 2009 Thursday HOW FORESTS OF FAKE TREES COULD FIGHT GLOBAL WARMING
- 409- Carbon dioxide helps the atmosphere **absorb** heat from the sun, which is why scientists are worried that too much of it is gradually increasing temperatures around the world. We have upset the natural balance of carbon dioxide entering and leaving the atmosphere. This is why we urgently need to stop burning so many fossil fuels. *The Guardian* May 22, 2009 Friday G2: Fizzy drinks, farts and the future BYLINE: Leo Hickman
- 410- In 2007, some ice-free areas were as much as 5C warmer than the long-term average. Arctic waters appear to have warmed as a result of the influx of warmer waters from the Pacific and Atlantic. The loss of reflective, white sea ice also means that more solar radiation is *absorbed* by the dark water, heating surface layers further. (...) Black carbon, or soot, is emitted from inefficient burning such as in diesel engines or from the burning of crops. It is warming the Arctic by creating a haze which **absorbs** sunlight, and it is also deposited on snow, darkening the surface and causing more sunlight to be absorbed. *Guardian.com* April 28, 2009 Tuesday Climate change hitting entire Arctic ecosystem, says report
- 411- Martin Parry, a British scientist who jointly chaired the IPCC working group on impacts for the 2007 report, and will attend next month's meeting, said: "I think it's a good idea. I would have thought most of this stuff is out there already but it deserves to be brought together and hammered home in a credible way." A number of "disturbing" trends seem to have accelerated since the IPCC report was published, he said, such as a decrease in the amount of carbon pollution **absorbed** in the oceans, and an increase in Greenland ice melt. (...) The average rise in global temperatures that scientists say nations should prepare for. The EU defines a 2C rise as dangerous *The Guardian* February 9, 2009 Monday National: Scientists plan emergency summit on climate change BYLINE: David Adam
- 412- Black carbon, the component of soot that gives it its colour, is thought to be the second largest cause of global warming after carbon dioxide. Formed through incomplete combustion of fossil fuels, wood and vegetation, it delivers a double whammy. While in the air, it is spread around the globe by the wind, and helps to heat the atmosphere by **absorbing** and releasing solar radiation. And when it falls out it darkens snow and ice, at the poles or high in mountains, reducing its ability to reflect sunlight. As a result it melts more quickly, and exposes more dark land or water which **absorbs** even more energy, and so increases warming. *The Independent on Sunday* January 4, 2009 Soot reduction 'could help to stop global warming' BYLINE: Geoffrey Lean

- 413- Could the oceans fight back? Plant life is hailed as **lock and key** to global warming *The Times* October 14, 2009 Wednesday BYLINE: Frank Pope
- 414- There is no hope of a complete or perfect solution to it. Indeed, climate change is already happening and a lot of future global warming has already been **locked** into the system, given that the burning of carbon fuels is not going to stop this year or next. *The Independent on Sunday* July 12, 2009 Against all odds, a step up for the planet BYLINE: John Rentoul
- 415- But other **greenhouse gases**, such as methane, account for up to 40 per cent of the **greenhouse gas effect, trapping** the Sun's heat on Earth. *The Express* December 4, 2010 Saturday What a gas...surgery is now being blamed for global warming BYLINE: John Ingham
- 416- The main uncertainties are the effects of clouds and aerosols - fine particles of airborne dust. Thus, some clouds **trap** heat in the atmosphere, causing warming, while others reflect solar radiation back into space, causing cooling. Similarly, some aerosols such as black soot **absorb** solar radiation, causing warming, while others which are white reflect it, causing cooling. (...) For example, a warmer atmosphere will allow it to contain more water vapour, thus **enhancing the greenhouse effect**. This will be offset partly by the amount rained out. (...) Furthermore, as the Earth's surface warms, increasing amounts of methane, which is 33 times **more potent as a greenhouse gas** than carbon dioxide, will be emitted from the melting tundra and from ocean floors. (...) These molecules **absorb** radiation at particular frequencies, which is then re-emitted in all directions, so that some is retained by the Earth's atmosphere. Indeed, this is what keeps the Earth warm enough for life to exist. (...) The most important is the decline of the albedo or "whiteness" effect in polar areas. The higher temperatures cause some of the sea ice and ice sheets to melt, exposing the much darker ocean or land, which, instead of reflecting some of the solar radiation back out to space, **absorbs** it, causing the Earth to warm all the more. And this in turn accelerates the process. *Morning Star* November 11, 2010 Thursday Feature - The science behind global warming; Jerry Jones cuts through the misinformation to explain climate change
- 417- The emails, which appeared to encourage data to be kept from Freedom of Information requests, have been seized upon by climate change sceptics - although none of them dispute the science behind the **"greenhouse effect" of gases** such as carbon dioxide, which **traps** solar heat and warms the atmosphere. *The Guardian* February 8, 2010 Monday Public belief in science of climate change has fallen after leaked emails scandal BYLINE: Jo Adetunji
- 418- Two weeks ago, the IPCC was forced to apologise for another report that claimed Himalayan glaciers could disappear as soon as 2035. It later emerged that most of the figures came from two 1999 magazine interviews, which had been recycled by the environmental campaign group WWF. The charity was found to have made basic errors in its arithmetic. Just last week, it emerged that another claim that 40 per cent of the Amazon was extremely vulnerable to a tiny decline in rain was lifted from a second unsubstantiated report published by the WWF. However, supporters of the IPCC say that a handful of mistakes does not undermine the case for manmade global warming that carbon dioxide **traps** heat from the sun and that levels of the **greenhouse gas have been rising** rapidly since the Industrial Revolution. *DAILY MAIL* February 6, 2010 Saturday HOW OUR BELIEF IN CLIMATE CHANGE IS DRAINING AWAY BYLINE: DAVID DERBYSHIRE
- 419- The open sea, being darker, **absorbed** more heat from the sun in the warmer, light months. As it remained clear for longer than usual it also bled more heat into the Arctic atmosphere. *The Guardian* December 21, 2010 Tuesday Comment: That snow outside is what global warming looks like BYLINE: George Monbiot
- 420- In reality, there have been many peer-reviewed studies into past climate change, and what they find is when our planet warms, positive feedbacks amplify the warming (such feedbacks are where higher temperatures bring higher emissions and faster warming - an example would be a reduction in sea ice leading to increased heating because the darker sea **absorbs** more heat than lighter ice). *Guardian.com* August 6, 2010 Friday Climate change denial? There's an app for that

- 421- This last cooling effect is caused by a decline in ozone in the stratosphere which prevents it **absorbing** as much ultraviolet radiation from the sun above. *Guardian.com* July 28, 2010 Wednesday Global warming pushes 2010 temperatures to record highs BYLINE: Juliette Jowit
- 422- The "urban heat island effect", in which buildings and roads **absorb** heat during the day and release it at night, could result in the temperature on the hottest nights remaining above 25C. (...) Cities can be up to 10C warmer at night than surrounding rural areas, partly because they **absorb** more heat from the sun but also because they generate more heat from vehicles, lighting, machines and air conditioning units. Even the metabolism of millions of city dwellers adds to the temperature. *The Times* June 1, 2010 Tuesday 20C and rising: climate change will make cities even hotter at night BYLINE: Ben Webster
- 423- A resurrected satellite, carrying the hopes of climate scientists, will make a second attempt to reach orbit today from the Baikonur cosmodrome in Kazakhstan. The first , ditching - with cruel irony - into the Arctic Ocean it was meant to study. (...) The melting of sea ice, ice caps and glaciers across the planet is one of the clearest signs of global warming and the UK-led team of scientists will use the data from CryoSat-2 to track how this is affecting ocean currents, sea levels and the overall global climate. Scientists are concerned that the loss of sea ice is leading to a feedback effect where the newly exposed, darker ocean **absorbs** more sunlight, warming the water yet further. In addition, sea ice can block glaciers on land from falling into the ocean, so its loss could raise sea levels. *Guardian.com* April 8, 2010 Thursday CryoSat-2 satellite prepares for mission to monitor climate change in Arctic BYLINE: Damian Carrington
- 424- The European Union has been rallying support to its plan to set a 2015 target date for a new climate deal that would impose binding cuts on the world's biggest emitters of **heat-trapping** gases, a pact that would come into force up to five years later. *Guardian.com* December 9, 2011 Friday Durban climate change talks BYLINE: James Randerson
- 425- It is beyond dispute that the earth has been warming for decades. The vast majority of climatologists believe that is because we are releasing gases which **trap** heat inside our atmosphere. *i-Independent* January 14, 2011 The evidence for global warming
- 426- Man cannot at his pleasure command the rain and the sunshine, the wind and frost and snow, yet it is certain that climate itself has in many instances been gradually changed and ameliorated or deteriorated by human action. The draining of swamps and the clearing of forests perceptibly effect the evaporation from the earth, and of course the mean quantity of moisture suspended in the air. The same causes modify the electrical condition of the atmosphere and the power of the surface to reflect, **absorb** and radiate the rays of the sun, and consequently influence the distribution of light and heat, and the force and direction of the winds. *Guardian.com* June 20, 2011 Monday The 1847 lecture that predicted human-induced climate change BYLINE: Leo Hickman
- 427- Black carbon affects climate by intercepting and **absorbing** sunlight, darkening snow and ice when deposited, and helping to form clouds. *The Guardian* June 15, 2011 Wednesday National: Black carbon curb could slow climate change BYLINE: John Vidal
- 428- A dark, open ocean **absorbs** more of the sun's heat than the highly reflective surface of an ocean capped by floating sea ice, and so should in theory result in even more heat and more melting. *i-Independent* May 30, 2011 'Feedback' effect could lead to accelerated global warming BYLINE: Steve Connor
- 429- Dampness affects the temperature quite dramatically, because water removes heat from the surroundings as it evaporates. Even the colour of the soil affects the speed at which it heats up, with darker soils **absorbing** more heat than lighter types. *The Sunday Telegraph* January 23, 2011 CLIMATE CHANGE; HOW TO MANIPULATE A GARDEN'S TEMPERATURE FOR THE BEST RESULTS BYLINE: BUNNY GUINNESS

- 430- Hopes for a Green Climate Fund, that would channel £60bn a year towards countries adapt to climate change, have barely moved forward. Kelly Dent, head of the Oxfam delegation, said a weak deal could **'lock in'** dangerous climate change as once the carbon is in the atmosphere it is impossible to reverse warming. Joseph Alcamo, the UN Environment programme chief scientist, pointed out that emissions need to peak within the decade or the world will be **"locked in"** to dangerous global warming. (...) There were also concerns about the role of China, that is notoriously secretive about its position. Other emerging economies are also shy of signing up to a deal that would forced them to cut emissions. *telegraph.co.uk* December 8, 2011 Thursday Durban Climate Change conference: world close to deal on global warming BYLINE: Louise Gray
- 431- Anything built from now on that produces carbon will do so for decades, and this **"lock-in"** effect will be the single factor most likely to produce irreversible climate change, the world's foremost authority on energy economics has found. If this is not rapidly changed within the next five years, the results are likely to be disastrous. (...) The **"lock-in"** effect is the single most important factor increasing the danger of runaway climate change, according to the IEA in its annual World Energy Outlook, published yesterday. *The Guardian* November 10, 2011 Thursday Front: World given 2017 climate deadline BYLINE: Fiona Harvey
- 432- Yet, despite intensifying warnings from scientists over the past two decades, the new infrastructure even now being built is constructed along the same lines as the old, which means that there is a **"lock-in"** effect - high-carbon infrastructure built today or in the next five years will contribute as much to the stock of emissions in the atmosphere as previous generations. This **"lock-in"** effect is the single most important factor increasing the danger of runaway climate change, according to the IEA in its annual World Energy Outlook, published on Wednesday. *Guardian.com* November 9, 2011 Wednesday World headed for irreversible climate change in five years BYLINE: Fiona Harvey
- 433- Their warning came after the UN last week warned of record levels of carbon dioxide and other **greenhouse gases** in the atmosphere, which will likely remain **trapped** there causing temperatures to continue to rise for centuries. *MailOnline* November 28, 2012 Wednesday The Glacier National Park may soon have to change its name BYLINE: DAMIEN GAYLE
- 434- Billions of tonnes of **greenhouse gases** released into the atmosphere are likely to be **trapped** for centuries with far-reaching impacts for all life, it was warned. (...) Other **greenhouse gases** are also on the rise and are contributing to the warming caused when the **trap** heat that would otherwise escape into space. (...) The increases mean that about 30 per cent more heat was **trapped** in the earth's atmosphere last year than it was in 1990. Rising carbon dioxide levels are considered to be having the most serious impact on global warming and is calculated to be responsible for 85 per cent of the extra **trapped** heat. *MailOnline* November 26, 2012 Monday Melting permafrost 'will DOUBLE carbon and nitrogen levels in the atmosphere' BYLINE: DAMIEN GAYLE
- 435- Billions of tonnes of **greenhouse gases** released into the atmosphere are likely to be **trapped** for centuries with far-reaching impacts for all life, it was warned. (...) Other **greenhouse gases** are also on the rise and are contributing to the warming caused when the **trap** heat that would otherwise escape into space. (...) The increases mean that about 30 per cent more heat was **trapped** in the earth's atmosphere last year than it was in 1990. Rising carbon dioxide levels are considered to be having the most serious impact on global warming and is calculated to be responsible for 85 per cent of the extra **trapped** heat. About half the 375billion tonnes of carbon released into the atmosphere, mainly from burning fossil fuels, since 1750 remains **trapped** in the atmosphere. *MailOnline* November 21, 2012 Wednesday **Greenhouse gases reached record levels** in 2011, prompting warning that global warming can only get worse BYLINE: LEWIS SMITH
- 436- Global warming, or the rise of the earth's atmosphere is believed in large part to be due to an increase of **greenhouse gases**, produced by industry emissions, the burning of fossil fuels and large scale farming, becoming **trapped** in the atmosphere. *MailOnline* October 5, 2012 Friday America, Britain and Japan are the countries most sceptical that man is to blame for global warming BYLINE: KATY WINTER

- 437- The ozone layer plays a vital role in allowing life to survive on Earth because it **traps** more than 97% of the sun's ultraviolet radiation. (...) Greenhouse gases **absorb** the heat, **trapping** it in the atmosphere (...) Earth's surface **absorbs** sunlight and emits the energy as heat (...) Car air-conditioning HFCs readily **absorb** and emit heat + Medical HFCs used as propellants in asthma inhalers *The Sunday Times* September 16, 2012 Sunday Green gases heat up Earth BYLINE: Jonathan Leake
- 438- Methane is up to 20 times more effective in **trapping** heat in the atmosphere than carbon dioxide (CO₂). *MailOnline* May 7, 2012 Monday Did dinosaurs cause climate change? BYLINE: PAMELA OWEN
- 439- The darker open waters now **absorb** more solar radiation, accelerating the melt. *The Guardian* September 15, 2012 Saturday National: Climate change: 'We have changed the face of the planet. It is staggering and scary' BYLINE: John Vidal
- 440- As the ice melts, for example, exposing the darker sea beneath, heat that would previously have been reflected back into space is **absorbed**. *The Guardian* August 28, 2012 Tuesday Comment: The rich world's smugness will melt along with the ice BYLINE: George Monbiot
- 441- The tiny particles play a key role in air pollution and climate change by providing a surface for chemical reactions and reflecting and **absorbing** radiation. *MailOnline* July 31, 2012 Danger in the air: Atmospheric particles a fraction of the width of human hair could be driving climate change BYLINE: EDDIE WRENN
- 442- Carbon dioxide in the atmosphere **absorbs and traps** heat that would otherwise return to space. *MailOnline* April 5, 2012 Thursday Severe global warming 55million years ago 'triggered by changes in Earth's orbit'
- 443- Other tipping points identified by Prof Steffen as part of the 'great acceleration' in global warming include the melting of ice in the Arctic that creates more areas of ocean and therefore **absorbs** more heat than reflective white, again causing a positive feedback loop. Although the global population is stabilising and we are more efficient at producing energy, human beings are causing more carbon dioxide to be released than ever before because the amount individuals consume is still rising, causing a number of environmental impacts. *telegraph.co.uk* March 27, 2012 Tuesday '**Compost bomb**' is latest climate change 'tipping point' BYLINE: Louise Gray
- 444- Other scientists say that heat has somehow been **absorbed** by the waters deep in the oceans. However, the evidence for this is contested, and there are no historical records with which to compare recent deepwater readings. (...) Other experts point out one of the biggest natural factors behind the plateau is the fact that in 2008 the temperature cycle in the Pacific flipped from 'warm mode', in which it had been **locked** for the previous 40 years, to 'cold mode', meaning surface water temperatures fell. *MailOnline* October 21, 2012 Sunday The REALLY inconvenient truths about global warming BYLINE: DAVID ROSE
- 445- And, of course, complications come **deep-fried, boiled or roasted** when you start **stirring the global warming pot**. *The Guardian* November 2, 2009 Monday The climate of fear BYLINE: Peter Preston
- 446- I dare say others have suggested this before. Perhaps there are better suggestions: global **boiling**, global melting? Some might complain that these terms are too emotive or lack precision. But shouldn't we start using language that conveys the urgency of the issue we face? *Guardian.com* September 21, 2009 Monday Global burning: could a phrase save us from catastrophic climate change? BYLINE: Jonathan Watts
- 447- There is a terrible irony implicit in the challenge posed by climate change; Man's scientific genius and ingenuity have brought the planet to **near-boiling point**, yet those same traits are our best hope of cleaning up the mess. Today some of the greatest minds at work in this overheating world are

meeting in London to discuss the looming environmental disaster. *The Times* May 26, 2009 Tuesday Nobel Cause; A meeting of minds from a range of disciplines can tackle climate change

- 448- Our world is starting to sizzle as rising levels of greenhouse gases **trap** more and more of the sun's heat in the lower atmosphere - a point that was confirmed on Wednesday when the Met Office reported that sensors from around the world were showing that 2010 would be the hottest, or just possibly the second hottest year on record. (...)New York has **baked** in a thick tropical heat and humidity that is gripping eastern America. *The Observer* August 1, 2010 A dark ideology is driving those who deny climate change BYLINE: Robin McKie
- 449- The day's next green talkfest is a conversation between Rosie Boycott and Nicholas Stern, the economist and life peer who authored 2006's Stern Review, which made the case for cutting our emissions on the basis of hard-headed logic: to do so now would take a tiny fraction of the world's cash and resources, whereas sitting back and then trying to cope with a **boiling** planet would almost literally cost the Earth. His specialism is a forensic, inevitably rather wonk-ish take on what to do next - underpinned by an optimism that defines just about all his answers. *The Guardian* June 1, 2010 Tuesday G2: Game over? BYLINE: John Harris
- 450- Our soldiers saw every season. The country suffers increasingly long droughts. Flash floods also strike, but can't be absorbed for crops as the earth is **baked solid**. The average rainfall since 2007 has been half of what farmers need. *Sunday Mirror* February 6, 2011 Sunday LAKE DRIED UP, THERE IS NO FOOD MY YOUNGEST 2 CHILDREN DIED; CLIMATE CHANGE REAPS A GRIM HARVEST IN CHAD BYLINE: EMILY MILLER
- 451- Climate change: **Off the boil** *The Guardian* October 14, 2011 Friday
- 452- America and Europe **baked** under heat waves, the American midwest weathered its worst drought in a generation, and parts of Brazil and China also went without rain. Pakistan, meanwhile, lost hundreds to floods caused by epic monsoon rains. West Africa also experienced floods. *Guardian.com* December 5, 2012 Wednesday Scientists to reveal full extent of Arctic ice loss amid climate change fears BYLINE: Suzanne Goldenberg
- 453- But the long list of damages that climate change threatens to wreak on the UK shows climate injustice exists from the poor flood-prone neighbourhoods by the Humber to the concrete jungles of London, set to become **ovens** on baking-hot days. *Guardian.com* January 26, 2012 Thursday Climate change set to hit UK hard and the poorest hardest BYLINE: Damian Carrington
- 454- Excellent news. We've got a way of pulling at least some of the CO2 out of the atmosphere where it's about to **boil** us all in our beds. *telegraph.co.uk* July 23, 2012 Monday Governments aren't taking climate change seriously. Otherwise they'd investigate this possible solution BYLINE: Tim Worstall
- 455- Must the sea **boil**, the Seine run dry, New York flood and the London Olympics be consumed by fire before countries are shocked into taking concerted action? *Guardian.com* July 4, 2012 Wednesday As the climate changes, extreme weather isn't that extreme any more BYLINE: John Vidal
- 456- But then I go back to the facts. However much I want them to be different, they sit there, hard and immovable. Nobody disputes that **greenhouse gases trap heat** in the atmosphere, like a **blanket holding** in the Sun's rays. Nobody disputes that we are increasing the amount of **those greenhouse gases** in the atmosphere. And nobody disputes that the world has become considerably hotter over the past century. (If you disagree with any of these statements, you'd fail a geography GCSE). *The Independent* December 4, 2009 Friday How I wish that the global warming deniers were right BYLINE: Johann Hari

- 457- Although the [sic] is the most well-known consequence of the **thickening blanket of greenhouse gases around the Earth**, it represents just a tiny fraction of the extra heat **trapped**. *Guardian.com* April 15, 2010 Thursday Global warming monitoring needs to find 'missing heat', say scientists BYLINE: David Adam
- 458- Those glaciers covered in a sufficiently thick mask of grit and rock have a better chance. If the covering is thick enough, say greater than a metre, the layer of rocks and debris acts like an **insulation blanket**, preserving the glacier from more rapid warming. A thin coating seems to have the opposite effect, however, absorbing the sun's rays, and speeding the melting process. *The Observer* September 25, 2011 EVEREST FACTS: Everest's melting glaciers send a signal to the world BYLINE: Suzanne Goldenberg
- 459- **Without a greenhouse effect**, life wouldn't exist, and **if the greenhouse effect is good** enough to provide you with life itself, obviously, logic suggests that it's also going **to act like a greenhouse if you add more gases and they're trapped and you heat up the earth**. This is pretty logical stuff, and it's astounding to me that even in the United States Senate and elsewhere, we have people who doubt it. *The Guardian* December 13, 2014 Saturday Summary; Updates and reaction from the UN climate summit in Peru
- 460- Scientists warned last month that the Earth is set for more heatwaves, floods, droughts and rising sea levels that could swamp coasts and islands as **greenhouse gases build up** in the atmosphere. (...) But others questioned the credibility of the predictions, pointing out that the IPCC's research had signally failed to predict the ongoing 'pause' in rising world temperatures. *MailOnline* October 6, 2013 Sunday The end of the world is nigh BYLINE: MARK DUELL
- 461- Climate change scientists warned yesterday that the Earth is set for more heatwaves, floods, droughts and rising sea levels that could swamp coasts and low-lying islands as **greenhouse gases build up in the atmosphere**. (...) The report acknowledges that temperature rises have dropped from 0.12c per decade since 1951 to just 0.05c per decade since 1998 - despite record amounts of **greenhouse gases being pumped into the atmosphere**. (...) One of the biggest differences between yesterday's report and the 2007 version comes in a key figure, used to work out how much temperatures will respond to **the extra greenhouse gases pumped into the air** by factories, farming and cars. Six years ago, the IPCC estimated that a doubling of carbon dioxide in the atmosphere would increase temperatures between 2c and 4.5c. *MailOnline* September 29, 2013 Sunday It's not as bad as we thought BYLINE: FIONA MACRAE
- 462- **Greenhouse gas concentrations** have increased to their highest level in at least 800,000 years, including a 40 per cent rise in carbon dioxide since pre-industrial times driven largely by the burning of fossil fuels. *telegraph.co.uk* September 28, 2013 Saturday Climate change report: extreme weather to become more common BYLINE: Nick Collins
- 463- **Concentrations of the greenhouse gases** carbon dioxide, methane and nitrous oxide have increased to levels unprecedented for at least 800,000 years. *MailOnline* September 27, 2013 Friday Climate change is on ice BYLINE: ELLIE ZOLFAGHARIFARD
- 464- It said a pause in rising temperatures over the past 15 years is just a temporary halt to climate change. The report (IPCC report) also warns global sea levels are likely to rise 2½ft by 2100 if carbon emissions are not reigned in. Last night, opponents said the claims were a cover-up for previous inaccurate predictions. (...) Ed Davey, the Energy and Climate Change Secretary, said solutions to **the problem of man-made greenhouse gases accumulating** in the atmosphere "must be set in motion today." *telegraph.co.uk* September 27, 2013 Friday IPCC report: global warming is 'unequivocal' BYLINE: Nick Collins
- 465- Many of the overestimations also made their way into the popular press. (...) Mr Christy (climate scientist) agrees that there has been some warming over time, but says **man-made greenhouse**

gasses are not as big of a driver of climate change as many think -- and that many scientists are in denial about their mistakes. *MailOnline* September 12, 2013 Thursday Climate change models may not be accurate after all as study finds most widely overestimated global warming

- 466- Global temperatures have continued to rise, but at a slower rate since 1998, despite **greenhouse gas concentrations** peaking due to more emissions created by increasingly-industrialised emerging nations. *MailOnline* August 23, 2013 Friday Why HAS global warming slowed? BYLINE: SARAH GRIFFITHS
- 467- The IPCC will try to explain why global temperatures, have risen more slowly since about 1998 even though **greenhouse gas concentrations** have hit record highs in that time. It could be due to a combination of ash from volcanoes dimming sunlight, a decline in heat from the sun during the solar cycle, and the possibility that the climate may be less sensitive than expected to carbon dioxide **build-up**. *telegraph.co.uk* August 16, 2013 Friday Climate change: forecast for 2100 is floods and heat ... and it's man's fault BYLINE: Nick Allen
- 468- Black carbon, which is released from diesel engines, coal-fired power stations and wood-burning stoves, has a warming effect of 1.1 Watts per square metre, which is about two thirds the warming effect of carbon dioxide, the principle **man-made greenhouse gas**. *Independent.co.uk* January 15, 2013 Tuesday Soot causes twice as much global warming as previously thought BYLINE: Steve Connor
- 469- In the 21st century, **greenhouse gases have continued to accumulate** in the atmosphere, just as they did in the 20th century, but global average surface air temperatures have stopped rising in tandem with the gases. *MailOnline* October 6, 2014 Monday Climate change has NOT affected the abyss: Nasa reveals cold waters of Earth's deep ocean have not warmed since 2005 BYLINE: MARK PRIGG
- 470- The 1 degree Fahrenheit of warming that has been recorded on the coast of the northwest Pacific Ocean is due to weaker winds and changing ocean circulation, not a **buildup of greenhouse gasses**. *MailOnline* September 24, 2014 Wednesday Changing wind patterns, NOT global warming, are causing temperatures to rise on America's West Coast, says study BYLINE: CHRIS SPARGO
- 471- For most people this is a disastrous turn of events. The weight of scientific consensus insists that the world's climate continues to warm with catastrophic effect and there is much work to do in curbing **manmade greenhouse gases**. *i-Independent* September 1, 2014 Time to warm up the climate change issue BYLINE: Danny Rogers
- 472- The new model differs in that it considers a wider temperature range when estimating the impact of doubling **the atmospheric concentration of greenhouse gases** - a measure of "climate sensitivity". *The Independent* June 16, 2014 Monday Climate change will 'cost world far more than estimated'; Lord Stern says current models do not adequately reflect the science and the impact on global economies BYLINE: TOM BAWDEN
- 473- In the shocking pictures the Jefferson Memorial in Washington D.C is surrounded by water, Ocean Drive in Miami looks like it would only be navigable by boat and Crissy Field in San Francisco is mostly under water. (...) Some scientists believe that a **build-up of man-made greenhouse gases** in the atmosphere is affecting wind patterns around Antarctica, driving warmer waters towards the continent. *MailOnline* May 21, 2014 Wednesday From the Statue of Liberty to Nasa's launchpads BYLINE: MARK PRIGG
- 474- Atmospheric **greenhouse gas concentrations continue to rise** and continued emissions will cause further warming over this century. Limiting the magnitude of future climate change requires large and sustained net global reductions in **greenhouse gases**. *Guardian.com*. March 3, 2014 Monday Climate change is redefining the Australia of 'sunburnt country' poem BYLINE: Graham Readfearn

- 475- Obama drew a clear connection between California's troubles and climate change as he toured part of a farm that will go unsown this year as the state faces its worst drought in more than 100 years. Even if the U.S. takes action now to curb pollution, the planet will keep getting warmer "for a long time to come" thanks to **greenhouse gases that have already built up**, Obama said. (...) Farmers recently learned they will not be receiving irrigation water from the State Water Project, a system of rivers, canals and reservoirs. They anticipate a similar announcement later this month from federal authorities who operate a similar system called the Central Valley Project. *MailOnline* February 15, 2014 Saturday Obama: US must rethink water as climate changes
- 476- **Concentrations of the greenhouse gases** carbon dioxide, methane and nitrous oxide have increased to levels unprecedented for at least 800,000 years. *MailOnline* February 10, 2014 Monday Global warming hasn't stopped BYLINE: ELLIE ZOLFAGHARIFARD
- 477- It (IPCC report) says that atmospheric **concentrations of greenhouse gases**, already at levels not seen in at least 800,000 years, will persist for many centuries and 'continued emissions of **greenhouse gases will cause further warming** and changes in all components of the climate system'. (...) But it concedes that world temperatures have barely risen in the past 15 years, despite **growing amounts of greenhouse gases** being pumped into the atmosphere. (...) This slowdown has been seized upon by climate sceptics who claim carbon dioxide is not as damaging as has been suggested. *MailOnline* February 3, 2014 Monday Global warming is 'almost definitely' caused by humans, UN report claims BYLINE: SARAH GRIFFITHS (my addition in parenthesis)
- 478- You can't blame climate change entirely for hot weather, but you can say that it increases the risk of extreme hot weather events occurring. **The planet's atmosphere has been loaded with extra greenhouse gases**, which gives the analogy of **loading the weather dice** to increase the chances of you **rolling a six** - or in this case, experiencing extremely hot days or seeing Snoopy. *Guardian.com*. January 16, 2014 Thursday Is the Australian Open tennis feeling the heat of climate change? BYLINE: Graham Readfearn
- 479- A map of the Sahel region in Africa, which was badly hit by famine in the 1980s People are now growing crops again in the Sahel region after the seasonal rains returned. However, the scientists also warned that despite the short-term positive impact global warming is having on Africa, in the long-term **the continued accumulation of greenhouse gases** in the atmosphere is an ecological **disaster** waiting to happen. *Express Online* June 2, 2015 Tuesday African drought is OVER BYLINE: Nick Gutteridge
- 480- But despite the beneficial impact of global warming on Africa, the scientists have warned that the long term impacts will be very different as **greenhouse gases continue to accumulate** in the atmosphere. (...) The Live Aid concerts came after a series of BBC news reports in 1984 by Michael Buerk showed heartbreaking footage of children in Ethiopia suffering from severe malnutrition due to famine brought on by drought. It then inspired a public campaign which culminated in millions of pounds being released through Band Aid's single Do They Know It's Christmas? later that year. *MailOnline* June 2, 2015 Tuesday Climate change is HELPING Africa because greenhouse gases are bringing rain to areas that have suffered drought for decades, says new study BYLINE: JENNIFER NEWTON
- 481- Global warming has fought famine; New research shows that **increasing concentrations of greenhouse gases have increased rainfall** in a drought-hit region of Africa(...) So thank goodness for the news from the Sahel, where human activities seem to be helping to put right something they may have done much to cause in the first place. Between the 1950s and 1980s, rainfall in the region slumped by 40 per cent and several studies have concluded that this was linked to air pollution, including by sulphur dioxide, in Europe and North America. *telegraph.co.uk* June 2, 2015 Tuesday BYLINE: Geoffrey Lean
- 482- The Duke-led study says that variability is caused by interactions between the ocean and atmosphere, and other natural factors. They claim these 'wiggles' can slow or speed the rate of warming from decade to decade, and exaggerate or offset the effects of increases in **greenhouse gas**

concentrations. If not properly explained and accounted for, they may skew the reliability of climate models and lead to over-interpretation of short-term temperature trends. *MailOnline* April 24, 2015 Friday Our climate models are WRONG: Global warming has slowed BYLINE: ELLIE ZOLFAGHARIFARD

- 483- A prominent academic and climate change denier's work was funded almost entirely by the energy industry, receiving more than \$1.2m from companies, lobby groups and oil billionaires over more than a decade, newly released documents show. Over the last 14 years Willie Soon, a researcher at the Harvard-Smithsonian Centre for Astrophysics, received a total of \$1.25m from Exxon Mobil, Southern Company, the American Petroleum Institute (API) and a foundation run by the ultra-conservative Koch brothers, the documents obtained by Greenpeace through freedom of information filings show. (...) Both Harvard and the Smithsonian acknowledge that the climate is changing because of **rising levels of greenhouse gas concentrations caused by human activities.** *The Guardian* February 23, 2015 Monday Work of prominent climate change denier was funded by energy industry BYLINE: Suzanne Goldenberg
- 484- Rising concentrations of carbon dioxide, the main **greenhouse gas**, are about 397 parts per million in the atmosphere, above 350 ppm that the study set as **the boundary for safe use.** *MailOnline* January 16, 2015 Friday Climate change and extinctions have put Earth into a 'danger zone' for humanity BYLINE: REUTERS and MARK PRIGG
- 485- If we continue to pump **greenhouse gases** into the atmosphere on current trajectories, we are facing a world with **temperatures of more than 4C** above pre-industrial levels by 2100 - hotter globally than at any time in human history. *mirror.co.uk* December 13, 2015 Sunday COP21: All you need to know after historic climate change deal is agreed in Paris
- 486- In Brazil, leaders had agreed on a UN Framework on Climate Change (UNFCCC), aimed at **stabilising atmospheric concentrations of greenhouse gases** and avoiding "dangerous anthropogenic interference". During the COP3 in Japan, the Kyoto Protocol was adopted; then the COP11 in Canada agreed to the Montreal Action Plan, while the COP15 in Copenhagen could only acknowledge that the Kyoto Protocol targets had not been achieved; this triggered the creation of a Green Climate Fund during the COP17 in Durban. This time, the aim is to find an effective and equitable agreement to limit global temperature rise to two degree Celsius. Will it succeed? Probably not: Because the interests of different players are too divergent. *MailOnline* December 11, 2015 Friday Blaming India and China for climate change helps no one BYLINE: CLAUDE ARPI
- 487- Global average temperatures broke through the 1C barrier as **the concentration of man-made greenhouse gases** in the atmosphere reached another new record, the climate scientists said. Latest figures on **greenhouse gas concentrations** show that levels of carbon dioxide, methane and nitrous oxide from industrial, agricultural and domestic activities reached record levels. *Independent.co.uk* November 9, 2015 Monday Global warming: World already halfway towards threshold that could result in dangerous climate change BYLINE: Steve Connor
- 488- Climate change: Before and after photos show how we are **killing** the planet; Rising global temperatures, largely due to **man-made greenhouse gases**, are the source of observable changes to the Earth *Independent.co.uk* November 8, 2015 Sunday BYLINE: Dina Spector
- 489- SB 32 increases those pollution reduction goals - specifically from **man-made greenhouse gases**, requiring the state to reduce emissions to 40% below its 1990 levels by 2030, and then increasing that to 80% below 1990 levels by 2050. *The Guardian* August 28, 2015 Friday 3 Climate change legislation approaches pivotal showdown with oil industry BYLINE: Anita Chabria
- 490- In an e-mail responding to an inquiry on business ethics from the Institute for Applied and Professional Ethics at Ohio University Bernstein, a 30-year industry veteran, has claimed Exxon knew

as early as 1981 that man made CO₂ emissions were warming the planet. This is seven years before it became a public issue when climate scientist James Hansen told Congress that **climate change was caused by the buildup of greenhouse gases in the atmosphere** due to the burning of fossil fuels. According to The Guardian, Exxon became aware of the potential that carbon-cutting regulations could hurt its bottom line over a generation ago and factored that knowledge into its decision on whether to develop an enormous gas field in south-east Asia. *MailOnline* July 10, 2015 Friday Exxon knew of climate change in 1981, e-mail says BYLINE: TIM MACFARLAN

- 491- Climate change was largely confined to the realm of science until 1988, when the climate scientist James Hansen told Congress that **global warming was caused by the buildup of greenhouse gases** in the atmosphere, due to the burning of fossil fuels. *The Guardian* July 9, 2015 Thursday Exxon knew of climate change in 1981, email says BYLINE: Suzanne Goldenberg
- 492- Arctic temperatures are rising faster than the world average **amid a build-up of greenhouse gases** in the atmosphere. *MailOnline* December 12, 2016 Monday Will Santa be able to take to the skies this year? BYLINE: REUTERS and SHIVALI BEST
- 493- **The average global temperature has risen by one degree** Celsius since the 1880s, as humans have pumped **greenhouse gases** from fossil fuels into the atmosphere. *The Independent* November 11, 2016 Friday Nature may need 'human-assisted evolution' to cope with climate change BYLINE: IAN JOHNSTON
- 494- **The average global temperature has risen by one degree** Celsius since the 1880s, as humans have pumped **greenhouse gases** from fossil fuels into the atmosphere. *The Independent* November 10, 2016 Thursday Climate change is changing nature so much it may need 'human-assisted evolution' BYLINE: Ian Johnston
- 495- British climate science denier James Delingpole also delivered a pudding of chilled vexatious abuse with lumpy custard (Delingpole attacked "pause deniers" on the back of a paper that expressly says 'we do not believe that warming has ceased'). So as is the norm, many of those commentators have either not read the paper, have misinterpreted the paper, have cherry-picked the bits of the paper that they like, ignored context or failed to ask the authors the most simple follow-up questions. What's more, the analysis is extremely unlikely to be the final word on the matter in the peer reviewed literature. Criticism of the statistical methods and choices used in the paper has already begun to surface, and you can be confident there will be more to come. Two previous papers in particular have argued that statistically and practically, the slowdown didn't happen (...) So the most obvious question for the authors of this latest analysis is, what does this actually mean for long-term projections of climate change, especially if we keep **loading the atmosphere with greenhouse gas** emissions from burning fossil fuels? *The Guardian* March 3, 2016 Thursday Did global warming really slowdown? BYLINE: Graham Readfearn
- 496- The study, which was released publicly before being submitted to a scientific journal, simulated a world in which the **accumulation of greenhouse gases** in the atmosphere **had not occurred** and found that in the real world Britain was 50-70% more likely to receive the catastrophic rainfall levels of last month. (...) The links between extreme weather and climate change are now widely reported in academic papers. So perhaps more remarkable than the findings themselves, is the speed at which scientists are able to draw links between events. In the past, this work has taken months, even years. Thursday's preliminary study has been released before the waters have even receded and is one of the fastest such analyses ever conducted. *The Guardian* January 14, 2016 Thursday Climate change 'made record UK rainfall in December more likely' BYLINE: Karl Mathiesen
- 497- Supporters of research into geoengineering argue that its techniques - roughly-speaking divided into carbon dioxide removal (CDR, or negative emission technologies) which **removes greenhouse gases**, and solar-radiation management (SRM or solar geoengineering) which reduces the amount of solar energy warming the planet - could help to lessen some of the consequences of climate

change. *The Guardian* October 14, 2017 Saturday Geoengineering is not a quick fix for climate change BYLINE: Kate Connolly

- 498- In a chapter released ahead of the publication of next month's World Economic Outlook, the Washington-based IMF said low-income countries had contributed little to the increase in **greenhouse gas concentrations** and could not afford to tackle the problem from their own meagre resources. (...) The International Monetary Fund has told rich countries they must do more to help poor nations cope with climate change or suffer from the weaker global growth and higher migration flows that will inevitably result. EX The United Nations has agreed a set of sustainable development goals to be met by 2030, but achieving them would require poor countries to increase public spending by up to 30% of gross domestic product. This would not be possible for most countries, the IMF said. *The Guardian* September 27, 2017 Wednesday Do more to help poor nations cope with climate change BYLINE: Larry Elliott
- 499- However, if carbon dioxide emissions grow at a rate of 2 per cent a year, **greenhouse gas removal** could only be achieved with a costly technological solution, capable of sucking carbon from the atmosphere. *MailOnline* July 17, 2017 Monday Cutting emissions isn't enough: We must remove CO2 from the atmosphere as soon as possible to avoid extreme climate change, warn scientists BYLINE: HARRY PETTIT
- 500- Mr Perry's statement is in line with Environmental Protection Agency chief Scott Pruitt, but flies in the face of several scientists and studies done on climate change that all say increased carbon emissions **creates a greenhouse effect** - the atmosphere is **clogged** and the planet heats up causing melting glaciers, rising sea levels, and natural disasters. *The Independent* June 20, 2017 Tuesday Trump's Energy chief Rick Perry: I do not believe carbon dioxide is a primary cause of climate change; His comments echo others given by Trump administration officials BYLINE: Mythili Sampathkumar
- 501- The finding suggests people knew about global warming and the impacts of burning coal earlier than originally thought. And its predictions appear to be coming true. Today, according to the Intergovernmental Panel on Climate Change (IPCC), concentrations of carbon dioxide, methane and nitrous oxide in the atmosphere are at their highest for at least the last 800,000 years. Fourteen of the sixteen warmest years on record have occurred since 2000, with 2015 confirmed as the warmest year globally on record. (...) In 1859 John Tyndall, an Irish physicist, shows **the greenhouse effect is created by the accumulation of gases** such as carbon dioxide and water vapour. *MailOnline* June 8, 2017 Thursday The 1912 news article that predicts the devastating impact of fossil fuels on climate change and warns the damage will be 'considerable in a few centuries' BYLINE: PHOEBE WESTON
- 502- Rahmstorf was a co-author on a paper in the journal *Environmental Research Letters* in April which found neither the claimed "pause" nor the recent spikes in global temperature were outside the bounds of how the climate should be expected to react when **it is loaded with extra greenhouse gases**. *The Guardian* May 4, 2017 Thursday Global warming scientists learn lessons from the pause that never was BYLINE: Graham Readfearn
- 503- The Department for Business, Energy & Industrial Strategy is cofunding an £8.6 million research programme into ways of **removing and storing greenhouse gases**. *The Times* April 21, 2017 Friday Fast-growing trees may be answer to climate change BYLINE: Ben Webster
- 504- Almost all governments blame this trend mainly on **a build-up of man-made greenhouse gases**. *MailOnline* March 29, 2017 Wednesday Melting sea ice is turning the Arctic GREEN BYLINE: REUTERS and SHIVALI BEST
- 505- Temperatures, lifted both by **man-made greenhouse gases** and a natural El Nino event that released heat from the Pacific Ocean last year, beat the previous record in 2015, when 200 nations agreed a plan to limit global warming. (...) Temperatures are unlikely to set a new peak in 2017 after El Nino faded, even as **greenhouse gases** from burning fossil fuels keep **building up** in the

atmosphere, led by China and the United States. *MailOnline* March 9, 2017 Thursday Carbon dioxide is NOT main cause of global warming says new environmental protection boss - in defiance of scientific consensus and his own agency

- 506- Her (Dr Sarah Kapnick's, scientist) team used high resolution climate models to investigate the changing patterns of mild weather globally by examining the effect over time of increased warming from **the build up of greenhouse gas** emissions in the atmosphere. (...) This research, published in the journal *Climatic Change*, projects that globally the number of mild days will decrease by 10 or 13 per cent by the end of the century because of climate warming from the **buildup of human-caused greenhouse gases** in the atmosphere. (...) The hardest hit areas are expected to be in Africa, Asia and Latin America, where some regions could see 15 to 50 fewer days of mild weather a year by 2100. These are also areas where research shows economic damages due to climate change. The loss of mild weather days, especially during summer, when they can serve to break up extended heatwaves, also could significantly affect public health. *MailOnline* January 22, 2017 Sunday Britain is in a climate change 'sweet spot' which could give us an extra fortnight of fine weather every year, researchers say BYLINE: JOSEPH CURTIS (my addition in parenthesis)
- 507- Carbon dioxide adsorbents are most commonly used to remove the **greenhouse gas pollutant** from smokestacks at power plants where fossil fuels like coal or gas are burned. *MailOnline* August 11, 2014 Monday Does the solution to climate change lie in a giant SPONGE? Scientists create plastic mop that absorbs CO2 BYLINE: SARAH GRIFFITHS
- 508- Scientists are more certain than they have ever been that humans are causing global warming, according to the most comprehensive report ever conducted into climate change, which predicts "with 95 per cent certainty" that **people's greenhouse gas emissions are heating the world**. *Independent.co.uk* September 27, 2013 Friday IPCC report: Scientists are 95% certain humans are responsible for climate change; Most comprehensive report on climate change ever leaves little doubt that **greenhouse gases are causing the world to heat up** BYLINE: Tom Bawden, James Legge
- 509- While **man-made greenhouse gases** warm the world as a whole, weather is supremely local. *MailOnline* June 5, 2014 Thursday America's global warming hotspots revealed BYLINE: MARK PRIGG
- 510- With an 'El Nino' climate phenomenon in the Pacific, which pushes up temperatures, developing on top of **warming caused by greenhouse gases put into the atmosphere by humans**, 2015 as a whole is set to be 1°C above pre-industrial levels *MailOnline* November 24, 2015 Tuesday How a volcanic eruption in the 1980s triggered a 'spurt' of global warming BYLINE: RICHARD GRAY
- 511- In June this year, 31 scientific bodies wrote to the US Congress with the basic message that climate change is real, is already happening and **is being caused by greenhouse gases produced by human activities**. (...) Centrica told The Independent that the money given to TPPF was not related to its stance on climate change, but because it looked into tax policies, healthcare, "safe neighbourhoods" and other issues of concern to the subsidiary's staff in the US. *The Independent* December 17, 2016 Saturday UK's biggest energy supplier faces boycott over climate change denier links BYLINE: IAN JOHNSTON
- 512- Humans ARE to blame for record temperatures: **Global warming caused by greenhouse gas** emissions has led to 13 of the world's hottest years, study claims *MailOnline* March 11, 2016 Friday BYLINE: RICHARD GRAY
- 513- It is extremely likely that **human activities**, especially emissions of **greenhouse gases**, are the dominant **cause of the observed warming** since the mid-20th century *MailOnline* November 3, 2017 Friday US government forced to release report warning climate change is real and 'extremely likely' to be caused by human activity
- 514- While the world has warmed since pre-industrial times, largely **as a result of humans putting greenhouse gases into the atmosphere**, there are still natural variations in the climate system which

mean temperatures do not rise evenly from year to year, the experts said. *MailOnline* September 18, 2017
Monday The 'slowdown' in global warming is OVER: Met Office warns changes in the Pacific Ocean will make the Earth heat up faster BYLINE: PHOEBE WESTON

- 515- Dr. Kirtman and Dr. Berry are among a group of Florida scientists who confronted Governor Rick Scott in recent years for his refusal to acknowledge that **human-made greenhouse gases are driving climate change**. (...) President Trump has derided climate change as a hoax. Pruitt (EPA administrator) has declared that carbon dioxide emissions from cars, power plants and other sources are not the primary contributor to global warming, despite overwhelming scientific evidence to the contrary. *The Independent* September 12, 2017 Tuesday Hurricane Irma: Donald Trump's EPA chief Scott Pruitt brands claims climate change to blame for storms 'insensitive' BYLINE: Lisa Friedman (my addition in parenthesis)
- 516- **Climate change driven by human greenhouse gas** emissions is not just increasing temperatures, but also raising sea levels, the acidity of the oceans and making extreme weather such as droughts and floods more frequent. All of these are forcing many species to migrate to survive. *The Guardian* March 30, 2017 Thursday Climate change: global reshuffle of wildlife will have huge impacts on humanity BYLINE: Damian Carrington
- 517- The world has missed the chance to avoid dangerous global warming - unless we start geo-engineering the atmosphere by **removing greenhouse gases**, according to new research. *The Independent* August 21, 2017 Monday World has missed chance to avoid dangerous global warming - unless we start geo-engineering the planet BYLINE: Ian Johnston
- 518- To date, the world has warmed by just under 1C **because of greenhouse gas** emissions caused by humans. *The Independent* July 13, 2017 Thursday National Grid slammed after energy report fails to consider Paris Agreement climate change target BYLINE: Ian Johnston
- 519- The conference is the last chance for 195 countries to agree on a strategy since members agreed in 1992 to **stabilise greenhouse gases** 'at a level that would prevent dangerous anthropogenic interference with the climate system'. (...) Nearly 200 nations adopted the global pact, calling on the world to collectively cut and then **eliminate greenhouse gas pollution** - but imposing no sanctions on countries that don't. (...) China and India, the world's two most populous nations and biggest developing country **greenhouse-gas polluters**, hailed Saturday's adoption of a universal climate pact as a step to a brighter future. *MailOnline* December 12, 2015 Saturday Tears of joy as historic deal passed BYLINE: FLORA DRURY, LYDIA WILLGREGG and COLIN FERNANDEZ
- 520- Greenpeace says China's efforts to tackle **greenhouse gas pollution** show it is increasingly a global climate leader. (...) The figures have led to China being hailed as a global climate change leader. A levelling off in 2014 was followed by a fall for the first time in 2015 and another year of zero growth in 2016, which is expected to be followed by a reduction of 1 per cent in 2017. The data showed a small increase in energy consumption, while non-fossil energy continued to grow at a rapid 12 per cent, meeting all of China's electricity demand growth since 2013. UK used more electricity from wind than coal for first time in 2016 Machine creates endless supplies of energy from seawater Government reviews potential for water energy *Express Online* February 28, 2017 Tuesday Fossil fuel emissions fall shows China 'is taking the lead on climate change'
- 521- Obama was taking action on climate change in the international arena too. On 8 June, Obama and the Chinese president, Xi Jinping, agreed to work with other countries to reduce the use of HFCs, the coolants that are one of the **most potent greenhouse gases**. In November, US negotiators played a constructive role in coming to an agreement at the international climate talks in Warsaw. (...) There were also few positive signs the EPA and other regulators were getting out ahead and putting stronger controls on the oil and gas industry. Campaigners urged the EPA to come out with strong controls on leaks of methane, a **potent greenhouse gas**. *Guardian.com*. December 20, 2013 Friday 2013 year in review: Obama talks climate change - but pushes fracking BYLINE: Suzanne Goldenberg

- 522- The warming effect of all three **greenhouse gases** together increased by almost a third between 1990 and 2012 as they **trapped** growing amounts of heat in the atmosphere. *telegraph.co.uk* November 6, 2013 Wednesday **Greenhouse gases** at record high, UN weather agency says BYLINE: Nick Collins
- 523- Abbott's conservative government plans to repeal laws that force Australia's worst **greenhouse gas polluters** to pay a tax for every ton of carbon dioxide that they emit. The tax was introduced last year to reduce Australia's **abundant greenhouse gas** emissions. *MailOnline* October 25, 2013 Friday New Australian PM dismisses as 'hogwash' claims of Climate Commission he stripped of state funding that bushfires were caused by global warming BYLINE: TED THORNHILL
- 524- Warming, as the oceans **absorb** much of the extra energy **being trapped by greenhouse gases**, is set reduce seasonal sea ice and lead to changes to sea layers, which will also cause lowering of oxygen levels. (...) A key international assessment of climate change last week revealed the oceans are **absorbing** much of the warming and unprecedented levels of carbon dioxide caused by human activity such as burning fossil fuels. *Independent.co.uk* October 8, 2013 Tuesday Climate change sending ocean health 'spiralling downward' faster than previously thought
- 525- Some **greenhouse gases**, such as methane and nitrous oxide, are more **potent** than carbon dioxide, but they are **removed** from the atmosphere within decades. (...) Energy from the sun arrives as visible and ultraviolet light, which is **absorbed** by the Earth. Some of this energy is released from Earth again as heat. Greenhouse gases in the atmosphere **trap** this heat and bounce it back towards the Earth's surface. *telegraph.co.uk* September 27, 2013 Friday Climate change report: environmentalists guide to climate change BYLINE: Nick Collins
- 526- Previous IPCC reports have sometimes spurred action at UN climate talks with ever stronger warnings that **greenhouse gases will cause** more floods, droughts, heatwaves and rising seas. (...) The IPCC faces extra scrutiny this year after errors were found in the 2007 report, which exaggerated the rate of melting of Himalayan glaciers. A review by outside experts found that the main conclusions were unaffected. The IPCC subsequently set up a more rigorous and formal process for dealing with errors. *MailOnline* September 22, 2013 Sunday Climate scientists insist global warming hasn't stopped, it's just on a break as they prepare to release report designed to salvage their reputation BYLINE: SHARI MILLER
- 527- THE United Nations body charged with assessing the threat from climate change has scaled back its estimates of how much **the Earth might be heated by greenhouse gas emissions** - but said the underlying science is more robust than ever. *The Sunday Times* September 22, 2013 UN cuts global warming estimate BYLINE: Jonathan Leake
- 528- The UN memo's authors say they are "95 per cent confident" that global warming has been **caused by greenhouse gases**, which have risen by 90 per cent in the past six years. (...) But US climate expert Professor Judith Curry said carbon dioxide is less influential and ocean temperatures are more important, leading to a period of cooling. *The Express* September 9, 2013 Monday Global warming? No, the planet is getting cooler BYLINE: Cyril Dixon
- 529- The men announced that their countries had agreed for the first time to partner on reducing hydrofluorocarbons, **a potent greenhouse gas** used in refrigerators, air conditioners, and industrial applications. *MailOnline* September 1, 2013 Sunday Obama makes climate change agreement with China as he presses leader on cybersecurity and North Korea
- 530- In principle, then, if everybody bought 10 times as much soda each year as they now do, and - crucially - never drank it, then we would mitigate quite a lot of **the greenhouse gases that now threaten us**. *The Daily Telegraph* July 2, 2013 Tuesday Our fizzy seas of soda water; Humanity's obsession with fizzy drinks could slow climate change - if we bought 10 times as much, and never drank it View from the lab BYLINE: Steve Jones

- 531- While the latest round of international negotiations to control **the greenhouse gas - the main cause of global warming** - draw (yet again) acrimoniously to a close, a few savvy environmentalists are celebrating a little noticed agreement struck by Presidents Barack Obama and Xi Jinping at the US-China summit last weekend. (...) The two leaders agreed to phase out the consumption and production of hydrofluorocarbons - HFCs for short - **potent greenhouse gases** used in refrigeration which form the fastest growing threat to the world's climate. *telegraph.co.uk* June 14, 2013 Friday Few may have noticed, but we have just witnessed the most important move yet to tackle climate change BYLINE: Geoffrey Lean
- 532- Barack Obama confronted China President Xi Jinping over allegations of cyber theft yesterday but they agreed to tackle climate change at a Californian summit. EX The two-day summit, which kicked off on Friday, marked the first time the leaders had met since Xi took office in March. (...) The men announced that their countries had agreed for the first time to partner on reducing hydrofluorocarbons, **a potent greenhouse gas** used in refrigerators, air conditioners, and industrial applications. (...) The men are expected to meet again in September, on the sidelines of an international economic summit in Russia. Xi also invited Obama to travel to China soon for a similarly informal round of one-on-one talks. *MailOnline* June 9, 2013 Sunday Obama makes climate change agreement with China as he presses leader on cybersecurity and North Korea BYLINE: ASSOCIATED PRESS and ROSEMARIE LENTINI
- 533- Scientific opinion varies on whether that's true, with skeptics saying the survivors may simply have luck to thank for their survival. The Archangel leaders say they're out to prove the doubters wrong. They've developed several methods of producing genetic copies from cuttings, including placing branch tips less than an inch long in baby food jars containing nutrients and hormones. (...) In recent years, they have focused on towering sequoias and redwoods, considering them best suited to absorb massive volumes of carbon dioxide, **the greenhouse gas primarily responsible for climate change**. *MailOnline* April 22, 2013 Monday The rebirth of the redwoods: Eco group begins planting giant tree CLONES to combat global warming BYLINE: SAM WEBB
- 534- The new guidelines also offered far less time for teaching about the physics involved in the **greenhouse effect**. Such knowledge was critical to ensuring students understand that **greenhouse gases cause climate change**, and that such emissions must be cut to prevent the worst effects of climate change. *Guardian.com*. April 9, 2013 Tuesday Climate change included in US science teaching guidelines for the first time BYLINE: Suzanne Goldenberg
- 535- The ramifications of **an amplified greenhouse effect**, such as frequent forest fires, outbreak of pest infestations and summertime droughts, may slow plant growth. (...) Warming reduces the extent of polar sea ice and snow cover, and, in turn, the darker ocean and land surfaces **absorb** more solar energy, thus further heating the air above them. *MailOnline* March 11, 2013 Monday Arctic goes green because of global warming: Nasa reveals shocking image to show how ice cap is melting BYLINE: MARK PRIGG
- 536- **The extra levels of greenhouse gas** are potentially enough to accelerate global warming. Natural ecosystems and human infrastructure would also be seriously disrupted. *MailOnline* February 28, 2013 Thursday Green lobby loses the public: Most people no longer consider global warming a serious issue in a recession BYLINE: DAMIEN GAYLE
- 537- Greenpeace says no proper analysis has been done on gas leakage from fracking sites. In particular, there is a fear that methane - which is a far **more dangerous greenhouse gas** than carbon dioxide - may be escaping from wells and adding to the warming of the atmosphere. *The Observer* February 17, 2013 World: American Association for the Advancement of Science BYLINE: Robin McKie
- 538- As a result of all this hyperbole, the voices of scientists get lost in the noise. The scientific consensus, echoed by every major academic institution in the world, is that increased **greenhouse gases are warming our planet**, and we reject this knowledge at our absolute peril. *The Times* January 9, 2013 Wednesday Don't be fooled: man-made global warming does exist BYLINE: Mark Lynas

- 539- This climate shift could shed new light on **the long feared impact of dangerous greenhouse gases causing** a rise in the average temperature of Earth's atmosphere and the thawing of arctic glaciers and sea ice. *MailOnline* January 2, 2013 Wednesday What global warming? Alaska is headed for an ice age as scientists report state's steady temperature decline
- 540- Global warming blamed for 'worst ever' Marshall Islands coral bleaching; Problem widespread across northern Pacific due to **greenhouse gas emissions causing elevated temperatures** under climate change *telegraph.co.uk* December 22, 2014 Monday
- 541- It is an attempt to lay down the ground rules for a crucial climate change summit in Paris next year. This summit is seen as critical for the international attempts to curb **the growing concentrations of carbon dioxide and other greenhouse gases** in the atmosphere. The ultimate aim is to try to reduce emissions to a level that scientists think will keep the world within the 2C upper target, which they see as a threshold for potentially dangerous climate change. (...) The UN Intergovernmental Panel on Climate Change has made it quite clear in a series of influential reports that the global climate is changing, the world is getting hotter and that **greenhouse gas emissions are likely to be the main cause**. *Independent.co.uk* December 15, 2014 Monday UN climate change deal in Peru attacked by environmental activists as 'weak' and 'ineffectual' BYLINE: Steve Connor
- 542- Mr. Obama 's words carried an extra edge in Australia, where Prime Minister Tony Abbott is a blunt skeptic about the science behind climate change. He boasted to the leaders gathered for the meeting that his government had repealed a tax on carbon emissions - a key tool to curb **the greenhouse gases that heat up** the atmosphere. *The Guardian* November 16, 2014 Sunday G20 Brisbane: climate change in spotlight on day two BYLINE: Michael Safi
- 543- Without sharp and rapid cuts in **greenhouse gases** the world faces "severe, widespread, and irreversible **impacts**" on people and the natural world: floods, droughts and even wars. *The Guardian* November 13, 2014 Thursday China-US carbon deal: A historic milestone in the global fight against climate change BYLINE: Damian Carrington
- 544- After years of opposition, hundreds of the world's major companies and investment firms - including several oil giants - have agreed that there should be a charge for **the damage done to the planet by greenhouse gases**. *Independent.co.uk* October 26, 2014 Sunday Climate change: Carbon trading edges closer as UN brokers deal BYLINE: Irene Hell, Ian Johnston
- 545- Standing on melting glaciers, their saddened faces are often plastered over posters, adverts and brochures warning of **the dangers of greenhouse gas** emissions. *MailOnline* September 17, 2014 Wednesday Is the polar bear a political weapon? Arctic creatures are NOT threatened by climate change, says scientist BYLINE: ELLIE ZOLFAGHARIFARD
- 546- In addition, cows burp lots of methane, and their manure also releases **this potent greenhouse gas**. *MailOnline* September 5, 2014 Friday Could a healthy diet speed up global warming? BYLINE: JONATHAN O'CALLAGHAN
- 547- Many developing nations, for instance, want a target of cutting world greenhouse gas emissions to a net zero by 2050. Opec nations, worried about loss of income from a shift to renewable energy, favour much vaguer long-term goals. (...) The (IPCC) report says if the world continues to **spew greenhouse gases** at its accelerating rate, it's likely that by mid-century **temperatures will increase** by about another 3.6 degrees Fahrenheit (2 degrees Celsius) compared to temperatures from 1986 to 2005. *MailOnline* August 27, 2014 Wednesday Obama will sidestep Congress by signing sweeping international climate change agreement BYLINE: AP REPORTER and JOSH GARDNER (my addition in parenthesis)

- 548- When the Supreme Court considered the appeals in October, the justices declined requests to consider overruling the court's 2007 decision, review the EPA's conclusion about **the health effects of greenhouse gas emissions** or question limits on vehicle emissions. (...) Two years later, with Obama in office, the EPA concluded that the release of carbon dioxide and other **heat-trapping** gases endangered human health and welfare. *MailOnline* June 23, 2014 Monday Justices rap EPA, but uphold global warming rules
- 549- Polls show a bipartisan majority of Americans favor measures to reduce **planet-warming greenhouse gases**, such as the new federal rule to limit carbon emissions from power plants. But they routinely rank climate change far behind the economy, the centerpiece of Scott's campaign, when prioritizing issues. *MailOnline* June 7, 2014 Saturday Seas rise, Fla. GOP leaders balk at climate change
- 550- The research, if made public, would be a huge challenge to the finding of the UN's Intergovernmental panel on Climate Change (IPCC), that **the global average temperature would rise by up to 4.5C if greenhouse gases in the atmosphere were allowed to double**. *MailOnline* May 21, 2014 Wednesday Did 'climategate' change your view on global warming? BYLINE: ELLIE ZOLFAGHARIFARD
- 551- Professor Bengtsson claims a scientist advised that the paper, which challenged findings that **global temperature would increase by 4.5C if greenhouse gases were to double**, should not be published in a respected journal because it was "less than helpful." *telegraph.co.uk* May 16, 2014 Friday Global warming research suppressed due to intolerance of scepticism, claims scientist BYLINE: Claire Carter
- 552- He (Professor Bengtsson) claims a scientist advised that the paper, which challenged findings that **global temperature would increase by 4.5C if greenhouse gases were to double**, should not be published in a respected journal because it was "less than helpful." *telegraph.co.uk* May 16, 2014 Friday Scientists accused of suppressing research because of climate sceptic argument BYLINE: Claire Carter (my addition in parenthesis)
- 553- Professor Bengtsson's paper challenged the finding of the UN's Intergovernmental Panel on Climate Change (IPCC) that **the global average temperature would rise by up to 4.5C if greenhouse gases in the atmosphere were allowed to double**. *The Times* May 16, 2014 Friday Scientists in cover-up of 'damaging' climate view; Clash over claims of slower global warming ; Climate research suppressed BYLINE: Ben Webster
- 554- The average US temperature has increased by less than 2 degrees Fahrenheit since the end of the 19th century, but the report warned **that temperatures could rise by as much as 10 degrees during the 21st century, if greenhouse gas emissions continue** to expand at their current pace. *Independent* May 7, 2014 Climate change 'now an issue of the present' BYLINE: Tim Walker
- 555- The average US temperature has increased by less than two degrees Fahrenheit since the end of the 19th century, with most of that increase occurring since 1970. But the report warns that **temperatures could go up** by as much as 10 degrees Fahrenheit during the 21st century **if greenhouse-gas emissions continue to expand** at their current pace. *The Independent* May 7, 2014 Wednesday America's climate wake-up call BYLINE: TIM WALKER
- 556- But the message has started to get through. This is exactly the kind of disaster predicted to become ever more frequent and extreme as **greenhouse gas-driven climate change** heats up the planet at a potentially catastrophic rate. (...) The basic physics may be unanswerable, 97% of climate scientists agree that carbon emissions are dangerously heating up the planet, the Intergovernmental Panel on Climate Change warn it's 95% likely that most of the temperature rise since 1950 is **due to greenhouse gases** and deforestation, the risk of a global temperature rise tipping above 1.5-2C be catastrophic for humanity. *The Guardian* February 20, 2014 Thursday Comment: Deniers have grasped that markets can't fix the climate BYLINE: Seumas Milne

- 557- Cutting red meat and dairy consumption would lead to a big saving in methane, which is 23 times **as potent a greenhouse gas** as carbon dioxide “from essentially belching cows”. *The Guardian* June 23, 2015 Tuesday 6 Eat less red meat and cycle more for your and the planet's health BYLINE: Sarah Boseley
- 558- The deal between the US and 11 other Pacific Rim countries - the contents of which have not been made available to the public - is widely acknowledged as being in big business's interest. Unions and green groups have warned of resulting job losses and the possibility of an enhanced global fossil fuel market that could in turn **increase greenhouse gas emissions and accelerate global warming**. *The Guardian* June 12, 2015 Friday EU politicians protest to Congress over climate exemption in TPP row BYLINE: Rose Hackman and Jana Kasperkevic
- 559- Glaciers in the Everest region of the Himalayas could be almost completely eradicated by 2100 **due to greenhouse gas** emissions, scientists have warned. (...) Glacial loss in Nepal raises concerns over future access to water resources, particularly in regions where groundwater is limited and monsoon rains are erratic. *MailOnline* May 28, 2015 Thursday Up to 99% of Everest's glaciers could be gone by 2100: Global warming set to devastate the Himalayas, scientists warn BYLINE: JONATHAN O'CALLAGHAN
- 560- Cannes concludes with call-to-arms on climate change: 'To not tackle the issue through film would be criminal'; The director and star of a film about one of the scientists who proved the **contribution of greenhouse gases to global warming** have urged audiences and movie-makers to recognise the urgency of action required - a message which has found echoes throughout the festival *The Observer* May 24, 2015 Sunday BYLINE: Catherine Shoard
- 561- Vast swathes of marshland in Siberia are starting to emit **greenhouse gases 30 times more potent** than carbon dioxide into the atmosphere. *Express Online* May 11, 2015 Monday Carbon time-bomb in Siberia threatens catastrophic climate change BYLINE: Will Stewart
- 562- With its use of coal-fired power and relatively small population, Australia is one of the world's worst per capita **greenhouse gas polluters** and has been increasingly isolated over its perceived reluctance to do more to tackle the climate threat. *telegraph.co.uk* May 8, 2015 Friday Australia PM advisor says climate change is 'UN-led ruse to establish new world order'; Tony Abbott's business advisor says global warming a fallacy supported by United Nations to 'create a new authoritarian world order under its control'
- 563- California is familiar with **the effects of greenhouse gas** emissions, as it is in the midst of a historic drought that scientists say is partially caused by climate change. *Independent.co.uk* April 29, 2015 Wednesday Climate change: California governor orders drastic cut in greenhouse gas emissions; Governor wants to reduce carbon emissions by 40 per cent by 2030 BYLINE: Payton Guion
- 564- Some researchers have suggested that this radical "geo-engineering" approach should be considered in a global emergency if the summer sea ice of the Arctic disappears completely, as climate models predict it will in the coming decades because of global warming. They have argued that such draconian measures may be the only way of helping to prevent the melting of frozen permafrost in the northern hemisphere which prevents billions of tonnes of underground methane - **a potent greenhouse gas** - from escaping into the air. This "positive feedback" would dangerously accelerate global warming. *The Independent* April 29, 2015 Wednesday Latest climate change plan to 'whiten' the seas is doomed, say scientists; Strategy would help ice regrow - but not enough to halt leaking methane BYLINE: STEVE CONNOR
- 565- For the first time, researchers have put figures to the effect on the world's weather extremes as a result of **the extra greenhouse gases** such as carbon dioxide that are being put into the atmosphere from the burning of fossil fuels. (...) Peter Stott, a climate researcher at the Met Office Hadley Centre, said that as each year passes the evidence for man-made influences on the global climate is mounting, but what has been lacking until now is an assessment of how much more likely extreme hot and wet weather is likely to become. *Independent.co.uk* April 27, 2015 Monday Three-quarters of extremely hot days influenced by man-made global warming, scientists say BYLINE: Steve Connor

- 566- The gases - desflurane, isoflurane and sevoflurane - are **potent greenhouse gases** that have 2,500 times the impact on global warming compared to carbon dioxide. *MailOnline* April 8, 2015 Wednesday Anaesthetic is WARMING the planet BYLINE: RICHARD GRAY
- 567- Vast areas of forest in; Forest fires destroyed vast areas of woodland in Canada and Russia between 2011 and 2013, greatly contributing to **greenhouse gas emissions that cause climate change**, satellite data reveals (...) Between 2011 and 2013 fires in the boreal forests of Canada and Russia accounted for almost a quarter of global forest losses. Some of this will return, but northern forests are particularly slow to recover after fire. Boreal forests are one of the world's great carbon sinks. But scientists predict that climate change will cause them to burn more often and with greater intensity, unlocking the carbon stored in the wood and soil. Already they are burning more than at any point in the past 10,000 years. As many as 90-95% of fires in Russia are ignited by human interventions... This is very different to North America. *The Guardian* April 2, 2015 Thursday
- 568- He (Professor Qi Ye, a leading Chinese adviser on energy policy) pointed to recent adverse publicity on air pollution, which is a major problem in Chinese cities and was recently highlighted by Chai Jing in a much-seen internet video, and that this would also provide a strong spur to **cleaning up greenhouse gas** emissions. This approach, of emphasising the "co-benefits" to health from dealing with climate change as well as air and water pollution, was gaining ground, he said. Diplomacy is stepping up in the lead-up to the crunch talks later this year. Todd Stern, the US envoy for climate change, told journalists last week it was important not to make snap judgements on the outcome of the Paris talks, the effects of which he said would take several years to be felt. He warned that Paris was a crucial stage for global negotiations on a new climate agreement. *The Guardian* March 4, 2015 Wednesday Focus on green tech to tackle climate change BYLINE: Fiona Harvey (my addition in parenthesis)
- 569- The prolonged and devastating drought that sparked the mass migration of rural workers into Syrian cities before the 2011 uprising was probably **made worse by greenhouse gas** emissions, US scientists say. (...) The theory has not convinced everyone though. Francesca de Châtel at Radboud University in Nijmegen, the Netherlands, points out that rural communities had been left disenfranchised and disaffected from 50 years of policies that exploited and mismanaged Syrian resources. In the journal *Middle Eastern Studies* last year, she wrote that the government's failure to respond to the drought crisis was only one of the triggers of the protests that started in March 2011, along with a host of other political, economic and social grievances. *The Guardian* March 3, 2015 Tuesday Global warming contributed to Syria's 2011 uprising BYLINE: Ian Sample
- 570- Methane is a **potent greenhouse gas** that warms the atmosphere many times more rapidly than carbon dioxide, although is far shorter lived. *MailOnline* February 16, 2015 Monday Could the solution to global warming lie in COWS? BYLINE: RICHARD GRAY
- 571- Climate scientists, in particular, have been accused of pursuing an ideological agenda for urging cuts to **the greenhouse gas emissions that are causing global warming**. *The Guardian* February 5, 2015 Thursday 'It's never the science itself': why the right questions climate and vaccines BYLINE: Suzanne Goldenberg
- 572- However, new research confirms what some environmentalists have long suspected: that the lawn has a bigger problem than rampaging legionaries. It is a significant source of the **greenhouse gases that contribute to global warming**. (...) And fertiliser - which produces nitrous oxide, a **greenhouse gas about 300 times more potent** than carbon dioxide and uses a lot of energy to produce - should be used sparingly, ideally only when the grass is newly planted. Instead, grass cuttings should be left on the lawn as a natural alternative. *The Independent on Sunday* January 18, 2015 The green, green grass of global warming BYLINE: Ian Johnston

- 573- With the use of coal-fired power and a relatively small population of 23 million, compared to others, Australia is considered one of the world's **worst per capita greenhouse gas polluters** and has been increasingly isolated over a perceived reluctance to do more to tackle the climate threat. *MailOnline* January 8, 2015 Thursday 'Climate change is real... humanity does contribute to it' BYLINE: FRANK COLETTA
- 574- Next year may be **even warmer** - levels of **greenhouse gases in the atmosphere** have risen to a new record every year for the past 30 years and El Niño is likely to continue into 2016. *MailOnline* December 17, 2015 Thursday Get set for a scorcher! BYLINE: VICTORIA WOOLLASTON
- 575- It is hoped that this month's conference - which hopes to save the planet from **the effects of greenhouse gases** - will avoid a repeat of the catastrophic attempt at negotiations at the annual UN talks in Copenhagen in 2009. *MailOnline* December 5, 2015 Saturday Climate change delegates agree on a draft plan to reduce global emissions after FOUR YEARS of negotiations - but warn a binding agreement is STILL some way off BYLINE: IMOGEN CALDERWOOD
- 576- Christiana Figueres, the UN's climate change chief, has a task just as great as the architects of that plan. She is in charge of the world's response to global warming, a threat potentially more catastrophic than any disaster yet seen, but one which is so slow-burning that governments and the public have been able largely to ignore it for more than three decades since scientists began to prove incontrovertibly **the dangers that greenhouse gas emissions pose** to our planet's stability. *The Guardian* December 3, 2015 Thursday Christiana Figueres: the woman tasked with saving the world from global warming BYLINE: Fiona Harvey
- 577- After decades of warnings from scientists that **greenhouse gas emissions were warming the planet**, governments started coming together in the 1980s to combat the problem. *MailOnline* December 1, 2015 Tuesday Let's hope the talks aren't a load of hot air, at least BYLINE: SIMON TOMLINSON
- 578- The government has pledged to reduce **greenhouse gas pollution** by at least 26% of 2005 levels by 2030, with the possibility of reducing it even further to 28% if the target does not adversely impact the economy. *The Guardian* November 30, 2015 Monday Turnbull government selling Australia short on climate change BYLINE: Shalailah Medhora
- 579- After decades of warnings from scientists that **greenhouse gas emissions were warming the planet**, governments started coming together in the 1980s to combat the problem. *MailOnline* November 30, 2015 Monday Hollande welcomes Obama amid unprecedented security operation as 150 world leaders meet in Paris to thrash out climate change deal BYLINE: PETER ALLEN, VICTORIA WOOLLASTON and SIMON TOMLINSON
- 580- We are deeply concerned that our global economic and industrial systems are accelerating rates of extinction, desertification and soil depletion, degrading ecosystems, acidifying and littering our rivers and oceans, and resulting in a relentless rise in **greenhouse gas emissions driving irreversible climate change**. *The Guardian* November 27, 2015 Friday Global creative community calls on world leaders to tackle climate change
- 581- One the one side are environmentalists who insist we must cut **greenhouse gases or the world will be a smouldering flood-ridden place** within the next 100 years. *Express Online* November 26, 2015 Thursday Global Warming row: Could NASA be about to settle the great climate change debate? BYLINE: Jon Austin
- 582- As many as 100 million people could slide into extreme poverty because of rising temperatures, which are **caused by greenhouse gas** emissions, the World Bank report said. (...) Programmes to lessen the impacts of climate change should not create new vulnerabilities and they should inform development policies by taking into account future climate conditions. (...) Environmental taxes, designed to reduce emissions, can raise the cost of fuel and food, which hit poor people hardest. *The Guardian* November 9, 2015 Monday Rising temperatures could drive 100m into extreme poverty BYLINE: Mark Anderson

- 583- The unfairness of islanders **suffering the consequences of greenhouse gases** they mostly didn't emit is mirrored by the raw deal suffered by the women who form the cornerstone of family life in the Pacific. *The Guardian* November 1, 2015 Sunday Pacific islands make last-ditch plea to world before Paris climate change talks BYLINE: Oliver Milman
- 584- Methane is a powerful **greenhouse gas** and these releases **threaten** to trigger secondary rises in global temperatures. *The Observer* October 17, 2015 Saturday Arctic powers gather for Alaska talks as pace of global warming threatens ice cap BYLINE: Robin McKie
- 585- Hydrofluorocarbons, or HFCs, which are used in air conditioners, refrigerators and fire extinguishing foams, are one of **the most dangerous greenhouse gases** in terms of climate change - because they are up to 10,000 times more warming than carbon dioxide. *The Guardian* October 15, 2015 Thursday White House puts 'super pollutant' HFCs in crosshairs with new initiative BYLINE: Suzanne Goldenberg
- 586- The administration's latest initiative to take on climate change falls in line with the mayor's plan to cut 80% in **greenhouse gas emissions** by 2050 and have the **cleanest air** of any large US city by 2030. *The Guardian* October 1, 2015 Thursday Bill de Blasio calls on New York pension funds to divest from coal companies BYLINE: Ellen Brait
- 587- Another \$200m went to ensure that garbage dumps, mines and livestock operations that were already capturing **the potent greenhouse gas** methane kept on doing what they were already doing. (...) And expert analysis, for example by Reputex, suggests it will fail even in that astonishingly modest aim, and instead allow the country's biggest emitters to increase **their greenhouse pollution**. *The Guardian* September 25, 2015 Friday The inconvenient truth about Direct Action comes from Turnbull himself BYLINE: Lenore Taylor
- 588- The grounds are highly absorbent and scientists have developed a simple process which enables the grounds to absorb methane - a far more **potent greenhouse gas** than CO₂ - from the atmosphere. (...) This is not the first time coffee grounds have been used for environmental purposes. Elsewhere, they have been turned into biomass pellets that can be burnt to create a relatively clean form of energy. *Independent.co.uk* September 2, 2015 Wednesday Leftover coffee 'can help fight global warming'; Research says coffee's ability to store methane could enable it to power homes BYLINE: Tom Bawden
- 589- Every year our factories and cars pump billions of tonnes of carbon dioxide and other **greenhouse gases** into the atmosphere and emissions continue to rise remorselessly. As a result, **our planet is heating** at a worrying rate, with the Arctic bearing the brunt of temperature rises. (...) That erosion of ice is likely only to worsen, scientists warn. Ice reflects radiation. But if it disappears, and reveals below it the Arctic's dark waters, which are much better than ice at **absorbing** heat, less and less solar radiation will be reflected back into space and the Arctic will warm up even more *The Observer* August 30, 2015 Sunday Nature's last refuge: climate change threatens our most fragile ecosystem BYLINE: Robin McKie
- 590- Methane is a far more powerful **greenhouse gas** than CO₂ and this massive release could hugely **accelerate climate change**, perhaps even send it spiralling beyond our control. *Independent.co.uk* July 15, 2015 Wednesday Climate change is as serious a threat as nuclear war - so why has the Government broken its green promises? BYLINE: Lee Williams
- 591- Natural gas - methane - is a **potent greenhouse gas** and the fuel is only cleaner than coal if leaks of methane are kept low *The Guardian* July 7, 2015 Tuesday Billions in gas projects stranded by climate change action BYLINE: Damian Carrington

- 592- **Greenhouse gas emissions contribute to global warming**, which is reducing the amount of summer sea ice in the Arctic. *MailOnline* July 3, 2015 Friday Polar bears in peril: Animals will soon be EXTINCT if global warming is not reversed BYLINE: MARK PRIGG
- 593- Polar bears eat, mate and give birth on sea ice. **Greenhouse gas emissions contribute to global warming**, which is reducing the levels of summer sea ice in the Arctic. No sea ice means polar bears will struggle to survive. *Independent.co.uk* July 2, 2015 Thursday Polar bears will die out if global warming is not reversed BYLINE: Doug Bolton
- 594- Rick Perry, the former governor of Texas, has repeatedly championed the oil industry and questioned science that shows that **greenhouse gas emissions contribute to climate change**, while deriding what he called "the secular carbon cult." *The Independent* December 13, 2016 Tuesday Climate change denier Rick Perry picked by Donald Trump for Energy Secretary BYLINE: Matt Broomfield
- 595- In effect, it means the world will have to had cut all harmful emissions that cause the **greenhouse effect** to zero by the latter part of the 21st Century. *Express Online* November 17, 2016 Thursday Boris Johnson signs Paris Agreement committing UK to tackling climate change BYLINE: Stuart Winter
- 596- Tens of millions of people living in Bangladesh alone are expected to lose their homes to the rising sea over the coming decades. Professor Chomsky said a leading scientist there had suggested "with considerable justice" that the climate refugees should have the right to move to countries responsible for the **greenhouse gases that had created the problem**. *The Independent* November 15, 2016 Tuesday Noam Chomsky: Donald Trump's election will accelerate global warming and humanity's 'race to disaster' BYLINE: Ian Johnston
- 597- Professor Michael Mann told *The Independent* that President Trump's term of office - coupled with new research suggesting **the Earth is more sensitive to greenhouse gases** than previously thought - could mean "game over" for hopes of preventing global warming from entering dangerous territory. *The Independent* November 12, 2016 Saturday Environmentalists launch 'emergency' campaign to persuade Trump climate change is real amid fears of 'planetary disaster' BYLINE: Ian Johnston, Joe Watts, Ashley Cowburn
- 598- Climate change may be escalating so fast it could be 'game over', scientists warn; New research suggests **the Earth's climate could be more sensitive to greenhouse gases** than thought, raising the spectre of an 'apocalyptic side of bad' temperature rise of more than 7C within a lifetime *The Independent* November 9, 2016 Wednesday BYLINE: Ian Johnston
- 599- The money will be used to find ways to improve the energy efficiency of transport and industry; reduce leaks of methane, **a potent greenhouse gas**, from oil and gas installations; and develop a viable system of carbon-capture-and-storage, which could slash emissions for power plants to just a few per cent. *The Independent* November 5, 2016 Saturday Climate change pledge by major oil firms dismissed as 'drop in the ocean' BYLINE: IAN JOHNSTON
- 600- It is also could trigger a number of 'tipping points' such as the melting of permafrost in the northern tundra, releasing vast amounts of methane, **a potent greenhouse gas**, that would send the temperature spiralling upwards. *The Independent* November 3, 2016 Thursday UN paints apocalyptic picture of famine, war and disease unless world wakes up to dangers of climate change BYLINE: Ian Johnston
- 601- Even former Chancellor Nigel Lawson, head of the UK's leading sceptic think tank, the Global Warming Policy Foundation, admits **greenhouse gases from fossil fuels cause global warming**. *The Independent* October 5, 2016 Wednesday Donald Trump is a 'threat to the planet', says world-leading climate change scientist BYLINE: Ian Johnston

- 602- **Greenhouse gases** are so-called because they **trap** the sun's heat in the atmosphere and drive global warming. *The Express* September 28, 2016 Wednesday Climate change blow is blamed on windy cattle BYLINE: John Ingham
- 603- Having collected its coal from one of the ports that dot the Great Barrier Reef, it's delivering it to somewhere in the world - perhaps India or China - where it will be burned, create more **greenhouse gases and further warm the atmosphere**, making the next coral bleaching more likely. *The Guardian* September 21, 2016 Wednesday 'It's a depressing sight': climate change unleashes ghostly death on Great Barrier Reef; Months after the worst coral bleaching event to hit the reef BYLINE: Michael Slezak
- 604- Britain's leading climate change sceptic Nigel Lawson says global warming is real; Former Conservative Chancellor says carbon dioxide is a **greenhouse gas that warms** the atmosphere - but says the UK would be 'crazy' to do anything about it *The Independent* September 14, 2016 Wednesday BYLINE: Ian Johnston
- 605- More carbon dioxide in the atmosphere - which adds to the **warming greenhouse effect** - will mean the pores on the leaves of plants, called stomata, will close more readily for some species. *MailOnline* August 29, 2016 Monday Plants are more resilient to climate change than thought: Warming will see some species adapt to thrive on LESS water
- 606- And there's another sting to keeping cool. Air conditioning systems also use powerful **greenhouse gases** called hydrofluorocarbons (HFCs), thousands of times more **potent** than carbon dioxide. *The Guardian* August 22, 2016 Monday Why air conditioning is a vicious circle BYLINE: Jeremy Plester
- 607- Climate change sceptics have always pointed to the fact that there has been a paradoxical expansion of the extent of floating ice on the ocean around Antarctica in recent decades - apparently defying the trend of global warming **blamed on greenhouse gases**. *Express Online* August 16, 2016 Tuesday CLIMATE CHANGE SHOCK: Global warming happened LONG before man started burning fossil fuels BYLINE: Jon Austin
- 608- Concern is also mounting over a class of chemicals widely used in refrigerants and air-conditioning units. Hydrofluorocarbons, which have largely replaced CFCs, which were found to damage the ozone layer, are **potent greenhouse gases**. Although they are far less significant today than CO2 for global warming, if the numbers of refrigeration and air-conditioning units explode as expected, they could add to the problem. *The Observer* August 15, 2016 Monday As the mercury soars, fear grows over 'air-con effect' BYLINE: John Vidal
- 609- An increase in **greenhouse gases affects** sea levels in a number of ways, including warming the ocean which causes the water to expand, and melting glaciers and ice sheets. (...) Researchers from the National Centre for Atmospheric Research in Colorado say that **greenhouse gases are already having an accelerating effect** on sea level rise, but the impact has been masked by the 1991 eruption of Mount Pinatubo. *MailOnline* August 9, 2016 Tuesday A huge 1991 volcanic eruption in the Philippines has masked the impact of global warming on sea level rise BYLINE: SHIVALI BEST
- 610- If humans continue on with a 'business as usual' attitude toward **greenhouse gases, temperatures in the US could soon climb** to more than 10 degrees higher than they have been historically. *MailOnline* July 29, 2016 Friday The interactive 'Climate Explorer' map that lets you see exactly how global warming will affect your city BYLINE: CHEYENNE MACDONALD
- 611- A reduction in livestock would help save land and water resources and would also reduce the emission of methane, a highly **potent greenhouse gas**. *telegraph.co.uk* June 21, 2016 Tuesday Climate change campaigners welcome China's plan to halve meat consumption BYLINE: Neil Connor

- 612- The melting of the permafrost represents one of humanity's greatest fears for it contains vast amounts of methane, **a greenhouse gas much more potent** than carbon dioxide. *The Independent* June 4, 2016 Saturday Huge Siberian crater shows effect of climate change BYLINE: IAN JOHNSTON
- 613- The researchers used a series of sophisticated climate models and found this rise in CO₂ would lead to surface temperatures rising by an average of 8C across the world by 2300. When the **effect of other greenhouse gases is added**, the rise climbs to 10C. The heating predicted by the models was not uniform across the globe. In the Arctic, the higher CO₂ levels led to 17C of warming, with another 3C **from other greenhouse gases**, across the year. *The Guardian* May 23, 2016 Monday World could warm by massive 10C if all fossil fuels are burned BYLINE: Damian Carrington
- 614- Those efforts to put Exxon on the spot gathered pace after Inside Climate News and the Los Angeles Times reported that the company's own scientists knew as early as the 1970s that **greenhouse gases caused climate change**. *The Guardian* May 20, 2016 Friday Oil company records from 1960s reveal patents to reduce CO₂ emissions in cars BYLINE: Suzanne Goldenberg
- 615- The hot water temperature that drove the devastating bleaching on the Great Barrier Reef this year was made 175 times more likely by human-caused climate change, and could be normal in just 18 years, according to preliminary findings by leading climate and coral reef scientists. The scientists said they took the unusual step of releasing the work prior to peer-review, because the methods used to reach the findings are now accepted in the climate science community and the alarming results needed to be released as quickly as possible. (...) Moreover, despite most of the current temperature record being driven by natural changes in temperature, they found that once **greenhouse gasses** reach levels expected in 2034, **temperatures seen this March will be the new average for the Coral Sea**. (...) They found the record warm temperatures in the Coral Sea that drove the bleaching this year were driven by a combination of 1C of warming since 1900 **caused by greenhouse gas emissions**, and about a 0.5C jump in temperature driven by natural variability. (...) The increase in regularity of bleaching events is worrying news, since reefs can often recover, so long as they are not being repeatedly affected by bleaching or other harms. Other research has shown coral reefs need around 15 years to recover from serious bleaching events, and only then recover if they are protected from fishing and poor water quality. Terry Hughes, a coral reef biologist at James Cook University and head of the National Coral Bleaching Taskforce, said the concerning results were not surprising - noting Hoegh-Guldberg had predicted similar results 17 years ago. *The Guardian* April 28, 2016 Thursday Great Barrier Reef bleaching made 175 times likelier by human-caused climate change BYLINE: Michael Slezak
- 616- This presents a major obstacle to Britain hitting its climate change targets, because natural gas consists primarily of methane, which when burnt produces carbon dioxide - **a greenhouse gas that causes global warming**. *telegraph.co.uk* April 9, 2016 Saturday UK homes could be heated by hydrogen under plan to tackle global warming BYLINE: Emily Gosden
- 617- Energy-related emissions from the two biggest polluters, China and the US, dropped last year, while renewables continued to grow around the world - making up 90 per cent of new electricity generation installed in 2015. (...) But environmental group Greenpeace said more must be done to reach zero net **greenhouse gas pollution** in the second half of the 21st century. *i-Independent* March 17, 2016 Global carbon emissions stall despite economic growth BYLINE: Emily Beament
- 618- Fracking is set to lead to a sharp rise in emissions of **climate changing greenhouse gases**, newly undermining industry and government claims that shale gas is a relatively clean fuel that can help combat global warming, an authoritative new study reveals. (...) On Thursday, the United States and Canada agreed to cut methane emissions from the oil and gas industry by almost half. (...) Their policies are based on the fact that gas emits only half as much carbon dioxide as coal when it is burned - but do not take into account the leakage of methane and other greenhouse gases during the process. When these are added in, studies show, shale gas can create even more pollution than coal. *The Independent* on Sunday March 13, 2016 'Greenhouse gases to soar with fracking' BYLINE: Geoffrey Lean

- 619- The initiative announced on Thursday brings the US a big step closer to meeting its own Paris target by committing for the first time to cut emissions of methane - a powerful **greenhouse gas responsible for about a quarter of warming** - from existing oil and gas wells. *The Guardian* March 10, 2016 Thursday US and Canada promise to lead world to low-carbon economy BYLINE: Suzanne Goldenberg
- 620- The way for change and freeing yourselves from the pressure of lobbyists is not through the Republican or the Democratic parties, but through undertaking a great revolution for freedom: not to free Iraq from Saddam Hussein but to free the White House and to free Barack Husayn so he can implement the change you seek. It does not only include improvement of your economic situation and ensure your security, but more importantly, helps him in making a rational decision to save humanity from **the harmful [greenhouse] gases that threaten** its destiny. *MailOnline* March 1, 2016 Tuesday Osama bin Laden penned essay calling on Americans to help President Obama fight climate change
- 621- The study released on Monday, compiled by an international team of scientists, found that if **greenhouse gas pollution** continues at its current pace, the sea level will rise by a further 57cm to 131cm. If countries fulfil the treaty agreed upon last year in Paris and limit further warming to another 2C, sea level rise would be in the 28 to 56cm range. *The Guardian* February 23, 2016 Tuesday Increased flooding in US coastal cities caused by climate change BYLINE: Oliver Milman
- 622- Indeed, impacts of Arctic warming include the melting of major Arctic glaciers and Greenland (containing the potential for up to 7 meters of sea level rise if it were to melt entirely), the thawing of carbon rich permafrost (which could add to **the burden of atmospheric greenhouse gas emissions**) and signs of worsening wildfires across the boreal forests of Alaska, to name a few. *Independent.co.uk* February 19, 2016 Friday Global warming: Scientists are floored by what's happening in the Arctic BYLINE: Chris Mooney
- 623- This gas is produced by the burning of fossil fuel and is blamed for causing **a greenhouse effect which is said to be heating up the world**. *mirror.co.uk* January 14, 2016 Thursday 1 Global warming could save humanity from a cataclysmic ice age BYLINE: Jasper Hamill
- 624- Scientists are normally cautious about attributing any single weather extreme to climate change and the rise in global average temperatures **due to human emissions of greenhouse gases**, such as carbon dioxide from fossil-fuel burning. (...) The current El Niño is one of the strongest on record. It has contributed to the record global average temperature in 2015, along with warming **caused by human greenhouse gas emissions** *The Independent* January 2, 2016 Saturday Hell and high water: 'freak' weather to become the norm BYLINE: STEVE CONNOR
- 625- In turn, this (temperature rise) leads to **additional greenhouse gases** in the atmosphere and to an **additional temperature increase**. *MailOnline* November 21, 2017 Tuesday Bubbling lakes could release huge amounts of methane and trigger a climate catastrophe by accelerating global warming, warn scientists BYLINE: SHIVALI BEST (my addition in parenthesis)
- 626- The global average temperature has risen only slightly since 1998 - which is surprising, considering scientific climate models predicted considerable warming **due to rising greenhouse gas emissions**. Some people used this apparent contradiction to question climate change per se - or at least the harm potential **caused by greenhouse gases** - as well as the validity of the climate models. *MailOnline* November 20, 2017 Monday There was NO pause in global warming: 'Slow down' in climate change between 1998 and 2012 was caused by a lack of data from the Arctic BYLINE: ELLIE ZOLFAGHARIFARD
- 627- Syria has become a signatory of the Paris climate agreement, leaving the US as the only country in the world not to support the framework deal to **combat greenhouse gas** emissions. *The Independent* November 7, 2017 Tuesday Syria signs Paris Agreement - leaving US only country in the world to refuse climate change deal BYLINE: Mythili Sampathkumar, Harry Cockburn

- 628- Trump, who has expressed doubts that **man-made greenhouse gas emissions are the prime cause of global warming**, announced in June that he intended to pull out and instead promote U.S. coal and oil industries. *MailOnline* November 7, 2017 Tuesday President Trump is SNUBBED by the Paris Climate Change Summit and left uninvited BYLINE: REGINA F. GRAHAM and REUTERS
- 629- Earth's sea ice has shrunk dramatically - particularly in the Arctic - in recent years as rising emissions of **greenhouse gases have warmed the planet**. *The Observer* November 5, 2017 Sunday Donald Trump accused of obstructing satellite research into climate change BYLINE: Robin McKie
- 630- The report does find some causes for hope. It notes that there is "rapidly expanding mitigation action" being done by governments, and finds that carbon dioxide emissions seem to have stopped rising since 2014. But it noted that other **dangerous greenhouses gases** like methane continue to rise. *The Independent* October 31, 2017 Tuesday UN releases warning about 'catastrophic' lack of action on climate change BYLINE: Andrew Griffin
- 631- Around 195 countries signed the Paris climate agreement in 2015 which established goals to reduce the emission of **greenhouse gases in a bid to prevent temperatures around the world rising** by more than two degrees in around 50 years. *Express Online* October 25, 2017 Wednesday 'Dark future' IMF boss warns Earth will 'toasted and roasted' due to climate change BYLINE: Jon Rogers
- 632- Nearly 200 countries have committed to **combat** global warming by reducing carbon dioxide and **other greenhouse gases that contribute to global warming**. *MailOnline* October 9, 2017 Monday 'The war on coal is over' says EPA chief as Trump administration dumps Obama's Clean Power Plan meant to tackle global warming
- 633- Queensland also experienced its hottest day over the whole state on 27 September, reaching 42.5C in Birdsville, and Victoria recorded a new September temperature record, measuring 37.7C for the first time at Mildura. (...) Lewis (researcher) said that estimate was now considered conservative, with actual extreme weather being seen **as almost impossible without the influence of greenhouse gases**. *The Guardian* October 5, 2017 Thursday Sweltering September smashes Australia's temperature records BYLINE: Michael Slezak
- 634- **Greenhouse gas emissions linked to human activity** have increased the chances of such heatwaves four-to-tenfold compared to the early 1900s, the WWA study found. **Such weather will become typical** in southern Europe by mid-century **if greenhouse gases continue to increase** in the atmosphere, according to the team's simulations. (...) More than 35,000 people died during a European heatwave in 2003, and tens of thousands perished in Russia during extreme heat in 2010. (...)The threat is particularly severe in already sweltering places, from South Asia to the Gulf. (...)Governments in 2015 agreed to limit warming to 'well below' 2°C above pre-industrial times, while pursuing efforts for a 1.5°C limit. *MailOnline* September 27, 2017 Wednesday 'Lucifer' heatwaves WORSE than this summer's weather will be normal in Europe in the next 30 years due to global warming BYLINE: REUTERS, ASSOCIATED PRESS and HARRY PETTIT
- 635- As we continue to pump **toxic greenhouse gases** into our atmosphere, scientists are devising new and creative ways to curb climate change. *MailOnline* September 19, 2017 Tuesday Burying the problem? Carbon dioxide could be stored as liquid LAKES in deep sea trenches to help stop climate change BYLINE: HARRY PETTIT
- 636- The threat of global warming is not as bad as previously thought, climate scientists admitted yesterday. Warnings made in 2015 at the Paris Climate Change Conference had been too pessimistic, they said. These were based on projections that suggested nations had already produced **too much greenhouse gas to limit global warming** to between 2C and 1.5C above 19th-century levels. This meant drastic and urgent cuts would have to be made in greenhouse gases to stop a climate catastrophe. *MailOnline* September 19, 2017 Tuesday Fear of global warming is exaggerated BYLINE: COLIN FERNANDEZ

- 637- About 13 per cent of people in Britain do not accept the science of climate change, according to a poll. The survey of 1,200 adults found that men (17 per cent) were more likely than women (11 per cent) to deny the widespread evidence of global warming - from melting sea ice and glaciers and rising sea levels to animals and plants heading for the poles. However, a substantial majority of 70 per cent said they did agree the temperature is rising and that **greenhouse gas emissions are to blame** - as accepted by every major scientific organisation in the world. *The Independent* August 25, 2017 Friday East Midlands men most sceptical on climate change BYLINE: IAN JOHNSTON
- 638- Under a moderate warming scenario, the average temperature during the grape growing season could go up 3.2C by 2020. This number rises significantly if **global greenhouse emissions aren't controlled - increasing to 4.4C**. Warmer temperatures and drier conditions caused by global warming are also likely to cause water deficits in the vineyards, meaning that more moisture will be lost from the land through evapotranspiration. This will significantly impact the wine's flavour, as exposure to higher climates during ripening is also likely to make the cava taste more acidic and sugary, as well as becoming more alcoholic. The UK's thirst for sparkling wines has soared in recent years. *The Independent* August 24, 2017 Thursday Climate change could alter the taste of cava, says study BYLINE: OLIVIA PETER
- 639- Like humans, peatlands need water to survive. When peatlands are drained, the compressed organic matter begins to decay, turning long-submerged carbon into carbon dioxide and **adding more greenhouse gases to our already overheated atmosphere**. Complicating matters, peatlands and all wetlands are natural sources of methane, **a more potent but shorter-lived greenhouse gas**. In some cases, draining may actually decrease methane emissions. *The Guardian* July 28, 2017 Friday Ultimate bogs: how saving peatlands could help save the planet BYLINE: Jeremy Hance
- 640- This lack of critical thinking was being demonstrated in the US public's reaction to scientific evidence that the world is getting warmer **because of greenhouse gas** emissions, largely caused by fossil fuels. (...) According to Nasa and other scientific bodies, **greenhouse gas emissions have caused** the vast majority of recent warming with the world experiencing three successive, record-breaking hottest years. *The Independent* July 28, 2017 Friday Science journalist retires at 98 and warns of generation of Americans who suffer from a thinking 'disability' BYLINE: Ian Johnston
- 641- A single cow releases between 70 and 120 kg of methane a year. **The greenhouse gas is thought to be 25 times more damaging** to the environment than carbon dioxide over a one hundred year period. *The Independent* July 19, 2017 Wednesday Irish farmers to create seaweed eating 'supercows' in bid to fight climate change BYLINE: Harry Cockburn
- 642- Much of western Europe sweltered earlier in June, and the severe heat in England, France, Belgium, the Netherlands and Switzerland was also made significantly more likely by global warming. (...) Scientists combined temperature records and the latest observations with a series of sophisticated computer models to calculate how much the global rise in **greenhouse gases has raised the odds of the soaring temperatures**. *The Guardian* June 30, 2017 Friday Europe's extreme June heat clearly linked to climate change BYLINE: Damian Carrington
- 643- Since the 1880s, the world's temperature has risen by about 1C **because of greenhouse gases** resulting from human activity - a process predicted by a Swedish Nobel Prize-winning scientist in 1895. *The Independent* June 28, 2017 Wednesday World has three years to prevent dangerous climate change, warn experts; Since the 1880s, the world's temperature has risen by about 1C **because of greenhouse gases** resulting from human activity BYLINE: Ian Johnston
- 644- Methane is a far **more potent greenhouse gas** than carbon dioxide. *The Guardian* June 6, 2017 Tuesday UK must use its trade policy to tackle climate change

- 645- He (Donald Trump) has said that the deal would hit the US coal industry hard and that it would prove "too costly" for the US to stick to the Paris accord to reduce **greenhouse gas emissions to limit global warming to 1.50C** above preindustrial levels. His decision led to an outpouring of criticism. His predecessor, Barack Obama, accused Mr Trump of "rejecting the future", while the SpaceX and Tesla founder Elon Musk said he would be leaving the President's advisory council as a result. The former Democratic presidential candidate Bernie Sanders described it as an "abdication of American leadership and an international disgrace". Under the pact, the United States committed to reducing its emissions by 26 to 28 per cent from 2005 levels by 2025. *i-Independent* June 2, 2017 Trump pulls out of Paris climate change accord BYLINE: Mythili Sampathkumar (my addition in parenthesis)
- 646- The departure of the States, the world's second-largest **greenhouse gas polluter**, will not end the 195-nation pact. But countries that reluctantly signed could ease their commitments on pollution. *Daily Mirror* June 1, 2017 Thursday US ready to 'drop climate change deal'
- 647- Big emitters led by China, the European Union and India have reaffirmed their commitment to the Paris deal, which seeks to **phase out greenhouse gas** emissions this century by shifting to **clean** energies. A U.N. panel of climate scientists says it is at least 95 percent probable that **man-made greenhouse gas emissions**, mainly from burning fossil fuels, are the main **cause of climate change** since 1950. *MailOnline* June 1, 2017 Thursday China piles pressure on Trump by vowing to UPHOLD the Paris climate change agreement as premier urges 'others' to follow suit and EU leader tells US president not to 'change the (political) climate for the worse' BYLINE: FRANCESCA CHAMBERS and HARVEY DAY
- 648- So far the world's average temperature has risen by just under one degree **because of greenhouse gas** emissions from human activity. *The Independent* May 31, 2017 Wednesday Donald Trump to withdraw US from Paris Agreement on climate change BYLINE: Ian Johnston, Mythili Sampathkumar
- 649- The supreme court ruled against George W Bush's administration, leading to the EPA determining that **greenhouse gases are a public health threat** and opening the way for Barack Obama's executive action on climate change. *The Guardian* May 23, 2017 Tuesday More people heading to court to spur action on climate change BYLINE: Oliver Milman
- 650- Having a measurement that shows both numbers, the scientists argued, would let governments and other institutions trying to reduce **greenhouse gas emissions and slow global warming** decide which policies would be best in the short term and which should be adopted longer term. (...) But their opponents, activists lobbying against natural gas, use a 20-year timescale to show the effects of burning natural gas on the climate. *MailOnline* May 4, 2017 Thursday Call for global warming to be measured in the same way as blood pressure to offer more precise predictions
- 651- Carbon dioxide is the primary **greenhouse gas driving climate change**, which threatens political instability, severe weather and food insecurity worldwide, according to the United Nations climate body. Natural CO2 levels have risen from 280 to 405 parts per million since the Industrial Revolution, and current estimates hold that the world will be 6 C hotter by 2100. In 2015, 196 nations signed the Paris climate accords, agreeing to curb greenhouse gas emissions to levels that would keep the rise in the Earth's temperature to under 2 C. *MailOnline* April 13, 2017 Thursday Scientists seek holy grail of climate change in Oman's hills
- 652- This is not the first time a child has taken its government to court over a lack of climate change action. In the US, a group of 21 youths aged between nine and 20 are claiming the federal government's promotion of fossil fuel production and its indifference to the risks posed by **greenhouse gas emissions threaten** the survival of future generations *The Independent* April 2, 2017 Sunday Nine-year-old girl suing Indian government over climate change failures BYLINE: CHLOE FARAND

- 653- Changes in the Arctic and melting sea ice were leading to a shift in wider oceanic and atmospheric circulation patterns. This in turn is affecting weather elsewhere in the world, since it impacts the waves in the jet stream - a fast-moving band of air that helps regulate temperature. It (the report) warned that **greenhouse gas emissions were the main driver** behind the warming trend. *MailOnline* March 21, 2017 Tuesday Last year's bizarre weather proves man-made climate change IS real with 'no room for doubt', say scientists BYLINE: PHOEBE WESTON
- 654- An EPA climate protection programme on cutting emissions of **greenhouse gases that contribute to global warming**, such as methane, would be cut by 70 per cent to \$29m. *i-Independent* March 4, 2017 Budget to fight climate change to be slashed by 70 per cent BYLINE: Lucy Pasha-Robinson
- 655- An EPA climate protection programme on cutting emissions of **greenhouse gases** like methane **that contribute to global warming** would be cut by 70 per cent to \$29 million (£23.6m). *The Independent* March 3, 2017 Friday Donald Trump plans to cut spending on EPA climate change programme by 70%; Initiative to **combat greenhouse gas** emissions would be reduced to \$29m (£23m) under proposal BYLINE: Lucy Pasha-Robinson
- 656- Under the Paris deal, Britain has a legally binding target to cut emissions of **harmful greenhouse gases** - such as those produced in fossil-fuel power plants - by 80 per cent from 1990 levels by 2050. But outside the ETS, it is unclear how Britain would meet its targets. *i-Independent* February 28, 2017 UK to back EU measures on climate change BYLINE: Leo Cendrowicz
- 657- With heavy use of coal-fired power and a relatively small population of 24 million, Australia is considered one of the **world's worst per capita greenhouse gas polluters**. *MailOnline* February 24, 2017 Friday Great Barrier Reef will be hit by WORST EVER blast of coral bleaching this year because of a 'lack of planning' for climate change BYLINE: DAISY DUNNE and AFP
- 658- The House has already passed legislation that would eliminate a BLM rule curbing the release of methane, **a potent greenhouse gas**, from oil and gas operations on federal land. *The Independent* February 21, 2017 Tuesday Trump's new executive orders will cut Obama's climate change policies BYLINE: Juliet Eilperin and Steven Mufson
- 659- In addition, when Arctic permafrost ground melts, it releases methane, amplifying the **greenhouse effect** in the atmosphere just like CO₂. (...) While ice reflects 90 per cent of sunlight, the ocean **absorbs** 90 per cent, so the less ice there is, the more heat the planet **absorbs**. *MailOnline* February 15, 2017 Wednesday Could we REFREEZE the Arctic using giant pumps? Bizarre £400 billion plan may help tackle climate change BYLINE: TIM COLLINS
- 660- If the world continues to burn fossil fuels at the current rate, without any major effort to mitigate **the damage caused by greenhouse gases**, the United States' peak electrical needs could rise by as much as 18 percent and cost around \$180 billion, said the report. *MailOnline* February 6, 2017 Monday Climate change could overload the US electrical grid: Experts warn increased demand for aircons could cause major blackouts
- 661- The GWPF has recently adopted a "lukewarmist" stance towards the issue, with Lord Lawson recently admitting that **greenhouse gases had caused temperatures to increase**. But he also said it would be "crazy" for the UK to attempt to reduce its emissions because they account for only two per cent of the global total. *The Independent* January 29, 2017 Sunday Global Warming Policy Foundation - the UK home of climate change sceptics - hit by 60% membership fee slump BYLINE: Ian Johnston
- 662- While the natural El Niño weather effect - a climate cycle in the Pacific Ocean with a global impact on weather patterns - played a role, it contributed just 0.2C of warming, compared to 0.9C **as a result of the greenhouse gas effect**. *The Independent* January 19, 2017 Thursday Time 'running out to avoid dangerous global warming' BYLINE: IAN JOHNSTON

- 663- It was a summit of sorts, but certainly not a meeting of minds: at 10am on 19 November, six of Britain's most eminent climate change scientists entered a wood-panelled committee room in the House of Lords to face the country's most prominent climate change sceptic, Lord Lawson. (...) But despite the hostile rhetoric, the meeting was rather more polite, according to others present. Both sides had agreed an agenda in advance, covering the climate history of the planet, changes at the poles, computer modelling and climate projections, and how science is used to inform policy - though, crucially, not the policies themselves. Professor Sir Brian Hoskins, of Imperial College London, said: "There was not any major disagreement on the science we presented." Hoskins debunked the so-called warming "pause", describing how excess heat has continued to be **trapped by greenhouse gases** for the past 15 years, showing that global warming is continuing. He said air temperature alone is a very limited view of climate change, given that 93% of all **trapped** heat enters the oceans. "I can't remember any challenge of that," he said. *The Guardian* December 14, 2013 Saturday Meeting does little to cool the climate change debate: Six eminent scientists in Lords showdown with sceptic Lawson - and team BYLINE: Damian Carrington
- 664- Scientists commonly use the scenario of emissions screeching to a stop to gauge the **heat-trapping** staying power of carbon dioxide. (...) By itself, such a decrease of atmospheric carbon dioxide should lead to cooling. But the heat **trapped** by the carbon dioxide took a divergent track. *MailOnline* November 26, 2013 Tuesday 'It may be too late': Reducing greenhouse gas emissions might not stop global warming, claims climate scientist BYLINE: TED THORNHILL
- 665- The prospect of legal challenges to extract damages from the titans of the extractive industry looks attractive, particularly as scientists get ever better at attributing extreme weather events to the **heat trapped** by carbon dioxide. *Guardian.com*. November 20, 2013 Wednesday Polluters list points the way to combating climate change BYLINE: Damian Carrington
- 666- On one hand, heat from the sun and heat **trapped by greenhouse gases** warm the planet, while sunlight reflected by aerosols in the atmosphere and heat **absorbed** by the ocean reduce temperatures. (...) **Greenhouse gas concentrations** have increased to their highest level in at least 800,000 years, including a 40 per cent rise in carbon dioxide since pre-industrial times driven largely by the burning of fossil fuels. Some 90 per cent of **the extra heat accumulated** since 1971 has been **absorbed** by the oceans, and sea levels have risen by 19cm (7.5in) in a century. *The Daily Telegraph* September 28, 2013 Saturday Global warming 'unequivocal' BYLINE: Nick Collins
- 667- What critics choose to ignore is that of all **the extra heat being trapped by our greenhouse gas** emissions - equivalent to four Hiroshima nuclear bombs every second - just 1% ends up warming the air. *Guardian.com*. September 27, 2013 Friday Global warming pause is a mirage: the science is clear and the threat real BYLINE: Damian Carrington
- 668- The UN's Intergovernmental Panel on Climate Change (IPCC) will say next week that certainty has increased from "very likely" to "extremely likely" that human activity has caused more than half of the observed temperature rise from 1951 to 2010, in a large part due to fossil fuels and deforestation. The Fifth Assessment Report, known as AR5, is the IPCC's most definitive yet, and will run to thousands of pages. It will be released in several stages over the coming year after contributions from more than 800 scientists in 85 countries. (...) The oceans have absorbed 93 per cent of the **heat trapped** in the climate system **by greenhouse gases** between 1971 and 2010, according to the draft report, with the top 75m warming by at least 0.1C a decade. (...) Leaks from the draft report have also caused controversy. The IPCC's findings show that the rate of warming has slowed down in the past 15 years with the rise dropping from 0.12C per decade between 1951 and 2012, to 0.05C between 1998 and 2012, which has been seized on by climate change sceptics. *Independent.co.uk* September 22, 2013 Sunday 'We are all to blame for climate change' BYLINE: Chris Stevenson
- 669- Scientists believe a series of naturally occurring La Nina weather events in the Pacific in recent years, which bring cooler waters to the surface, have masked the **heat-trapping effect caused by greenhouse gases**. (...) Other experts noted the study did not fully explain the hiatus, especially where extra **the heat trapped by greenhouse gases**, led by carbon dioxide, was building up in the

system.(...) Almost 200 governments have agreed to limit a rise in temperatures to less than 2 degrees Celsius above levels before the Industrial Revolution - meaning average world surface temperatures should not rise above about 15.6 Celsius. Temperatures have so far gained by about 0.8 C and many scientists say that warming is already causing more extreme weather, ranging from heatwaves to downpours. *MailOnline* August 29, 2013 Thursday Cooling of the Pacific has slowed pace of global warming as changes in ocean currents absorb excess heat

- 670- The problem for the Met Office is to explain why the rate of increase in global temperatures has declined in recent years while concentrations of carbon dioxide in the atmosphere have continued to accelerate. Sceptics claim that this shows there is not a strong link between the two, whereas climate scientists insist that rising carbon dioxide concentrations are largely responsible for the rise in global temperatures. (...) The most likely explanation for the current pause is that **excess heat trapped** by carbon dioxide in the atmosphere is being transferred to the oceans where it is being transported down to deeper layers that cannot be monitored by satellites, Professor Belcher said. *i-Independent* July 23, 2013 Global warming 'paused' due to ocean heat sinks BYLINE: Steve Connor
- 671- A UN panel of scientists, the IPCC, says **heat-trapping gases** from burning fossil fuels are raising temperatures. A small number of scientists dismiss human-influenced global warming. *i-Independent* July 16, 2013 Seas could rise 2.3m for each 1C increase; Panorama Around the world in 10 stories
- 672- People consulting with White House officials on Obama's plan say they expect the president to put forth regulations on **heat-trapping gases** emitted by coal-fired power plants that are already running. *MailOnline* June 24, 2013 Monday Kerry insists America must tackle climate change ahead of Obama policy announcement on Tuesday
- 673- Methane **traps** more heat than carbon, and speeds the warming. *MailOnline* April 19, 2013 Friday Could Earth become as barren as Venus? Climate change scientist James Hansen warns of a planet 'not only ice-free but human-free' BYLINE: MARK PRIGG
- 674- Theories for the pause include that deep oceans have **taken up more heat** with the result that the surface is cooler than expected, that industrial pollution in Asia or clouds are blocking the sun, or that **greenhouse gases trap less heat** than previously believed. The change may be a result of an observed decline in **heat-trapping water vapor** in the high atmosphere, for unknown reasons. (...) Swedish chemist Svante Arrhenius first showed in the 1890s how man-made carbon dioxide, from coal for instance, **traps heat** in the atmosphere. *MailOnline* April 16, 2013 Tuesday The climate change slowdown baffling scientists across the globe
- 675- Recently three changes in atmospheric chemistry have become familiar subjects of concern. The first is the increase in the **greenhouse gases**-carbon dioxide, methane, and chlorofluorocarbons- which has led some to fear that we are creating **a global heat trap** which could lead to climatic instability. *telegraph.co.uk* April 9, 2013 Tuesday Margaret Thatcher: Godmother of 'global warming'? BYLINE: James Delingpole
- 676- The United Nations Environment Programme (UNEP) estimates that permafrost contains about 1,700billion tonnes of **heat-trapping** carbon - twice the amount currently in the atmosphere. *MailOnline* February 22, 2013 Friday Study of Siberian permafrost caves shows global warming of just 1.5C 'would pump out a TRILLION tonnes of methane and CO2' BYLINE: DAMIEN GAYLE
- 677- Mr Obama temporarily blocked the pipeline last year. Republicans and business groups claim that the project would help to achieve energy independence for north America and create thousands of jobs. But environmental groups say the pipeline would transport "dirty oil" and produce **heat-trapping gases** that contribute to global warming. Mr Obama tried and failed in his first term to get a climate change Bill through Congress. *Morning Star* January 22, 2013 Tuesday Environmentalists praise president's climate change vow

- 678- There are uncertainties of course, but the basic physics is that carbon emissions are **trapping** more energy in the atmosphere, increasing climate chaos. *The Guardian* January 9, 2013 Wednesday Extreme weather: Climate change turns up the heat BYLINE: Damian Carrington
- 679- The study, published in the journal *Science*, is the latest to suggest that huge amounts of heat are being **absorbed** by the deep ocean. A previous study for instance found that changes to the cold Pacific current, called La Nina, may have resulted in **the absorption of excess heat** from the atmosphere. (...) One recent estimate for instance suggested that the heat being **absorbed** by the deep ocean is equivalent to the power generated by 150 billion electric kettles. *Independent.co.uk* October 31, 2013 Thursday Pacific Ocean 'warming 15 times faster than ever before'; Study adds weight to the theory that recent global warming 'pause' is down to **heat absorbed** by ocean depths BYLINE: Steve Connor
- 680- Clouds reflect sunlight, helping to cool the planet's surface. This is stronger than the warming effect of clouds, which can **absorb heat** from the ground and act **like a radiator** *The Independent on Sunday* October 13, 2013 Cloudy with a chance of ... climate change BYLINE: Ian Johnston
- 681- It is not possible to account for the recent lack of surface warming solely by looking at the difference between amount of heat being received from the Sun and the amount of thermal energy being lost from the planet - calculations show that extra heat continues to be **absorbed** by the Earth at a rate of 0.6 Watts per square metre, equivalent to about 300bn 1KW electric heaters or 150bn 2KW kettles distributed across the planet. *Independent.co.uk* July 23, 2013 Tuesday Has global warming stopped? BYLINE: Steve Connor
- 682- The melting sea ice will not add to sea level rise but could increase warming as water **absorbs** heat from the sun, rather than reflecting it back into space. *telegraph.co.uk* March 4, 2013 Monday Shipping lanes could open over the North Pole due to climate change; BYLINE: Louise Gray
- 683- Climate change will **lock** the world into more frequent and severe heatwaves in the next few decades, researchers have claimed. (...) The last decade has seen an exceptional number of extreme heatwaves around the world, hitting the U.S. in 2012, Russia in 2010, Australia in 2009, and Europe in 2003 with damaging impacts on health, the economy, agriculture and wildlife. *MailOnline* August 15, 2013 Thursday Climate change will **lock** the world into frequent and severe heatwaves over the next 30 years, experts warn BYLINE: RACHEL REILLY
- 684- The IPCC said even if emissions of carbon dioxide were to stop, the consequences so far mean the world is already **locked** into climate change, with effects persisting for centuries. *Daily Mirror* September 28, 2013 Saturday WETTER WARNING; »Man 'causing climate change' ; »More floods and heatwaves' BYLINE: RICHARD SMITH
- 685- Geology tells us that fossil fuels are predominantly carbon which was part of our atmosphere before being **locked** away in the earth millions of years ago. (...) It is obvious the world can live with these fluctuations in the level of atmospheric carbon. There is a correlation between temperature and CO2, but some of my colleagues have put the cart before the horse. The evidence shows CO2 levels follow temperature, not the other way around. Indeed, there may be many factors that determine our climate. *MailOnline* May 1, 2013 Wednesday The Great Green Con no. 1 BYLINE: DAVID ROSE
- 686- The second leg is adaptation, when you make advance preparations for the impacts of climate change that are already **locked in** (building sea walls, cyclone shelters or developing hardier varieties of food crops - that sort of thing). *Guardian.com*. November 25, 2013 Monday How rich countries dodged the climate change blame game in Warsaw BYLINE: Graham Readfearn

- 687- Many developing nations, for instance, want a target of cutting world greenhouse gas emissions to a net zero by 2050. Opec nations, worried about loss of income from a shift to renewable energy, favour much vaguer long-term goals. (...) The (IPCC) report says if the world continues to **spew greenhouse gases** at its accelerating rate, it's likely that by mid-century temperatures will increase by about another 2°C (3.6°F) compared to temperatures from 1986 to 2005. (...) Global warming, it says, is impacting 'all continents and across the oceans,' and further pollution from **heat-trapping gases** will raise the likelihood of severe impacts for mankind. *MailOnline* December 10, 2014 Wednesday 'There is no time for tinkering' on climate change BYLINE: ELLIE ZOLFAGHARIFARD and REUTERS (my addition in parenthesis)
- 688- Scientists say that after carbon dioxide, methane is the most important contributor to **the greenhouse effect**, in which gases in the atmosphere **trap** heat that would otherwise radiate from the Earth. Pound for pound, methane has about 20 times the **heat-trapping effect** as carbon dioxide. *MailOnline* December 9, 2014 Tuesday Are three MILLION abandoned wells pumping methane into the atmosphere? BYLINE: JONATHAN O'CALLAGHAN
- 689- The most striking evidence of warming was probably in the oceans, however. Most of the excess **heat trapped** in the atmosphere by greenhouse gas emissions ends up in the oceans. *The Guardian* December 3, 2014 Wednesday 2014 set to be world's hottest year ever BYLINE: Suzanne Goldenberg
- 690- Over the seas, temperatures were the highest on record, around 0.45C above the 1961-90 average, and were particularly high in the Northern Hemisphere. The **heat trapped** in the ocean as far down as 2000m (6,500ft) was also estimated as the highest recorded. *MailOnline* December 3, 2014 Wednesday 2014 is on course to be the world's hottest year ever BYLINE: STEPH COCKROFT
- 691- In the two decades since world leaders first got together to try to solve global warming, the world has become more polluted with **heat-trapping gases**, more crowded and just downright wilder. *MailOnline* December 3, 2014 Wednesday It takes just TEN YEARS for CO2 to damage the climate BYLINE: ELLIE ZOLFAGHARIFARD
- 692- This means more non-frozen surface area to **trap** far-infrared energy, which further contributes to warming in the region. (...) It also complements a process in which darker oceans **absorb** more solar energy than sea ice. *MailOnline* November 6, 2014 Thursday Is infrared energy melting the Arctic? BYLINE: ELLIE ZOLFAGHARIFARD
- 693- Methane is a powerful **greenhouse gas** responsible for **trapping** heat in the Earth's atmosphere. *MailOnline* October 24, 2014 Friday Mysterious microbes are speeding up climate change BYLINE: ELLIE ZOLFAGHARIFARD
- 694- Some of this methane - which is over 20 times more potent than CO2 at **trapping** heat - is now making it to the ocean's surface. *MailOnline* October 24, 2014 Friday 'There is NO climate crisis' BYLINE: ELLIE ZOLFAGHARIFARD
- 695- Climate change is widely blamed on man's burning of fossil fuels such as coal, oil and gas which release **greenhouse gases** such as carbon dioxide that **trap** the heat in the atmosphere. (...) Some studies suggest that the excess **heat has been absorbed** by the deep oceans and could return to the atmosphere in about 30 years. *Express Online* October 14, 2014 Tuesday Climate change DOUBT BYLINE: John Ingham
- 696- United Nations Secretary-General Ban Ki-moon is challenging more than 100 world leaders at the climate summit to set a new course for a warming world and reverse the **rise of heat-trapping gases**. *telegraph.co.uk* September 23, 2014 Tuesday Leonardo DiCaprio urges UN to tackle 'humankind's greatest challenge' climate change

- 697- Scientists have calculated that the world's future carbon emissions cannot exceed 1,200 billion tons if it is to have a reasonable chance of keeping global warming to 2C - the point beyond which the consequences become increasingly devastating. Once in the atmosphere, CO2 can remain there for hundreds of years. (...) Professor Dave Reay, of the University of Edinburgh, said the latest UEA research about the escalation in carbon emissions - which exacerbate global warming by **trapping heat** in the atmosphere - was very concerning. (...) The research comes a day after yesterday's march, in which hundreds of thousands of people took to the streets in 2,000 rallies, marches and protests in 150 countries to demand greater action on climate change. Celebrities including the actress Emma Thompson, the musician Peter Gabriel and the designer and activist Vivienne Westwood joined an estimated 40,000 people to march through Westminster calling on politicians to tackle global warming. The divestment movement has 500 wealthy individuals and 168 institutions, mostly from the US, but also from Europe, Australia, Africa and the UK. The UK's contribution comprises seven institutions with a combined investment portfolio of just £250m. The demonstration comes ahead of a UN climate-change summit in New York tomorrow where world leaders including David Cameron and the US President, Barack Obama, are expected to announce a major forest-restoration programme as they seek to inject some momentum into talks to agree a meaningful treaty to tackle climate change next year. *The Independent* September 22, 2014 Monday Investors pledge to take their money out of firms blamed for climate change BYLINE: TOM BAWDEN
- 698- Global warming, it (IPCC report) says, is impacting 'all continents and across the oceans,' and further pollution from **heat-trapping gases** will raise the likelihood of severe impacts for mankind. (...) There is little in the report that wasn't in the other more-detailed versions, but the language is more stark and the report attempts to connect the different scientific disciplines studying problems caused by the burning of fossil fuels, such as coal, oil and gas. *MailOnline* August 27, 2014 Wednesday Man-made global warming is already dangerous and could be 'IRREVERSIBLE' BYLINE: ELLIE ZOLFAGHARIFARD and ASSOCIATED PRESS (my addition in parenthesis)
- 699- Several studies have focused on the Pacific as potentially playing a major role. But the study, published yesterday in the journal *Science*, concludes that the Pacific alone cannot explain the warming "hiatus", and that much of **the heat being trapped by the greenhouse gases** at record levels in the atmosphere is being sunk hundreds of metres down in the Atlantic and Southern oceans. *The Guardian* August 22, 2014 Friday Atlantic is storing excess heat, say climate scientists BYLINE: Adam Vaughan
- 700- Some of this methane - which is over 20 times more **potent** than CO2 at **trapping heat** - is now making it to the ocean's surface. (...) The gas is 23 times more **potent** than carbon dioxide in **trapping heat** and is currently being targeted by government in an attempt to mitigate global warming. *MailOnline* August 8, 2014 Friday 'We're f*****': Climate change will be catastrophic for mankind after study reveals methane leaking from the Arctic Ocean, scientist warns BYLINE: ELLIE ZOLFAGHARIFARD
- 701- Parts of Australia have been gripped by devastating drought and heatwaves in recent years. In March, the World Meteorological Organisation said record high temperatures in 2013 would have been 'virtually impossible' without human emissions of **heat-trapping greenhouse gases**. *MailOnline* July 14, 2014 Monday Is Australia drying out because of global warming? BYLINE: ELLIE ZOLFAGHARIFARD
- 702- The Amazon rainforest affects climate change because trees soak up **heat-trapping** carbon dioxide as they grow and release it when they rot or are burnt. Brazil has sharply slowed deforestation rates in recent years. Carson said that the growth of Amazonian forests could, for instance, have contributed to the Little Ice Age, from about 1350 to 1850 by **absorbing heat-trapping gases** from the air. *MailOnline* July 9, 2014 Wednesday Amazonian rainforest was created just 2,000 years ago by climate change that wiped out ancient farmers BYLINE: MARK PRIGG
- 703- The \$468 million mission is designed to study the main driver of climate change emitted from smokestacks and tailpipes. Some of the carbon dioxide is sucked up by trees and oceans, and the rest is lofted into the atmosphere, **trapping** the sun's heat and warming the planet. (...) About half ends up **trapped** in Earth's atmosphere while a quarter is **absorbed** into the ocean. Another quarter is sucked up

by trees and plants. (...) Two years later, it happened again. Despite a design change, NASA's Glory satellite was lost aboard another Taurus XL rocket. The mission was supposed to study solar radiation and airborne particles that reflect and **trap** sunlight. *MailOnline* June 29, 2014 Sunday NASA to launch global warming satellite after loss

- 704- One year ago, Obama unveiled sweeping plans to tackle climate change and cut U.S. emissions of **heat-trapping** gases 17 percent by 2020. The idea was that U.S. leadership would spur other countries to act as well. *MailOnline* June 25, 2014 Wednesday Obama claims progress on curbing climate change
- 705- Contrails disperse into wispy clouds which **trap** heat in the atmosphere, a study showed. These clouds, which can be 100 miles long, could contribute more to global warming than the carbon dioxide in the fuel burnt by the aircraft which formed them. *The Times* June 23, 2014 Monday Take longer flights to cut global warming BYLINE: Ben Webster
- 706- Just like natural clouds, contrails reflect some of the sun's incoming energy, resulting in a cooling effect, but also **trap** some of the infrared energy that radiates from Earth into space, to have a warming effect. *MailOnline* June 19, 2014 Thursday Could re-routing flights reduce climate change? BYLINE: SARAH GRIFFITHS
- 707- The gas is 23 times more **potent** than carbon dioxide in **trapping** heat in the atmosphere and is currently being targeted by government in an attempt to mitigate global warming. *MailOnline* May 28, 2014 Wednesday Are babbling brooks causing climate change? BYLINE: ELLIE ZOLFAGHARIFARD
- 708- Still, it's not too late to prevent the worst of climate change, says the 840-page report, which the Obama administration is highlighting as it tries to jump-start often-stalled efforts to curb **heat-trapping gases**. (...) And leaders in the fossil fuel industry, which is responsible for a large amount of the **heat-trapping** carbon dioxide, said their energy is needed and America can't afford to cut back. *MailOnline* May 7, 2014 Wednesday Climate change already affecting US
- 709- Still, it's not too late to prevent the worst of climate change, says the 840-page report, which the White House is highlighting as it tries to jump-start often stalled efforts to curb **heat-trapping gases**. (...) The White House plans to use the long report as scientific justification to reduce emissions of **heat-trapping gas** from the burning of fossil fuels, such as coal, gas and oil and to encourage local communities to adapt to changes in the climate, as outlined in President Barack Obama's 2013 Climate Action Plan. *MailOnline* May 6, 2014 Tuesday More wild weather, extreme winters, record-breaking heat and more allergies BYLINE: ASSOCIATED PRESS and FRANCESCA CHAMBERS
- 710- The new study blames an unusual combination of a strong Western high pressure ridge and deep Great Lakes low pressure trough. And it says that is linked to a recently found precursor to El Nino, the world-weather changing phenomenon. And that precursor itself seems amplified by a **build-up of heat-trapping greenhouse gases**. *MailOnline* April 24, 2014 Thursday Study links California drought to global warming
- 711-If the world doesn't cut pollution of **heat-trapping** gases, the already noticeable harms of global warming could spiral "out of control," the head of a United Nations scientific panel warned Monday. (...) Global warming is triggered by **heat-trapping** gases, such as carbon dioxide, that stay in the atmosphere for a century. Much of the gases still in the air and **trapping heat** came from the United States and other industrial nations. China is now by far the No. 1 carbon dioxide polluter, followed by the United States and India. *MailOnline* March 31, 2014 Monday Global warming dials up our risks, UN report says

- 712- Climate change is increasing the frequency of extreme weather events, as more energy is **trapped** in the atmosphere. *The Guardian* March 29, 2014 Saturday First it was glaciers, now your coffee faces climate threat: Coffee faces threat from climate change BYLINE: Damian Carrington
- 713- China and the United States are the biggest sources of emissions of carbon dioxide and other gases that cause the atmosphere to **trap** solar heat and alter the climate. Scientists say such changes are leading to drought, wildfires, rising sea levels, melting polar ice, plant and animal extinctions and other extreme conditions. (...) Kerry said the cost of inaction will far outweigh the significant expense of reducing **greenhouse gas emissions that trap** solar heat in the atmosphere and contribute to the Earth's rising temperatures. *MailOnline* February 17, 2014 Monday John Kerry warns climate change is 'the world's most fearsome weapon of mass destruction'
- 714- Kerry argued that the cost of inaction to environments and economies will far outweigh the significant expense of reducing **greenhouse gas emissions that trap** solar heat in the atmosphere and contribute to the Earth's rising temperatures. (...) China and the United States are the biggest sources of emissions of carbon dioxide and other gases that cause the atmosphere to **trap** solar heat and alter the climate. *MailOnline* February 16, 2014 Sunday In Indonesia, Kerry blasts climate change deniers
- 715- In a speech in Jakarta to be delivered on Sunday, Kerry will argue that the cost of inaction to environments and economies will far outweigh the significant expense of reducing **greenhouse gas emissions that trap** solar heat in the atmosphere and contribute to the Earth's rising temperatures, according to U.S. officials. (...) China and the United States are the biggest sources of emissions of carbon dioxide and other gases that cause the atmosphere to **trap** solar heat and alter the climate. *MailOnline* February 16, 2014 Sunday In Indonesia, Kerry urges action on climate change
- 716- Global warming has not stopped. People should understand that the planet is a closed system. As we increase our emissions of **greenhouse gases**, the fundamental thermal dynamics tells us **we have added heat** into the system. Once it's **trapped**, it can go to a myriad of places - land surface, oceans, ice shelves, ice sheets, glaciers for example. *Guardian.com*. February 12, 2014 Wednesday The "pause" in global warming is not even a thing BYLINE: Graham Readfearn
- 717- A number of theories exist on why the globe is experiencing a warming hiatus, including changes in the way heat is **absorbed** by the ocean or a period of weak solar activity. *MailOnline* November 19, 2014 Wednesday Are volcanoes SLOWING global warming? BYLINE: ELLIE ZOLFAGHARIFARD
- 718- As the ice melts it exposes open water which, being very much darker, **absorbs** more heat. *telegraph.co.uk* October 27, 2014 Monday Cold winters have been caused by global warming BYLINE: Geoffrey Lean
- 719- Oceans may be **absorbing** heat; The News Matrix The day at a glance *i-Independent* August 22, 2014
- 720- Rising levels of water vapour miles above the Earth are set to magnify the effects of global warming, scientists say. They predict that, as the planet warms, due to the burning of fossil fuels, more vapour will enter the upper troposphere. It, in turn, will **absorb** more heat and raise Earth's temperature further. *The Daily Telegraph* July 29, 2014 Tuesday Water vapour link to global warming
- 721- Even by the alarming standards to which climate change-watchers have become accustomed, the latest report by the World Meteorological Organisation (WMO) is disturbing. For the first time, it raises concerns that the world's oceans and plants - major carbon sinks **absorbing** half of mankind's carbon emissions between them - may be reaching **saturation point**. *Independent.co.uk* September 10, 2014 Wednesday Carbon test: The PM must seize initiative at climate change summit

- 722- Sport4Climate boasts supporters that include football players, swimmers, coaches, paralympians, kitesurfers, and former Olympians. "It's really important that we get the message out about our planet's climate situation, so that people can really engage with this," says Brazilian kite surfer Milla Ferreira. The athletes' concern for the health of the planet is justified. In the World Bank's Turn Down the Heat report, the Potsdam Institute for Climate Impact Research and Climate Analysis found that without action, global temperatures are on track to rise to four degrees Celsius above pre-industrial times by the end of the century, and that a 1.5 degree Celsius warming is already **locked** into the Earth's atmosphere *The Guardian* December 30, 2014 Tuesday How athletes are fighting climate change BYLINE: Eleanor Ross
- 723- Last month, the World Bank published a report warning that a 1.5C rise was already all but "**locked in**" because of past and unavoidable future carbon emissions. A version of the text was still being discussed yesterday - and was yet to be agreed last night. By yesterday evening, Chinese negotiator Liu Zhenmin told the Associated Press that there was "deadlock", with several developing nations rejecting a draft. US representative Todd Stern said that failure to produce a decision would represent a "serious breakdown". Some reports stated that a draft expressed "grave concern" that the existing promises to fight climate change were too lax to avoid overshooting the 2C limit. The Lima round of negotiations kicked off on a wave of optimism following high-profile commitments from the European Union, United States and China - which together account for most of the world's greenhouse gas emissions - to slash their carbon footprints. However, with many countries refusing to budge from their established positions and China, now the world's largest emitter, being singled out for seeking to avoid independent scrutiny of its plan to peak emissions by 2030, that momentum appeared to have been lost. China and other developing countries opposed plans for a review process that would allow the pledges to be compared against one another before Paris. *The Independent on Sunday* December 14, 2014 Rich square up to poor at climate talks BYLINE: Simeon Tegel
- 724- A report from the World Bank Group recently claimed that the world must brace itself for more extreme weather, as it is **locked** on a path to unstoppable warming. (...) Liberals and women were also more likely than conservatives and males to attribute the warmer-than-normal local winter temperatures to global warming. The results suggest that, apart from actual science, people's view on climate change can be skewed by their beliefs. And as the climate has the potential to become more out-of-tune with normality in the coming years, the researchers warn it will be harder and harder to convince people on global warming. *MailOnline* November 26, 2014 Wednesday Think it's unusually warm outside? BYLINE: JONATHAN O'CALLAGHAN
- 725- Because the Earth's atmospheric system is "**locked into**" warming close to 1.5C above pre-industrial levels by the middle of the century, it may already be too late to avert extreme weather events, the Potsdam Institute for Climate Impact Research and Climate Analytics scientists warned. (...) But countries could still take action to reduce the rate of climate change, he said as he called on world leaders and policy-makers to adopt measures to create clean public transport, cleaner energy and more energy efficient factories, buildings and appliances. *telegraph.co.uk* November 23, 2014 Sunday Extreme weather 'could become normal' BYLINE: Rosa Silverman
- 726- In May, Nasa scientists told reporters that vast glaciers in West Antarctica seem to be **locked** in an irreversible thaw linked to global warming that may push up sea levels for centuries. (...) The results provide the first clear evidence for dramatic melting in Antarctic's and reflect predictions for the region's future. It also follows recent news that destabilisation of part of the West Antarctic ice sheet has already begun and could be 'unstoppable.' *MailOnline* July 4, 2014 Friday Global warming is creating MORE ice BYLINE: ELLIE ZOLFAGHARIFARD
- 727- But the report also acknowledges that a certain amount of warming is already **locked** in, and that in some instances there is no way to escape the effects of climate change. The 2007 report on the effects of climate change contained an error that damaged the credibility of the UN climate panel, the erroneous claim that Himalayan glaciers could melt away by 2035. This year's report will be subject to far more rigorous scrutiny, scientists said. It will also benefit from an explosion of scientific research. The number of scientific publications on the impacts of climate change doubled between 2005 and

2010, the report will say. *Guardian.com*. March 28, 2014 Friday IPCC report: climate change felt 'on all continents and across the oceans' BYLINE: Suzanne Goldenberg

- 728- Since emissions surged in the late 19th century, some 1,900 Gigatonnes (Gt) of CO₂ and 1,000 Gt of other **greenhouse gases** have already been emitted, leaving less than 1,000 Gt of CO₂ left to emit before **locking** the planet in to dangerous temperature rises of more than 2°C above pre-industrial levels. *The Guardian* November 19, 2014 Wednesday CO₂ emissions must be zero by 2070 to prevent climate disaster BYLINE: Arthur Neslen
- 729- The scientists, using a supercomputer climate simulator, said that **heat-trapping** emissions accounted for three quarters of the recovery in rainfall, rather than other suggested factors such as changes in sea temperature. (...) Representatives of almost 200 nations are meeting in Bonn this week to work on a deal to limit climate change that is due to be agreed in Paris in December. *The Times* June 2, 2015 Tuesday Global warming does what Live Aid never could BYLINE: Ben Webster
- 730- Now scientists have found vast deep water gas hydrates in the Arctic that are reservoirs for abiotic methane - a gas which is 20 times more effective in **trapping** heat than carbon dioxide. (...) The gas is 23 times more **potent** than carbon dioxide in **trapping** heat and is currently being targeted by government in an attempt to mitigate global warming. (...) Some of this methane - which is over 20 times more **potent** than CO₂ at **trapping** heat - is now making it to the ocean's surface. *MailOnline* April 15, 2015 Wednesday Will methane in the Arctic speed up global warming? BYLINE: ELLIE ZOLFAGHARIFARD
- 731- Several large companies that supply the US government also are expected to announce voluntary reduction of emissions, according to the White House. If the government and the companies meet their goals, they could reduce greenhouse gases in the atmosphere by 25 tonnes by 2025, though no specifics were given on how those targets would be met. Scientific evidence has shown that **greenhouse gases**, especially carbon dioxide, **trap** heat in the atmosphere, leading to increased global temperatures and climate change. Reducing the **greenhouse gases** emitted is thought to help alleviate the effects of global warming *Independent.co.uk* March 19, 2015 Thursday Climate change: President Obama orders US to cut greenhouse gas emissions by 40 per cent BYLINE: Payton Guion
- 732- Overall, the world is getting warmer due to increasing **greenhouse gas emissions that trap** the sun's heat. *MailOnline* March 9, 2015 Monday Global warming is happening FASTER BYLINE: ELLIE ZOLFAGHARIFARD
- 733- The ice tells how levels of carbon dioxide, the **heat-trapping** gas, have fluctuated over hundreds of thousands of years. This is also the place where a hole in the ozone layer, from man-made refrigerants and aerosols, periodically parks for a couple months and causes trouble. *MailOnline* February 20, 2015 Friday Could Antarctica reveal mankind's fate? Mystery continent may hold clues to alien life, global warming and Earth's demise
- 734- Fourteen of the 15 hottest years on record have occurred since 2000, according to the UN World Meteorological Organisation, as rising carbon emissions continue to **trap heat** and drive climate change. (...) Global sea-surface temperatures reached record levels in 2014, which is significant because 93% of the heat **trapped** in the atmosphere by greenhouse gases from fossil fuels and other human activities ends up in the oceans. *The Guardian* February 2, 2015 Monday 14 of the 15 hottest years on record have occurred since 2000 BYLINE: Damian Carrington
- 735- NASA made global news this month when it got egg on its face after claiming 2014 was the hottest year on record. Its own data, however, showed there was only about a one-third probability that was true. In contrast, other scientists point to temperature measurements that indicate the planet hasn't warmed, on balance, for the last 17 years even as emissions of **heat-trapping** greenhouse gases have dramatically increased. *MailOnline* January 27, 2015 Tuesday Cold shoulder: Obama leaves India without a global-warming deal as Modi refuses to commit on CO₂ emissions and Air Force One emits 809 TONS of it BYLINE: DAVID MARTOSKO

- 736- The Nasa scientists, who had been analyzing changes in the Earth's climate since the 1970s, told a congressional committee that something called the "**greenhouse effect**" where heat-**trapped** gases are released into the atmosphere was causing global warming with a 99% certainty. A New York Times report of the 1988 testimony includes the radical suggestion that there should be a "sharp reduction in the burning of coal, oil and other fossil fuels that release carbon dioxide", a plea familiar to those who have watched politicians who have traipsed up to the lectern or interviewer's microphone in Paris over the past two weeks. *The Guardian* December 13, 2015 Sunday James Hansen, father of climate change awareness, calls Paris talks 'a fraud' BYLINE: Oliver Milman
- 737- The burning of coal, oil and gas spews **heat-trapping** gases that not only make the world warmer, but cause other changes in storms, rain, drought and even timing of biological life. *MailOnline* November 29, 2015 Sunday The new danger of climate change... 'flying boulders' BYLINE: KHALEDA RAHMAN
- 738- Scientists have known for more than a century that certain gases, like carbon dioxide, **trap** heat. Last year, more than 32bn tonnes of these **greenhouse gases** were pumped into the atmosphere by human activity, including power plants, agriculture and transport. *The Guardian* November 24, 2015 Tuesday California public school textbooks mislead students on climate BYLINE: Oliver Milman
- 739- Compared to what it would be without more global warming, the average global income will shrivel 23 percent at the end of the century if **heat-trapping** carbon dioxide pollution continues to grow at its current trajectory, according to a study published Wednesday in the scientific journal *Nature*. (...) Seven of the nine months this year have broken monthly global heat records, tying 1998 for the most monthly heat records broken. This year, only January and April did not surpass records going back to 1880. (...) This is has been the hottest first nine months of any year. *MailOnline* October 21, 2015 Wednesday Interactive graphic reveals global warming will hurt three-quarters of the world's nations and widen the gap between rich and poor
- 740- These murky ponds, containing the brown-hued detritus from processed palm oil fruit, release a huge amount of methane into the atmosphere - a gas so potent it **traps** around 34 times as much heat as carbon dioxide. *The Guardian* September 16, 2015 Wednesday The palm oil plantations powering communities and tackling climate change BYLINE: Oliver Milman
- 741- But the pace of its retreat has been sped up thanks to **heat-trapping** greenhouse gases blamed for global warming, said Deborah Kurtz of the National Park Service. (...) The day before, the President had said the U.S. was doing its part by working to cut emissions of **heat-trapping gases** by up to 28 per cent over the next decade. *MailOnline* September 2, 2015 Wednesday 'Glad this was the only Bear I met in the park' BYLINE: FLORA DRURY
- 742- On his first day in Alaska, Obama offered no new policy prescriptions or federal efforts to slow global warming, but said the U.S. is doing its part by working to cut emissions of **heat-trapping** gases by up to 28 per cent over the next decade. *MailOnline* September 1, 2015 Tuesday 'We will condemn our children to a planet beyond their repair'
- 743- Cows have a huge flatulence problem that is damaging the planet. They produce methane - a **greenhouse gas which is 23 times more potent** than carbon dioxide in **trapping heat** in the atmosphere Last year, the Obama administration said that it would make a multi-pronged attack on cow flatulence in an attempt to cut emissions. *MailOnline* August 15, 2015 Saturday Supplement that makes cows less flatulent could help fight climate change BYLINE: ELLIE ZOLFAGHARIFARD
- 744- Hoping to position the United States to take the lead in global negotiations later this year to combat climate change, President Barack Obama yesterday unveiled a bold plan to slash emissions of **heat-trapping** carbon dioxide from power stations at home by almost a third within fifteen years. *Independent.co.uk* August 4, 2015 Tuesday Obama reveals new climate change initiative BYLINE: David Osborne, Tim Walker

- 745- During the 20th century, as **greenhouse gas concentrations increased and trapped** more heat energy on Earth, global surface temperatures also increased *MailOnline* July 10, 2015 Friday Have the oceans been HIDING the true scale of global warming? BYLINE: ELLIE ZOLFAGHARIFARD
- 746- Whereas green spaces have a cool atmosphere that **absorbs** heat, patios act like a "storage heater", giving out heat overnight and keeping cities warmer, Lord Deben, the chairman of the CCC - the government's official climate change adviser - said. (...) The UK has lost seven per cent of its urban green space since 2001, with two-thirds of that caused by garden lawns and verges being paved over. An area seven times the size of Hyde Park is paved over in UK cities every year, the CCC's experts said, suggesting that planning rules designed to stop gardens being concreted over were not being enforced by local councils. *telegraph.co.uk* June 30, 2015 Tuesday Why your patio is making the heatwave even hotter BYLINE: Emily Gosden
- 747- It is likely that its effect is being buffered in some way, perhaps with increased atmospheric heat being **absorbed** by the deep oceans. *Independent.co.uk* June 2, 2015 Tuesday Nature Studies: The world's nations have one last chance to slow climate change BYLINE: Michael McCarthy
- 748- However, there are concerns that as the sea ice reduces due to global warming, more heat will be **absorbed** by the darker oceans beneath and so increase the rate of climate change. (...) Others have suggested floating granular materials that would also reduce the solar heat being **absorbed** by the water beneath. (...) There are fears that as the Arctic warms, melting of the ice will reduce this effect and cause more heat to be **absorbed** by the dark ocean and ground - creating a feedback loop of warming. (...) The ocean whitening would have even less effect on the permafrost in the Arctic Circle as this would still melt and release huge amounts of methane - **a potent greenhouse gas** *MailOnline* April 29, 2015 Wednesday Turning the oceans 'white' will NOT stop sea ice from melting BYLINE: RICHARD GRAY
- 749- Since 1998, the warmest year on record, the steep increase in global temperatures seen during the 1990s has levelled off, failing to match computer model predictions for climate change. This pause, or hiatus, has been blamed on weak solar activity and increased uptake of heat by the world's oceans. The UN's Intergovernmental Panel on Climate Change last year concluded that the deep oceans had been responsible for **absorbing** an increasing amount of heat, but warned that this could not continue indefinitely. *MailOnline* February 3, 2015 Tuesday Global warming slowdown is NOT down to climate model errors BYLINE: ELLIE ZOLFAGHARIFARD
- 750- Anthropogenic radiative forcings, put simply, are measured by the difference between the amount of sunlight **absorbed** by Earth, and the energy that is radiated back to space. *MailOnline* January 21, 2015 Wednesday Is climate change really that dangerous? BYLINE: VICTORIA WOOLLASTON
- 751- FOR those hoping global warming might at least mean an improvement in the British summer, meteorologists have spotted clouds on the horizon. The "pause" in global warming may indeed be about to end, a Met Office study suggests, but changes in the Atlantic Ocean mean that Britain might actually experience cooler summers. Global average surface temperatures rose rapidly in the last decades of the 20th century but have been relatively flat since 1998, prompting claims from climate sceptics that global warming is no longer happening. (...) Scientists have attributed the recent slowdown in warming to heat being **absorbed** in the oceans, and to a series of small volcanic eruptions. *The Daily Telegraph* September 14, 2015 Monday Get ready for cooler summers ... thanks to global warming BYLINE: Emily Gosden
- 752- The 'pause' in global warming could be about to end, a new Met Office study suggests - but changes in the Atlantic Ocean mean Britain might actually experience cooler summers. Global average surface temperatures rose rapidly in the last decades of the twentieth century but have been relatively flat since 1998, prompting claims from climate sceptics that global warming is no longer happening. (...) Scientists say heat has been being **absorbed** in the oceans and a series of small volcanic eruptions may

also have contributed to the slowdown in warming rates. *telegraph.co.uk* September 14, 2015 Monday World is warming again, says Met Office - but Britain could see cooler summers BYLINE: Emily Gosden

- 753- Oddly, the US space agency does not just focus on getting to space and beyond. It uses its network of satellites in Earth orbit to research and collect data on environmental and weather patterns. But climate change appears to be a complex issue. This video shows how around half of the carbon emitted is absorbed by the seas, trees and land, meaning they don't go on to affect the climate. But it questions if this will continue indefinitely or if they will breach **saturation point** with more going into the atmosphere. (...) Overall, the space agency's experts appear to agree that carbon emissions need to be cut or the planet temperatures will increase, sea levels will rise and we will face severe flooding and other consequences in future if action is not taken. (...) There were 14,491 votes cast in a number of questions, and 12,421 pledged their scepticism about climate change, with answers ranging from being undecided to firm denials global warming is happening. *Express Online* November 30, 2015 Monday WATCH: Is climate change real? NASA gives verdict on global warming before Paris talks
- 754- Carbon dioxide emitted into the atmosphere by human activities influences the amount of the sun's energy **trapped** by Earth's atmosphere. *Express Online* November 16, 2015 Monday CLIMATE CHANGE: Land and sea remove HALF man-made carbon emissions but are they full?
- 755- This amount of warming is virtually **locked** in due to the current amount of greenhouse gas emissions. *The Guardian* February 3, 2015 Tuesday Barrier Reef coral genetically altered in hope of surviving climate change BYLINE: Oliver Milman
- 756- Almost 1C of warming is already **locked in**. To get to 1.5C most scientists think the world would have to suck back **greenhouse** emissions already in the atmosphere, using processes that remain uncertain. (...) A new agreement can promise financial help to poor countries to cope with **locked-in** climate change, it can put different expectations of the extent of emission reductions different countries can deliver, and it can recognise that many of them just aren't able to do comprehensive emission calculations. *The Guardian* December 13, 2015 Sunday Paris climate deal might just be enough to start turning the tide on global warming BYLINE: Lenore Taylor
- 757- Ban (Ki Moon) set out the elements of a strong Paris agreement, most of them still hotly disputed in the draft text before negotiators. He said the agreement must contain a goal to limit temperature rise to less than 2 degrees, because for many states even 1.5 degrees of warming would have "grave consequences"; and include regular reviews, starting before 2020, so that countries could strengthen their national commitments "according to what the science tells us". It also had to include a single framework for measuring, monitoring and reporting how countries are meeting their emission reduction promises, and clear commitments from developed countries on financing poor countries' efforts to reduce emissions and adapt to already **locked-in** warming. (...) Countries like the United States and Australia say the categorisation of countries has changed dramatically over the past 23 years and the Paris agreement must include the expectation that all nations work towards the same rules for monitoring and reviewing their emissions reductions. *The Guardian* December 7, 2015 Monday Julie Bishop says Australia will reward 'innovation' to tackle climate change BYLINE: Lenore Taylor
- 758- No part of the deal has been finalised because in the end it is likely to be a tradeoff between developing countries' demands - particularly for financing to help cope with the impacts of **locked-in** climate change - and wealthier nations' insistence that over time all countries properly account for the progress they have made towards emission reduction goals. *The Guardian* December 6, 2015 Sunday Paris climate change talks yield first draft amid air of optimism BYLINE: Lenore Taylor and Suzanne Goldenberg
- 759- Hunt (Australian Minister of Health) also released Australia's plan to cope with **already-locked-in** climate change at the Paris summit - a compilation of existing efforts and policies including mapping Australia's coastline to help state governments plan for future flooding, planning guidelines and CSIRO research for housing in areas subject to more intensive cyclones. The Abbott government

defunded the Howard government's \$50m national climate change adaptation research facility before restoring \$9m over three years. The lion's share of that funding will go to the coastal mapping database. *The Guardian* December 3, 2015 Thursday Australia acting as a 'broker' between blocs at Paris climate talks BYLINE: Lenore Taylor (my addition in parenthesis)

- 760- Methane is 28 times more efficient at **trapping** the sun's heat. (...) But industrialisation and a surging human population have upset a long-standing natural balance, leaving an excess of both **heat-trapping** gases in the atmosphere. (...) Methane is very efficient at **trapping** heat in the atmosphere. *MailOnline* December 12, 2016 Monday Cows and rice paddies are boosting methane levels BYLINE: AFP and LIBBY PLUMMER
- 761- Climate scientists argue that increased carbon dioxide in the atmosphere **traps heat** radiating from earth, creating global warming. Australia is one of the largest carbon emitters per capita because of its reliance on coal-fired power plants for electricity. *mirror.co.uk* November 29, 2016 Tuesday Great Barrier Reef suffers biggest ever coral die-off - and scientists think global warming is to blame
- 762- About 21 percent of the accord's expected reductions in **heat-trapping gases** through 2030 were to come from the United States, according to Drew Jones, co-director of Climate Interactive , a group of researchers who model climate emissions and temperatures. Trump has called for stripping regulations to allow unfettered production of coal, oil and natural gas - a key source of emissions - and rescinding the Clean Power Plan , an Obama administration strategy to fight climate change. *MailOnline* November 9, 2016 Wednesday Will Donald Trump pull America out of climate change deals?
- 763- Using observations, statistics and 30 different computer models, the study authors show **heat-trapping gases** cause warming and the melting of sea ice in a way that can be translated into a simple mathematical formula. *MailOnline* November 3, 2016 Thursday Driving 90 miles melts a square foot of Arctic sea ice: Researchers link human actions to climate change in sobering study
- 764- Scientists say the **buildup** of CO2 and other **greenhouse gases** is raising temperatures by **trapping** heat in the atmosphere. As a result, glaciers and ice sheets are melting, sea levels are rising and many parts of the world are experiencing more intense heat waves and droughts. The 2-degree target was established as a threshold to avoid the worst impacts of climate change. But the Paris deal also set an aspirational goal of limiting warming to 1.5 degrees C (2.7 degrees F), a demand from the most vulnerable countries, such as low-lying island nations that may not survive the sea-level rise associated with 2 degrees of warming. *MailOnline* November 3, 2016 Thursday Climate change crisis as UN warns 'huge' emissions cuts are still needed to meet Paris Agreement goals
- 765- Six scientists who were leaders in past international climate conferences joined with the Universal Ecological Fund in Argentina to release a brief report Thursday, saying that if even more cuts in **heat-trapping** gases aren't agreed upon soon, the world will warm by another 1.8 degrees Fahrenheit (1 degree Celsius) by around 2050. (...) If carbon pollution continues with just the emission cuts pledged in Paris, Earth will likely hit the danger mark by 2050, Watson and colleagues calculated, echoing what other researchers have found. They said with just a few more cuts, the danger level might be delayed by 20 years. In Paris, the countries also added a secondary tougher goal of limiting warming to just another 0.9 degrees Fahrenheit (half a degree Celsius) as an aspiration. *MailOnline* September 29, 2016 Thursday Global warming will hit 'critical' levels in just 35 years, scientists warn as they hit out at politicians celebrating Paris agreement
- 766- In the course of a 17-year experiment on more than 1 million plants, scientists put future global warming to a real-world test - growing California flowers and grasslands with extra heat, carbon dioxide and nitrogen to mimic a not-so-distant, hotter future. The results, simulating a post-2050 world, aren't pretty. And they contradict those who insist that because plants like carbon dioxide - the main **heat-trapping** gas spewed by the burning of fossil fuels - climate change isn't so bad, and will result in a greener Earth. *MailOnline* September 5, 2016 Monday Chilling results from 17 year million plant global warming study finds 2050 predictions for Earth will make the planet far less green

- 767- Methane is very efficient at **trapping** heat in the atmosphere. *MailOnline* September 1, 2016 Thursday California to crack down on methane emissions in landmark climate change deal
- 768- In 1997, then-Vice President Gore helped broker an international treaty, the Kyoto Protocol, to reduce **heat-trapping** gases from the burning of coal, oil and gas. The U.S. later withdrew from the treaty. *MailOnline* August 15, 2016 Monday DIVIDED AMERICA: Global warming polarizes more than abortion
- 769- Since 1950 more than 90% of the excess heat our carbon emissions have **trapped** in the atmosphere has gone into the oceans. As a result their surface temperature has increased by 1C in just the past 35 years. *The Guardian* June 17, 2016 Friday The Great Barrier Reef: a catastrophe laid bare BYLINE: Michael Slezak
- 770- Knowing where the **extra heat trapped** by greenhouse gases goes, and identifying why the poles are warming at different rates, will help to better predict temperatures in the future. *MailOnline* May 30, 2016 Monday Is this why Antarctica isn't melting? BYLINE: SARAH GRIFFITHS
- 771- Methane is 25 times more powerful than carbon dioxide at **trapping heat** and a cow weighing 550kg is thought to produce 800 to 1,000 litres of emissions each day. The US Department of Agriculture estimates that, as of last summer, there were 98 million cattle in the US. *The Independent* May 20, 2016 Friday Feeding cows oregano can reduce methane and 'help fight climate change'; Researchers in Denmark believe they have found a simple solution BYLINE: Andrew Buncombe
- 772- Methane is 23 times more potent than carbon dioxide in **trapping** heat in the atmosphere and can be found in animal waste, landfills, coal mines and leaking natural gas pipes. *MailOnline* May 18, 2016 Wednesday Can OREGANO help solve climate change BYLINE: CHARLOTTE WORRALL
- 773- For simplicity, the study omitted discussing other major drivers and effects of climate change, including ocean acidification, **other greenhouse gases**, and mechanisms that cause warming to accelerate further. (...) Researchers warn that by burning fossil fuels at our current pace and releasing **heat-trapping** gasses, we will provoke an abrupt climate shift with 'highly undesirable consequences'. *MailOnline* March 22, 2016 Tuesday New York and London could be underwater within DECADES BYLINE: STACY LIBERATORE
- 774- NASA's chief climate scientist Gavin Schmidt usually discounts the importance of individual record hot months, but said this month was different, calling it 'obviously strange.' This was due to the long-term warming from **heat-trapping gases** and the powerful El Nino, so these types of records will continue for a few more months, but probably will not be a permanent situation, Schmidt said in an email. But other were not so sure, including Arndt, who compared it to moving into a new hotter neighborhood. *MailOnline* March 17, 2016 Thursday Experts warn we are in 'new era' of climate change as new figures show February smashed global temperature record by 'astronomical and strange' amount BYLINE: MARK PRIGG
- 775- Good attribution studies are based on what Titley calls a 'three-legged stool' of observational records of decades of past events, detailed understanding of the physics that cause the weird weather itself, and sophisticated computer models that simulate the chances of the extreme event if there were no **man-made, heat-trapping** gases warming the atmosphere. *MailOnline* March 11, 2016 Friday Extreme weather events CAN be blamed on climate change: Panel says there is 'high confidence' some extreme heat and cold events are manmade
- 776- But the atmosphere doesn't stop at the surface. In fact 93% of the extra energy **trapped** by the **greenhouse gases humans have emitted** gets sunk into the oceans - just 1% ends up in the atmosphere where temperature is most often and most thoroughly measured. *The Guardian* March 4, 2016 Friday Why is 2016 smashing heat records? BYLINE: Karl Mathiesen

- 777- Despite constantly rising **greenhouse gas emissions trapping** ever more heat on Earth, the last decade has seen relatively slow warming of air temperatures, dubbed a "pause" in climate change by some. In fact, global warming had not paused at all. Instead, natural climate cycles led to more of the **trapped** heat being stored in the oceans (which already absorbed most the heat), some of which El Niño is now releasing. Scientists usually assess changes in climate over decades, rather than years, and the each of the last four decades has been warmer than any decade on record before. *The Guardian* January 21, 2016 Thursday 2015 smashes record for hottest year BYLINE: Damian Carrington
- 778- The reduction in shrub height helps boost the amount of solar radiation **bouncing** back into space instead of it being **absorbed** into the earth. *telegraph.co.uk* December 22, 2016 Thursday How reindeer help protect the North Pole from climate change – study BYLINE: Mark Molloy, and PA
- 779- Deposits of soot - unburned carbon particles - have stained parts of the Arctic black, changing the ice from a reflector of sunlight to an **absorber** of heat, and accelerating the melting of ice and snow, which itself is starting to alter global weather patterns. *The Guardian* December 21, 2016 Wednesday Why cutting soot emissions is 'fastest solution' to slowing Arctic ice melt BYLINE: Fiona Harvey
- 780- Arctic snow and ice reflect heat back into space - the albedo effect. When there is less ice, less sunlight is reflected and the sea, newly exposed, **absorbs** more heat, which melts more ice, and so on in a cycle. *The Guardian* December 19, 2016 Monday The Guardian view on climate change action: don't delay; Arctic temperatures have been 20C above normal.
- 781- Those tipping points happen when a natural system undergoes quick or overwhelming change, leading to profound effects on nearby ecosystems that might never be reversed. (...) In the Arctic, they include growing vegetation on the tundra that stops reflective snow and ice and so **absorbs** more heat, and the release of methane from the Arctic as it warms. The report, compiled by 11 different organisations, includes a range of different calamitous events that are likely to be produced by the warming poles. (...) At this time of year, the Arctic ocean would be expected to start freezing up into sea ice again - usually a rapid process that sees thousands of square kilometres of exposed ocean ice over. But that it isn't happening. *The Independent* November 26, 2016 Saturday Melting Arctic sea ice 'could trigger irreversible climate change' BYLINE: ANDREW GRIFFIN
- 782- For instance, when sea ice shrinks it leaves areas of dark ocean that **absorb** more heat than the reflective ice, which in turn causes further shrinkage, and so on in a spiral. *The Guardian* November 25, 2016 Friday Arctic ice melt could trigger uncontrollable climate change at global level BYLINE: Fiona Harvey
- 783- Losing Arctic sea ice is a major problem because ice reflects 85 per cent of sunlight while open water reflects just seven per cent, meaning the rest is **absorbed** by the planet, which speeds up global warming. A massive melt of freshwater could also disrupt global ocean currents, and change weather systems. *The Daily Telegraph* October 8, 2016 Saturday The Arctic apocalypse that failed to arrive BYLINE: Sarah Knapton
- 784- The world's waters have **absorbed** more than 93 per cent of the enhanced heating from climate change since the 1970s, curbing the heat felt on land but drastically altering the rhythm of life in the ocean. *MailOnline* September 5, 2016 Monday Global warming is making the oceans SICK - and it is causing increased disease in humans, animals and plants BYLINE: SHIVALI BEST
- 785- So if you replace ice with water, which is darker, much more solar heat will be **absorbed** by the ocean and the planet will heat up even more rapidly than it is doing at present. *The Observer* August 21, 2016 Sunday 'Next year or the year after, the Arctic will be free of ice' BYLINE: Robin McKie
- 786- Even if emissions from human activities are cut, those from melting ice sheets will increase while the darker surfaces exposed will **absorb** more heat. *The Guardian* August 5, 2016 Friday Our collective amnesia on climate change

- 787- By contrast, Qatar, Australia and the US use more than four times the resources and waste that the planet can regenerate and **absorb** in the atmosphere. In the long term this means depleted groundwater, deforestation, collapsed fisheries and the accumulation of carbon dioxide emissions in the atmosphere. *The Guardian* June 15, 2016 Wednesday Five charts that explain who gets hit hardest by food price rises BYLINE: Tom Levitt
- 788- Where clouds are absent, darker surfaces like the ocean or vegetated land **absorb** heat, but where clouds occur their white tops reflect incoming sunlight away, which can cause a cooling effect on Earth's surface. (...) The high altitude clouds clear to reveal dark ocean below - which **absorbs** incoming sunlight and causes a warming effect. *MailOnline* May 6, 2016 Friday Global warming is pushing high altitude clouds towards the poles, Nasa study finds BYLINE: MARK PRIGG
- 789- Heat records this month included 10 consecutive days above 30C for Canberra and Melbourne's hottest March night on record at 38.6C. Brisbane researchers this month predicted the world economy was on track to produce enough carbon emissions by 2020 to lock in a 1.5C rise above pre-industrial levels, and enough by 2030 to **lock** in a 2C rise. *The Guardian* May 18, 2016 Wednesday Australian Climate Council calls for urgent action as records tumble BYLINE: Joshua Robertson
- 790- The latest climate science has told us exactly how much fossil fuels we can burn before we **lock** in catastrophic warming-warming that will make today's mega-fire look modest. But companies have access to four or five times that amount in their reserves. They plan to extract and burn it all. *The Guardian* May 13, 2016 Friday The arsonists of Fort McMurray have a name BYLINE: Martin Lukacs
- 791- No one will deny the urgency. Roads and bridges are crumbling and congested with traffic. Subways are overcrowded and underfunded. We need a roll-out of emissions-reducing initiatives to avert catastrophic climate change, and a build-up of defences to protect ourselves from floods and fires already **locked** in. *The Guardian* November 22, 2016 Tuesday Justin Trudeau's giant corporate giveaway BYLINE: Martin Lukacs
- 792- Brodie and his colleague Richard Pearson analysed all the current management plans, evaluated their impacts and developed an estimate of what would be needed to give the reef a fighting chance against already **locked-in** climate change. (...) Several water quality improvement plans have been created over the past couple of years. They involve input from agricultural scientists, reef ecologists, economists and social scientists. (...) Stronger regulation was also needed, with powers available under the federal Environment Protection and Biodiversity Conservation Act and the Great Barrier Reef Marine Park Act being used to stop activities on land that are polluting the water. *The Guardian* May 19, 2016 Thursday Great Barrier Reef needs \$10bn for chance of survival, scientists say BYLINE: Michael Slezak
- 793- Ban (Ki Moon) set out the elements of a strong Paris agreement, most of them still hotly disputed in the draft text before negotiators. He said the agreement must contain a goal to limit temperature rise to less than 2 degrees, because for many states even 1.5 degrees of warming would have "grave consequences"; and include regular reviews, starting before 2020, so that countries could strengthen their national commitments "according to what the science tells us". It also had to include a single framework for measuring, monitoring and reporting how countries are meeting their emission reduction promises, and clear commitments from developed countries on financing poor countries' efforts to reduce emissions and adapt to already **locked-in** warming. (...) Countries like the United States and Australia say the categorisation of countries has changed dramatically over the past 23 years and the Paris agreement must include the expectation that all nations work towards the same rules for monitoring and reviewing their emissions reductions. *The Guardian* May 18, 2016 Wednesday Julie Bishop says Australia will reward 'innovation' to tackle climate change; Foreign minister cites Malcolm Turnbull's statement on Monday as evidence of Australia's intent at start of high-level negotiations at climate talks in Paris BYLINE: Lenore Taylor (my addition in parenthesis)

- 794- But the **greenhouse gas** reduction promises made by 187 countries in Paris - even if they are kept (and that's a very big if) would result in warming of between 2.7 and 3.5C. Almost 1C of warming is already **locked in**. To get to 1.5C most scientists think the world would have to **suck back greenhouse** emissions already in the atmosphere, using processes that remain uncertain. (...) A new agreement can promise financial help to poor countries to cope with **locked-in** climate change, it can put different expectations of the extent of emission reductions different countries can deliver, and it can recognise that many of them just aren't able to do comprehensive emission calculations. *The Guardian* May 18, 2016 Wednesday Paris climate deal might just be enough to start turning the tide on global warming BYLINE: Lenore Taylor
- 795- Experts generally prefer the term "climate change" to "global warming" because the effects of humans emitting **heat-trapping** greenhouse gases are more likely to manifest as extreme weather events rather than temperature increases alone. *The Independent* December 29, 2017 Friday Donald Trump says US needs 'good old global warming' to cope with snow burying east coast; President has long cast doubt on climate change BYLINE: Jeremy B White
- 796- Last year was the warmest since records began in the 19th century, as global average temperatures continued a rise dating back decades that leading climate scientists attribute to **man-made greenhouse gas emissions that trap heat** in the atmosphere. *The Independent* December 25, 2017 Monday Trump withdraws US from Paris Agreement in blow for global climate change fight BYLINE: MYTHILI SAMPATHKUMAR AND ALEXANDRA WILTS
- 797- Most heat **trapped** by greenhouse gases in the atmosphere gets **absorbed** by oceans, and this trapped energy is what fuels hurricanes. *The Independent* December 13, 2017 Wednesday Hurricane Harvey's rainfall made three times more likely by global warming, say scientists BYLINE: Josh Gabbatiss
- 798- Pope Francis has denounced "short-sighted human activity" for causing global warming and rising sea levels, and urged world leaders at climate talks in Germany to act in tackling **heat-trapping** emissions. (...) World leaders are meeting in Bonn in the first major conference on climate change since US president Donald Trump announced the US withdrawal from the Paris climate accord. *The Independent* November 13, 2017 Monday Pope decries 'exploitation of natural resources', as UN meets on climate change BYLINE: JEFF FARRELL
- 799- Furthermore, other **heat-trapping** greenhouse gases, mainly methane from cattle and leaks from oil and gas exploration, are still rising and went up by 1% in 2016. (...) However, over a quarter of the warming effect seen by the world comes from non-CO2 **greenhouse gases**, with methane by far the most significant. *The Guardian* September 28, 2017 Thursday Global carbon emissions stood still in 2016, offering climate hope BYLINE: Damian Carrington
- 800- However, increasing air temperatures only account for about 3% of the **heat trapped by greenhouse gases**. *The Guardian* September 18, 2017 Monday Ambitious 1.5C Paris climate target is still possible, new analysis shows BYLINE: Damian Carrington
- 801- Pope Francis has sharply criticised climate change doubters, saying history will judge those who failed to take action. Francis was asked about climate change and the spate of hurricanes, including Irma, have pummelled the US, Mexico and the Caribbean recent days. He called on world leaders to take the necessary decisions to curb **heat-trapping** emissions blamed for the warming of the Earth. (...) The Paris accord, agreed on by nearly 200 countries, aims to cut emissions blamed for global warming. The United States committed to reducing its own by 26 to 28 per cent, compared with 2005 levels, by 2025. US President Donald Trump withdrew from the Paris agreement shortly after visiting the Vatican in May. *MailOnline* September 11, 2017 Monday Pope blasts climate change doubters and calls on world leaders to take action in the wake of the devastation caused by hurricane Irma BYLINE: TIM COLLINS, REUTERS and AP

- 802- US agriculture is a major source of **heat-trapping** gases, with 15% of the country's emissions deriving from farming practices. *The Guardian* August 7, 2017 Monday USDA has begun censoring use of the term 'climate change', emails reveal BYLINE: Oliver Milman
- 803- Carbon dioxide is a byproduct of fossil-fuel burning that helps **trap heat** around the Earth. *MailOnline* August 2, 2017 Wednesday Global warming may result in the early death of 150 MILLION people globally by 2050 due to loss of protein in crops like rice and wheat BYLINE: AFP and TIM COLLINS
- 804- Should little be done to constrain **heat-trapping** gases, temperatures could increase by up to 10F (5C) by the end of the century. (...) Climate change is likely to worsen existing inequalities in the US, with the poorest areas of the country poised to lose as much as 20% of their income by the end of the century if **greenhouse gases** are not significantly reduced. *The Guardian* June 29, 2017 Thursday Climate change set to worsen inequality in US if **greenhouse gases** aren't reduced BYLINE: Oliver Milman
- 805- The study, published Thursday in the journal *Science*, calculates probable economic harms and benefits for the more than 3,100 counties in the United States under different possible scenarios for worldwide emissions of **heat-trapping** gases. (...) The county hit hardest if **greenhouse gas** emissions continue unabated is tiny and impoverished Union County in Florida, where median income would take a 28 percent hit. *MailOnline* June 29, 2017 Thursday America's south to be 'hammered' by climate change
- 806- When the Paris pact was being negotiated in 2015, small island nations successfully campaigned for a stricter but secondary target for limiting global **heat-trapping** emissions. *MailOnline* June 22, 2017 Thursday Donald Trump's controversial climate change decision has doomed small islands around the world, experts warn
- 807- And that damage will come sooner rather than later if the US backs out of the Paris deal curb emissions of the **heat-trapping** gases that cause climate change. *MailOnline* June 8, 2017 Thursday Donald Trump's decision to pull out of climate change agreement puts many of his properties
- 808- The "urban heat island" effect is caused by replacing plants and other natural features with **heat-trapping** concrete and asphalt and by the impact of heat from sources such as cars and air conditioning units. (...) But local efforts to reduce temperatures, such as switching to "cool" pavements and roofs which reflect the sun and **absorb** less heat, could have significant benefits for cities. *i-Independent* May 30, 2017 Cities at greater risk from climate change due to 'heat island' effects; ENVIRONMENT BYLINE: Emily Beament
- 809- The world has already warmed by just over half that amount - with about one-fifth of the past **heat-trapping** carbon dioxide emissions coming from the United States, usually from the burning of coal, oil and gas. *The Independent* May 27, 2017 Saturday Scientists explain what will happen if Donald Trump pulls out of Paris climate change agreement BYLINE: Seth Borenstein
- 810- The meeting is due to set targets to reduce black carbon in the Arctic, a pollutant that **traps** atmospheric heat, but comes amid fears the US is poised to downgrade its commitments made at the 2015 Paris conference on climate change. *The Guardian* May 11, 2017 Thursday Finland voices concern over US and Russian climate change doubters BYLINE: Patrick Wintour
- 811- Scientists have warned that nations face a shrinking window of time in which to cut **heat-trapping** emissions to avoid further warming beyond 2C that would cause severe sea level rise, heatwaves, spread of disease and the potential mass displacement of people. (...) The unusually public internal debate over the future of the deal has shown deep divisions within Trump's administration as to whether to ditch the pact, which was struck in 2015 when nearly 200 nations agreed to curb their **greenhouse gas** emissions to avoid dangerous climate change. *The Guardian* May 9, 2017 Tuesday Donald Trump's closest advisers clash over fate of Paris climate deal BYLINE: Oliver Milman

- 812- Under the agreement, the US pledged to reduce its annual **greenhouse gas** emissions in 2025 by 26 to 28 per cent below 2005 levels, which would be a reduction of about 1.6 billion tons of annual emissions. Besides continuing Mr Obama's efforts to reduce US **heat-trapping** gases, Mr Trump has two general options. *The Independent* April 18, 2017 Tuesday Donald Trump in talks about keeping the US in Paris climate change deal BYLINE: Jill Colvin, Seth Borenstein
- 813- Rising **greenhouse gases** in the atmosphere have long been expected to **lead to increasing extreme weather events**, as they **trap** extra energy in the atmosphere. But linking global warming to particular events is difficult because the climate is naturally variable. *The Guardian* March 27, 2017 Monday Climate change: 'human fingerprint' found on global extreme weather BYLINE: Damian Carrington
- 814- Climate scientists have been forecasting just such an increase in bad weather driven by the rising global temperature, with a huge amount of extra energy now being **trapped** in the atmosphere as a result the greenhouse gases humans pumped into the atmosphere. (...) The election of Mr Trump - who has appointed a string of climate science deniers to key positions in his administration, such as Scott Pruitt, the head of the Environmental Protection Agency - has given new currency to so-called sceptics the world over. This was a major theme of the American Association for the Advancement of Science's annual meeting in Boston last month, and a March for Science and a Climate March are planned in Washington DC and other major cities around the world next month. *The Independent* March 21, 2017 Tuesday Last year's weather proves climate change is real with 'no room for doubt', say scientists BYLINE: Ian Johnston
- 815- Last week, Pruitt said he does not believe carbon dioxide is "a primary contributor to the global warming that we see", even though Nasa and the EPA itself agree it is. Scientists have known since the mid-19th century that carbon dioxide **traps heat** and that the oceans and gases in regulate the Earth's atmosphere. *The Guardian* March 19, 2017 Sunday Trump administration's 'anti-scientific statements' alarm ex-energy secretary BYLINE: Alan Yuhas
- 816- Scott Pruitt does not mention climate change in first EPA speech. Mr Pruitt, who was picked by Donald Trump for the role, recently said that he does not believe carbon dioxide is a primary contributor to global warming. (...) Major scientific bodies around the world agree unanimously that rising levels of carbon dioxide and other **greenhouse gases** have been adding to the atmosphere's ability to **trap** heat -the main driver behind global warming. *The Independent* March 10, 2017 Friday Bernie Sanders calls Donald Trump's new EPA chief 'pathetic' for climate change stance BYLINE: Chantal Da Silva
- 817- Pruitt said on Thursday that he did not believe that the release of CO₂, a **heat-trapping** gas, was pushing global temperatures upwards. (...) Scientists have understood for more than a century that CO₂ **traps** heat. Atmospheric concentrations of the gas have increased by more than a third since the industrial revolution, driven by the burning of fossil fuels and deforestation. *The Guardian* March 9, 2017 Thursday EPA head Scott Pruitt denies that carbon dioxide causes global warming BYLINE: Oliver Milman
- 818- While the biggest input to the Earth's temperature is obviously the sun, rising levels of carbon dioxide and other **greenhouse** gases have been increasing the atmosphere's ability to **trap** its heat and this is the main reason why temperatures have risen by about one degree Celsius since the late 19th century. *The Independent* March 9, 2017 Thursday Donald Trump's most senior climate change official says humans are not primary cause of global warming BYLINE: Ian Johnston
- 819- The penguins have learned to look for places with lower sea temperatures and large amounts of a type of chlorophyll. These are telltale signs of plankton and, in turn, the fish that feed on them. These once sure-fire ways to find large shoals are now leading the penguins into an "**ecological trap**" that is pushing them closer to extinction. *i-Independent* February 10, 2017 Climate change puts penguins off their fish BYLINE: Ian Johnston

- 820- These once sure-fire ways to find large shoals are now leading the penguins into an "**ecological trap**" that is pushing them closer to extinction. *The Independent* February 9, 2017 Thursday Endangered penguins hunting for fish in wrong place after climate change creates '**ecological trap**'; Global warming is having different effects on different animals and plants so the tell-tales signs used by African penguins to find their prey no longer point in the right direction
BYLINE: Ian Johnston
- 821- But over-exploitation of fishing stocks, warming seas and changing salinity now lead the young birds into an '**ecological trap**', forcing them to search in the wrong places to find food. *MailOnline* February 9, 2017 Thursday Time is almost up for the African penguin
BYLINE: TIM COLLINS
- 822- As fast as the trees go, the chance of slowing or reversing climate change becomes slimmer. Tropical deforestation causes carbon dioxide, the main **greenhouse gas**, to linger in the atmosphere and **trap** solar radiation. This raises temperatures and leads to climate change: deforestation in Latin America, Asia and Africa can affect rainfall and weather everywhere from the US Midwest, to Europe and China. *The Guardian* January 23, 2017 Monday We are destroying rainforests so quickly they may be gone in 100 years
BYLINE: John Vidal
- 823- In fact, our planet's atmosphere is in relative terms no thicker than **the skin on an apple** and into that fragile envelope we are **loading** more and more **heat-trapping** gases. *MailOnline* January 21, 2017 Saturday HRH the Climate Change avenger
BYLINE: SIMON WALTERS
- 824- The eruptions heaved 'huge clouds' of ash into the sky, and when the ash fell on the ice sheet, its darker colour made the ice **absorb** more solar heat than usual. *MailOnline* October 24, 2017 Tuesday A new threat to global warming? Ice sheets could melt as a result of volcanic eruptions THOUSANDS of miles away, scientists claim
BYLINE: PHOEBE WESTON
- 825- That model, mustered up by Swedish scientist Svante Arrhenius who is considered one of the godfathers of physical chemistry, claimed carbon dioxide **absorbs** infrared radiation. (...) While the fact that carbon dioxide **absorbs** infrared radiation is not disputed, what Dr Maloney and co argue is that it is not correlated correctly to a heating globe. (...) The scientists says [sic] global warming is a natural phenomenon which heats the globe in cycles - much like how Ice Ages have cooled Earth throughout history. (...) However, Nasa, for one, has repeatedly stated that global warming is a result of human activity, saying that there is a "95 per cent probability" that it is caused by man. *Express Online* August 25, 2017 Friday Climate Change - the REAL inconvenient truth: Scientist claims global warming is NATURAL
BYLINE: Sean Martin
- 826- Less sea ice coverage also means that less sunlight will be reflected off the surface of the ocean. The water will **absorb** more heat, further fueling global warming. *MailOnline* August 14, 2017 Monday Scientists launch 6,200-mile journey through the Arctic to uncover the effects of global warming
- 827- Dark roofs and dark pavements both contribute to global warming by **absorbing** large amounts of solar energy stored in sunlight, then radiating the energy back into the atmosphere in the form of heat. *MailOnline* August 11, 2017 Friday Could PAINT be the answer to global warming?
BYLINE: HANNAH PARRY
- 828- Because ice is white, it reflects much of the sun's energy, but dark algae **absorb** the heat, increasing the rate of melting *The Independent* July 25, 2017 Tuesday Climate change scientists 'very worried' Greenland ice sheet might start to melt 'faster and faster'
BYLINE: Ian Johnston
- 829- The heat-island phenomenon comes about as plants and bodies of water give way to concrete and asphalt, which can **absorb** and conduct much more thermal energy. (...) Crowded cities could be affected twice as badly as their surroundings by climate change because of the "urban heat island" effect that **traps** warmth. *The Times* May 30, 2017 Tuesday Climate change will hit big cities twice as hard, say scientists
BYLINE: Oliver Moody

- 830- The urban heat island effect is caused largely because concrete, stone and road surfaces tend to **absorb** considerable amounts of energy from the sun. It enables olives to be grown next to a south-facing stone wall as far north as Aberdeen. *The Independent* May 29, 2017 Monday Urban 'heat island' effect could intensify climate change, making cities up to 7C warmer BYLINE: Ian Johnston
- 831- More heat has been **absorbed** by the oceans over the past 50 years than experts previously thought. *MailOnline* May 24, 2017 Wednesday The chilling climate change map of the ocean that reveals how animals are being forced to move to cooler regions BYLINE: CHEYENNE MACDONALD
- 832- The story began nearly 150 years ago when Irish physicist John Tyndall discovered 'carbonic acid' - today known as carbon dioxide - was one of a number of "perfectly colourless and invisible gases and vapours" to **absorb** radiant heat. *The Independent* May 4, 2017 Thursday Is climate change real, and is the world actually getting warmer? BYLINE: Ian Johnston
- 833- This has created a cycle of increased ice melting and further warming as sunlight that would once have been reflected back into space is now **absorbed** by dark ocean water. *i-Independent* April 15, 2017 Under siege, the world's last great wilderness BYLINE: Tom Bawden
- 834- Coral bleaching is caused by rising water temperatures resulting from two natural warm currents. It is made worse by man-made climate change, as the oceans have to **absorb** about 93% of the increase in the Earth's heat. *mirror.co.uk* April 10, 2017 Monday Two-thirds of the Great Barrier Reef has been damaged by coral bleaching - with warm oceans to blame; Coral bleaching is caused by rising water temperatures and is made worse by man-made climate change, as the oceans have to **absorb** about 93% of the increase in the Earth's heat BYLINE: Stephen White
- 835- Megacities are believed to experience deadly heat waves because of the **heat-absorbing** asphalt and concrete and the millions of people that call those places home, explained Dr. Georges Benjamin, director of the American Public Health Association. (...) Nearly 200 nations adopted the global pact, calling on the world to collectively cut and then eliminate **greenhouse gas pollution** - but imposing no sanctions on countries that don't. *MailOnline* March 28, 2017 Tuesday More DEADLY heat is on its way BYLINE: STACY LIBERATORE
- 836- In the recently released US Global Change Research Program Report, one of the chapters I was most interested in was about the changes we've observed in the world's oceans. The oceans are really the key to the climate change issue, whether that be in quantifying how fast it's happening or how much will happen in the future. As **humans emit greenhouse gases** (particularly carbon dioxide), we see some major changes that **cannot be explained naturally**. *The Guardian*. December 26, 2017. US government climate report looks at how the oceans are buffering climate change Byline: John Abraham
- 837- Speaking to *The Independent*, Dr Schmidt said discussions about annual changes in temperature before the record warmth of the past three years had been exploited by some in a reference to those known as "sceptics" or "deniers". (...) While he said the recent high temperatures were equally likely to be statistical noise, studies of how much extra energy is being **absorbed** by the atmosphere and particularly the oceans suggest global warming is going to gather pace over the next 20 years or so. *The Independent* January 21, 2017 Saturday Global warming never 'paused' and could soon accelerate, Nasa warns BYLINE: IAN JOHNSTON
- 838- For example, the melting of ice to reveal darker land or water means more of the sun's energy is **absorbed** as heat. Melting ice is also releasing **trapped greenhouse gases** like methane from the Arctic tundra. *The Independent* January 10, 2017 Tuesday Global warming leads to wildfire 'death spiral' in alpine areas, say scientists BYLINE: IAN JOHNSTON

- 839- 1860: Irish physicist John Tyndall measures the **absorption** of heat or "infrared radiation" by **greenhouse gases** including carbon dioxide, methane and nitrous oxide in his laboratory in London. *The Sun* November 8, 2017 Wednesday Thirst world problems
- 840- The study, published in the journal *Science*, is the latest to suggest that huge amounts of heat are being **absorbed** by the deep ocean. A previous study, for instance, found that changes to the cold Pacific current, called La Niña, may have resulted in the **absorption** of excess heat from the atmosphere. *The Independent* November 1, 2013 Friday Pacific depths warming at fastest rate in 10,000 years BYLINE: STEVE CONNOR
- 841- But the meeting of the Intergovernmental Panel on Climate Change has been seized on by climate sceptics, who argue that the effects of greenhouse gases will be small and felt long into the future. An estimate that 97% of the effects of carbon dioxide so far have been absorbed by the oceans has led some sceptics to claim that further warming could be similarly absorbed. Scientists contest this view, saying that research shows that the extra warming will alter the world's climate systems, and the **absorption** of heat by the oceans has serious effects, including sea level rises. The effects of the warming on ocean currents, and thus global weather systems that depend on them, could also cause rapid changes to weather. *The Guardian* September 25, 2013 Wednesday Climate change sceptics are unscientific, says Stern BYLINE: Fiona Harvey
- 842- Global warming has increased five-fold the probabilities that Australians will **bake** in record hot summers, according to new research from the University of Melbourne. (...) Australians are used to summer heat, drought and periodic bush fires as part of the continent's natural cycle, and these are often linked to a Pacific Ocean temperature phenomenon known as El Niño, dubbed "the Child" in Peru because it tends to occur around Christmas time. But there was no El Niño: if anything, the ocean heat was turned down a little in a counter phenomenon called La Niña. So the extreme heat, catastrophic flooding and devastating bushfires early this year - the southern hemisphere summer - were certainly not expected. *Guardian.com*. July 8, 2013 Monday Australian heatwaves 'five times more likely due to global warming' BYLINE: Tim Radford
- 843- Being in this 'Goldilocks' zone has allowed oceans to develop in temperatures neither too hot to **boil** the water away, or too cold to freeze it into permanent ice. *MailOnline* September 19, 2013 Thursday Global warming will end life on earth (but don't panic, you've got 3.5bn years left!) BYLINE: FIONA MACRAE
- 844- A runaway greenhouse Armageddon in which the oceans **boil** dry could theoretically happen on Earth, researchers claim. The good news is that human activity on its own will probably not be enough to trigger such an end-of-the-world scenario in the near future. Previously it was thought more energy from the sun would be needed for global warming on Earth truly to spin out of control. But new calculations from Canadian and US scientists show that catastrophic warming can occur more easily than had been assumed. For a planet receiving the same amount of solar radiation as the Earth, a runaway greenhouse effect is a realistic possibility. *Independent.co.uk* July 29, 2013 Monday Global-warming Armageddon? BYLINE: John von Radowitz
- 845- The impact of flooding is expected to quadruple - while **boiling** hot summers will increase 10-fold. *Independent.co.uk* November 27, 2014 Thursday Climate change: Global weather predicted to become increasingly extreme despite warnings BYLINE: Rose Troup Buchanan
- 846- It's time to crack out the barbecue as Britain prepares to **bake** in record-breaking heatwaves thanks to climate change, scientists claim. Last year was the hottest since records began for central England and new research predicts the country is going to get even warmer. A study found that there was 'significant and substantial increase' in the likelihood that the UK will experience another record-breaking year because of man-made climate change. *MailOnline* May 1, 2015 Friday Brace yourself for heatwaves: Man-made climate change will lead to more record-breaking temperatures across Europe BYLINE: HANNAH PARRY

- 847- In the broadest sense that's true. In two billion years the sun is due to heat up by 20 per cent, change the climate and **boil** the seas. But there is no respectable science to suggest that man made global warming will tip Earth into a climate tailspin that threatens the existence of humanity. *Express Online* January 26, 2015 Monday We're all doomed! Doomsday Clock put forward but is climate change REALLY a threat? BYLINE: Nigel Burke
- 848- As the temperature increases some people say **it will be like boiling a frog**, but surely in that analogy **the frog doesn't know that the temperature is rising**. Humanity is fully aware but possibly just too depressed to do anything. **It's more like boiling a recently divorced 45-year-old man**. There could be a plus side to the ice caps melting. Think of the interesting things you find when you just defrost your freezer; we could discover the first ever entirely breadcrumbed mammoth. (...) We imagine the Earth will sink gradually into chaos, but non-linear theories of global warming mean it might just be one afternoon of people screaming, then suddenly you disappear under a **boiling**, 100-mile-high wave of sewage flecked with famous landmarks from across the world; your mind finally silenced by the sudden arrival in the space previously occupied by your forehead of a shit-coloured Taj Mahal. *The Guardian* December 2, 2015 Wednesday We're going to help developing nations deal with drought by submerging them under the ocean BYLINE: Frankie Boyle
- 849- A heatwave in 2003, when France **baked** in record summer temperatures, caused alarm in the Champagne region as production fell by half because grapes dried up and lost acidity, an essential property for the wine to age properly and develop its aromas. *telegraph.co.uk* August 6, 2016 Saturday Climate change threatens champagne - but is a boost for English sparkling wine BYLINE: David Chazan
- 850- UK weather: Britain to **bake** in 3 MONTHS of sizzling sunshine in hottest summer for more than 100 years *mirror.co.uk* July 25, 2016 Monday 2016 on track to be hottest year on record - and experts say global warming is to blame
- 851- Scientists recently expressed alarm at the record heat that has **baked** the planet in the first few months of 2016, which follows a year that was the warmest on record. (...) Nevertheless, humanity is still pumping out CO₂ into the atmosphere at a rate 10 times faster than at any point in the past 66m years, with the resulting sea level rises, extreme weather events, coral bleaching and drought already evidenced around the globe. *The Guardian* March 22, 2016 Tuesday Climate guru James Hansen warns of much worse than expected sea level rise BYLINE: Oliver Milman
- 852- Hahahaha, here we go again. Listen, they're all "shocked" - what planet do these people live on?! You know there was ice on the bird bath again last night? In March! And now we're meant to panic because it's **boiling** in Australia. *The Guardian* March 26, 2016 Saturday Modern tribes: the climate change denier BYLINE: Catherine Bennett
- 853- One desperate intervention could be solar engineering, which is being studied by a team led by David Keith at Harvard University. The researchers are looking at how chemical compounds, such as limestone dust, can be dispersed in the atmosphere, thereby scattering sunlight and sparing an area below from its heat. (...) But if we continue to **cook** our planet then governments may have to turn to the likes of Keith to help avert the worst. *The Guardian* May 5, 2017 Friday Fake meat and clever concrete: the best US climate change innovations; Trump's climate plans have sparked anger and upset - but businesses are finding alternative solutions. BYLINE: Oliver Milman
- 854- Carbon dioxide essentially acts **like a giant transparent blanket** that allows sunlight though the atmosphere but then **traps** heat inside - hence the greenhouse analogy. (...) Some scientists have suggested taking drastic measures such as geo-engineering to counteract the **warming effects of greenhouse gases**. (...) Climate scientists believe that the deep ocean in the Pacific and Atlantic have started **absorbing far more heat** than had been anticipated and are **acting like giant storage heaters**. *telegraph.co.uk* September 27, 2013 Friday IPCC report: Sceptics guide to climate change; As the fifth major assessment of the scientific evidence underlying global warming is being published by the UN's Intergovernmental Panel on Climate Change, we examine some of the issues that will be of interest to global warming sceptics. BYLINE: Richard Gray

- 855- Thinning the highest layer of clouds, which otherwise **act as a blanket, retaining heat**. *telegraph.co.uk* November 26, 2014 Wednesday Six radical ways to tackle global warming; Reflecting the sun's rays could stop climate change - but with 'terrifying' consequences BYLINE: Emily Gosden
- 856- The long-held belief that carbon dioxide is **wrapping the planet in a 'blanket' that traps** more heat, causing global warming, is not quite right, scientists say. (...) A team from the University of Washington and the Massachusetts Institute of Technology (MIT) explained that broadly speaking, carbon dioxide being belched out by factories and vehicles acts as a **blanket, trapping long-wave infrared energy** coming off the Earth. (...) But the Earth gradually heats up **under this 'blanket'** and hotter objects emit more long-wave radiation, according to the Pnas study. (...) So within about a decade the effect of **adding the thicker 'blanket'** has been cancelled by the warmer body emitting more energy, the experts explained. (...) Experts say that in the long term, global warming is more **like tanning oil letting the Earth absorb** more of the sun's incoming rays. (...) In the longer term, the study and its computer models show that the Earth will begin to **absorb** more shortwave radiation - the high-energy rays coming directly from the sun. (...) The researchers warn that the planet is likely to have less ice and the air will become more humid under climate change, both of which will act to **absorb** more shortwave radiation from the sun. Those effects will be like putting **tanning oil** on the planet, letting it **absorb** more of the sun's incoming rays, they explained. Melting ice creates darker surfaces that can **absorb** more heat, and the more melting, the more heat it can **absorb**. Likewise, warmer air holds more water vapour, causing it to **absorb** solar radiation that might otherwise bounce back off clouds, ice or snow. *MailOnline* November 13, 2014 Thursday Global warming is not just a **'blanket' trapping heat** on Earth - it's more **like tanning oil**, scientists claim BYLINE: SARAH GRIFFITHS
- 857- Man-made carbon dioxide in the atmosphere forms a **blanket** around Earth, **trapping** heat and preventing it from escaping back into space, causing temperatures to rise. While this **blanket-effect** may cause a brief pause, global warming is expected to speed up because of the amount of carbon dioxide that has been emitted into the atmosphere, researchers warn. A team from the University of Washington and the Massachusetts Institute of Technology (MIT) explained that instead of carbon dioxide simply creating a **blanket** to slowly warm the planet, the story is more complicated - although the ending is the same. Carbon dioxide being belched out by factories and vehicles **acts as a blanket, trapping** long-wave infrared energy coming off the Earth. (...) But the Earth gradually heats up under this **'blanket'** and hotter objects emit more long-wave radiation, according to the Pnas study. (...) So within about a decade the effect of **adding the thicker 'blanket'** has been cancelled by **the warmer body** emitting more energy, the experts explained. *MailOnline* November 10, 2014 Monday Global warming will **SPEED UP** after a pause, scientists warn BYLINE: JONATHAN O'CALLAGHAN
- 858- Much of it is reflected back as infrared radiation, and a great deal is **absorbed** by greenhouse gases in the atmosphere - especially water vapour and carbon dioxide - heating the world further, as **under an aerial duvet**. Without this natural process, the earth would be 20C colder, and uninhabitable. Logically, increasing these gases - for instance, by emitting carbon dioxide - raises temperatures further, as if **adding a blanket to the duvet**. (...) The role of clouds, for example, is hotly debated. Broadly speaking, low clouds reflect more heat back into space than they **trap** while, with higher clouds, it is the other way round. (...) Meanwhile, rising temperatures increase the amount of warming water vapour in the atmosphere - while melting ice exposes darker land or water, which **absorbs** more heat. (...) Such "feedbacks" provide much of the interest in climate science and much of the grounds for debate. The basic physics of global warming are undisputed by any serious protagonist, on either side. Sunlight **passes through** the atmosphere, **like glass in a greenhouse**, warming the earth. *The Daily Telegraph* October 15, 2014 Wednesday We cannot rest on Mother Nature's laurels BYLINE: GEOFFREY LEAN
- 859- The gases, originating from industrial processes and the burning of fossil fuels, **blanket** the Earth. (...) **Greenhouse gases**, originating from industrial processes and the burning of fossil fuels, **blanket** the Earth. *MailOnline* September 4, 2014 Thursday Could this 'skin' stop global warming? BYLINE: VICTORIA WOOLLASTON

- 860- Each of the last ten years has been among the hottest on record. 2014 exceeded them all, and the changing **carbon content of the great blanket** we call the atmosphere is at the heart of this warming. Without carbon dioxide to **trap** heat, average temperatures would hover around minus 10C. *The Times* November 28, 2015 Saturday Climate Control; Paris will host a festival of good intentions and muddled thinking on climate change next week.
- 861- The aviation industry is a leading emitter of carbon dioxide - which acts **as a thermal blanket** for the Earth - and is now falling victim to the very climatic change it has helped create. *telegraph.co.uk* September 12, 2016 Monday Bad news for nervous fliers: climate change is making severe turbulence more common BYLINE: Gavin Haines
- 862- But on the other they (clouds) also act **like a blanket, trapping heat** and preventing it from radiating out into space. *The Independent* July 11, 2016 Monday Climate change causing clouds to rise higher in the sky and move towards poles BYLINE: Ian Johnston (my addition in parenthesis)
- 863- Clouds are believed to play a significant role in the Earth's climate as they can reflect sunlight. While they can also **act like a blanket**, keeping the planet warm, it is thought they have an overall cooling effect. Some scientists have even controversially suggested creating clouds artificially to help reduce global warming. *The Independent* May 16, 2016 Monday How the sea gets its smell - and why it's important BYLINE: Ian Johnston

NEW - FOOTPRINT scenario:

- 864- **The UK's total carbon footprint**, according to the Carbon Trust, is some 648m tonnes, with business responsible for approximately 40% of that. And it is costing companies dear: poor energy efficiency costs business an estimated £2bn annually. (...) So how helpful is carbon labelling for companies that want to measure and **reduce their carbon footprint?** (...) What the labels do not make explicit is that companies that use it must sign a "reduce it or lose it" clause: if they fail **to cut their carbon footprint** over two years, the Carbon Trust will withdraw the label. (...) Travel reduction plans for the whole Ikea group, its employees and customers are now being drawn up to help **reduce the company's carbon footprint**. *The Guardian* June 27, 2007 Wednesday Climate change: Challenging business: **Footprinting: A step in the right direction**: Interest in carbon labelling has grown since last month's energy white paper told large companies they will have to calculate and reduce their CO2 emissions. Tobias Webb looks at an inexact science BYLINE: Tobias Webb
- 865- The disagreement over exactly how to **measure the carbon footprint** of food has led to the Government stepping in. *The Sunday Telegraph* June 3, 2007 Sunday HOW THE CO2 EMISSIONS COMPARE: GREENER BY MILES BYLINE: RICHARD GRAY
- 866- No doubt the organisers have balanced **this trail of environmental footprints**, leading from Bangor, Barnstaple and elsewhere, with the compensatory, long-term benefits of having George Bush and his delegates at the Montreal climate talks appreciate that, instead of meeting separately in Bangor, Barnstaple, etc, **anti-climate change marchers** feel committed enough to get up early on Saturday and gather together in large numbers, in at least 24 different places in the world. *The Guardian* December 1, 2005 G2: Going on the climate change protest this Saturday is like marching for niceness - and just as ineffectual BYLINE: Catherine Bennett
- 867- Do you have to make sacrifices to do it? You have to write a cheque. You're a lot more conscious of the amount of trucks you use and the opportunities to do things better. We wrote a cheque, **we took care of our footprint** and raised awareness, blah blah blah, and I've bought a hybrid. *The Guardian* June 7, 2007 Thursday g2: Question time: Jon Bon Jovi in the 'cheeky' British media, the search for notoriety and the chequebook solution to global warming BYLINE: Hannah Pool
- 868- Already the rules for the new age are beginning to emerge. We are beginning to learn that we should **reduce our "carbon footprint"** - the amount of greenhouse gases we each produce - to tread

more lightly on the Earth. Companies are taking up "carbon trading". (...) The most sophisticated such system, "contraction and convergence", was dreamed up by a former London busker, Aubrey Meyer, who runs the Global Commons Institute. Under it everyone on Earth would be entitled **to the same carbon footprint**. (...) Those who want to **exceed this permitted footprint**, such as by driving more or flying frequently, would have to buy permits from those who live more modestly. *The Independent on Sunday* November 12, 2006 **Carbon footprints**; News analysis: CLIMATE CHANGE; In the future we may each have our own personal emissions allowance. BYLINE: Geoffrey Lean

869- Among the report's findings were that the 19 million people living in New York state have a bigger carbon footprint than the 766 million people living in the world's 50 poorest countries (...) If every person in the world **had the same carbon footprint** as someone living in a high-income country, there would need to be six planets to cope, the UN said, while bringing everybody up to the level of carbon emissions in the US and Canada would require nine planets. *The Guardian* November 28, 2007 Wednesday National: Climate change report: Findings: Crops hit, more water shortages, higher sea levels, bigger disease risk BYLINE: Larry Elliott and Ashley Seager

870- Are your students consistent? Do they think the environment is important and yet still drop litter? Do they understand how **big an "environmental footprint"** seemingly cheap foods such as burgers impose on the world? Help them to grasp this by calculating all the hidden resources that go into getting beef all the way from South America to the high street. (...) According to figures released by Encams, the organisation behind the scheme, UK schools' **overall environmental "footprint"** is quite staggering. *The Guardian* January 18, 2005 Education: Learn: Class eco-war: Climate change is a vast issue that can easily overwhelm students. BYLINE: Jerome Monahan

871- For the Turkana, however, whose **own carbon footprint is so small** as to be almost invisible, time has already run out. Among 2.4 million Kenyans in drought-struck areas desperately in need of food aid, this is a tribe pushed to the limits of human endurance. (...) **Our carbon footprint** in the West is enormous by comparison, yet it is the Turkana who are suffering the effects of climate change. *The Mirror* November 27, 2006 Monday 3 TO US, GLOBAL WARMING IS JUST A MILD WINTER AND BEING TOLD TO TAKE FEWER CHEAP FLIGHTS. BYLINE: ROS WYNNE-JONES

872- The French, 80 per cent nuclear, have **half the UK's carbon footprint**. *The Sunday Telegraph* November 12, 2006 Sunday WRONG PROBLEM, WRONG SOLUTION BYLINE: Christopher Monckton

873- According to the Carbon Trust, two thirds of UK consumers are likely to choose products with **a low carbon footprint**. More than half take environmental issues into account when buying consumer products. *The Daily Telegraph* November 6, 2006 Monday climate change Green is the new fashion statement for consumers BYLINE: Caroline Muspratt

874- A Giving List investigation of the world's 10 biggest corporations shows that only four of them have published strategies for **reducing their carbon footprints**. *The Guardian* November 6, 2006 Monday Financial: Climate change produces little shift in corporate attitudes BYLINE: Murray Armstrong

875- Although CCC's (Committee on Climate Change) focus is corporate, it is working on a project to help consumers to **shed a carbon footprint size or two**. *The Independent* November 4, 2006 Saturday Saving the planet all part of the job to green capitalist; A day in the life of ...; Mark Woodall Chief executive, Climate Change Capital BYLINE: SUSIE MESURE (my addition in parenthesis)

876- Last night, as part of moves to show it is taking action, the Government announced that 10 NHS trusts across the UK were preparing to **reduce their annual carbon footprint** by 15 per cent, or 40,000 tons of carbon dioxide emissions between them, after signing up to the new NHS Carbon Management Programme. *The Independent* October 31, 2006 Tuesday Brown seizes day to become minister for global warming BYLINE: Colin Brown

- 877- There must be generous grants for decentralised energy production (micro-generation). Local authorities should be given binding targets for **reducing their carbon footprint**. *The Independent* October 26, 2006 Thursday Climate change: Our green paper; Tony Blair says global warming is among the biggest threats of our age. But are his plans for a climate Bill ambitious enough?
- 878- On this measure, the United Arab Emirates is the world's most ecologically profligate part of the world, followed by the US. The countries with the **smallest ecological footprint** are Bangladesh, Somalia, Afghanistan and Malawi. North America has the highest per person ecological deficit, with the EU next. At the other extreme is Latin America. *The Guardian* October 25, 2006 Wednesday Science: Climate change: Resources: Collapse of ecosystems likely if plunder continues BYLINE: John Vidal
- 879- So the more that his (Sir Richard's, chairman of Virgin) airliners can **reduce their carbon footprint**, the less it will cost him. (...) But on top of this, sooner or later the aviation industry will introduce some form of carbon-trading emissions scheme. So the more that his airliners can **reduce their carbon footprint**, the less it will cost him. *The Independent* September 22, 2006 Friday Branson pledges \$3bn to combat global warming BYLINE: Michael Harrison (my addition in parenthesis)
- 880- Individual companies such as Wal-Mart are already discovering that the costs of **reducing their carbon footprint** are offset heavily by efficiency gains. *The Times* September 15, 2006, Friday When it comes to climate change, I'll take a small bet that Pascal was right BYLINE: Gerard Baker
- 881- Last month an environmental research firm called Trucost released **the first "carbon footprint" ranking** of a selection of 44 UK unit and investment trusts - enabling investors to compare funds on an environmental basis. By calculating the greenhouse gas emissions of all UK companies, Trucost is able to look at the various stocks held in a fund and then work out the carbon dioxide levels attributable to it. **The footprint of the fund is then expressed in terms of how much CO2** is emitted for each pounds 1m invested. Schroder UK Alpha Plus, for example, which is ranked 10th in the table, **has a carbon footprint of 889** - meaning it produces 889 tons of CO2 per million pounds invested. There are a number of important findings in Trucost's survey. First, there is a huge difference in the performance of the best and worst funds. Topping the table is Scottish Widows Investment Partnership UK & Income - Environmental Investor, **with a footprint of 337**. AXA's UK Equity Income fund languishes at the bottom of the table, **with a footprint of 1,719**. And although there are four socially responsible investment (SRI) funds in the top five, traditional "ethical" funds do not necessarily perform well. F&C Stewardship Growth, for example, comes **fifth with a carbon footprint of 694**, but another ethical fund from the same stable -F&C Stewardship Income - is 38th with **a footprint of 1,343**. "Investors should look at what their fund managers actually do with respect to the environment," says Mr Thomas - "not what they say." *The Independent on Sunday* July 30, 2006 For 'green' investors, this isn't a lovely way to burn BYLINE: Paula Hawkins
- 882- **The carbon "footprint" of an average American family** is shown as black blocks floating over their heads and expanding with the decisions they take. *The Sunday Times* May 21, 2006 It's serious - Attenborough says stop climate change BYLINE: Stuart Wavell
- 883- Global crisis reveals big cracks in policies. WITH the United Nations conference on climate change kicking off in Bali this week, the public sector is busy wondering what it can do to help to save the planet. BMJ (Dec 1) sets the tone, arguing that health professionals should lead the way in tackling the "potentially catastrophic" effects of climate change. They should set an example by **cutting their own carbon footprint** and that of their organisations, an editorial says. (...) Electricity monitoring devices will be fitted to homes and will help to reduce energy bills and **residents' carbon footprint**. *The Times* December 4, 2007, Tuesday Climate change
- 884- Fylde borough council is aiming to become the most energy-efficient borough in the country through its Fylde Low Waste and Energy initiative (Flowe) while Manchester is My Planet is helping

people throughout the city **to lower their carbon footprint** and their energy bills. *Guardian.com* November 28, 2007 A bid for glory on climate change

- 885- Global temperatures would rise by up to 5C and dangerous climate change would be inevitable if other developed countries followed Britain's flawed blueprint for **reducing its carbon footprint**, the United Nations warned yesterday in its annual flagship report on global development. Calling for urgent action on a post-Kyoto agreement to reduce greenhouse gases, the UN accused the government of a lack of ambition. It cited the upward trend in emissions from the energy and transport sectors and the lack of progress in developing renewable sources of energy. *Guardian.com* November 27, 2007 UN attacks British blueprint to tackle climate change
- 886- The survey found that just eight per cent of respondents were taking fewer holidays out of concern for the environment and only 12 per cent were likely to change destinations to **reduce their carbon footprint**. The prospect of swapping holidays abroad for ones at home - and thereby, in most cases, avoiding the need to fly - was not something many respondents would stomach. To the question, would or do you currently take holidays in the UK instead of going abroad **to reduce your carbon footprint**, 39 per cent said they never holiday in the UK and would not consider it in the future. However, the survey suggests that Britons do have a more open mind to how they travel. (...) More than a quarter of respondents (27 per cent) said they would consider alternative means of travel to flying to help **reduce their carbon footprint**, and a further 22 per cent said they would consider switching if it didn't significantly inconvenience them. (...) 27% would consider alternative means of travel to flying, such as by train, ferry or car, to help **reduce their carbon footprint**, and a further 22 per cent would do so as long as it didn't significantly inconvenience them. (...) 12% are likely to change their holiday destination in order **to reduce their carbon footprint**. (...) 39% do not - and would not - take holidays in the UK **to reduce their carbon footprint**. (...) Fly less frequently and stay away for longer. Fly economy: the less space you take up in the plane, **the smaller your footprint**. *Mail on Sunday* November 25, 2007 Flying in the face of our principles? BYLINE: Fred Mawer
- 887- We are told not to use our cars, fly around on holiday or in any way increase **our so-called carbon footprints**. (...) Is the vast requirement of information before we travel a heavily disguised way of getting us **to reduce our carbon footprints**? *The Daily Telegraph* November 19, 2007 Monday If European leaders know global warming is urgent, they must cut imports from polluters
- 888- And who can blame them? If dinner-table chatter is anything to go by, my friends are sick of hearing that they should forsake their fun in the sun **to reduce their carbon footprint**. *The Times* November 17, 2007, Saturday You don't need to forsake your fun in the sun to help combat climate change BYLINE: Jane Knight
- 889- The Meat and Livestock Commission said there could be other ways **to reduce the carbon footprint** of meat eating, including using more UK-produced food which did not have to be transported as far and changing the diet of cows, which could reduce methane output by half. *The Observer* November 11, 2007 Why eating less meat could cut global warming BYLINE: Juliette Jowit
- 890- Only 48 of the top 100 companies trading on the UK stock exchange have published a plan to address and **reduce their carbon emissions** and a significant minority refuse even to **reveal their carbon footprint**, a Guardian survey shows. (...) In a separate study for the Guardian, the sustainable development charity Forum for the Future analyses **the carbon footprints** of the top 10 global companies, which between them emit the same amount of carbon dioxide a year as the entire UK. *The Guardian* November 5, 2007 Monday National: Half of UK's top firms fail to publish plans to cut carbon emissions BYLINE: Murray Armstrong and David Adam
- 891- MODERN home owners are so keen **to reduce their carbon footprint** that most would be willing to buy a new property that was more eco-friendly. A survey, from Redrow Homes, found as many as 80 per cent are prepared to become a bit more green. *Sunday Express* October 21, 2007 Living in the

green belt; Property - With the threat of global warming hanging over us all, one Scots firm of housebuilders has been asking buyers what they would do **to reduce their carbon footprint**. BYLINE: HEATHER ROSE

- 892- Given that road transport already accounts for about **a quarter of Britain's carbon footprint** and that aviation is the fastest growing source of greenhouse gas emissions, these are sensible ideas. But while all the talk will be about whether or not David Cameron will take their thorough work on board, the real question is - will Brown? (...) It's no wonder Brown doesn't want to hear any dissenting voices. Nuclear new build would **reduce the UK's carbon footprint** by just 4 per cent, but at a cost of tens of billions that could take Britain into a low-carbon, clean energy future if spent elsewhere. *The Independent on Sunday* September 9, 2007 Gordon plays the jolly Green giant, but he needs to get serious
- 893- While environmentalists may urge people **to reduce their carbon footprint**, their words appear to be falling on deaf ears as the latest new sales figures show SUVs are up 29.6 per cent to the end of July, compared to last year. *Daily Mail* August 9, 2007 Thursday Climate change? Were putting the boot in... BYLINE: Alan Sherry
- 894- **By cutting its carbon footprint** by a planned one-twentyfourth, the show is expected to heavily publicise a "carbon-neutral" season finale when it is aired next summer. Filming is to start in the next few weeks. *The Independent* August 6, 2007 Monday Jack Bauer, the hero of '24', takes on global warming BYLINE: Stephen Foley
- 895- Having seen some of the consequences so close to home, it must be hoped that more people will be persuaded **to reduce their carbon footprint** - say, by giving up their 4x4s, patio-heaters and frequent flying - and put pressure on the Government to do likewise. *The Independent* July 27, 2007 Friday The floods have exerted a salutary effect
- 896- And none more so than companies that help the homeowner **reduce their carbon footprint**. Questor is aware of more than a handful of floats of home improvement companies that have launched themselves on to the market in recent weeks, with varying degrees of success. *The Daily Telegraph* July 24, 2007 Tuesday Climate change need not be bad news for investors if you pick rising green stars BYLINE: JAMES QUINN
- 897- The form of transport with **the smallest carbon footprint** is cycling, but despite the crowds gathering to see the English leg of the Tour de France last weekend we are not donning the Lycra as much as we would like to think. *The Times* July 16, 2007, Monday Jams, fuel and climate change, but we just can't give up the car BYLINE: Alan Hamilton
- 898- A range of initiatives to persuade council staff **to reduce their own carbon footprints** have also been launched. *The Sunday Telegraph* July 15, 2007 'Green' town halls spend millions on Al Gore and global warming advisers Taxpayers fund an army of 3,500 'climate change' staff as key services are slashed BYLINE: ROBERT WATTS
- 899- It was acknowledged from the stage that **the performers' own carbon footprints** did not bear close examination. *The Guardian* July 9, 2007 Monday National: Al Gore rocks the world, but will he save the planet?: Music extravaganza may yet bring climate of change: Wembley stars **leave a large carbon footprint** BYLINE: Oliver Burkeman
- 900- Some bands such as the Arctic Monkeys stayed away, saying that it was hypocritical for jet-setting acts with higher than **average carbon footprints** to lecture others on the problem of global warming. *Morning Star* July 9, 2007 Monday Britain - Rock stars highlight threat from climate change
- 901- Organisers pulled out the stops **to reduce the carbon footprint** of Live Earth in London, but admitted that more waste could have been recycled. *Sunday Express* July 8, 2007 Proud but not so loud; Stars turn sound down and cut out bubbly as they try to stamp out climate change **without leaving carbon footprint** BYLINE: Charlotte Heathcote and Andy Tristrem

- 902- If yesterday's Live Earth concerts organised by Al Gore are anything to go by, it's officially cool to be green. But it is not just politicians and rock stars who are trying to persuade people **to reduce their carbon footprint**. Banks, lenders and fund managers are dreaming up ethical options for environmentally aware customers. *The Sunday Telegraph* July 8, 2007 THE GLOBAL GREENWASH Financial providers have gone green with a vengeance. BYLINE: Paul Farrow
- 903- The Turkana are a proud people unaccustomed to asking for help. They do not pollute or use any manmade materials. Their way of life is completely sustainable, except for the cutting of trees for firewood. **Our carbon footprint in the west is enormous** by comparison, yet it is the Turkana and not yet us who are suffering. *The Mirror* July 6, 2007 Friday 3 A WORLD IN CRISIS; CLIMATE CHANGE IS ALREADY CAUSING STARVATION FOR THE TRIBES OF KENYA. BYLINE: ROS WYNNE JONES
- 904- One in five say they do not believe human behaviour was altering the climate - while most say they are doing nothing **to reduce their carbon footprint**. *Daily Mail* July 4, 2007 Wednesday Voters haven't warmed to climate change BYLINE: David Derbyshire
- 905- Gore convinced Wall to use the concert to launch a three-year campaign to mobilise public opinion and persuade people **to reduce their carbon footprints**, led by the Alliance for Climate Protection - which he chairs - and other international environmental organisations. *The Independent on Sunday* July 1, 2007 Geldof jeers, as stars sing out for the planet BYLINE: Geoffrey Lean
- 906- Last month the company published a set of new targets, which cover everything from **reductions in the carbon footprints** of its employees, to better labels that show customers the energy efficiency rating of their latest electronic box of tricks. *The Guardian* June 27, 2007 Wednesday Climate change: Challenging business: Footprinting: Case study: British Telecom BYLINE: David Adam
- 907- In future, energy will be derived from all plant matter, including grasses and wood, using every part of the plant, and **carbon footprints will drop dramatically**. *The Guardian* June 27, 2007 Wednesday Climate change: Challenging business: Biofuels: Seeds of hope: There's mounting concern in the north about the headlong rush into biofuels, but the view from the south is very different. BYLINE: Terry Slavin
- 908- His (Bishop of London's) forceful comments have made him a figurehead for the Church's public conversion to the cause of "Creation Care", or plain old environmentalism to those outside the Church. He recently oversaw the publication of *How Many Lightbulbs Does it Take to Change a Christian?*, a booklet that sets out simple steps for Christians **to reduce their footprint** and explains why there is a "moral duty" to do so. (...) However, it is the issue of "fasting" from flying that still seems to best symbolise his efforts **to reduce his own footprint** *The Guardian* June 14, 2007 Thursday G2: Ethical living: The green cross code: The Bishop of London says Christians have a moral duty to save the planet. BYLINE: Leo Hickman (my addition in parenthesis)
- 909- At the same time, green groups are launching a campaign to press computer manufacturers **to cut their carbon footprint**. They want companies to make it easier for people to upgrade their computers rather than replacing them every few years - and they want computers to use less energy. *The Independent on Sunday* June 10, 2007 Cyber warming; Special report: IT and climate change BYLINE: Marie Woolf Geoffrey Lean
- 910- Western politicians know that any attempt to rein in greenhouse gases that doesn't include the developing world is futile. Yet the emerging countries maintain that the West should adjust most. Nearly all the carbon already in the atmosphere, they say, stems from our earlier industrialisation. They also point out that Western emissions per capita are much higher; **the "carbon footprint" of each Chinese person is six times smaller** than each American's. Global carbon trading accentuates these tensions. That's because, by definition, it involves a massive resource transfer to the relatively low-

polluting East from the high-polluting West. *The Sunday Telegraph* June 10, 2007 Only a carbon policy committee can defeat global warming BYLINE: LIAM HALLIGAN

911-Global warming is now the default argument for putting your pet cause on the side of the angels. The path to the moral high ground is apparently monopolised by those **leaving smaller carbon footprints**. *The Times* June 5, 2007, Tuesday My temper is rising. Must be global warming... BYLINE: Mick Hume

912- Global Cool was founded this year and is backed by musicians such as the Scissor Sisters and KT Tunstall, the Scottish singer. The firm gives advice to live events on how to cut their environmental impact and **reduce their carbon footprint** and is working with next month's celebration of Nelson Mandela's 90th birthday. *The Times* June 5, 2007, Tuesday The cool way to fight global warming BYLINE: Martin Waller

913- That suggests that American companies and consumers are already finding ways **to trim their carbon footprint** and to lower the carbon concentration of their economic activity. *The Times* June 5, 2007, Tuesday On climate change, Bush is all heart BYLINE: Gerard Baker

914- Other proposals, such as compensating citizens of poor countries with a **low "carbon footprint"**, are more or less a done deal. *The Independent on Sunday* June 3, 2007 World leaders gather in Germany for G8 summit BYLINE: Raymond Whitaker

915- **Different countries have different "carbon footprints". A carbon footprint is the measure** of how much greenhouse gas is produced dependent on an individual's or population's lifestyle, measured in carbon dioxide. *The Daily Telegraph* June 2, 2007 Saturday HOT ISSUE OR HOT AIR? BYLINE: Myra Butterworth

916- We can achieve this step-change **reduction in carbon footprints** at the same time as actually increasing overall quality of life. *The Guardian* June 2, 2007 Saturday Change your mind: When it comes to creativity there really are no limits BYLINE: William Cook

917- We are nowhere near that situation. This week Ian Pearson, the climate change minister, announced plans for retailers to use a labelling system so that customers know which products, through their whole life cycle, **leave the largest carbon footprint**. Good idea. But the code will be voluntary, will take at least 18 months to develop, and, when it comes out, will probably be no more transparent than the information about sugar and salt in foodstuffs. Climate change is treated as a matter of private consumer choice, like eating lentils rather than doughnuts. *The Guardian* June 1, 2007 Friday Comment & Debate: Humanity must recognise our entire way of life is chronically short-termist BYLINE: Peter Wilby

918- The foreign secretary, Margaret Beckett, is expected to call on Japan to sign up to more ambitious greenhouse gas reduction targets as part of the international fight against climate change, when she arrives in Tokyo next week. Climate change is expected to be a major theme of Ms Beckett's three-day trip, which comes ahead of next month's G8 summit in Germany. She will meet the Japanese prime minister, Shinzo Abe, before holding talks with her counterpart, Taro Aso. She will also address a Tokyo conference on climate change, where senior executives from BP, Tesco and Barclays Capital will discuss the business community's attempts **to reduce their carbon footprint** with Japanese counterparts from Toyota and Tokyo Electric Power. With climate change also expected to dominate next year's G8 summit in Japan, Ms Beckett is reportedly keen to press Tokyo into agreeing to commitments that go beyond those it has already made under the Kyoto protocol. *Guardian.com* May 18, 2007 Beckett to focus on climate change on Japan visit

919- Unless people in the developed world **reduced their carbon footprint** urgently, there was no reason why others should act, he told business leaders including Stuart Rose, the chief executive of Marks and Spencer, and Richard Baker, the chief executives of Alliance Boots. Participants at the event, sponsored by six leading companies and the Carbon Trust, were invited to pledge how much

carbon they would save. *The Daily Telegraph* May 2, 2007 Wednesday Charles summons up wartime spirit to tackle climate change BYLINE: Charles Clover

- 920- The Sustainability Centre has one aim, which is to get people to live in a way which produces **less of a carbon footprint** on the earth. *The New Review* April 22, 2007 Today Hampshire, tomorrow, the world BYLINE: Emma Townshend
- 921- Both of them cleave to the idea - laid out in George Monbiot's book *Heat: How To Stop The Planet Burning* - that the countries of the industrialised world have **to shrink their carbon footprint by 90%** within a generation, or watch as climate change enters a stage known as "positive feedback" and moves beyond human control. For Drax, they argue, that can only mean only one thing: closure, and quick. *The Guardian* April 14, 2007 Saturday Weekend: THE BURNING ISSUE: A single chimney at Yorkshire's Drax power station pours out more pollution than entire countries. BYLINE: John Harris
- 922- The environment has become a big news story, with the prime minister, environment secretary David Miliband and Prince Charles being criticised by the press for **the size of their carbon footprint**. But journalists are at risk of sounding hypocritical. The sustainable level of emissions for each person in the world, is one tonne per year. **The carbon footprint of the journalism industry, although impossible to calculate, is substantial**. But does it need to be? Can we justify it and what impact will becoming environmentally friendly have on our work? *The Guardian* April 9, 2007 Monday Media: Carbon copy: Climate change may be a big story but many journalists still take emission-heavy trips abroad. So should they? BYLINE: Claire Dodd
- 923- Both examine what individuals can do **to cut their carbon footprint**. Goodall (Dr Jane Goodall) takes the detailed route, Lynas (Mark Lynas, journalist and environmentalist) the condensed. *The Guardian* April 7, 2007 Saturday Review: We've got your number: Jeremy Leggett looks at two ways **to assess your carbon footprint**: How to Live a Low-Carbon Life BYLINE: Jeremy Leggett (my addition in parenthesis)
- 924- There are signs of movement. The Treasury wants a spending review for departmental carbon budgets, perhaps linking **cuts in the carbon footprint** to budgets or public service agreements. *The Guardian* April 5, 2007 Thursday Public: Climate change and energy: Where's the green script for the state? BYLINE: Anna Bawden
- 925- Local government should put its own house in order, establishing its own green credentials. Others said councils should lead in the community, influencing people - at the same time as **reducing their own carbon footprint**. *The Guardian* April 5, 2007 Thursday Public: Climate change and energy: Demanding the tools for local action
- 926- Some nations with **deep ecological footprints**, such as Canada and Australia, are also ecological creditors because their high consumption levels are more than matched by their national resources. *The Times* March 30, 2007, Friday Business reaps benefit of action on climate change BYLINE: Oliver Tickell
- 927- OVER coming decades we will be persuaded, cajoled, inveigled and taxed in order to reduce **our national carbon footprint** by 60 per cent by 2050. In terms of leading the world in such a forward-looking venture, Tony Blair's Government is to be commended. It may prove to be his only positive legacy after a decade as Premier. *Sunday Express* March 18, 2007 Green taxes are no solution to climate change BYLINE: Stuart Winter
- 928- For a man who likes to warn of impending financial meltdown because of global warming, Sir Nicholas Stern has **a gigantic carbon footprint**. *The Guardian* March 17, 2007 Saturday Stern consequences: This week's ambitious climate change bill demands big cuts in carbon emissions. BYLINE: David Adam

- 929- It is boom time in the green economy. In 2005 Britain's environmental industries had a turnover of £ 25bn, according to the Department of Trade and Industry, a figure projected to grow to £ 46bn by 2015. Shopping ethically, eating organic food and **reducing carbon footprints** are the height of consumer fashion, and the Stern Report on the economic impact of climate change has put the government under greater pressure than ever. Employment in the 'renewables sector' is expected to grow sixfold by 2010 in the south west. Companies scent an opportunity to cash in and Cornwall, the poorest county in the country, suddenly finds itself in pole position. *The Observer* February 11, 2007 Another Eden is rising in the West BYLINE: David Smith
- 930- The chief executive of the world's biggest retailer yesterday **stepped up the pace in the race to be green** with a series of initiatives **to cut its own giant carbon footprint** - and those of its suppliers, customers and staff. *The Guardian* February 2, 2007 Friday Financial: Climate change: Wal-Mart boss says he will press suppliers **in race to go green** BYLINE: Julia Finch
- 931- What we should not do is impose arbitrary bans or restrictions on certain activities such as cheap flights or car usage, with witch hunts against individuals whose "**carbon footprint**" is deemed by popular opinion to be **excessive**, or insist that all companies, activities or individuals should be "carbon neutral". *The Daily Telegraph* January 29, 2007 Monday Global warming needs a free and open debate BYLINE: Roger Bootle
- 932- **The Low-Carbon Diet:** (or how to lose half a tonne in just one month): Global warming is alarming, but there's no need to be defeatist: our future is in our own hands. On these pages Lucy Siegle offers 36 positive suggestions on how we can change our lives, reduce carbon emissions and help save the planet - all in the form of three simple and enticing menus, calculated not in calories but 'carbs'. And best of all, if you **reduce your carbon footprint you can treat yourself**, with a gloriously clear conscience. *The Observer* January 21, 2007 BYLINE: Lucy Siegle
- 933- Sir Terry Leahy, Tesco's chief executive, wants to help empower consumers **to cut their carbon footprints**. His speech, which will be delivered to a roomful of environmentalists and businessmen at an event hosted by the sustainable development charity Forum for the Future, is expected to list ways shoppers can do their bit by buying homegrown produce. *The Independent* January 16, 2007 Tuesday Tesco follows M&S with climate change move BYLINE: Susie Measure
- 934- In fact, 164 countries in the world have a **smaller carbon footprint** than the UK, while just 20, mainly including the major oil producers as well as the US, have a larger one. *The Independent* January 9, 2007 Tuesday How richest fuel global warming - but poorest suffer most from it BYLINE: Philip Thornton
- 935- Eco-terrorists and republicans now use this entirely harmless activity to accuse her (The Duchess of Cornwall) of **destroying the planet with the resulting "carbon footprint"**. (...) However hard it will be to **reduce the carbon footprint** of local areas, central government could do a lot more to help. The roundtable agreed on three things. First, the production of a toolkit to help councils identify quick wins, three or four actions with the biggest impact. Second, Whitehall (in England) needs to provide money to councils to invest in **cleaner** energy. Third, local authorities need stronger planning powers, so they can insist on more sustainable construction. *The Daily Telegraph* May 19, 2007 Saturday So Camilla causes global warming, does she? Simon Heffer on Saturday BYLINE: Simon Heffer (my addition in parenthesis)
- 936- Whitehall departments, local authorities and NHS trusts failing to **reduce their carbon footprint** would be penalised accordingly and those at or near being carbon neutral rewarded. (...) What is more fragile is the relationship between his recommendations and what the UK government itself does, **the state's own carbon footprint**. (...) Growing numbers of public bodies are attempting **to reduce their carbon footprints**. (...) The 10 NHS trusts have pledged **to cut their annual carbon footprint** by 15%, which will also shave £700,000 a year off their respective energy bills. (...) The NHS could **reduce its carbon footprint** still further by reducing pharmaceutical waste and better

managing medical equipment. *The Guardian* December 7, 2006 Thursday Public: Climate change: Saving the planet starts at home BYLINE: Anna Bawden

- 937- It's just a matter of time before the global warming police come and **inspect our carbon footprints** and tax us, based on this faulty science. *The Independent on Sunday* November 25, 2007 Is the world dying or is this a false alarm?
- 938- GORMLESS; GREEN PARTY LEADER JETS TO NEW YORK FOR A CLIMATE CHANGE SUMMIT.. AND **DOESN'T PAY FOR HIS CARBON FOOTPRINT** *The Mirror* September 25, 2007 BYLINE: AINE HEGARTY
- 939- Instead of **panicking about carbon footprints**, shouldn't we all enjoy the positives while doing what we can for the environment? *Sunday Express* July 22, 2007 Island in the sun is a treat at any time BYLINE: JAMES MURRAY
- 940- But we should think about why we are travelling, make efforts to stay longer in destinations when flying long-haul to make that journey more worthwhile and demand that the companies we travel with **take steps to reduce the size of their footprint**. When travelling closer to home, we perhaps should consider the train as a viable alternative to the plane. *The Daily Telegraph* April 19, 2008 Saturday THE RISE OF RESPONSIBLE TOURISM We no longer have a choice. BYLINE: Graham Boynton
- 941- The Turner household **may not be greener than green, but has taken steps to reduce its own footprint by a quarter**. (...) Maybe it is par for the course that the chairman of the government's newly created Committee on Climate Change is being investigated by the press for possible double standards. Never mind that this millionaire has **reduced his carbon footprint** by 25 per cent. (...) Turner admits **his own carbon footprint is above average**, though not for his income level. *The Observer* February 3, 2008 Business: MAMMON: From blue chips to the green dream BYLINE: Nick Mathiason
- 942- The committee accuses airlines of "**dragging their feet**" in cooperating on environmental schemes, and recommends that airlines adopt a system of eco-labelling, so that consumers can compare **the environmental footprint of each airline** when buying tickets. *Guardian.com* February 5, 2008 MPs call for climate change minister
- 943- **Our "carbon footprint" looks like a clown's size-20 shoe**. As a rough guide, for every pounds 100 of gas bill, we release about a ton of carbon dioxide into the air each year. (...) Next year, **my carbon footprint will be not a giant clown's shoe but a dainty Cinderella slipper**. Honestly. *The Daily Telegraph* March 25, 2006 Saturday The green gospel according to Dave With global warming an ever-increasing threat, we all have a duty to do our little bit. BYLINE: Sarah Lonsdale
- 944- The move could undermine the environmental claims of firms such as BT, which have invested heavily in so-called green electricity tariffs **to cut their carbon footprints**. (...) Green tariffs have become a popular way for firms and individuals **to cut their carbon footprints**. They exploit the 5% of UK grid electricity generated from clean hydroelectric and wind sources, which suppliers claim they can effectively ringfence and sell separately. *The Guardian* August 14, 2008 Thursday National: Climate change: Crackdown on misleading green energy claims BYLINE: David Adam
- 945- Fewer nasty CO2 emissions. (There are still planes, I suppose: but one takes, does one not, **vis-a-vis carbon footprint**, the attitude that it's flying there anyway, so surely it's better to be on it?)

The Observer June 15, 2008 FOCUS: Reasons to be cheerful: We're all doomed: house prices are plummeting, fuel costs are soaring, and global warming has us all in its grip. BYLINE: Euan Ferguson

- 946- These are the folk who assure us that a Christmas crocus means The Day After Tomorrow, **talk darkly of the 'carbon footprint'** and declare we are doomed, doomed, unless we cycle to work, burn down Tesco and knit our own yoghurt. *Daily Mail* May 17, 2008 Saturday HOPE SPRINGS ETERNAL BYLINE: John MacLeod
- 947- In Britain, for example, the Bishop of London has taken a lead in calling on Anglicans to think about **their carbon footprint and act responsibly** to reduce emissions. *The Times* December 12, 2009 Saturday Faiths unite to heal the Earth; Global warming, want, drought, human discord - spiritual leaders from around the world met in search of solutions BYLINE: Michael Binyon
- 948- It is surely no coincidence that Gore has re-emerged as one of the most appalling climate-change scaremongers, along with fatuous rock stars **whose own carbon footprints really would kill the planet if aped by the rest of us**. They think their self-righteous sound and fury will save the Earth. In fact their vanity and arrogance betrays it. *The Express* November 28, 2009 Saturday CLIMATE-CHANGE SCAREMONGERS ARE DOING THEIR CAUSE A DISSERVICE BYLINE: PATRICK O'FLYNN
- 949- We've tentatively included for comparison a figure for a **"sustainable" footprint**. We've plumped for 3.1 tonnes by 2050, based on the [sic] but factoring in carbon from goods in addition. But we're well aware that **what counts as a sustainable footprint** depends on a whole host of assumptions, including how quickly we reduce our emissions and how much risk of **runaway** climate change we're prepared to accept. Again, then, this is just an indicative number. Some people would argue that **the only truly sustainable footprint is a non-existent one**. (...) One problem is that existing carbon calculators tend to focus exclusively our consumption of gas, electricity, car fuel and flights. Significant as these emissions sources are, they only **add up to around half of the average footprint**. *Guardian.com* October 21, 2009 Wednesday Let us equip you with the right tool to help you fight climate change BYLINE: Duncan Clark
- 950- Just as money from green consumers and firms **anxious about their carbon footprint** is used to fund projects that plant trees, fit green lightbulbs and develop renewable energy, in exchange for carbon credits, so it could pay people across the world to paint, coat and resurface. *The Guardian* January 16, 2009 Friday G2: Paint it: Global warming may seem like an overwhelmingly complex problem to tackle. BYLINE: David Adam
- 951- Irony flickers over the ecowarriors spewing noxious emissions from their vehicles as they tour the pristine snowscapes they are keen to protect (**carbon footprints imposed** by the trip are to be "offset by planting 3,000 trees in Venezuela as soon as a site could be identified and local officials bribed"). *The Sunday Times* March 7, 2010 Love in a warm climate; The climate-change debate gets a brilliant reworking in Ian McEwan's hilarious and sizzling novel about a priapic Nobel scientist wrestling with his conscience and his appetites BYLINE: PETER KEMP
- 952- It had power, speed and glamour, but it wasn't enough. And, depressing as it may be, F1 will choke like Concorde unless it quickly **shifts the carbon footprint pressed into its throat**. *Daily Mail* December 9, 2008 Tuesday Climate change makes fossil fools of F1 BYLINE: DES KELLY
- 953- The government is to announce tomorrow that it will include rapidly growing aviation and shipping emissions in Britain's commitment **to curb its carbon footprint** by 80% by 2050. (...) The government has not been able to calculate exactly which emissions from international flights and shipping lanes will be attributable to **Britain's carbon footprint**. *The Guardian* October 27, 2008 Monday Minister bows to calls on climate change bill BYLINE: David Hencke

- 954- The thinking behind the proposal is that when a home is extended **it increases its carbon footprint**, and that work should be carried out to reduce it instead. *The Independent on Sunday* October 19, 2008 Miliband's manifesto; Special report Energy Saving Week A blueprint for greener homes BYLINE: Geoffrey Lean
- 955- Deputy Boyle claimed the result showed Ireland should do more **to reduce its carbon footprint**. (...) Ireland has **a carbon footprint of 17.5 tonnes per person** *The Mirror* July 7, 2008 Monday SAFE AS GREEN HOUSES; IRELAND SECOND SAFEST NATION ON EARTH TO SURVIVE DEADLY EFFECTS OF GLOBAL WARMING SURVEY REVEALS BYLINE: GARY ANDERSON
- 956- It was Dr Walker who set the scene: **your average UK citizen's carbon footprint is 11 tonnes (the EU average), in the US it's 27 tonnes, India 2.2 tonnes** - precisely the level to which we must aspire to meet Gordon Brown's declared ambitions. *Guardian.com* May 28, 2008 So what are we going to do about global warming?
- 957- Climate change has become the new orthodoxy for our times. It is the moral fable that justifies new limits and restrictions for our shiny 21st century. It provides, in a post-tradition world, a new internalised framework for individuals to govern their behaviour in the name of **reducing their carbon footprint**. *telegraph.co.uk* May 6, 2008 Tuesday God, climate change and EU BYLINE: Bruno Waterfield
- 958- Gordon doesn't even hold a driving licence. Not for them **the 'carbon footprint' surcharge**, or the London congestion charge. Another 50p or even £1 a litre on petrol doesn't concern them since they won't have to pay it. *Daily Mail* May 2, 2008 Friday £5-a-gallon 'climate change' scam BYLINE: RICHARD LITTLEJOHN
- 959- The findings make depressing reading for green campaigners, who have spent months urging Government to take more radical action **to reduce the UK's carbon footprint**. The UK is committed to cut emissions by 60 per cent by 2050, a target that most experts believe will be difficult to reach. *The Independent* May 2, 2008 Friday Majority of Britons resent paying green taxes, poll finds
- 960- Up to 100 neighbourhoods in England will also be identified with an aim **to reduce their carbon footprints by more than 60% per cent**. *The Guardian* April 2, 2008 Wednesday £3bn climate change bill for energy firms BYLINE: Patrick Wintour
- 961- **My carbon footprint is estimated to be 13.73 tonnes a year**, mainly due to a whopping 11.53 tonnes on travel. The national average is 4.48 tonnes. And I'm not going to stop travelling by air. *The Sunday Telegraph* March 30, 2008 Sunday Am I being led up the carbon path? BYLINE: Caroline Phillips
- 962- When we are all being encouraged **to minimise our carbon footprint**, why is it that it is still acceptable for shops (and offices) to be overheated all day long, with staff often wearing no more than a thin shirt, often short-sleeved? *The Times* February 28, 2008, Thursday Biofuels, climate change and office heating
- 963- Sony and other big multinationals today committed themselves to drastically **reducing their carbon footprint** and urged other businesses to join the fight against global warming. *Guardian.com* February 15, 2008 Sony leads charge against climate change
- 964- The TUC advice includes tips on boosting recycling, improving heating and lighting efficiency and encouraging options such as home or remote working **to reduce workers' carbon footprint** by avoiding the journey into work. *Morning Star* January 3, 2008 Thursday Britain - TUC urges workers to do their bit on climate change

- 965- **Huge carbon footprint** Marriott is delighted that climate change is finally attracting the attention it needs. "The more the merrier," he says, rejecting the criticism that artists are climbing on a green bandwagon. He is scathing, however, of the continuing blindness of artists, curators and institutions to **their own enormous carbon footprints**. *The Guardian* December 3, 2009 Thursday G2 Arts: The art of survival: Artists are waking up to climate change. BYLINE: Madeleine Bunting
- 966- PRINCE Charles used up seven months' worth of **the average British person's "carbon footprint"** yesterday flying to Copenhagen on an executive jet to make a speech on climate change. The heir to the throne, who prides himself on his green credentials, cost taxpayers an estimated GBP 12,000 and racked up **a 6.486-ton carbon footprint** in one day by taking a seven-seater RAF Royal Flight HS125 jet to the summit in the Danish capital. (...) The Prince, who will offset the pollution he caused by using taxpayers' money to invest in environmentally-friendly initiatives, generates **an annual carbon footprint of 2,601 tons**, compared to 11 tons for an average UK citizen. *The Express* December 16, 2009 Wednesday Executive jet (with **a big carbon footprint**) gets the Prince to climate change talks BYLINE: Richard Palmer
- 967- This week, as delegations from 192 countries meet in Copenhagen to negotiate a new treaty limiting greenhouse emissions, Mr Tunim will be there in the Danish capital, trying to persuade the big battalions of the industrialised world to pay some attention to his people, who are already paying the price of the fossil-fuel economy despite **their own minuscule carbon footprint**. *The Daily Telegraph* December 10, 2009 Thursday COPENHAGEN; SUMMIT 2009; The sea; is killing our island paradise BYLINE: Neil Tweedie
- 968- COPs usually attract about 5,000 delegates, observers and journalists, but the sense of the world being on the edge of an abyss means that about double that number will be in Copenhagen. The same number of activists are expected to travel to the city, many staying in the hippy commune of Christiania where they will plot various stunts and blockades. Most will arrive by plane, generating **an enormous carbon footprint**, though a special climate express will carry 400 delegates on a 13-hour train ride from Brussels to Copenhagen. Yet when the conference ends and no one is watching, many of the rail martyrs will quietly fly home. *The Times* December 3, 2009 Thursday Roll up. Roll up!; So much is riding on the Copenhagen summit, but it's just part of a never-ending circus that is more about hobnobbing and budgets than the science of climate change BYLINE: Ben Webster
- 969- Bangladeshis have one of **the lowest carbon footprints** per head in the world, at 1.1 tons a year, compared with 29 tons for the average American and 15 tons for Britons, yet they are suffering the most from global warming. *The Daily Telegraph* December 2, 2009 Wednesday On the climate change front line; COPENHAGEN; SUMMIT 2009 BYLINE: Louise Gray
- 970- EAT GREEN: cut down on meat consumption (farming animals for food leaves a **huge carbon footprint**); buy local produce; reduce "food miles". *The Independent* December 2, 2009 What now?; The problem and the potential consequences are all too clear. BYLINE: Cathy Holding
- 971- The Population Fund acknowledged that reducing population growth in developing countries would have little immediate impact on emissions because their inhabitants have relatively **small carbon footprints**. *The Times* November 19, 2009 Thursday Birth control may be best brake on climate change BYLINE: Ben Webster
- 972- The leadership has worked hard in the past five years to present itself as fully committed to environmental issues. The entire in September, pledging **to cut their personal carbon footprints** by 10% within a year. *Guardian.com* November 16, 2009 Monday Top 10 Tory bloggers disagree with David Cameron on climate change BYLINE: Mike Power
- 973- Customers don't understand the concept of **a tonne of carbon dioxide, or even carbon footprints**. You get a total blank. What we find resonates much more is the general concept of

sustainability - that we are using three planets' worth of resources but last time we looked we had only one planet. *The Sunday Times* November 15, 2009 What does climate change mean to you?

- 974- But this means a vast number of women are still having more than three children and, given **the disproportionate bulk of their carbon footprint**, they need to be persuaded not to. *Guardian.com* October 27, 2009 Tuesday Climate change is a feminist issue BYLINE: Mary Fitzgerald
- 975- Nearly 100,000 music fans at two of the UK's biggest summer music festivals will be cheered to know that next year's pop-fuelled hedonism will come with **a shrunken carbon footprint**. (...) The campaign, launched on 1 September, encourages people and organisations **to cut their carbon footprints** by 10% during 2010. *The Observer* October 25, 2009 Top UK music festivals join eco campaign BYLINE: Adam Vaughan and James Randerson
- 976- Too often the green movement is associated with what it is against, what it wishes to ban, close down, toll, tax or charge, not what we stand for. Too often green messages are directed towards people as consumers, too seldom as citizens or producers. Our goal is to **reduce our carbon footprint** but it must also be **to expand our active democratic footprint**. *Morning Star* September 11, 2009 Friday Feature - Unions must be seen green BYLINE: Richard Leonard
- 977- A report published today by the Institute for Public Policy Research says that personal quotas for carbon emissions - which could be traded between people with **a high carbon footprint** and those who live **greener** lifestyles - may be needed if present policies fail to cut greenhouse gases. (...) People who did not use all of their credits because they had **a low carbon footprint** could sell the excess to people who used more fossil fuels to power their cars or homes or to go on holiday. The quotas would shrink over time to reduce carbon emissions. *The Times* September 9, 2009 Wednesday Climate change deal is 'slipping away' even before the talks begin BYLINE: Ben Webster
- 978- The world's population has risen roughly sevenfold since Darwin's day, with a similar increase in the amount of energy each individual uses. That suggests **the ecological footprint** of humanity upon the planet has increased fiftyfold since Darwin published *On the Origin of Species* in 1859. *The Guardian* September 7, 2009 Monday National: Leading scientist calls on religious leaders to tackle climate change BYLINE: Ian Sample
- 979- Virgin Climate Change (Virginmoney.com/funds) invests in UK/European firms with a **lighter carbon footprint**. Down 28.2% over the past 12 months but up around 30% since March. *The Guardian* September 5, 2009 Saturday Money: How to ...: Invest in tackling climate change
- 980- The campaign is the brainchild of Franny Armstrong, whose recent eco-movie *The Age Of Stupid* is so unsophisticated it makes *An Inconvenient Truth* look like *Tarkovsky*, and is indeed now widely recognised as the second most lame, risibly awful and toe-curlingly emetic movie in British cinematic history after *Love Actually*. It calls for everyone to help save the world by **reducing their carbon footprint** by 10 per cent in 2010. What I like about these lists is that they give you an instant aide-memoire of all the celebrity pillocks whose broadcasts/recipes/duff plays and movies/clothes/building programmes you need never bother with again. (Shame about Antony Beevor, who is also mysteriously on the list. I was rather looking forward to reading his take on the Battle of the Bulge). "But so what if this bunch of ocean-going knobs wish to burnish their egos and salvage their consciences by pledging to cut the odd weekend trip to Bora Bora here and plant the odd carbon-neutralising mango forest there? Who are we to judge?" I hear some of you asking. And up to a point I'd agree with you. The thought that I shall be 10 per cent less likely to have any of these dorks sitting next to me on an EasyJet flight to Palma any time during 2010 is indeed of considerable comfort in these dark times. The problem is, I can't get out of my head the much more urgent and terrifying story on the front of today's *Telegraph*. The one predicting massive power cuts across Britain within ten years. telegraph.co.uk September 1, 2009 Tuesday Power cuts are a much more serious problem than 'Climate Change' BYLINE: James Delingpole

- 981- Hence "OMG", the abbreviation for "Oh my God" that peppers e-mails and text messages; and **"carborexix"** to describe someone obsessed with **reducing his carbon footprint**. *The Times* August 31, 2009 Monday Word Perfect; A new dictionary reflects our growing interest in climate change and digital culture
- 982- When it comes to the environment, kids are far ahead of the grown-ups. All over the country, schools are doing their bit to raise awareness of climate change and **cut their carbon footprint**. *The Times* July 21, 2009 Tuesday It's cool for kids!; Schools lead the way on climate change, reports Chloe Lambert BYLINE: Chloe Lambert
- 983- Oxfam points out, for example, **how large is the carbon footprint** of a steak compared to the same amount of calories produced from vegetarian sources. Behaviour change is one of the two ways forward, yet despite the fervent hopes of "deep greens", it will need state or market intervention to make most people change their ways. The ultimate (and fair) way of doing it would be to give everyone the same personal "carbon allowance" which they can use as they wish; this is a long way off in practical terms, but as global warming gets worse, it may yet appear on the agenda. *The Independent* July 10, 2009 Friday Will it really be possible to meet the G8's climate change targets? BYLINE: MICHAEL MCCARTHY
- 984- Global warming consequences detailed in the study included an increase in heavy downpours, shorter and warmer winters - more than 7F warmer in the Mid-west - and declining forest growth in the South West. (...) Climate-related proposals that would seek to reduce **America's enormous carbon footprint** are currently before the US Congress. *The Daily Telegraph* June 18, 2009 Thursday Darkest US warning yet on climate change BYLINE: Tom Leonard
- 985- **The industry's carbon footprint is also expected to shrink** by 7% this year, largely due to the recession, although IATA credits two percentage points of that reduction to efficiency gains such as better air traffic control. *Guardian.com* June 8, 2009 Monday Airlines reject new tax to fight global warming
- 986- The austere rhetoric of environmentalists who lectured people for excessive driving or flying had convinced many that **reducing the size of their carbon footprint** was too much like hard work, he said. The prospect of a lower quality of life was unattractive. *The Times* June 4, 2009 Thursday Making everyone feel guilty 'is not the way to combat climate change' BYLINE: Mark Henderson
- 987- The dire efficiency standards of the public estate, which includes government offices, laboratories and museums, will make uncomfortable reading for the department's secretary of state, Ed Miliband. He recently announced ambitious plans to cut the energy use of UK buildings as part of the overall targets **to cut the country's carbon footprint** by 80% by 2050. *The Guardian* May 17, 2009 Sunday National: Which ministry is least green? BYLINE: Alok Jha
- 988- Although **the carbon footprint of the poorest billion people is about 3% of the world's total footprint**, loss of life is expected to be 500 times greater in Africa than in the wealthy countries. *The Guardian* May 14, 2009 Thursday National: Climate change biggest threat to health, doctors say BYLINE: Sarah Boseley
- 989- Administration officials set out a \$1.8bn (£1.19bn) plan to develop a new generation of more environmentally-friendly biofuels that are not made from food crops and have **a lower carbon footprint**, while also providing an immediate bail-out of existing corn ethanol producers, which are suffering in the global economic crisis: falling petrol prices have undercut demand for ethanol at the pump. *The Guardian* May 6, 2009 Wednesday International: Obama's dollars 1.8bn vision of greener biofuel BYLINE: Suzanne Goldenberg
- 990- But the big PR question, the one that must earn Miller his remuneration, is how to rationalise this oxymoron **"clean coal"**. How to square this carefully created image with inconvenient facts about **the fuel's huge carbon footprint** - greater than other fossil fuels such as oil and natural gas. *Guardian.com* February 26, 2009 Greenwash: Why 'clean coal' is the ultimate climate change oxymoron

- 991- The stunts, **which range from giant footprints to a great wall of carbon**, are taking place as part of Friends of the Earth Scotland's Big Ask Campaign for a tough Climate Change Bill at Holyrood. *Morning Star* January 31, 2009 Saturday Britain - Scottish campaign to illustrate contribution to global warming
- 992- Miliband is determined to move away from the pro-industry bias of the Department for Business, Enterprise and Regulatory Reform (DBERR) towards a greener agenda. One recent example was his inclusion of shipping and aviation emissions in plans **to curb Britain's carbon footprint**. *The Guardian* January 14, 2009 Wednesday Politics: Miliband and Mandelson battle for top staff to back rival green agendas
BYLINE: David Hencke
- 993- Yeo had a suggestion to overcome the US problem. If the EU was to combine its economic clout with **China's jumbo carbon footprint** and work together, the two groups could set the lead, he suggested. "I think you are absolutely right. We should definitely look into that," was Huhne's surprising answer. By now his face was resting heavily on his fist. Graham Pincher, Labour, asked "why are we not talking about per capita emissions", which reveal **the vastly greater carbon footprints** of Americans compared to Chinese, despite their national totals being similar. Huhne agreed, the argument was "morally unanswerable" before then suggesting per capita arguments were too frightening to the US. *Guardian.com* December 15, 2010 Wednesday Cancun climate change talks 'anarchic' says Chris Huhne
BYLINE: Damian Carrington
- 994- Those with **a small carbon footprint** would benefit, while those with gas-guzzling SUVs and air conditioners would have to pay dearly for their habit. In short, it would encourage everybody to think carefully about his or her patterns of consumption. *Morning Star* December 8, 2010 Wednesday Feature - Green power to the people
- 995- Second, the media and telecommunications industry not only has **a carbon footprint as large as the aviation industry**, it promotes absurdly high levels of built-in obsolescence. *Morning Star* November 23, 2010 Tuesday Feature - The media and climate change
BYLINE: Ian Sinclair
- 996- While many companies are **reducing their own footprint** they are failing to act as agents of change *Guardian.com* October 14, 2010 Thursday Business failing to lobby government on climate change
BYLINE: Jo Adetunji
- 997- Dr Rajendra Pachauri is also a winner of a Nobel Peace prize, the holder of India's second-highest civilian award, an officer of the French Legion of Honour and is used to being treated with respect. But for some of those who challenge the international consensus on climate change he is public enemy number one and his travel arrangements are fair game. (...) In that role he has never had any qualms about lecturing other people on how to **reduce their carbon footprint**, insisting for instance that we all give up meat to help save the planet. He is of course a vegetarian. (...) Five years later the feud was buried when the pair were jointly awarded the Nobel Peace Prize for their work on global warming. Many now claim that Gore's adulation is seriously misplaced and that he has manipulated some climate data to suit his own "catastrophe" thesis. Nobody could accuse Pachauri of being in the pocket of oil companies now. As well as describing Western lifestyles as unsustainable and advocating a diet that should include one meat-free day a week he has singled out lobbyists in the Us for attempting to delay America's climate legislation, thereby holding up a global deal. But his scientific integrity was badly battered when it emerged that the 2007 assessment included the false claim about Himalayan glaciers. In echoes of our own "dodgy dossier" scandal over the Iraq war it turned out the line had been lifted from a report by the World Wildlife Fund, which had in turn taken it from a magazine article. (...) THEN came further charges that he has been making a fortune from "lucrative" links with carbon-trading companies. Last week a report by the auditors KPMG found that any money paid as a result of work he has done for other organisations had been paid to tERI, not him, and he received only his annual salary of £45,000. the newspaper that made the claims has retracted them and

apologised. But this week the independent team of scientists commissioned by the UN to look into his stewardship of the IPCC was withering in some of its conclusions. the panel's response to revelations of errors in the 2007 assessment was "slow and inadequate", it said, and there should be stronger enforcement of existing procedures to review scientific data to minimise the number of errors. Most damning of all for Pachauri was the proposal that the limit of two six-year terms for the chair is too long and should be limited to one. that clearly implied that the current incumbent has outstayed his welcome by two years *The Express* September 2, 2010 Thursday HYPOCRISY OF THE GREEN BULLY BYLINE: John Triggs

- 998- It didn't help, when the debate got going, that the selected question on global warming was a soft one, asking what the leaders had personally done **to reduce their carbon footprints**. *telegraph.co.uk* April 23, 2010 Friday Climate change surfaces in the election at last - in a disappointing exchange BYLINE: Geoffrey Lean
- 999- This show hovers somewhere between a display of contemporary art and a list of New Year's resolutions - or perhaps that should be commandments. Thou shalt not pollute. Thou shalt recycle. Thou shalt **reduce thy carbon footprint**. Or else. *The Sunday Telegraph* January 10, 2010 Warming to a theme; art Despite occasional preachiness, this exhibition on climate change is a cautionary memorial with some striking pieces BYLINE: ANDREW GRAHAM-DIXON
- 1000- Cue awkward shuffling of chairs and three hours of brinkmanship resulting in an "accord" between the five big nations represented in that room. Its aim was **to shrink their carbon footprints** by differing amounts in different ways according to different timetables. *The Times* January 7, 2010 Thursday Obama faces more huffing and puffing BYLINE: Giles Whittell
- 1001- A brief tally of sign-ups gives an idea of the topsy-like like growth 10:10 has enjoyed in its first 120 days or so: more than 50,000 individuals promising **to cut their carbon footprint** by 10% in 2010. *The Guardian* January 1, 2010 Friday G2: 10:10: Overview: The time for action: The great Copenhagen cop-out has put the onus on individuals to step up the struggle against climate change. BYLINE: Ian Katz
- 1002- His (Mohamed Adow, from a pastoralist family in the dry north east of Kenya, interviewee) father lost 60 per cent of his cattle in the last drought, he added, and the whole way of life of a people with one of **the lowest carbon footprints** on the planet is imperilled. (...) As it happens, 2020 is a significant date in the negotiating hall because many of the most highly polluting countries - such as the United States, Japan, Canada, Russia, India and Brazil - are effectively resisting taking further action, beyond what they have already voluntarily promised to do, until after then. *telegraph.co.uk* December 2, 2011 Friday Climate change: Third World reaps a bitter harvest BYLINE: Geoffrey Lean (my addition in parenthesis)
- 1003- It has been estimated that **the carbon footprint for this event could be in the order of 15,000 tonnes of CO2 equivalent**. However this does not include the flights of the 15,000 delegates that is likely to increase the emissions to **the annual footprint** of a small African country. Durban City Council are offsetting the footprint by through an ecosystem rehabilitation project in the uMbilu catchment west of Durban. It is expected to offset 16,000 CO₂e. *telegraph.co.uk* November 27, 2011 Sunday Durban for Dummies: Your guide to the UN climate talks BYLINE: Louise Gray
- 1004- Not least because, evidence is now emerging which indicates that gas derived from shale may have a significantly **greater carbon footprint** than previously thought, seriously questioning whether it can play any role in the transition to a low-carbon economy. *Guardian.com* November 23, 2011 Wednesday Shale gas push 'would wreck UK's climate change targets' BYLINE: Fiona Harvey
- 1005- Unfortunately our Prime Minister is one of the most fervent converts, which is why Britain is going out of its way to **reduce its carbon footprint**, even though this will make our industries less

competitive, add to our domestic power bills and despoil our lovely countryside and coast with ugly wind farms. *The Express* November 2, 2011 Wednesday CLIMATE change is not [...] BYLINE: Peter Hill

- 1006- He (Bjorn Stigson, the outgoing president of the World Business Council for Sustainable Development) contrasts this with China, which is very clear about why it is embracing the green economy: it is reducing its reliance on energy imports, preventing social unrest in rural areas caused by the impacts of climate change, becoming the leading exporter of resource efficient solutions and avoiding border tax adjustments **caused by products with a high-pollution footprint**. *Guardian.com* November 2, 2011 Wednesday Time for the West to get its act together on climate change BYLINE: Jo Confino (my addition in parenthesis)
- 1007- The bad news is that in many of the nations with **the biggest carbon footprints** - US, UK and Australia (per capita) and China (total emissions) - plenty of people seem to think that climate change is a problem that can deal with another day. *Guardian.com* August 30, 2011 Tuesday Climate change concern tumbles in US and China BYLINE: Damian Carrington
- 1008- The average UK citizen has **a carbon footprint around 4.5 times that large**, while the **average US citizen's footprint is 10 times as large**. *The Guardian* July 16, 2011 Saturday National: Time to ditch Kyoto protocol, says climate change expert BYLINE: Fiona Harvey
- 1009- An economy dependent on gas, rather than coal, cannot but help but **lower its carbon footprint**. *telegraph.co.uk* February 28, 2011 Monday The real cost of 'global warming' BYLINE: James Delingpole
- 1010- The Department of Energy and Climate Change (Decc) cut **its carbon footprint** by 20% compared with 2009. *The Guardian* February 8, 2011 Tuesday Government's climate change department surpasses 10:10 goal BYLINE: Damian Carrington
- 1011- **The carbon footprint left by the flights amounted to 380 tons**, the equivalent of driving a car round the Equator 50 times. *The Express* January 7, 2011 Friday Global warming quango racks up GBP 36,000 flight bill BYLINE: Dean Herbert
- 1012- Qatar has **the largest carbon footprint** per head of any country in the world, largely due to gas flaring, desalination plants and air conditioning. *telegraph.co.uk* December 10, 2012 Monday Has Doha finally laid the ghosts of Copenhagen to rest?
- 1013- There are more than 17,000 delegates attending the talks in the desert in Doha. It is estimated that the talks themselves have had **a carbon footprint of more than 40,000 tons** of carbon dioxide - equivalent to cutting down 64 hectares (158 acres) of rainforest. (...) Qatar, one of the world's richest nations, with plentiful supplies of cheap energy from its oil, has **the largest carbon footprint** per person in the world. There was disappointment that the hosts had failed to build any momentum for cutting emissions in the Middle East. *The Sunday Telegraph* December 9, 2012 Britain set to pay billions to keep island nations above water BYLINE: LOUISE GRAY; RICHARD GRAY; ROB WATTS
- 1014- However despite hosting the talks and having **the largest carbon footprint** per head in the world, Qatar has failed to even put forward voluntary targets. *telegraph.co.uk* December 7, 2012 Friday Doha: Climate change deal limping towards 'disappointing' conclusion BYLINE: Louise Gray
- 1015- Qatar, the host of the talks, that has one of the highest GDPs per head and the **highest carbon footprint** per head in the world, has also failed to make any promises. *telegraph.co.uk* December 7, 2012 Friday UN climate talks: 24 hours to go but no document on the table BYLINE: Louise Gray

- 1016- Doha: Talks on brink of collapse as anger rises against Qatari hosts; Climate change: Anger is growing against the host country of Qatar, which has **the largest carbon footprint** in the world per person, for failing to take action on climate change and cut its emissions. *telegraph.co.uk* December 6, 2012 Thursday BYLINE: Louise Gray
- 1017- As one of the richest countries in the world per head with **the highest carbon footprint** at 43t of CO2 per capita, Qatar itself is expected to lead the way. *telegraph.co.uk* December 3, 2012 Monday Doha: Will the Arab World lead the way on climate change?; As the United Nations talks on climate change enter the final week in Doha, Qatar all eyes are on the nation with **the highest carbon footprint** in the world to lead the way on cutting emissions. BYLINE: Louise Gray
- 1018- **The carbon footprint of people in Qatar**, where the conference is being held, was **43 tonnes**. *telegraph.co.uk* December 2, 2012 Sunday Doha: Latest figures show global CO2 emissions are rising BYLINE: Louise Gray
- 1019- The Carbon Conversations groups that Rosemary Randall runs are one way of **reducing our carbon footprints in tandem with others**. Another is the Transition movement, through which people in communities support each other to develop practical, local initiatives for life beyond oil. *The Guardian* December 1, 2012 Saturday You can't ignore this: Anne Karpf is not a climate-change sceptic. BYLINE: Anne Karpf
- 1020- Doha has **the largest carbon footprint** per person in the world. *telegraph.co.uk* November 26, 2012 Monday Is Doha the worst place in the world for a climate change summit ... or possibly the best? BYLINE: Louise Gray
- 1021- The summit has already been attacked for being held in an oil and gas state, that boasts **the highest carbon footprint** per person of anywhere in the world. But compared to previous summits like Copenhagen, which ended in chaos, negotiators are optimistic this year's conference will make steady progress towards a global deal. Talks will continue on setting up a Green Climate Fund, to provide \$100bn per annum to help poor countries adapt to climate change from 2020 and on sharing green technology and stopping deforestation. *telegraph.co.uk* November 23, 2012 Friday UK to sign up to new climate change treaty in Doha rejected by US and China BYLINE: Louise Gray
- 1022- Gas provides a temporary stopgap, with **half the carbon footprint** of coal and few of the other pollutants. In the U.S., with little or no energy or climate policy, shale gas is making major inroads into coal, resulting in some of the biggest drops in emissions in the developed economies, outside the Kyoto agreement. *Guardian.com* November 8, 2012 Thursday Kyoto won't save us from climate change - but a carbon tax could
- 1023- Environmental groups thought they had won a key victory with the Government considering plans to introduce new emissions targets, forcing electricity producers **to reduce drastically their carbon footprint**. (...) To beat this restriction, Ed Davey, the Energy Secretary, has proposed a loophole that would excuse energy companies from **cutting their own carbon footprint** if technological advances made it cheaper for other sectors, such as transport, to go green instead. *The Times* October 12, 2012 Friday The power game: how a climate change loophole may put Britain's foot on the gas BYLINE: Tim Webb
- 1024- The roadmap goes even further, suggesting that the use of carbon trading would mean aviation's **current carbon footprint could be halved** even if passenger numbers more than doubled. (...) Greens note that aviation is the fastest growing source of carbon emissions in the UK and that Britons have had **the highest flying footprint** of any nation. *Guardian.com* September 6, 2012 Thursday Can the UK fly more without breaking climate change targets? BYLINE: Damian Carrington

- 1025- Canada and Australia - who also have **heavy carbon footprints** and a history of sceptical climate policies - are next furthest advanced in CCS. Norway, which has put \$1bn of state money into the world's largest CCS test centre at Mongstad and has been burying CO2 since 1996, is also a leader, but for different reasons. *Guardian.com* May 9, 2012 Wednesday Whatever happened to carbon capture in the fight against climate change? BYLINE: Damian Carrington
- 1026- The boffin's fuel-burning flights mean **his carbon footprint is so big** it would take 95 acres of trees a year **to absorb it all**, Government figures show. (...) Celebrity "carbon coach" Dave Hampton, who helps the rich and famous **reduce their eco-footprints**, said: "He should really walk the talk on climate change action and not fly the lie of encouraging others to change their lifestyle to be more environmentally friendly while acting in such a hypocritical way." *Sunday Mirror* February 5, 2012 Sunday PROF'S 20,000-MILE FLIGHT..TO LECTURE ON CLIMATE CHANGE BYLINE: VINCENT MOSS
- 1027- Those Britons with **outsize carbon footprints**, inflated by jet-setting and SUV-driving, will suffer far less than those with daintier environmental treads. *Guardian.com* January 26, 2012 Thursday Climate change set to hit UK hard and the poorest hardest BYLINE: Damian Carrington
- 1028- The National Hockey League announced today it plans **to offset the league's carbon footprint** during the current season, and shrink energy use moving forward. (...) The company will also work with the NHL to analyze the league's energy use and **reduce its carbon footprint**. *The Guardian* December 19, 2014 Friday NHL fights global warming by going carbon neutral; BYLINE: Timothy Pratt
- 1029- **Carbon footprints have been useful because people can improve.** You can actually have a **positive trajectory** and feel good about that. Then you can compete. *The Guardian* November 10, 2014 Monday Your brain on climate change BYLINE: Greg Harman
- 1030- On issues of climate change, more than 80% of respondents said **reducing their carbon footprint** in their operations was a priority, while almost half are looking to do the same in their supply chains. *The Guardian* October 2, 2015 Friday Major corporations taking climate change threat more seriously - survey; Survey of 440 sustainability workers around the world finds companies are **taking steps to reduce their carbon footprints** BYLINE: Alison Moodie
- 1031- In keeping with today's busy lifestyles, convenience is key. We drink our coffee on the run, eat with plastic cutlery at our desks, buy pre-packed sandwiches and salads. But nowadays, **we all know what a carbon footprint is, and many of us take steps to minimise ours**. *Independent.co.uk* March 28, 2015 Saturday Earth Hour 2015: millions will turn off lights and electricity to fight climate change. BYLINE: Siobhan Norton
- 1032- Worldwide, though, those who can't afford to run a car, cook food or heat their homes adequately contribute more **to reducing humanity's collective footprint** (...) Many households and individuals already try **to reduce personal carbon footprints**, and this will continue. *The Observer* May 10, 2015 Sunday Climate change: we must look to international agencies to save the world; Individuals and governments can't bring change alone
- 1033- The port supports five oil refineries, whose owners include Shell and the Koch brothers, along with a massive coal-fire power plant. Officials say the port accounts **for 17 per cent of the entire nation's carbon footprint**. A central paradox - and to sceptics, the ultimate hypocrisy - of this city's environmental self-branding is that, at heart, Rotterdam's economy continues to rely on the fossil fuel industry. *The Independent* June 29, 2017 Thursday The Dutch have solutions to rising seas - and the world is watching BYLINE: Michael Kimmelman

- 1034- As I discussed on Planet Oz a few days ago, just two recently approved coal mines in Queensland will emit 3.7 billion tonnes of CO₂-e over their proposed 30-year life spans - the equivalent of six years worth of **the United Kingdom's greenhouse gas footprint**. *Guardian.com*. November 14, 2013 Thursday Will Australia cause a slip on the climate change stepping stones in Warsaw? BYLINE: Graham Readfearn
- 1035- A worsening cycle of extreme weather patterns was among the most perilous of impacts to feature in the report, which warns that climate change is already in the process of leaving **a damaging footprint on the planet**. *telegraph.co.uk* March 31, 2014 Monday IPCC report: global warming to increase heatwaves, flooding and conflict BYLINE: Danielle Demetriou
- 1036- **REVEALED: THE CARBON FOOTPRINT OF CLIMATE CHANGE ACTIVIST CELEBRITIES** (...) The 10,638-mile flight burned through a massive 1.8 tonnes of carbon dioxide alone in a year that **stacked up against him in terms of his carbon footprint**. *MailOnline* December 13, 2017 Wednesday Nasa scientist blasts the hypocrisy of climate campaigners who emitted 30,000 tonnes of CO₂ this weekend travelling to a global warming conference BYLINE: TIM COLLINS
- 1037- I suppose it had to come - **the shoe without a footprint**. Yes, two companies are planning to produce "the world's first carbon-negative footwear". *telegraph.co.uk* November 22, 2013 Friday China: now an example to the world?; China and the US are both finally taking action over global warming BYLINE: Geoffrey Lean
- 1038- But what does **this massive carbon footprint** mean in context? (...) **The United Kingdom's carbon footprint** gives us another comparison. The UK emitted 571.6 Mt of CO₂-e last year. The total contribution of the two Galilee Basin mines would be like making the United Kingdom carbon neutral for six years. *Guardian.com*. November 7, 2013 Thursday **The whopping climate change footprint** of two Australian coal mining projects BYLINE: Graham Readfearn
- 1039- A meteorologist who has covered weather for the Wall Street Journal tweeted that he has decided not to have children in order to leave **a lighter carbon footprint**, and is considering having a vasectomy. (...) Holthaus, who now writes for Quartz, has decided he will also **reduce his carbon footprint** by giving up on air travel. *MailOnline* September 30, 2013 Monday 'No children, happy to go extinct', tweets weatherman after grim climate-change report made him cry (now he's considering a vasectomy) BYLINE: MARIE-LOUISE OLSON
- 1040- China and the US, the world's biggest emitters of CO₂ by far, have lately made a series of positive noises about the prospect of **cutting their carbon footprint** and have even agreed to team up to tackle the matter. *i-Independent* September 26, 2013 Global warning: what world's top scientists say about climate change BYLINE: Tom Bawden
- 1041- Once the environmental impact of imported goods **has been added to its carbon footprint** Europe has clearly failed to keep its environmental promises. *The Times* July 22, 2013 Monday The greens can't defy gravity. BYLINE: Tim Montgomerie
- 1042- Even a passenger in business class ticket has **a carbon footprint that is around three times the size** as someone in economy. The figure gets worse if some of the expensive seats are left empty. (...) **A carbon footprint measures** an individual's emissions of the greenhouse gases that are responsible for global warming. (...) Air travel represents at least **55 per cent of the organization's carbon footprint** and could be as high as 70 per cent, as reported by a World Bank blog. *MailOnline* June

15, 2013 Saturday Are first class passengers to blame for global warming? Flying up front **multiplies your carbon footprint by more than nine times** compared to economy class

- 1043- The CCC report pointed out that overall **the UK's "carbon footprint" has grown** by a tenth in the last two decades - largely because of imported carbon. (...) However the CCC did not advocate **including "imported carbon" in our footprint**. *telegraph.co.uk* April 24, 2013 Wednesday Climate change advisers says fracking can be OK BYLINE: Louise Gray
- 1044- The University of East Anglia paper said that the decision not to take a flight will have no "net effect" on the amount of greenhouse gases produced globally - and taking a diesel train or petrol bus instead could **even make your carbon footprint larger**. (...) Taking a bus or a diesel train instead could even **increase your carbon footprint**. *telegraph.co.uk* January 30, 2013 Wednesday Why flying could produce less carbon than taking the bus BYLINE: Louise Gray
- 1045- When the athletes join the programme, they make a pledge to lead by example and adopt a sustainable lifestyle. They vow to teach others how to tackle societal problems with environmental solutions and help motivate policymakers to make clean energy available. They also promise to encourage coaches and club leaders **to measure their carbon footprint** and adopt sustainable technologies - all tall orders for young people consumed with athletic training. *The Guardian* December 30, 2014 Tuesday How athletes are fighting climate change BYLINE: Eleanor Ross
- 1046- The Lima round of negotiations kicked off on a wave of optimism following high-profile commitments from the European Union, United States and China - which together account for most of the world's greenhouse gas emissions - **to slash their carbon footprints**. *The Independent on Sunday* December 14, 2014 Rich square up to poor at climate talks; Bickering countries rock Peru summit on global warming. Simeon Tegel reports from Lima BYLINE: Simeon Tegel
- 1047- Experts say the Lima talks will have **the biggest carbon footprint** of any UN conference to date at more than 50,000 tons of carbon dioxide. As well as the diesel generators, **the footprint has been enlarged** by the jet fuel burned by the estimated 11,000 people who flew in from abroad to attend - including roughly 4,000 from non-governmental organisations - as well as the emissions from the fleet of coaches that crawl through Lima's gridlocked streets to shuttle delegates to and from the venue. *telegraph.co.uk* December 13, 2014 Saturday Frantic efforts to save Lima climate change talks BYLINE: By Emily Gosden Lima and Harriet Alexander
- 1048- Despite plans to offset greenhouse gas pollution by introducing protection for three nature reserves in the South American country, the conference is expected to have the **biggest carbon footprint** of any UN climate meeting measured to date. *Express Online* December 10, 2014 Wednesday Pippa Middleton: Rejoice for climate change - now I can have white truffles for breakfast! BYLINE: Greg Heffer
- 1049- More than 40 Government officials are believed to be flying to attend the Lima conference, with **an estimated footprint of more than 1,600kg** of carbon dioxide each. *The Sunday Telegraph* December 7, 2014 It ain't half hot at the climate change summit BYLINE: EMILY GOSDEN
- 1050- Just throwing away less food and eating less meat means you can **make a significant dent in your carbon footprint**. *The Guardian* November 4, 2014 Tuesday Six ways you can help stop climate change BYLINE: Bibi van der Zee
- 1051- Asked if he was taking measures to try reduce **his own ecological footprint**, Caine (actor) jokingly protested that he was still making up for a frugal youth. *The Guardian* October 30, 2014 Thursday How Interstellar made Michael Caine think again about climate change BYLINE: Catherine Shoard (my addition in parenthesis)

- 1052- DiCaprio has tried to stay green in other parts of his life. He owns a \$4million apartment in an eco-friendly apartment building in Battery Park City. (...) Even if he flew on a commercial jet for all of flights, **his carbon footprint so far in 2014 would be a minimum of 40million metric tons of CO2** spewed into the atmosphere, more than twice the average American output for an entire year. *MailOnline* September 24, 2014 Wednesday 'You can either make history or be vilified by it': Leo DiCaprio lectures UN on climate change BYLINE: MICHAEL ZENNIE
- 1053- Countries around the world are searching for ways **to reduce their carbon dioxide footprint.** *MailOnline* September 4, 2014 Thursday Could this 'skin' stop global warming? BYLINE: VICTORIA WOOLLASTON
- 1054- Since February the ex-Deputy Prime Minister and former Environment Secretary has attended all-expenses paid summits in Europe, North America, India and China. There he has delivered lectures on the perils of damaging the environment and discussed new legislation which could restrict the ability of others to fly or drive cars in future. But he has been leaving **a substantial carbon footprint of his own.** *MAIL ON SUNDAY* August 10, 2014 Sunday PRESCOTT FLIES 40,000 MILES* IN FIVE MONTHS - TO LECTURE ON CLIMATE CHANGE
- 1055- As a result, the wholesale embrace of fracking in the United States has led to that great climate sceptic nation (it bears remembering that it did not sign the Kyoto Protocol) being one of the few in the world to have significantly **reduced its CO2 footprint.** *The Times* April 2, 2014 Wednesday Flashing Green Light
- 1056- By making street lighting less necessary, **the carbon footprint of urban centres could be drastically reduced.** *The Daily Telegraph* April 1, 2014 Tuesday Dream solutions to global warming
- 1057- **The carbon footprint' of two people flying to Vietnam and back is estimated at almost nine tons of CO2.** This is the same as **the average carbon footprint** for one Briton for a whole year - or 90 times that of one Ethiopian - and would need 24 trees to be planted to offset' it. *DAILY MAIL* February 22, 2014 Saturday SHAMED EX-MINISTER WHO LOVES LECTURING US ON GLOBAL WARMING FLIES 12,000 MILES FOR A HOLIDAY BYLINE: SAM GREENHILL
- 1058- Approving just two of the coal mines in Queensland's Galilee Basin, which would push coal through the dredged area at Abbot Point, **would add emissions equivalent to six times the annual carbon footprint of the UK.** *Guardian.com.* January 31, 2014 Friday Death by sludge, coal and climate change for Great Barrier Reef? BYLINE: Graham Readfearn
- 1059- Professor Turney and his acolytes were lured into an embarrassing fiasco by their own neurotic creed. On Christmas Eve, little more than a fortnight after the start of its voyage, the *Shokalskiy* became wedged in thick ice. As the weather worsened so did the crisis on board. The vessel had turned into a ship of fools. What made the debacle all the more humiliating was that this is now the height of summer in Antarctica, when ice coverage is meant to be at its most limited before the onset of winter. Faced by evidence that confounded their ideology the team were bewildered. (...) Eventually, with nerves fraying, winds howling and ice deepening, Turney's band was rescued by helicopter, a move that can have done nothing for **their burgeoning carbon footprint.** *Express Online* January 6, 2014 Monday Global warming brigade lose the plot on a ship of fools BYLINE: Leo McKinstry
- 1060- In Atlanta, the archbishop's office used the encyclical to sign up scientists and engineers to help parishes, and parishioners, **reduce their carbon footprint.** The bishop of Des Moines is planning to hold a press conference at a wind farm. *The Guardian* June 19, 2015 Friday US Catholics ready to follow Pope's 'marching orders' on climate change BYLINE: Suzanne Goldenberg
- 1061- The archbishop's office in Atlanta signed up scientists and engineers to help parishes, and parishioners, **reduce their carbon footprint.** The Bishop of Des Moines is planning to hold a press

conference at a wind farm. *The Guardian* June 18, 2015 Thursday The Pope's encyclical on climate change - live reaction and analysis BYLINE: Adam Vaughan

1062- The good news is that companies are recognizing the very real threat of climate change and taking steps to mitigate its effects. According to the report, 81% of the world's 500 largest companies have set targets **to reduce their carbon footprints**. *The Guardian* May 21, 2015 Thursday Companies aren't doing enough to prevent catastrophic climate change BYLINE: Alison Moodie

1063- Putting the two businesses together makes **a growing carbon footprint even bigger**. Shell's direct greenhouse gas emissions from facilities were 76m tonnes on a CO2-equivalent basis in 2014, up 4% from 73m tonnes 12 months earlier. *The Guardian* May 19, 2015 Tuesday The real story behind Shell's climate change rhetoric BYLINE: Terry Macalister

1064- The Episcopalian church will host a webcast on 24 March to kick off a month-long action campaign designed to encourage church members **to reduce their own carbon footprints** and lobby government and international corporations to fight climate change. *The Guardian* March 24, 2015 Tuesday Climate denial is immoral, says head of US Episcopal church BYLINE: Suzanne Goldenberg

1065- The US military has been tasked with **reducing its carbon footprint** at all of its military bases and in war zones. *The Guardian* February 18, 2015 Wednesday Canadian mounties' secret memo casts doubt on climate change threat BYLINE: Suzanne Goldenberg

1066- Analysis from the Australian Conservation Foundation has said if all nine proposed Galilee Basin mines went ahead, the burning of the coal would add 700 million tonnes of CO2 to the atmosphere every year. That's about 150 million tonnes more than **Australia's entire annual greenhouse gas footprint**. *The Guardian* January 28, 2015 Wednesday Queensland election: Climate science denied and ignored BYLINE: Graham Readfearn

1067- BP and Shell were targeted by the new shareholder resolutions because they have **the biggest carbon footprints** of all the companies listed on the London stock exchange. The resolutions also challenge the companies to reduce their own emissions and invest in renewable energy. *The Guardian* January 21, 2015 Wednesday Shareholders challenge BP to confront climate change risk BYLINE: Damian Carrington

1068- New shampoo bottles contain less plastic, deodorant aerosols have had **their carbon footprint trimmed** and Unilever has developed a handwash, Lifebuoy, that changes colour when children have cleaned their hands for sufficient time to kill germs. (...) Back in 2011, Mr Polman pledged to double Unilever's turnover by 2020 while **halving the company's carbon footprint**. A slowdown in emerging markets has made that tricky, but still the shares have risen by 39 per cent in five years. *The Times* January 17, 2015 Saturday The boss with an appetite for more than Just Pot Noodle and ice cream BYLINE: Andrew Clark

1069- Won't the summit have **a huge carbon footprint**? *The Guardian* December 11, 2015 Friday The Paris climate summit at a glance; BYLINE: Adam Vaughan

1070- While **our consumption footprint is undoubtedly outsized** more than 80 per cent of Nobel science and other prizes have been awarded to western nations - reflecting what we have given to global civilisation. *The Times* December 7, 2015 Monday Climate change reparations are a ridiculous idea BYLINE: Tim Montgomerie

1071- **Reducing agriculture's carbon footprint** Agriculture, forestry and fisheries can make a significant contribution to global mitigation efforts by **reducing their carbon footprint**, adopting low

emission growth strategies and enhancing carbon storage in soils, forests and aquatic systems. *The Guardian* December 1, 2015 Tuesday 10 reasons why agriculture is key to combating climate change; Global warming's impact on food production is one of the hot topics to be discussed by world leaders in Paris at COP21

- 1072- Much of the public oppose green taxes on petrol, electricity and imported food - or any products with a **high carbon footprint**. *Express Online* November 29, 2015 Sunday Global warming FARCE: Overwhelming majority of Britons think climate change is FAKE BYLINE: Oli Smith
- 1073- The challenge is to achieve a balance of all three of these energy policy goals - to do so it's crucial that Britain establishes a long-term energy policy that accommodates a broad mix of capacity types including nuclear, gas, carbon capture and storage, renewables and new forms of capacity like storage, demand-side response and smart meters which can help consumers control and **reduce their carbon footprint** and energy bills at an individual and community level. *The Guardian* November 20, 2015 Friday Tackling climate change should be the UK's top energy priority
- 1074- The two scientists, who met at summer school in Svalbard four years ago, have carried their own possessions **to minimise their carbon footprint**. Today Knudsen's rucksack weighs 10kg but in northern Norway, where he had to carry warm layers and up to 10 days' worth of food, it could weigh as much as 15kg. *The Guardian* November 11, 2015 Wednesday Running for climate change: 'I was very much on the edge physically and mentally' BYLINE: Emma Howard
- 1075- Climate change: what are you doing to **reduce your carbon footprint?**; Are you more or less concerned about climate change than you were? And what are you doing to cut your emissions? Share your thoughts with us before the Paris climate talks next month *The Guardian* October 28, 2015 Wednesday BYLINE: Carmen Fishwick
- 1076- The Prince of Wales has been branded a "serial hypocrite" after it emerged that the heir to the throne- who prides himself on his green credentials - used a helicopter to fly less than 70 miles in order to attend a polo match. Prince Charles has frequently spoken of the need to address climate change and has urged members of the public **to cut their carbon footprint**. But the Prince appears to be struggling to practice what he preaches. Last weekend, he instructed the royal helicopter, which is based at RAF Odiham, Hampshire, to fly 60 miles to his Gloucestershire retreat, Highgrove. He was then transported to Windsor Great Park, 68 miles away, where he stepped into a Jaguar for the short trip to Guards Polo Club. *Independent.co.uk* July 31, 2015 Friday Prince Charles branded a 'serial hypocrite' after flying less than 70 miles to attend polo match; The Prince of Wales has frequently spoken of the need to address climate change and has urged members of the public **to cut their carbon footprint** BYLINE: Katie Grant
- 1077- Those with **large carbon footprints** - like the very rich, with multiple large homes, for example - would bear the brunt. In that way, market forces would be allowed to let renewables compete and lower the cost of clean energy. *The Guardian* July 29, 2015 Wednesday Hillary Clinton's climate change plan 'just plain silly' BYLINE: Caty Enders
- 1078- The environmental lobby is unanimous in its certainty that carbon emissions from human activities have caused the globe to warm in recent decades, even though raw thermometer data from around the world suggest it has been 18 years since the planet's temperature has ticked upward. **Reducing that carbon footprint**, they say, requires dramatic cuts in the burning of fossil fuels like the jet fuels Clinton's jet consumed between Iowa and New Hampshire. *MailOnline* July 28, 2015 Tuesday EXCLUSIVE: Video shows Hillary Clinton boarding private jet just hours after launching global-warming push BYLINE: DAVID MARTOSKO
- 1079- According to estimates by the Asset Owners Disclosure Project, only 7% of asset owners **calculate the carbon footprint** of their investment portfolios and only 1.4% have an explicit target to reduce it. (...) The EIU (Economist Intelligence Unit) follows warnings from the Bank of England about the financial risks posed to fossil fuel companies if global climate action renders their reserves of

oil, coal and gas worthless. *The Guardian* July 24, 2015 Friday Investors could lose \$4.2tn due to impact of climate change BYLINE: Terry Macalister (my addition in parenthesis)

- 1080- The list of international development projects funded by British aid grows more bizarre - an anti-litter drive in Jordan, a water park in Morocco, a study of coconuts in the Pacific, **measuring the carbon footprint of the Dakar rally** in Senegal. *MailOnline* July 24, 2015 Friday DAILY MAIL Climate change and an inconvenient truth
- 1081- Bill de Blasio, the mayor of New York City, has pledged **to reduce his city's carbon footprint** by 40% by 2030 in a speech in which he praised Pope Francis - who he called the "highest moral authority" - for calling on the world to take bold action on climate change. *The Guardian* July 21, 2015 Tuesday Mayor Bill de Blasio pledges to cut New York carbon emissions by 40% by 2030 BYLINE: Stephanie Kirchgaessner
- 1082- EU regulations are meant to avoid the destruction of crucial natural peat and grass habitats. But the EU's renewable energy directive is in some cases having the opposite effect. Maize grown for biogas on drained peatlands can receive large environmental subsidies, despite having **a carbon footprint eight times higher** than coal, according to professor Joosten. *The Guardian* July 20, 2015 Monday Swamp power: how the world's wetlands can help stop climate change BYLINE: Arthur Neslen
- 1083- Organic farming first emerged in the US in the 1940s and now makes up three per cent of agricultural land in the US. (...) This all contributes to **the growing carbon footprint** of organic farming. *MailOnline* July 17, 2015 Friday Is organic farming making climate change worse? Demand for 'sustainable' food has increased greenhouse gas emissions BYLINE: RICHARD GRAY
- 1084- Citizens of the US, Canada and Australia have **a higher carbon footprint** - about 16 tonnes - each causing almost 50 sq m of ice loss per year. In the UK, the average emissions are 7.5 tonnes per year, meaning 22.5 sq m of ice loss. *The Guardian* November 3, 2016 Thursday **Your carbon footprint destroys 30** square metres of Arctic sea ice a year; New research calculates the impact of the average westerner's carbon emissions to help people understand their own contribution to climate change BYLINE: Damian Carrington
- 1085- Even before BlackRock's report, evidence was mounting that investing in companies with **a low carbon footprint** pays off. *The Guardian* October 27, 2016 Thursday The carbon bubble: why investors can no longer ignore climate risks BYLINE: Carol J Clouse
- 1086- Even the worthiness of individual efforts **to reduce one's 'carbon footprint'** were seen quite differently, with 52 percent of liberal Democrats saying this can make a big difference compared to 21 percent of conservative Republicans. *MailOnline* October 5, 2016 Wednesday Majority of Americans don't believe humans are to blame for climate change - and most are skeptical scientists can find a solution BYLINE: HANNAH PARRY
- 1087- The main driver of wildlife extinction is not climate change but humanity's rapacious harvesting of species for food and trophies, along with **our ever-expanding agricultural footprint**, said researchers pleading for a rest of conservation priorities. *MailOnline* August 11, 2016 Thursday Climate change is NOT the 'biggest killer' of wildlife: Guns and tractors threaten biodiversity more than global warming BYLINE: ELLIE ZOLFAGHARIFARD
- 1088- **The ecological footprint attempts to measure in hectares** the natural resources a country requires on a per capita basis to produce all the food, water and non-food commodities it consumes, or absorb the waste it generates. (...) The countries that have the **lowest ecological footprint** tend to be the most vulnerable to the impacts of climate change, including sea level rises and water scarcity. *The Guardian* June 15, 2016 Wednesday Five charts that explain who gets hit hardest by food price rises BYLINE: Tom Levitt

- 1089- We used the myclimate.org calculator. It presumes commercial flights are fully-loaded and **we multiplied by an average factor of 12 to estimate the carbon footprint** of all private jet flights. It's unclear who shared any of the private flights, so our figures are calculated as if he was flying alone *MailOnline* May 24, 2016 Tuesday Eco-warrior or hypocrite? BYLINE: ALISON BOSHOF and SUE CONNOLLY
- 1090- As Anohni sings, "I want to burn the animals," in 4 Degrees, note that this is coming from a globetrotting pop star **with a whopping carbon footprint**. *The Times* May 6, 2016 Friday Protest singing just got fabulous; Anohni rails against Obama, drones and global warming to sweeping strings and a disco beat BYLINE: Will Hodgkinson
- 1091- Unfortunately, with my green efforts **I take one step forward and two huge strides back, leaving a massive smudgy carbon footprint** with my "mumtruck". *The Independent* January 30, 2016 Saturday The joy of a freezing January day when global warming haunts the weather forecast BYLINE: Sara Cox
- 1092- With Rihanna and Leonardo DiCaprio it's an age old tale of boy meets girl, boy gets girl, boy realises girl has a **massive carbon footprint**. (...) This could be concerning for the Bajan beauty who is permanently zipping about on tours and holidays - no doubt leaving a **massive carbon footprint**. *mirror.co.uk* January 22, 2016 Friday Things heating up between Leonardo DiCaprio and Rihanna - but global warming could divide them; With her 500 holidays a year Rihanna doesn't strike us as having a **low carbon footprint** - this could be bad news for a budding romance with the eco warrior BYLINE: Simon Keegan
- 1093- But for every certainty there is also a rumour, a supposition where the void of celebrity leaves a blank. He's (Leonardo DiCaprio) an environmentalist whose jet-set lifestyle **leaves a huge carbon footprint**. He's a party boy, a playboy, a commitment-phobe modeliser who might, or might not, have proposed recently to his Sports Illustrated model girlfriend, Kelly Rohrbach, over dinner. *telegraph.co.uk* January 14, 2016 Thursday Leonardo DiCaprio: 'wealth and success don't make you happy' (my addition in parenthesis)
- 1094- Well aware of the impact snow sports are having on the environment, Burton Snowboards recently announced a series of changes **aimed at diminishing its environmental footprint**. *MailOnline* December 18, 2017 Monday How climate change is killing the Winter Olympics: Scientists warn rising temperatures will threaten winter sports
- 1095- The world's appetite for meat and dairy foods is rising as people's incomes rise, but the simple arithmetic is that unless this is radically curbed, there is no way to beat global warming. The task looks daunting - people hate being told what to eat. However, just in the last year, a potential solution has burst on to the market: plant-based meat, **which has a tiny environmental footprint**. *The Guardian* November 8, 2017 Wednesday The seven megatrends that could beat global warming BYLINE: Damian Carrington
- 1096- Won't the Bonn summit have a **massive carbon footprint**? *The Guardian* November 5, 2017 Sunday The COP23 climate change summit in Bonn and why it matters; Halting dangerous global warming means putting the landmark Paris agreement into practice - without the US - and tackling the divisive issue of compensation BYLINE: Damian Carrington
- 1097- Lots of you have been in touch to lend your support to our expanded environmental coverage, and to tell us about **the steps you have personally been making to reduce your carbon footprint** and to help and encourage others to do the same. (...) Other commenters, however, were quick to point out the much **larger carbon footprints** of those born in the US, Europe and Australia, for example (ie: the solution lies with all of us). *The Guardian* September 9, 2017 Saturday Guardian members: join our podcast on climate change and population BYLINE: Vicky Frost
- 1098- Although **Native American tribes' own carbon footprints are relatively small**, they are set to be some of the communities worst hit by climate change. *The Independent* July 17, 2017 Monday Native

American tribes reject Trump's stance on climate change and pledge to uphold the Paris Agreement; Four Native American nations have joined together to 'aggressively address climate change' BYLINE: Caroline Mortimer

- 1099- Other efforts **to reduce the city's carbon footprint** include the promotion of water taxis and trolley buses, to get cars off the streets, and incentives for green construction. *The Guardian* June 12, 2017 Monday The fight against climate change: four cities leading the way in the Trump era BYLINE: Oliver Milman, Joe Eskenazi, Richard Luscombe, and Tom Dart
- 1100- People in the South-west of England have one of **the biggest 'carbon footprints'** in Europe, according to new research. (...) **Average household carbon footprint in tonnes** of carbon dioxide (...) The average household in France, Spain, Sweden and Poland also had **lower carbon footprints** that the average British family. (...) **Total household carbon footprint in megatonnes** of carbon dioxide equivalent *The Independent* June 1, 2017 Thursday **European carbon footprint maps** show places doing most and least to cause climate change; The South-west of England has **one of the highest average carbon footprints**, while people in Romania have some of the lowest BYLINE: Ian Johnston
- 1101- Other major companies like Google, Apple, Facebook, Walmart, and electronics retailer Best Buy have committed **to reducing carbon footprints** of their supply chains in part due to consumer demand. *The Independent* May 31, 2017 Wednesday Elon Musk threatens to quit role advising Trump if he pulls US out of Paris Agreement on climate change; The White House says the President will make on decision on wether towithdraw'very soon' BYLINE: Mythili Sampathkumar
- 1102- The former President - who reportedly pocketed £2.5million for the one and a half hour speech - appeared at the Global Food Innovation Summit on Tuesday to urge conference-goers **to reduce their carbon footprints**. But footage from the event shows an ostentatious arrival, with police cars, motorbikes, and gas-guzzling armoured SUVs ferrying the ex-Commander in Chief to the event. Mr Obama was allegedly chauffeured straight from the airport to the £7,100 -a-night Park Hyatt hotel in the city, reportedly with an escort of up to 300 police officers. *Express Online* May 11, 2017 Thursday Obama 'travels with gas-guzzling 14 car escort to give £2.5million climate change talk' BYLINE: Fraser Moore
- 1103- And (EURO)1.8million will go to the piSCES project, which aims to improve the quality and security of energy supply for fisheries businesses in remote locations while minimising their exposure to energy price peaks and **reducing their carbon footprints**. *Daily Mirror* March 7, 2017 Tuesday EU gives (EURO)7m fund for Irish Sea climate change study BYLINE: JOHANNA CARR
- 1104- You may have read that urban wood burners were to blame, which is true, but not very true. Most likely, they contributed to a tiny proportion of the spike, with the vast bulk being the fault of diesel cars. Both, though, were once regarded as ways of **lowering your CO2 footprint**, which is the sort of irony global warming sceptics grow positively gleeful about. *The Times* January 31, 2017 Tuesday Even a sceptic has to believe in air pollution; Andrea Leadsom should ignore the bickering about global warming and **take radical steps to clean up our toxic cities** BYLINE: Hugo Rifkind
- 1105- **The carbon footprint of Kutubdia's 100,000 islanders is small** - most do not even have access to a regular electricity supply. *The Guardian* January 20, 2017 Friday On the climate change frontline: the disappearing fishing villages of Bangladesh; **Kutubdia's islanders don't have much of a carbon footprint** - most don't have regular electricity. But they are facing the reality of a changing climate, and soon tens of millions of their fellow Bangladeshis will be at risk BYLINE: Karen McVeigh

NEW - Doom Prediction scenarios

NEW - CRASHING TRANSPORTS scenarios:

- 1- You'd be hard pressed, however, to find anyone in Alaska prepared to admit this. With 80% of state revenues coming from royalties paid by drilling companies, and many of the highest-paying and most reliable jobs based on extraction and oilfield services, **no one wants to rock the boat.** *The Guardian* February 14, 2004 Weekend: MELTDOWN: Alaska is a huge oil producer and has become rich on the proceeds. BYLINE: Mark Lynas

- 2- Like the ice-caps, which as they shrink reflect less sunlight and encourage the earth to warm still more, these are "positive feedback" mechanisms, and once disrupted by CO₂-induced warming, they act to accelerate that process further. **They are, in other words, like runaway trains. And once they're rolling, they won't stop until they've crashed us** into a very new and very different climatic situation. *The Daily Telegraph* July 1, 2006 Saturday We must act now A volume of detailed analysis shows that cataclysmic climate change may occur as early as 2020 BYLINE: JAMES FLINT

- 3- Scientists warn that the years of inaction since the IPCC issued its earlier warnings could prove costly. Emissions have continued to rise, worsening the inevitable climate problems and making it more awkward for politicians to pledge to slow **a rapidly accelerating runaway train.** And it has also made it more difficult for the world to meet the UN's millennium development goals. *The Guardian* September 24, 2008 Wednesday All out on poverty: Hunger: opinion/globalisation: 'We risk seeing progress reversed' BYLINE: David Adam

- 4- **Imagine you are about to get on a plane with your family.** A huge group of qualified airline mechanics approach you on the tarmac and explain they've studied the engine for many years and **they're sure it will crash if you get on board.** They show you their previous predictions of **plane crashes**, which have overwhelmingly been proven right. Then a group of vets, journalists, and plumbers tell they have looked at the diagrams and it's perfectly obvious to them **the plane is safe and that airplane mechanics - all of them, everywhere - are scamming you. Would you get on the plane?** That is our choice at Copenhagen. *The Independent* December 4, 2009 Friday How I wish that the global warming deniers were right BYLINE: Johann Hari

- 5- "Coal-fired power plants are **factories of death,**" wrote Hansen (scientist), "the trains carrying coal to power plants are **death trains**". This deliberate echo of **the trains carrying Jews to Nazi death camps** recalled how the more extreme warmists like to equate sceptics on climate change with "**Holocaust deniers**". But such overheated language seemed somehow at home in the newspaper which in 1996 solemnly predicted that by 2016 half a million Britons would be dying each year from having eaten BSE-infected beef. *The Sunday Telegraph* February 22, 2009 Climate change rhetoric spirals out of control BYLINE: Christopher Booker (my addition in parenthesis)

- 6- The often repeated question is: **would you get into a plane if someone told you there was a ten-to-one chance it would crash?** Of course you wouldn't. So why take that chance with the planet? *The Guardian* November 30, 2009 Monday Copenhagen 2009: Why Copenhagen matters: After 400 generations of stable weather, the world is on the brink of what could be sudden and violent climate change. BYLINE: Fred Pearce

- 7- It's all a question of probability and risk. (...) **You are putting your daughter on a plane. The pilot tells you there is a 1-in-100 chance it will crash.** You, if you have any sense, **take your daughter off the plane.** Why? Because the potential loss is so great that 1 in 100 is unacceptable. So it is with global warming - except the down side probability is a good deal higher than 1 in 100. *The Sunday Times* November

29, 2009 THIS MOUNTAIN RANGE IN BOLIVIA WAS ONCE COVERED IN SNOW. NOW IT ISN'T. WHAT DO ITS BARREN SLOPES TELL US? BYLINE: Bryan Appleyard

- 8- But at a conference on reporting climate change last week, senior Chinese scientists and negotiators were in an altogether less emollient mood. The official Chinese position is snappily summarised as "shared burden, differentiated responsibilities", **which roughly translates as: We're all in the same boat but it's your fault that it's taking on water**, so you'd better do most of the **balancing**. *The Guardian* September 17, 2009 Thursday The world waits for Beijing: It could be the most crucial question we face today: just what is China's climate change strategy? BYLINE: Ian Katz

- 9- But with public confidence in climate science taking such a knock in recent months, what will it take to convince the public that urgent action really is required to reduce greenhouse gas emissions - or, as is Lovelock's preference, **to adapt and prepare the lifeboat for a changing climate**? *The Guardian* March 30, 2010 Tuesday G2: 'Fudging data is a sin against science': In his first major interview since the climate-change emails scandal. BYLINE: Leo Hickman

- 10- David Evans, who was a consultant for the then Australian Greenhouse Office until last year, said: "The whole idea that carbon dioxide is the main cause of any warming is based on a guess made in 1980 that was proved totally wrong by scientists as far back as the mid-Nineties." The whole thing is now **a train wreck**. Although no one started out to scam or mislead, really the climate scientists are a bit corrupt now as they know they are exaggerating, but there are now too many jobs, industries, trading profits and political careers **riding along on this nonsense** to admit it is just that. *Sunday Express* June 12, 2011 An uncomfortable lie; The truth behind climate change tyrants' hype BYLINE: Hilary Douglas

- 11- The pollution we emit today will have effects for many years (partly because of the oceans). We cannot just stop emitting pollution and think this problem will immediately go away. We have to plan ahead. And, importantly, we have to stop emitting before most of the effects are evident. I like to think of the Earth's climate **like a heavy train. A train cannot stop quickly; the brakes have to be applied far ahead of an obstacle**. The ocean is our **"climate train."** *The Guardian* December 26, 2017 TuesdayUS government climate report looks at how the oceans are buffering climate change BYLINE: John Abraham

- 12- Vivian Nicoli, investment director at Eiser, told delegates that her firm had recently canvassed key investors to find out if they would be interested in a specific renewables fund. Their answer, she said, was for the most part "no". Investors are very cautious because regulators often change renewable energy subsidies and tariffs, she said, which doesn't give investors the stability they are looking for. For example, governments often agree to pay more for electricity produced by renewables in order to encourage long-term investment in the industry, however, that price can often be reviewed or even scrapped when the political landscape changes. "A more cohesive strategy at the national level would help," Nicoli added. (...) For many delegates, the only way to counter this was through a global carbon price, although there was disagreement around the table about how this could work in practice, given that Russia and the "Stan" states were still likely to dig these resources up. (...) But perhaps Nicoli summed up the mood of participants best, likening the world's transition to a clean economy to **an unstoppable train that has already left the station**. "It's going to happen," she said, "because it makes economic sense." *The Guardian* June 20, 2014 Friday The Guardian roundtable sponsored by WWF: Keep the climate, change the economy BYLINE: Craig Scott

NEW - CONFLICT scenarios:

- 13- One of the most difficult areas is distinguishing between natural variation in climate - an inherently "chaotic" system - and changes resulting from the man-made emissions of greenhouse gases. Computer models have attempted to tease apart **the natural "forcing" of the greenhouse effect from man-made, or anthropogenic influences. A positive "radiative forcing"**, such as that caused by an increasing concentration of greenhouse gases in the atmosphere, tends to warm the Earth's surface. **A negative radiative forcing**, caused for instance by the release of particles into the atmosphere from a volcanic explosion, causes cooling. *The Independent* July 12, 2001, Thursday GLOBAL WARMING REPORT: THE DOUBTS - EFFECT OF POLLUTION WILL LAST FOR GENERATIONS BYLINE: Steve Connor

- 14- This is being seen in the North Sea in particular, where the water temperature has risen by 2C in the last 20 years, and where the whole ecosystem is thought to be undergoing a "regime shift", or a **fundamental alteration in the interaction** of its component species. *The Independent* July 30, 2004, Friday DISASTER AT SEA: GLOBAL WARMING HITS UK BIRDS BYLINE: MICHAEL MCCARTHY

- 15- It was a **complex series of feedbacks and interactions** which regulated the temperature, the chemical composition of the atmosphere, even the salinity of the seas, so that life could thrive - and what was controlling it all, was life itself. *The Independent* May 24, 2004, Monday GURU WHO TUNED INTO GAIA AND GAVE FIRST CLIMATE CHANGE WARNING BYLINE: MICHAEL MCCARTHY

- 16- Climate continually changes through a **complex interaction** of natural causes that is still not fully understood. *The Times* August 15, 2003, Friday Kyoto agreement and climate change

- 17- The UN dated its list of "**forcings**" (influences on temperature) from 1750, when the sun, and consequently air temperature, was almost as warm as now. But its start-date for the increase in world temperature was 1900, when the sun, and temperature, were much cooler. (...) Every "**forcing**" produces "**climate feedbacks**" making temperature rise faster. For instance, as temperature rises in response to a **forcing**, the air carries more water vapour, the most important greenhouse gas; and polar ice melts, increasing heat absorption. Up goes the temperature again. The UN more than doubled the base forcings from greenhouse gases to allow for **climate feedbacks**. It didn't do the same for the base **solar forcing**. (...) Sami Solanki, a solar physicist, says that in the past half-century the sun has been warmer, for longer, than at any time in at least the past 11,400 years, contributing a base **forcing** equivalent to a quarter of the past century's warming. That's before adding **climate feedbacks**. The UN expresses its **heat-energy forcings** in watts per square metre per second. It estimates that the sun caused just 0.3 watts of forcing since 1750. Begin in 1900 to match the temperature start-date, and the base **solar forcing** more than doubles to 0.7 watts. Multiply by 2.7, which the Royal Society suggests is the UN's current factor for **climate feedbacks**, and you get 1.9 watts - more than six times the UN's figure. (...) Even a 0.6C temperature rise wasn't enough. So the UN repealed a fundamental physical law. Buried in a sub-chapter in its 2001 report is a short but revealing section discussing "lambda": the crucial factor converting **forcings** to temperature. The UN said its climate models had found lambda near-invariant at 0.5C per watt of **forcing**. (...) On the UN's figures, **the entire greenhouse-gas forcing** in the 20th century was 2 watts. (...) Finally, the UN's predictions are founded not only on an **exaggerated forcing-to-temperature** conversion factor justified neither by observation nor by physical law, but also on an excessive rate of increase in airborne carbon dioxide. *The Sunday Telegraph* November 5, 2006 Sunday DON'T BELIEVE IT The sun is warmer now than for the past 11,400 years The Stern report last week predicted dire economic and social effects of unchecked global warming. BYLINE: Christopher Monckton

- 18- However, this value is associated with substantial error bars, and the warming is occurring in a system that can vary about that much without any **forcing** at all - something not surprising in a system that is both turbulent and heterogeneous. Yes, there does appear to be warming, but the amount is hardly certain or indisputable. And the amount found does not appear that alarming. (...) That imbalance can develop as a consequence of several different "**forcing factors**": for instance, changes in the sun's output, changes in the chemical composition of the atmosphere, and changes in the surface

characteristics of the planet. *The Sunday Telegraph* October 29, 2006 Sunday The temperature is as likely to go down as up Is global warming happening? BYLINE: PHILIP EDEN

- 19- It's a shame that George Monbiot didn't check his facts with me before using his column to describe my two recent Sunday Telegraph articles on climate change as "nonsense from start to finish" (This is a dazzling debunking of climate change science. It is also wildly wrong, November 14). He implies that a classically trained peer ought not to express scientific opinions. It's still a free country, George. And at least I got the science right. (...) He says I overlooked the difference between the immediate and delayed temperature **response** to changing conditions. In fact I expressly addressed it, citing evidence on both sides of the theory that the delayed air-temperature **response** arises from warming of the oceans. *The Guardian* November 15, 2006 Wednesday This wasn't gibberish. I got my facts right on global warming: BYLINE: Christopher Monckton

- 20- Rising sea levels due to global warming account for only a quarter of the pounds 27bn forecast in the report. A tiny percentage comes from the gradual sinking of the south-east, a **see-saw response** to the rebound of the Scottish Highlands since the glaciers retreated at the end of the last ice age. *The Independent on Sunday* August 27, 2006 Storm warning; CLIMATE CHANGE Will devastating floods hit Britain next month? And what if they do? BYLINE: Paul Rodgers

- 21- We know that the global climate is influenced by **complex interactions** between the weather systems of the oceans and those of the atmosphere. Land, too, plays its part, whether it is the effect of snow and ice reflecting sunlight and hence heat due to the "albedo effect", or mountain ranges that influence the direction of prevailing winds. *The Independent* February 11, 2006 Saturday Why flutter of butterfly's wings explains global warming BYLINE: STEVE CONNOR

- 22- The Gaia system, founded on the **interaction** of life-forms with their environment, is made up of **feedback mechanisms** that have previously acted in a benign way for humans. *The Independent* January 17, 2006 Tuesday Green campaigners support Lovelock for sparking fresh debate on global warming BYLINE: Michael McCarthy

- 23- The Earth's climate is influenced by a vastly complex series of factors which **interact** with each other in literally millions of ways. *Daily Mail* January 13, 2006 Friday Does this prove that global warming's all hot air? BYLINE: MELANIE PHILLIPS

- 24- The **radiative forcing** potential - the amount the blanket can warm the planet - has increased 30 per cent. *The Daily Telegraph* February 3, 2007 Saturday Official: global warming is all our fault BYLINE: Charles Clover

- 25- Of the 22 indicators, five show improvement, three show deterioration, and five show no change, fluctuation or divergent component trends. Nine present baseline data for a new measure. In particular, four indicators reveal **biodiversity responses** to climate change across terrestrial, coastal and marine environments. Declines in some nesting seabirds, such as guillemots and kittiwakes, are of particular concern. *The Independent* October 10, 2007 Wednesday Butterflies enlisted to help track climate change in natural world

- 26- The effects of the Sun, water vapour, geothermal exchanges, aerosols, unreliable data series, oceanic and terrestrial carbon absorption, currents, volcanoes, etc are all crucial but as yet little understood.

These elements **interact** in complex and mysterious ways. Chaos theory rules. *The Times* December 20, 2007, Thursday The false certainties of climate change theory

- 27- This has resulted in many depressions crossing southern and central parts of Britain, **interacting** with very warm and moist air to the south and **generating** exceptionally heavy rain storms, while other parts of Europe are experiencing drought. *The Daily Telegraph* July 28, 2007 Saturday Apocalypse now? As Britain counts the costs, both human and financial, of the worst floods in 200 years BYLINE: Charles Clover
- 28- Weather forecasts start life as measurements of sunshine, rainfall, wind speed and air pressure, which are then extrapolated to predict how all those things will **interact** and change. *The Guardian* May 21, 2007 Monday Weather: The heat is on BYLINE: David Adam
- 29- The realistic optimist, therefore, accepts that **a major battle in the war** against global warming has been lost, and prepares for the next push. International agreements are often messy and imperfect, processes rather than events. The treaties which liberalised world trade after **the war started** with the General Agreement on Tariffs and Trade in 1947, but the World Trade Organisation which was envisaged then was only set up in 1995. *The Independent* June 16, 2001, Saturday MR BUSH'S INSOUCIANCE OVER GLOBAL WARMING WILL SOON SEEM OUT OF DATE
- 30- America must join **war against global warming**, says the green Queen (...) Senior aides said they cannot recall the Queen weighing into a debate on such a sensitive international question during an official visit. She will raise the issue when she opens the UK-German climate change conference in Berlin on Wednesday. The Queen has already introduced a number of measures to make Buckingham Palace more environmentally friendly. Royal cars have been converted to run on liquefied petroleum gas to cut harmful emissions, and energysaving light bulbs have been fitted throughout the Royal estates *Mail on Sunday* October 31, 2004 BYLINE: MATT NIXSON
- 31- The problem is that while the threat of atomic obliteration was all too real, the threat from climate change is still largely unproven. For all their posturing over their green policies, Tony Blair and Michael Howard may find they have **declared war on an enemy that doesn't exist and instead of weapons of mass destruction, we now have weather of mass deception**. *DAILY MAIL* September 15, 2004 Global warming? No. Just hot air from politicians BYLINE: MICHAEL HANLON
- 32- The Pentagon's predictions - ignored by the Bush administration - are coming true faster than anybody could have expected. The genocide unfolding in Darfur is in fact **the first global warming war**. *The Independent* September 15, 2004, Wednesday THE GLOBAL WARMING CRISIS: THESE SMALL STEPS ON CLIMATE CHANGE FALL SHORT OF THE DRASTIC SOLUTIONS WE NEED BYLINE: JOHANN HARI
- 33- Beckett sees **climate change as righteous war Blair could win** (...) If Tony Blair's legacy seems forever bound up with Iraq, well, here's a way out. How about: Blair saves the world? This is a slight exaggeration, not a dramatic one. As environment secretary, Beckett has been at the centre of international talks about climate change, and believes next year will be pivotal. Eighteen months ago, Blair told her climate change would be the priority for Britain's presidency of the G8 next year. Since then there have been intensive, unreported, discussions between cabinet ministers. *The Guardian* June 30, 2004 Policy & Politics BYLINE: Jackie Ashley

- 34- **MILLIONS IN PERIL AS WAR OVER GLOBAL WARMING HOTS UP; CHOICES WE MAKE TODAY WILL DECIDE HOW MANY LIVE OR DIE TOMORROW** *Sunday Express* April 11, 2004
BYLINE: Stuart Winter
- 35- **Global warming is real terror war** says top adviser (...) THE government's chief scientific adviser is to criticise the American government for what he claims is inaction over global climate change when he makes a keynote speech in Seattle this week, writes Jonathan Leake. (...) (Sir David King) King's speech follows yet another period of extraordinarily warm weather in Europe. The beginning of this month was one of the warmest on record in Britain.(...) Last year 15,000 people died in France in an unprecedented heatwave and the 10 hottest years on record globally have occurred since 1991. There is growing international tension over global warming. Europe and many other countries have accepted the scientific arguments and incorporated greenhouse gas reduction into government policy. However, the Kyoto treaty of 1997, which would set international reduction targets and create a system in which countries can trade permits to emit greenhouse gases, remains unratified -because Bush has refused to countenance any agreement that might restrict American businesses. *Sunday Times* February 8, 2004 BYLINE: Jonathan Leake
- 36- **THIS WEEK'S BIG ISSUES - KYOTO WAR HOTS UP; MINISTERS HEAD TO MILAN TO DISCUSS GLOBAL WARMING** *Independent on Sunday* November 30, 2003 BYLINE: GEOFFREY LEAN
- 37- **War on climate change** targets flatulent cows *The Sunday Times* December 4, 2005 BYLINE: Toby McDonald
- 38- PRINCE Charles yesterday **declared war on global warming**. He warned that climate change was the greatest challenge facing mankind. And he accused politicians of not doing enough to safeguard our future. But one environmentalist slammed the prince for being a wasteful user of energy and the UK's second biggest user of carbon. *The Mirror* October 28, 2005, Friday THE CLEAN HEIR ACT; CHARLES' FURY AT GLOBAL WARMING BYLINE: NATHAN YATES
- 39- OUR TB, you will recall, **put the war against global warming** at the very heart of last month's G8 summit of the world's richest nations in Gleneagles -**a war that sees air travel as one of the worst creators of greenhouse gases**. *The Sun* August 16, 2005 THE WAR AGAINST GLOBAL WARMING
- 40- It is a stark picture: mankind is clearly making profound and worrying alterations to our climate. This leaves us with two remaining issues: the range of actions at our disposal and the lessons of history. The former are discussed throughout this supplement and make it clear that individuals, companies and government can play a significant role in **the war against global warming**. *The Observer* June 26, 2005 Turning the Tide: Planet in Peril BYLINE: Robin McKie
- 41- So, in Bellamy's poor typing, we have the basis for **a whole new front in the war against climate science**. The 555 figure is now being cited as definitive evidence that global warming is a "fraud", a "scam", a "lie". I phoned New Scientist to ask if Bellamy had requested a correction. He had not. *The Guardian* May 10, 2005 Junk science: David Bellamy's inaccurate and selective figures on glacier shrinkage are a boon to climate change deniers BYLINE: George Monbiot

- 42- Let's go together in **war against global warming** *Sunday Express* November 5, 2006 BYLINE: KATE GARRAWAY
- 43- WAKE UP, WORLD; EXCLUSIVE BROWN'S **GLOBAL WARMING WAR...BUT HE PLEDGES NO BIG TAX SHOCKS** *The Mirror* October 31, 2006 Tuesday BYLINE: OONAGH BLACKMAN
- 44- Economists regularly argue that the best way to tackle climate change is to put a price tag on the environment. As it happens, in recent weeks **a bidding war has broken out over the issue** - not in dollars or carbon trading futures but between Britain's major political parties. In contrast to political debates on migration, for example, **this bidding war is a virtuous one, a race to the top rather than the bottom**, as the Conservatives, Liberal Democrats and Labour seek to burnish their eco-credentials. (...) **The other environmental bidding war** going on at the moment is a Dutch auction in which geologically suitable local authorities vie to become home to Britain's pile of highly toxic radioactive waste. *The Guardian* October 26, 2006 Thursday Climate change: Bidding for the environment
- 45- But these lobby groups, such as the American Competitiveness Institute - whose chairman was treated by Jeremy Paxman on Wednesday's Newsnight **as if he were some sort of war criminal** - are not-for-profit bodies just like Greenpeace; and just like Greenpeace they have a passionate belief that they can help to make the world a better place. *The Independent* September 22, 2006 Friday The debate on climate change is far too important to be shut down by the scientists BYLINE: DOMINIC LAWSON
- 46- **Global warming war** will drive prices even higher *Daily Mail* July 20, 2006 Thursday
- 47- James Lovelock, the inventor of the Gaia theory, which likens the Earth to a living organism, will tell the the Royal Society in London this evening that **humans have in effect declared war on the planetary survival system**, causing it to **explode out of control**. Man-made emissions of greenhouses gases were triggering a positive **feedback** in the climate in which temperature increases generated further temperature rises and the release of vast amounts of carbon dioxide from natural stores on land and in the oceans. *The Independent* October 29, 2007 Monday Rapid global warming will create famine and drought, Lovelock warns
- 48- Can Jack Bauer save the world? News that television's secret agent, played by Kiefer Sutherland in the addictive thriller 24, is to take **the war against global warming** into millions of homes has been welcomed by environmental campaigners as a seminal moment in the '**greening**' of Hollywood. *The Observer* August 12, 2007 Special Report: Climate Change: 24 HOURS TO SAVE THE PLANET BYLINE: David Smith
- 49- **China at war over climate change** *The Daily Telegraph* May 4, 2007 Friday BYLINE: Charles Clover
- 50- As the conflict in Darfur spreads across central Africa, with thousands more displaced and killed, Julian Borger in Chad investigates the origins and contradictions of what is likely to be seen as **the first climate change war** *The Guardian* April 28, 2007 Saturday BYLINE: Julian Borger

- 51- In some cases the debate is dividing traditionalists from younger congregations. In the US the diverse 50m-strong conservative evangelical churches are increasingly **at war about the human contribution to global warming**. *The Guardian* April 27, 2007 Friday International: Environment: Protect God's creation: Vatican issues new green message for world's Catholics: Pope addresses climate change conference US church leaders lobby Bush on global warming BYLINE: John Vidal and Tom Kington
- 52- Today Hampshire, tomorrow, the world; From its base in an ex-naval building, The Sustainability Centre is **at war with global warming**. Emma Townshend joins the **fight**. *The New Review* April 22, 2007 BYLINE: Emma Townshend
- 53- Environment: **Fighting for air: frontline of war on global warming**: Progress comes at a high price for China and India, but there are grounds for hope: Who emits what? *The Guardian* March 26, 2007 Monday BYLINE: Jonathan Watts, Linfen and Randeep Ramesh
- 54- DAVID Miliband today outlines his vision to put Britain at **the forefront of the war on global warming**. In an exclusive interview with Sunday Mirror Political Editor VINCENT MOSS, the Environment Secretary - seen by many as a possible future Prime Minister - explains why we have to act now before it's too late... *Sunday Mirror* March 11, 2007 ENVIRONMENT SECRETARY DAVID MILIBAND: 'CLIMATE CHANGE IS THE BIGGEST THREAT TO OUR FUTURE ECONOMY BYLINE: VINCENT MOSS
- 55- **Deniers, the war is over**. You still have time to come in from the cold and join the warming world on which the rest of us live. *The Independent* January 25, 2007 Thursday **The last gasp** of the global warming deniers BYLINE: JOHANN HARI
- 56- Stars bring 'cool' image to **war on global warming** Martin Baker talks to the man whose green campaigns gain 'street cred' from the Scissor Sisters and Orlando Bloom *The Daily Telegraph* January 18, 2007 Thursday BYLINE: Martin Baker
- 57- Australia is engaged in **its own climate war**, with the pace of global warming faster across the country than in other parts of the world, the country's Bureau of Meteorology said. Half of the country was desperate for water and the other half was awash with a year's rainfall for the entire continent. *The Independent* January 6, 2007 Saturday 'Irreversible' global warming claims its first victims of the New Year BYLINE: Ian Herbert
- 58- The key point, he (J. Lovelock) says, is to realise that **humanity is now at war with the planet**. We have **assailed** his beloved Gaia for too long and it is about to **wreak revenge**. Ice caps are melting and meadows being transformed into deserts. Millions were killed between 1939 and 1945. Billions will die in the forthcoming climatic change. *The Observer* June 11, 2006 Energy: It's too late for the planet: or can we pull it from the fire? BYLINE: Robin McKie (my addition in parenthesis)
- 59- The change is described as the "**fingerprint**" of global warming. As the world heats up, more water evaporates from the tropics and falls as rain in temperate and polar regions, making the warm waters saltier and the cold ones fresher. Melting polar ice adds more fresh water. *Independent on Sunday* January 25, 2004 GLOBAL WARMING WILL PLUNGE BRITAIN INTO NEW ICE AGE WITHIN DECADES' BYLINE: GEOFFREY LEAN

- 60- **Like detectives raking over ancient clues**, scientists Will Soon and Sallie Baliunas also pored over facts and figures, anecdotes and records dating back to the Dark Ages and beyond, which gave an indication of temperatures long before we had thermometers and weather stations. *DAILY MAIL* April 8, 2003 ye olde hot aire BYLINE: Michael Hanlon
- 61- The record temperatures in Britain last weekend made global warming feel all too real. Atmospheric carbon dioxide from burning fossil fuels usually gets the blame, and, consequently, alternative, "clean" energy sources such as wind farms, solar panels and fuel cells are the new vogue. **But is carbon dioxide really the culprit?** Or might the global-warming theory be based on hot air? *The Independent* August 13, 2003, Wednesday SCIENCE & TECHNOLOGY: BLAME IT ON THE SUPERNOVA BYLINE: KATE RAVILIOUS
- 62- Scientists believe these findings have important implications for the potential management of carbon dioxide (CO₂) - considered **a culprit in global warming** - in the United States. *The Guardian* July 15, 2003 Education: Learning: Trading our future BYLINE: John Crace
- 63- The stormy weather was followed by an equally stormy debate among tropical meteorologists about whether **the fingerprint of global warming may be to blame**. *The Independent* July 5, 2005, Tuesday THE PROOF OF CLIMATE CHANGE BYLINE: MARK LYNAS
- 64- Amid signs that industry is also coming to terms with calls for action, airlines sought yesterday to shake off their reputation as **key culprits for climate change** by promising cleaner aircraft, better technology and tough restrictions on older jets by 2010. *The Guardian* June 21, 2005 Blair told: act now on climate: G8 countdown BYLINE: Julian Glover, John Vidal and Andrew Clark
- 65- **Wrong culprits** in the frame on global warming *The Times* November 4, 2006, Saturday BYLINE: Sally Baker
- 66- Yet the film somehow gets right to your gut. Methodically, using graphics, photographs and the odd bit of computer animation, the former US vice-president sets out the case that the climate is changing, with human activity the most obvious **culprit**. *The Guardian* September 13, 2006 Wednesday An inconvenient truth: beware the politician in fleece clothing: Al Gore's film delivers a stunning lesson on global warming. BYLINE: Jonathan Freedland
- 67- Nor are doubts confined to temperature. America may still be a **culprit** when it comes to carbon-dioxide but the Pacific Research Institute's index of leading environmental indicators, published last week, showed stunning falls in US emissions of carbon monoxide, down 56% between 1970 and 2004, nitrogen oxides, down 30%, particulates, down 79%, and sulphur dioxide, down 51%. *The Sunday Times* April 30, 2006 Getting far too heated over global warming BYLINE: David Smith
- 68- There is still some dispute over how much humans are to blame. The world has heated up and cooled down dramatically before, long before humans started mass burning fossil fuels (the last Ice Age ended 10,000 years ago - relatively recently in geological timescales). This is a seductive argument: it is tempting to believe natural phenomena that we 'can't help' are the real **culprit** and to keep burning fossil fuels. *The Observer* March 12, 2006 Greening the company car BYLINE: Juliette Jowit

- 69- Their study is the first to find a "**human fingerprint**" in the rainfall changes which have been detected in a belt of the northern hemisphere stretching from the Mediterranean to the UK to Norway. (...) Gordon Brown, who flew over the flood region yesterday, used his first monthly press conference since arriving at Number 10 to make the clear link between global warming and the flood devastation. He said: "Like every advanced industrialised country, we are coming to terms with the issues surrounding climate change. *The Guardian* July 24, 2007 Tuesday Floods: Climate change: Human activity linked to heavier rainfall BYLINE: James Randerson
- 70- The Hadley Centre lead scientist involved with the study was Dr Peter Stott, who specialises in finding "**human fingerprints**" - sometimes referred to as anthropogenic signals - on the changing climate. (...) The **human fingerprint** is detected by making computer simulations of the recent past climate, with and without emissions of greenhouse gases - and then comparing the results with what has actually been observed in the real world. *The Independent* July 23, 2007 Monday After the deluge - scientists confirm global warming link to increased rain BYLINE: Michael McCarthy
- 71- The carbon released by this wholesale destruction puts Indonesia right up there with China and the US in terms of greenhouse gases emitted - these countries are **culprits** numbers one, two and three, respectively. *Morning Star* December 3, 2007 Monday Paying the price BYLINE: Ronnie Hall
- 72- The atlas's editor-in-chief Mick Ashworth, said: "We can see environmental disasters unfolding before our eyes. We have a real fear that in the near future famous geographical features will disappear forever." The main **culprits**, he added, are climate change and ill-conceived irrigation projects. (...) Particularly ravaged areas include the Aral Sea in central Asia, which has been reduced by three-quarters in the past 40 years, while the Dead Sea is some 82ft lower than it was 50 years ago and sections of rivers including the Rio Grande and Colorado in America, the Tigris in the Middle East and the Yellow River in China are drying out each summer. There are fears that some places, particularly low-lying Pacific islands such as Tuvalu could be wiped off the map by rising sea levels, turning their populations into "climate refugees". In the 100 years up to 1950 the greatest population shifts took place in Europe and North America, but in the past 50 years there has been a huge growth in the number of urban dwellers in the less developed countries. Nowhere is this more true than in China, which now has more than 1.3 billion people - one fifth of the world's population. China is now also the world's second biggest consumer of energy behind the USA. And due to its increasingly dry climate and the extraction of water to support the growing population, the mouth of the Yellow River has changed shape. *The Daily Telegraph* September 3, 2007 Monday Atlas reveals how global warming is changing the world BYLINE: Paul Eccleston
- 73- US activists are turning their fire from four-wheel drives and focusing on meat eating as the greater **culprit** in global warming. *The Independent* August 30, 2007 Thursday Global warming 'caused by meat' By Leonard Doylein
- 74- GORE SAYS: **The culprit** is humanity's emissions of "huge quantities" of carbon dioxide and other greenhouse gases, which trap more of the infrared radiation of the sun that would otherwise escape out into space. WE SAY: Variations in solar activity may have been responsible for past warm periods, though it's hard to be entirely sure because we have been taking good measurements of it only since 1978. But recent solar increases are too small to have produced the present warming, and have been much less important than greenhouse gases since about 1850. *The Independent on Sunday* March 4, 2007 **An inconvenient truth or hot air?**; Everyone agrees global warming is a terrible fact of life. Right? Wrong. A film to be screened this week ridicules the Al Gore orthodoxy. Geoffrey Lean reports on **the green war** BYLINE: Geoffrey Lean

- 75- FORGET everything you have ever heard about climate change - it is likely to be hot air. New thinking on the looming global warming disaster that threatens life on Earth has found a new **culprit**. And it is not mankind. *Sunday Express* March 4, 2007 Sunday Why the Sun is to blame for causing our global warming BYLINE: Stuart Winter
- 76- As a rough guide, for every pounds 100 of gas bill, we release about a ton of carbon dioxide into the air each year. That's expensive. Worse, for many of us it is a burgeoning moral burden - every time I crank up the heating now, **I feel slightly criminal, like a dieter gorging on chocolate**. *The Daily Telegraph* March 25, 2006 Saturday The green gospel according to Dave With global warming an ever-increasing threat BYLINE: Sarah Lonsdale
- 77- **With a kind of savage justice**, climate change is an issue which exposes the weakest link in the cultural mindset of western market capitalism: the collective capacity for self-restraint in pursuit of a common good. *The Guardian* August 26, 2004 Put us all on rations BYLINE: Madeleine Bunting
- 78- So, whatever the "road map" deal that is agreed, post-Bali talks will have to focus on their needs, rather than the concerns of the US and EU, if we are to deliver **climate justice** for all in the years to come. *Morning Star* December 15, 2007 Saturday Time is running out; Bali Diary BYLINE: Tom Sharman
- 79- Seeds for Change, which campaigns for social and **environmental justice** and helps other grassroots protests get off the ground, has already given the group one session on legalities and techniques: this gathering is all about the actual planning. *The Guardian* March 8, 2007 Thursday G2: Ethical living: Action stations BYLINE: Bibi van der Zee
- 80- The United Kingdom is one of world's main **ecological debtors**, consuming far more of the Earth's resources than we can contribute. *The Times* March 30, 2007, Friday Business reaps benefit of action on climate change BYLINE: Oliver Tickell
- 81- A succession of companies have been set up on the internet to provide offsetting services, by presenting consumers with a calculator to work out **their CO2 "debt"** and a range of options to neutralise their emissions. *The Independent* January 11, 2007 Thursday Does carbon offsetting **really help in the fight against climate change?** BYLINE: CAHAL MILMO
- 82- Then there is the fact that carbon emissions have a disproportionate effect at high altitudes. Thanks to an effect known as "**radiative forcing**", carbon in the upper atmosphere produces 2.7 times more warming than emissions near the ground. *The Observer* December 21, 2008 The Airport Debate: Could climate goals survive Heathrow's third runway? BYLINE: ROBIN McKIE
- 83- So how was the claim arrived at? It was argued that climate models could not account for this slight warming unless **forced** to do so, and the only "**forcing**" the modellers could think of was Man. Within a year of the 2007 IPCC report, scientists from modelling centres in the UK and Germany acknowledged that the failure of the models to predict the relatively static temperatures of recent years was due precisely to the models' failure to adequately display natural variability. This hardly proves that Man made no contribution, but it certainly does invalidate the claimed attribution. *The Times* December 3, 2009 Thursday Is Man largely responsible for global warming?; **Fight Club**
- 84- The idea behind the Sunspot Gambit is that global temperature trends are dependent on solar activity. Well, it's true, they are, a bit. But the idea that large-scale trends are caused by "**solar forcing**" is wrong. *The Sunday Times* November 29, 2009 THIS MOUNTAIN RANGE IN BOLIVIA WAS ONCE COVERED IN SNOW. NOW IT ISN'T. WHAT DO ITS BARREN SLOPES TELL US? BYLINE: Bryan Appleyard

- 85- One or two disaster movies have given a careful nod towards the more **apocalyptic** scenarios, having exhausted aliens from space, tidal waves, asteroids and sea monsters in their bid to destroy New York on camera - but it's kind of hard to deliver a narrative arc based on **the interaction of greenhouse gases** with fluid dynamics and radiative transfer, although Thom Yorke has obviously had a go. *The Sunday Times* February 7, 2010 Helen Baxendale, the Friends and Cold Feet actress, has produced a budget film about two misfits on a mission to the North Pole. BYLINE: Stephen Armstrong
- 86- "Black carbon" from burning wood or diesel cars is a major factor in short-term **"climate forcing"**, the UN Environment Programme reported. Most of the problem is caused by "dirty" industry in the developing world such as brick kilns or simple cooking stoves. However, more than 300,000 tons of black carbon emissions in Europe and North America come from burning wood. *The Daily Telegraph* November 26, 2011 Saturday Wood stoves 'make global warming worse' BYLINE: Louise Gray
- 87- The scientific motivation for this article seems to be that that scientists understand the evolution of global temperature **forcing** and that the answer is **forced** variability (not natural internal variability), and this explanation of the recent lack of warming supports a similar argument for the cooling between 1940 and 1970. (...) As indeed might you and I be. For years the Warmists have been telling us that they're so sure of their computer models that they know, they just know, that CO2 has a **forcing effect** on global temperatures and that combined with positive **feedbacks** this is going to cause catastrophic warming. *telegraph.co.uk* July 6, 2011 Wednesday There has been no global warming since 1998 BYLINE: James Delingpole
- 88- In short: We can now estimate, based on observations, how sensitive the temperature is to carbon dioxide. We do not need to rely heavily on unproven models. Comparing the trend in global temperature over the past 100-150 years with the change in **"radiative forcing"** (heating or cooling power) from carbon dioxide, aerosols and other sources, minus ocean heat uptake, can now give a good estimate of **climate sensitivity**. The conclusion-taking the best observational estimates of the change in decadal-average global temperature between 1871-80 and 2002-11, and of the corresponding changes in **forcing** and ocean heat uptake-is this: A doubling of CO2 will lead to a warming of 1.6-1.7C (2.9-3.1F). (...) For many years, scientists on both sides of the argument have agreed that if atmospheric CO2 doubles from pre-industrial levels - as it will before the end of the century - its **"forcing"** effects will result in between 1.1 degrees C and 1.2 degrees C of global warming. (...) So why all the fuss? Because the part scientists disagree on is not the **"forcing"** effects of CO2-induced warming - but the "positive" or "negative" **feedbacks** which might arise from it. *telegraph.co.uk* December 19, 2012 Wednesday Global Warming? Not a snowball's chance in hell BYLINE: James Delingpole
- 89- The **forcing** from changes in total solar irradiance alone does not seem to account for these observations, implying the existence of an amplifying mechanism such as the hypothesized GCR-cloud link. We focus here on observed relationships between GCR and aerosol and cloud properties. (...) The admission of strong evidence for enhanced solar **forcing** changes everything. (...) The climate alarmists can't continue to claim that warming was almost entirely due to human activity over a period when solar warming effects, now acknowledged to be important, were at a maximum. *telegraph.co.uk* December 13, 2012 Thursday Man-made global warming: even the IPCC admits the jig is up BYLINE: James Delingpole
- 90- SCIENTISTS who made the first global prediction of climate change 20 years ago have proved accurate so far, experts have found. Their report, published in 1990, revealed how much the world was likely to warm by 2030. According to the estimate, average global temperatures were likely to rise by between 0.7C and 1.5C. Halfway through the period, the forecast appears to be close to the trend. (...) Yet the 1990 report did not foresee the eruption and deposits from Mount Pinatubo, a volcano on the island of Luzon in the Philippines in June 1991. It was also unable to predict the collapse of Soviet Bloc heavy industry or the rapid expansion of many Asian economies including China and India and strong growth in South America. All these factors have had a significant impact on global climate. (...) It was the overwhelming impact of existing greenhouse gas warming that prevented these **"external forcings"** from undermining the accuracy of the 1990 forecast, said the two researchers whose IPCC

evaluation is reported in the journal *Nature Climate Change*. *The Daily Telegraph* December 10, 2012 Monday
Global warming prediction accurate

- 91- The latest data analysis reached much further back in time but also searched for the most likely cause of the rise by plotting the upward temperature curve against suspected "**forcings**". (...) In a move aimed at appeasing climate sceptics by allowing "full transparency", the results have been publicly released before being peer reviewed by the *Journal of Geophysical Research*. Early indications suggest that climate sceptics are unlikely to fully accept Best's results. *The Guardian* July 30, 2012 Monday Climate change study converts sceptical scientists BYLINE: Leo Hickman
- 92- This is currently an active research area, known as operational attribution, in which many climate model simulations are made with and without **forcing** due to climate change in order to compute differences in the probabilities of particular events. *Guardian.com* July 3, 2012 Tuesday Is it now possible to blame extreme weather on global warming? BYLINE: Leo Hickman
- 93- The findings contradict previous theories which suggest evolutionary changes were gradual **responses** to either long and steady climate change or one drastic change. *MailOnline* December 28, 2012 Friday How rapid climate change helped humans to evolve BYLINE: DAMIEN GAYLE
- 94- The timing of seasonal events such as flowering dates is known as phenology, and the phenologies of plants in a temperate climate such as that of Massachusetts are very **sensitive** to temperature, say the scientists. Studying phenology is therefore a good indicator of **ecological responses** to climate change. *Guardian.com* March 14, 2012 Wednesday Scientists use Thoreau's journal notes to track climate change BYLINE: Alison Flood
- 95- Sceptics described the forthcoming report of the Intergovernmental Panel on Climate Change (IPCC) as a "game changer" because of its apparent support for the controversial theory that solar activity, **interacting** with cosmic rays from deep space, can explain global warming. *Independent.co.uk* December 17, 2012 Monday Bid to heap blame on sunspots for climate change has backfired BYLINE: Steve Connor
- 96- The combination of the film's majestic settings and its engaging subject is compelling. As a photographer Balog had long ago realised that the most powerful issue of our times is the **interaction** of humans and nature. *telegraph.co.uk* December 10, 2012 Monday Chasing ice: glaciers in retreat; James Balog, whose time-lapse photographs of retreating glaciers tell the truth about climate change, is the subject of a powerful new film called *Chasing Ice*. BYLINE: Jessamy Calkin
- 97- Slate asks scientists how much climate change has to do with the so-called "**Frankenstorm**". The response is rightly cautious and headline-wary, but not all that comforting. (...) Kerry Emanuel, an MIT climate scientist, said that his profession has little knowledge of hybrid storms, so couldn't know for certain how they **interact** with changing global temperatures. *Independent.co.uk* October 30, 2012 Tuesday Did climate change cause Hurricane Sandy?
- 98- Hurricanes form when the sea's surface temperature increases above 26C. They result from a **chaotic interaction** between the difference in sea and air temperatures, humidity and wind. *i-Independent* October 16, 2012 Hurricanes worse 'because of global warming' BYLINE: Steve Connor
- 99- Hurricanes form when the sea's surface temperature increases above 26C. However, they result from a **chaotic interaction** between the difference in sea and air temperatures, humidity and wind, so there is disagreement about how frequent they will become in a warmer world. *Independent.co.uk* October 16, 2012 Tuesday Global warming is 'causing more hurricanes' BYLINE: Steve Connor

- 100- Temperatures at the South Pole are also being kept down by the hole in the ozone layer - caused by the release of now banned CFC gases from aerosols - which opens each year in the atmosphere. The hole causes more westerly winds which, through a complex **interaction** between ice, sea and wind, lower temperatures. *MailOnline* October 12, 2012 Friday Now there's more ice at South Pole than ever (So much for global warming thawing Antarctica!) BYLINE: DAVID DERBYSHIRE
- 101- Anderson, an expert at the Tyndall Centre for Climate Change Research at Manchester University, was about to send the gloomiest dispatch yet from the frontline of the **war against climate change**. *The Guardian* December 19, 2008 Friday Year in review: Climate change: Too late? Scientists start to say 'yes' BYLINE: David Adam
- 102- **EUR60M WAR ON GLOBAL WARMING** *Sunday Mirror* September 28, 2008 BYLINE: SENAN HOGAN
- 103- Johnson unveils **secret weapon in war on climate change** the roof garden: London mayor announces plan to soak up rainwater: Strategy outlined to deal with heatwaves and floods *The Guardian* August 30, 2008 Saturday BYLINE: David Adam
- 104- GORDON Brown claims it (renewable energy) will create thousands of jobs, help in **the war against climate change** and lead to secure power supplies for the UK. (...) Wind, wave, solar and biomass account for most of the renewable electricity now, with about a quarter of the total coming from hydro. The entire world uses renewable sources for about 10 per cent of its energy. The EU average is about seven per cent. But in the UK we get only two per cent of our total energy from renewables - putting us near the bottom of the European league led by Germany. The total direct cost to the economy of meeting the target of 15 per cent would be pounds 5billion to pounds 6billion a year - a figure which would be lower if oil were above 70 dollars a barrel. *The Mirror* June 27, 2008 Friday WIND OF CHANGE BYLINE: JAKE MORRIS AND MIKE SWAIN
- 105- **The war to end all wars:** The climate change threat needs drastic action. Only a cross-party approach can deliver it *The Guardian* May 20, 2008 Tuesday BYLINE: Rosie Boycott
- 106- We sit at my kitchen table to start our **war on global warming**. *The Sunday Telegraph* March 30, 2008 Sunday Am I being led up the carbon path? Hot on the heels of global warming have come the 'eco-auditors', telling us how to make our homes green. BYLINE: Caroline Phillips
- 107- The Prince of Wales today urged governments around the world to take drastic action comparable to going on **a war-footing** to prevent climate disaster. *Guardian.com* February 14, 2008 Prince of Wales likens climate change **battle to war**
- 108- **THE AMAZON'S DIRTY WAR;** In the Ecuadorean Amazon basin our thirst for oil has triggered an eco-disaster: wholesale pollution and catastrophic cancer rates. **And a bloody turf war has broken out.** Ecuador Is taking a survival plan to the Copenhagen Climate Change Conference. But will western governments listen? *The Sunday Times* November 29, 2009 BYLINE: Christine Toomey
- 109- New study **pours cold water on a global warming war** *The Sunday Times* October 25, 2009 BYLINE: John Burns

- 110- Here's another **phoney war**: the one on climate change *The Independent* October 13, 2009 Tuesday BYLINE: Dominic Lawson
- 111- China 'poised to take the lead' in the **war** on global warming *The Times* September 22, 2009 Tuesday BYLINE: James Bone; Francis Elliott
- 112- So, are we all **guerrillas in the war on climate change**? "Calling it a **war** is what we need, otherwise there's no chance." Westwood herself attended London's G20 protests in April in a bandanna that read "Chaos". (...) Westwood recently changed political allegiance from the Labour Party, which she has always supported, to the Conservatives, as she believes it will do more in **the climate war**. *The New Review* July 12, 2009 Rebel with a cause BYLINE: Harriet Walker
- 113- So let's say it one more time, shall we? George Monbiot, the eco-doommonger who - more than perhaps anyone in Europe - has been pushing for ever-more-stringent, intrusive and expensive government measures to **combat "climate change" has finally conceded that the war is lost**. *telegraph.co.uk* June 16, 2009 Tuesday Now even Moonbat has surrendered on global warming why can't Barry Obama? BYLINE: James Delingpole
- 114- Climate change '**is like nuclear war**' *The Daily Telegraph* May 29, 2009 Friday BYLINE: Louise Gray
- 115- **The war on climate change** needs its poets. *The Times* May 26, 2009 Tuesday Nobel Cause; A meeting of minds from a range of disciplines can tackle climate change
- 116- **The dirty war against science**: Global warming? Acid rain? No big deal - at least, according to a group of far-right institutions who exploit confusion over science to protect business interests *The Observer* August 8, 2010 BYLINE: Robin McKie
- 117- Campaigners believe **war on climate change** will be stymied; The parties are divided over nuclear power, offshore oil drilling and many other green issues - and critics say that will hinder **the fight against global warming** *The Independent on Sunday* May 16, 2010 BYLINE: Mark Leftly, Jonathan Owen, Jane Merrick and Mark Jewsbury
- 118- Whatever the case, it is a different world now in **the war against the AGW scam** (anthropogenic global warming). Zac Goldsmith, warmist fanatic and Tory candidate, is telling environmentalists that green issues are vote losers. He should tell Dave that and stop him making an even bigger fool of himself. We are experiencing a tipping point in **the climate war** and the advantage is slowly but irresistibly moving towards the sceptics. *telegraph.co.uk* March 25, 2010 Thursday Now it's CowGate: expert report says claims of livestock causing global warming are false BYLINE: Gerald Warner
- 119- Down in Lewes, "Transition Townies" visit schools and hold energy fairs. Ovesco, an Industrial and Provident Society for community benefit spun out of the town's energy group, has dispensed 200 grants for biomass-fuelled boilers, photo-voltaic panels and insulation. It sounds mundane but in **the climate war's battle** for hearts and minds, perhaps that's what matters. *The New Review* February 14, 2010 The thin green line BYLINE: Robin Barton
- 120- The Pentagon, in acknowledging the threat of global warming, will now have to factor climate change into **war game exercises** [non-figurative] and long-term security assessments of badly affected regions such as the Arctic, sub-Saharan Africa, and South Asia. Military planners will have to factor climate change into **war game exercises** [non-figurative] and long-term security assessments of badly affected regions such as the Arctic, sub-Saharan Africa, and South Asia. *Guardian.com* January 31, 2010 Sunday Pentagon to rank global warming as destabilising force BYLINE: Suzanne Goldenberg (my addition in parenthesis)

- 121- BRITAIN'S homes and businesses are to become **the new front line in the war** against climate change. *The Sunday Times* September 25, 2011 Dig a pond, cool down Britain BYLINE: Jonathan Leake
- 122- Based on our performance during the second world war - when we cut coal use by 25%, we saved waste to feed pigs, car use plummeted and so on - it calls for Britain to get **onto a war footing again to combat climate change**. (...) This is the Greens shooting themselves in both feet prior to standing on a rake. If evoking **the war as a model for our response to climate change** is a mistake, then evoking Iraq is an egregious blunder. Blair did not get us into that war on the basis of his popular leadership skills; he got us in against massive popular resistance and on the basis of wrong intelligence and extremely dodgy dossiers. *The Sunday Times* March 6, 2011 FIRST CAME THE FLOODS, THEN CAME THE SNOW... AND THE CLIMATE SCIENTISTS WERE SILENT BYLINE: Bryan Appleyard
- 123- Monday G2: Can these scientists **end the war on climate change?**: A group of scientists in California say they are about to reveal the definitive truth about global warming. *The Guardian* February 28, 2011 BYLINE: Ian Sample
- 124- 'We have seen **the enemy**': Bangladesh's **war against climate change** *Guardian.com* May 9, 2012 Wednesday BYLINE: John Vidal
- 125- Is the real **culprit** for climate change about to stand up? *The Times* November 17, 2009 Tuesday
- 126- Perhaps the biggest issue, however, is that this kind of "solar radiation management" does not do anything to tackle the **culprit** behind global warming: carbon dioxide. *The Guardian* October 22, 2009 Thursday Technology: Green Tech BYLINE: Alok Jha
- 127- Confronted by other evidence of a significant change in the North Sea's health, which has led to declines of up to 40% in seabirds in eight years, conservationists have begun a series of urgent studies into possible causes. Many believe climate change is the main **culprit**. *The Guardian* July 1, 2009 Wednesday National: Meet the satnav seabird helping scientists track climate change BYLINE: Severin Carrell
- 128- The area of detection, finding the human **fingerprint**. Has the science definitively detected that the warming of the last 100 years is significantly human-caused? That's a tricky one. Since there is nothing unequivocally statistically unprecedented, so far as we can tell, about the climate changes in the last 50 years compared to prior periods, there is little prima facie evidence that we have caused it. The science claims that once you adjust for what we know about natural variation, the human **fingerprint** becomes clearer, leading to the IPCC concluding that it is 90% probable that we are responsible for 50%+ of recent warming. *telegraph.co.uk* July 14, 2010 Wednesday Some common sense on global warming BYLINE: James Delingpole
- 129- Climate scientists and the UN's climate body, the Intergovernmental Panel on Climate Change (IPCC), have come under intense pressure in recent months after the panel was forced to admit it had made two errors in its fourth assessment report published in 2007. Climate scientists' emails at the University of East Anglia, revealed in November, also sparked inquiries into allegations of a lack of transparency by researchers and manipulation of the peer review process. (...) This technique, called optimal detection, showed clear **fingerprints** of human-induced global warming, said Stott. "This wealth of evidence shows that there is an increasingly remote possibility that climate change is being dominated by natural factors rather than human factors." *The Guardian* March 5, 2010 Friday Climate change: After emails and errors, fightback begins to prove global warming is caused by humans BYLINE: Alok Jha
- 130- The review, led by Peter Stott of the Met Office Hadley Centre in Exeter, found the "**fingerprints**" of human activity on many different aspects of climate change, including the overall warming of the Antarctic recently documented for the first time by other researchers. (...) Climate change is a matter

of science, not faith. *The Independent* March 5, 2010 Friday Humans must be to blame for climate change, say scientists
BYLINE: Steve Connor

- 131- The "**fingerprints**" of human influence on the climate can be detected not just in rising temperatures but in the saltiness of the oceans, rising humidity, changes in rainfall and the shrinking of Arctic Sea ice at the rate of 600,000 sq km a decade. *The Times* March 5, 2010 Friday 95 per cent chance that Man is to blame for global warming, say top scientists BYLINE: Ben Webster
- 132- No one knows exactly how the effluents from the exhausts of millions of vehicles affect the climate but given that a major byproduct is water vapour, it doesn't take a rocket scientist to realise the car is the likely **culprit**. *The Express* November 22, 2010 Monday ARE GLOBAL WARMING CLAIMS JUST HOT AIR?
- 133- Scapegoat for the snow: The cold snap has little to do with climate change. Arctic oscillation is the probable **culprit** *The Guardian* January 7, 2010 Thursday BYLINE: Robert Henson
- 134- The new research joins a small number of studies in which the **fingerprint** of climate change has been separated from natural variations in weather and other factors, demonstrating that the effects of warming have already been felt in the world. *Guardian.com* May 5, 2011 Thursday Food prices driven up by global warming, study shows BYLINE: Damian Carrington
- 135- As a United Nations report has just uncovered, wood burning and diesel vehicles are two of the biggest **culprits** in the developed world in generating the black carbon - soot - that is a major cause of climate change. *The Guardian* November 28, 2011 Monday Wood fires help fuel climate change, says UN BYLINE: Fiona Harvey
- 136- Last October, the Best team published results that showed the average global land temperature has risen by about 1C since the mid-1950s. But the team did not look for possible **fingerprints** to explain this warming. *The Guardian* July 30, 2012 Monday Climate change study converts sceptical scientists: 'Humans almost entirely the cause' of 1.5C warming Berkeley team examine records dating back to 1753 BYLINE: Leo Hickman
- 137- So, can we now say, or not, that specific extreme weather events are caused, or at least exacerbated, by global warming? Has anything changed in climate scientists' understanding of the attribution - or "**anthropogenic fingerprint**" - of such events? Are they now more confident about making such links? (...) As for the willingness of scientists to make such statements: as the climate signal due to the ever-increasing greenhouse effect strengthens and emerges more and more from the noise in the system, and as statistical techniques for doing such "**fingerprinting**" studies as I mention above improves, scientists have become more confident in making such claims, which is to be expected. *Guardian.com* July 3, 2012 Tuesday Is it now possible to blame extreme weather on global warming? BYLINE: Leo Hickman
- 138- New York governor Andrew Cuomo and mayor Michael Bloomberg both pointed to climate change as the **culprit** for Sandy's ravages as they addressed the scale of the destruction on Tuesday morning. *MailOnline* October 31, 2012 Wednesday Will global warming bring storm barriers to New York Harbor? Bloomberg and Cuomo blame Hurricane Sandy on climate change
- 139- Europe warmed by about 5c over that period and the research suggests nitrous oxide, which has 310 times the warming potential of carbon dioxide, could have been the main **culprit**. *MailOnline* July 20, 2012 Friday It's no laughing matter... Nitrous oxide may have caused the end of the last ice age - and could yet accelerate global warming BYLINE: DAMIEN GAYLE
- 140- The evidence for man-made global warming is looking shakier by the day, Germany's answer to Jonathon Porritt or George Monbiot admitted. Far more likely a **culprit** is the sun. *MailOnline* June 18, 2012 Monday It's no wonder the world's cooling on climate change BYLINE: JAMES DELINGPOLE

- 141- Equally, you can deny climate change is happening, but you cannot avoid having to take the actions that will reduce the risk of it happening. Happily, the environmental agenda of cutting emissions fits well with the new economic reality, which demands that we save cash. As energy and food prices escalate, **ecological and financial debt** begin to merge. (...) Meanwhile, more creative market mechanisms are emerging, such as payment for ecosystem services: power companies with hydroelectric stations are paying farmers and communities to maintain forests and soil upstream in Costa Rica and Kenya, for example. **With debt-for-nature swaps**, countries have some debts cancelled, and some of the savings are invested in conservation and the rehabilitation of degraded ecosystems. *The Guardian* July 16, 2008 Wednesday Climate change: It's the environment, stupid BYLINE: John Vidal
- 142- The scientists found that, in the case of some crops, it would take several centuries of growing them to pay off the "**carbon debt**" caused by their initial cultivation. Those environmental costs do not take into account any extra destruction to the environment, for instance the loss of biodiversity caused by clearing tracts of pristine rainforest. (...) Both studies looked at how much carbon dioxide is released when a piece of land is converted into a biofuel crop. They found that when peat lands in Indonesia are converted into palm-oil plantations, for instance, it would take 423 years **to pay off the carbon debt**. The next worse case was when forested land in the Amazon is cut down to convert into soybean fields. The scientists found that it would take 319 years of making biodiesel from the soybeans to **pay of [sic] the carbon debt** caused by chopping down the trees in the first place. (...) The European Union is already having second thoughts about its policy aimed at stimulating the production of biofuel. Stavros Dimas, the EU environment commissioner, admitted last month that the EU did not foresee the scale of the environmental problems raised by Europe's target of deriving 10 per cent of its transport fuel from plant material. *The Independent* February 8, 2008 Friday Biofuels make climate change worse, scientific study concludes BYLINE: Steve Connor
- 143- Fred Pearce is author of *The Last Generation: How nature will take her **revenge** for climate change* (Eden Project Books) and writes a weekly greenwash column for environmentguardian.co.uk *The Guardian* November 30, 2009 Monday Copenhagen 2009: Why Copenhagen matters BYLINE: Fred Pearce
- 144- Consider the words of James Lovelock's **Revenge of Gaia**, published this year. 'The bell has started tolling to mark our ending. Only a handful of the teeming billions now alive will survive.' And in *The Last Generation* Fred Pearce revealed a similar sense of biblical misery in his subtitle: 'How Nature will take **revenge** for Manmade Climate Change'. *The Observer* November 12, 2006 Review: Books: ENVIRONMENT: Who will save the Earth? BYLINE: Robin McKie
- 145- She (Bernarditas de Castro Muller, former diplomat in Kenya) was persuaded to fight for climate **justice** when she went back to live in Manila after the downfall of President Marcos in the late 1980s. (...) Even seasoned diplomats find the talks surreal, with an arcane language, logic and a pace of their own. In three years, they have gone well beyond being just about emission cuts and now embrace development, trade, finance, carbon markets, forestry, science and technology. Because they are so complex, most nations belong to one or another of the negotiating blocs, like the G77, the EU, the Alliance of small island states, or the African group. *The Guardian* November 7, 2009 Saturday The climate power game BYLINE: John Vidal (my addition in parenthesis)
- 146- Without a coherent vision of the future based upon reduced consumption, ever greater social and **environmental justice** combined with an egalitarian international and intergenerational dimension and a redistribution of power, we will not inspire the mass movement that is necessary to prevent climate change degenerating into climate chaos. *Morning Star* September 11, 2009 Friday Unions must be seen green BYLINE: Richard Leonard
- 147- The former Conservative Agriculture Minister and Environment Secretary - who famously tried to feed his daughter a burger to convince people that British beef was safe from BSE - will step down at the next election. (...) Speaking to *The Times*, he (John Gummer) said that industrialised countries such as

Britain and the US had grown rich by polluting the atmosphere and needed to recognise **the environmental debt** that they owed to the rest of the world. *The Times* December 31, 2009 Thursday Gummer quits as MP to force more passion out of West on climate change BYLINE: Ben Webster (my addition in parenthesis)

- 148- But Anakila's plight will come back to haunt us in two ways. The entire debate around Africa and aid will shift in coming years from one dominated by charity and post-imperial responsibility to one framed primarily around **environmental justice**. (...) As we left Anakila, we were given gifts - fresh milk and two hens. When might this generosity become a demand for **environmental justice**? *The Guardian* November 1, 2010 Monday In this remote town in Mali, climate change takes on a sinister reality: The debate about Africa and aid will shift from charity and post-imperial responsibility to seeking **environmental justice** BYLINE: Madeleine Bunting
- 149- Bolivia wants to create a UN charter of rights and to draft an action plan to set up an international **climate justice tribunal**. *The Guardian* April 19, 2010 Monday Climate talks to give poor a voice BYLINE: Andres Schipani, and John Vidal
- 150- Earlier this week, John Vidal interviewed the activist, who said the **battle for climate change justice** was similar to struggle against **apartheid**: What I see now is very similar to the moment of change **from apartheid to democracy**. *Guardian.com* December 9, 2011 Friday Durban climate change talks - the final day BYLINE: James Randerson
- 151- Greenpeace International's director says the struggle for **climate justice** is similar to **the fight against apartheid** (...) He has been criticised for not being an environmentalist, but he responds that the struggle for human and **climate justice** is similar to that against **apartheid**. **Apartheid** was a system of differentiation and injustice maintained by the powerful in the same way as governments and industries abuse nature. *Guardian.com* December 6, 2011 Tuesday Kumi Naidoo: 'I hope sanity will prevail with climate change, just as it did with apartheid' BYLINE: John Vidal
- 152- The idea of **climate injustice** is more familiar in the context of the African subsistence farmer whose livelihood is trodden down by the polluting effects of heavy western consumption. But the long list of damages that climate change threatens to wreak on the UK shows climate **injustice** exists from the poor flood-prone neighbourhoods by the Humber to the concrete jungles of London. *Guardian.com* January 26, 2012 Thursday Climate change set to hit UK hard and the poorest hardest BYLINE: Damian Carrington
- 153- Second, the language needs to change. Phrases such as "**climate justice**", association with anti-capitalist messages and a focus on living like a hermit are part of the problem. *Guardian.com* January 5, 2012 Thursday The climate change message is not being heard. Here's how to change tack BYLINE: Sunny Hundal
- 154- Many of us, though we wouldn't want to admit it, are with Groucho Marx when he said "Why should I care about future generations? What have they ever done for me?" It's going to take a huge cultural change to counter our unbridled narcissism, which demands immediate gratification, and inculcate the idea that we're just **trustees** of the earth instead. The Hungarians have a parliamentary commissioner for future generations. (...) I was particularly struck by the book's emphasis on **the ecological debt** we run up if we use more than our fair share of finite resources. *The Guardian* December 1, 2012 Saturday: You can't ignore this BYLINE: Anne Karpf
- 155- So the overall man-made "**forcing**" of the climate - once greenhouse gases are taken into account - may actually be less than thought. *The Independent on Sunday* October 13, 2013 Cloudy with a chance of ... climate change BYLINE: Ian Johnston

- 156- In reality, we're likely to hit a **climate forcing** equivalent to double preindustrial CO₂ by mid-century even with reasonably ambitious emissions cuts, and even sooner on current trends. *Guardian.com*. October 7, 2013 Monday UN climate change panel: two graphs that tell the real story of the IPCC report BYLINE: Duncan Clark
- 157- Solar **forcing** on the other hand has not been increasing over the last 3 decades and an increasing solar contribution to global warming would have led to warming of the stratosphere not cooling. *Guardian.com*. January 21, 2013 Monday Boris Johnson says snow casts doubt on climate change science BYLINE: Leo Hickman
- 158- The reason for this has baffled scientists and has been seized upon by sceptics. Yet again it highlights the complexity of the Earth's climate and its **response** to rising greenhouse gas levels. (...) One of the largest uncertainties in the latest IPCC report is how much of a role the **interaction** between aerosols released into the atmosphere and clouds play in global warming. *telegraph.co.uk* September 27, 2013 Friday IPCC report: Sceptics guide to climate change; As the fifth major assessment of the scientific evidence underlying global warming is being published by the UN's Intergovernmental Panel on Climate Change, we examine some of the issues that will be of interest to global warming sceptics. BYLINE: Richard Gray
- 159- Now contrast the new result with the Met Office's flagship climate model, the one that ministers and their advisers place most faith in. Called HadGEM2-ES, it expects a transient climate **response** of 2.5C, or almost double the best estimate that the Oxford team has just published. Indeed, the latter's study concludes that it is more than 95 per cent certain that the **response** is below 2C, considerably short of the Met Office model's estimate. (...) Notice that this new understanding is consistent with what we have actually experienced: about 0.1C per decade over the past 50 years. The most remarkable thing about the recent milestone of 0.04 per cent carbon dioxide in the atmosphere (400 parts per million) is that it comes after 15 years of no net warming at all. *The Times* May 20, 2013 Monday Earth to Met Office: check your climate facts; The latest science suggests that our policy on global warming is hopelessly misguided BYLINE: Matt Ridley
- 160- Those familiar with the final version say it will be clear about how human and physical processes **interact** to change landscapes, environments and the climate, and how humans depend on the effective functioning of natural systems. *The Guardian* July 6, 2013 Saturday National: Gove restores climate change to curriculum BYLINE: Patrick Wintour
- 161- To conclude from the Met Office data that man-made global warming need no longer concern us is, then, a misunderstanding of both the figures themselves and the nature of the climate. Meteorologists are only beginning to understand the complex **interactions** between the elements of the Earth's various natural cycles. *The Independent* January 10, 2013 Thursday Climate change: no less of a problem than it was
- 162- What does the phrase anthropogenic **forcing** mean to you? (...) And what is the difference between global warming and climate change? *Guardian.com*. March 7, 2014 Friday Global warming is a misleading term because it actually sounds quite nice BYLINE: Fiona Harvey
- 163- The production of methane is accelerated because stationary pools of water contain much less oxygen than a flowing river **interacting** with the atmosphere and microbes thrive in low-oxygen environments *Independent.co.uk* December 17, 2014 Wednesday Arctic squirrels blamed for climate change damage BYLINE: Tom Bawden
- 164- And while heat and ozone can each damage plants independently, the factors also **interact**. (...) Because of these **interactions**, the team found that 46 per cent of damage to soybean crops that had previously been attributed to heat is actually caused by increased ozone. *MailOnline* July 28, 2014 Monday Climate change and air pollution will lead to famine by 2050, study claims BYLINE: ELLIE ZOLFAGHARIFARD

- 165- Known as '**radiative forcing**' this suggests that forest fires can make a significant contribution to balance global warming from carbon dioxide emissions. *MailOnline* February 17, 2015 Tuesday Are wildfires COOLING Earth? BYLINE: RICHARD GRAY
- 166- It is now widely understood, except by those who live inside such models, that a climate **response** based primarily on a carbon price will deliver only marginal change. Politically it serves as a brake on ambition not a stimulus, especially when accompanied by an aversion, also evident in your speech, to hard caps on emissions. (...) The commitments made at COP21 may still fall short of a 2C **response**. But the forces now at work will act inexorably to push up not rein back our ambition. *The Guardian* March 31, 2015 Tuesday Open letter to Shell's Ben van Beurden from John Ashton BYLINE: John Ashton
- 167- Reducing our reliance on fossils fuels is seen as crucial in tackling the threat of global warming, but cutting pollution from burning them may actually cause the Earth to get hotter in some places. Scientists have warned that sulphur-containing aerosols released into the atmosphere through the burning of fossil fuels, such as diesel, have actually been helping to keep parts of the planet cooler. (...) She (Kate Marvel, a climatologist at Nasa) added that because earlier studies do not account for the cooling effect in parts of the northern hemisphere, predictions of the Earth's climate **sensitivity and response** have been underestimated. *MailOnline* December 22, 2015 Tuesday Has pollution been cooling the planet? BYLINE: RICHARD GRAY
- 168- They (scientists) then used 34 different climate models to identify how the winds, and flight times, might have **responded** to climate variation, and how the **response** might continue. (...) Global warming already costs the airlines increasing airtime and wear and tear because atmospheric turbulence seems to be on the increase. However, the oceanographers' study began not because of a bumpy ride, but because of an unexpectedly smooth one. *The Guardian* July 16, 2015 Thursday Climate change costing airlines millions of dollars in extra fuel and flying time BYLINE: Tim Radford (my addition in parenthesis)
- 169- Around two-thirds of the warming effect, known as **radiative forcing**, by long-lived greenhouse gases comes from carbon dioxide. *MailOnline* October 24, 2016 Monday A 'new era' of climate change BYLINE: PRESS ASSOCIATION and ABIGAIL BEALL
- 170- That means a bet that the next decade is warmer than the previous decade is a pretty likely bet, and that is because of the role of **greenhouse forcing of climate**. That doesn't mean that it can't happen, but it is much less likely to happen in **the current greenhouse era**. *The Guardian* April 14, 2016 Thursday Why even climate science denialist Marc Morano knows not to bet against global warming data BYLINE: Graham Readfearn
- 171- We do not know yet how temperature shifts can influence the biological **interactions** within food webs. We cannot yet predict whether prokaryotes will exacerbate or attenuate the magnitude of climate change on marine ecosystems, but they are expected to be a key component that is able to influence the oceans' **feedback** on climate change. *The Guardian* May 6, 2016 Friday Deep sea microbes may be key to oceans' climate change feedback BYLINE: Howard Lee
- 172- Nearly 30 years ago, scientists developed a computer model of the Earth's climate that predicted the level of global warming - to the ridicule of 'sceptics' at a time when there still seemed to be a debate over the issue. Now two leading researchers have compared the model's results with what actually happened over the last three decades and, to their surprise, found they were "very similar". (...) They (Dr Ronald Stouffer, head of the climate and ecosystem group at Princeton University, and Dr Syukuro Manabe, a senior meteorologist) said the model was unlikely to have had the correct distribution of thermal **forcing** - the factors causing the temperature to rise - but this did appear to be "critical". *The Independent* March 4, 2017 Saturday Global warming levels vindicate climate forecasts ridiculed 30 years ago BYLINE: IAN JOHNSTON

- 173- Third, we need to harness the computing horsepower of the software industry to create next-generation forecasts of species' **responses** to climate change. We can explore endless permutations of those digital species to predict threats and test solutions. Imagine a computer game that simulates nature, all within our laptops. *The Guardian* December 28, 2017 Thursday Ice will return but extinctions can't be reversed. We must act now; We have to develop digital forecasts of species' **responses** to climate change, design robust strategies to protect as many as possible, and help nature to adapt BYLINE: Mark Urban
- 174- Global average temperature reached +1.3°C (2.34°F) above pre-industrial levels in 2016 and will increase at least a few tenths of a degree more during the next few decades. This is because of a delayed **response** to past increases in carbon dioxide and other gases. *MailOnline* July 17, 2017 Monday Cutting emissions isn't enough: We must remove CO2 from the atmosphere as soon as possible to avoid extreme climate change, warn scientists BYLINE: HARRY PETTIT
- 175- One of the key goals of the Paris Agreement is to limit the increase in global temperatures to 1.5°C. While this is ambitious, it is 'in reach', according to a new study. (...) Firstly, they (experts) reassessed the evidence from the Earth System Models - a widely used climate model that integrates the **interactions** of atmosphere, ocean, land, ice, and biosphere. *MailOnline* September 18, 2017 Monday We CAN meet ambitious Paris climate change agreement goal to limit global temperatures rise to 1.5°C by 2100 (but only if countries stop using coal) BYLINE: SHIVALI BEST
- 176- Well, it is true that natural factors, including changes to the strength of the Sun, the impact of volcanic eruptions and natural cycles, such as the El Nino **interactions** between the Pacific Ocean and the atmosphere, can all influence temperature fluctuations *MailOnline* January 21, 2017 Saturday HRH the Climate Change avenger BYLINE: SIMON WALTERS
- 177- Norwegian army goes vegetarian as it goes to **war against climate change** by cutting 'ecologically unfriendly' foods *MailOnline* November 20, 2013 Wednesday BYLINE: JENNIFER SMITH
- 178- The **climate war** has been polarised in the same way that the nature- nurture debate was in the 1970s. Back then, if you argued that genes affected behaviour even a bit, you were pigeon- holed as a heartless fatalist with possible tendencies to Nazism. *The Times* September 28, 2013 Saturday Global lukewarming need not be catastrophic BYLINE: Matt Ridley
- 179- As an exercise in bravura spin, these claims are up there with Churchill's attempts to reinvent the British Expeditionary Force's humiliating retreat from Dunkirk as a victory. In truth, though, the new report offers scant consolation to those many alarmists whose careers depend on talking up the threat. (...) It (IPCC 5th Assessment report) says not that they are winning the **war** to persuade the world of the case for catastrophic anthropogenic climate change - but that **the battle is all but lost**. *The Daily Telegraph* September 26, 2013 Thursday Global warming believers are feeling the heat BYLINE: JAMES DELINGPOLE (my addition in parenthesis)
- 180- China offers fresh hope in global warming **war**; Beijing's offer of a cap on emissions is huge boost for international treaty prospects *The Independent* May 22, 2013 Wednesday BYLINE: TOM BAWDEN
- 181- Third casualty in **Treasury 'war' against climate change brigade**; Exodus of energy experts as funding for renewables is held up on grounds of cost *The Independent* May 11, 2013 Saturday BYLINE: PAUL BIGNELL and OLIVER WRIGHT

- 182- How 'weirdo words' undermine **the war on global warming** *The Independent* March 6, 2014 Thursday BYLINE: TOM BAWDEN
- 183- First, though, let me tell you where we agreed: that **the war climate alarmists are waging against sceptics** is getting more and more vicious. *MailOnline* May 29, 2015 Friday Putting my name on this sick headstone won't stop me defying climate zealots BYLINE: JAMES DELINGPOLE
- 184- Storm as National Trust boss vows to go **to war on global warming**: Charity warned not to meddle in politics after its pledge to step up attempts to tackle climate change *MailOnline* April 7, 2015 Tuesday BYLINE: BEN SPENCER
- 185- Clean Power Plan: Barack Obama ignites **war on coal to hit climate change targets**; The Obama administration is toughening rules that force states to cut pollution from coal-burning power plants *Independent.co.uk* August 3, 2015 Monday BYLINE: Joby Warrick, Steven Mufson
- 186- Peter Turkson: the public face of Pope Francis's **war on global warming**; Ghanaian cardinal who unveiled the encyclical on climate change is vital to the pope's vision of an outward-engaging church acting for the poor *The Guardian* July 1, 2015 Wednesday BYLINE: Stephanie Kirchgaessner
- 187- In Britain, 29,000 people die a year from breathing in particles of unburned carbon and construction dust, and an estimated 23,500 more as a result of nitrogen dioxide. To condone these deaths is unforgivable; to actively seek to carry on polluting is **like declaring war on the public**. *The Guardian* February 20, 2016 Saturday Climate change politics is blinding us to the devastating effects of dirty air BYLINE: John Vidal
- 188- The study, edited by scientists from Noaa and the UK Met Office, detected the **fingerprints** of climate change on about half of the 12 most extreme weather events of 2012. (...) Climate change was not responsible for Britain's miserable summer last year, which was the rainiest in a century. The researchers also ruled out climate change as a **culprit** for the Netherlands' cold spell last year. *Guardian.com*. September 5, 2013 Thursday Study says climate change exacerbated half of recent extreme weather events BYLINE: Suzanne Goldenberg
- 189- The **fingerprint** of human activity is very clearly seen in the observed pattern of temperature changes including warming in the troposphere (the lower atmosphere) and cooling in the stratosphere (the upper atmosphere above about 10km) and greater warming over land than ocean. *Guardian.com*. January 21, 2013 Monday Boris Johnson says snow casts doubt on climate change science BYLINE: Leo Hickman
- 190- While cars are often named as the worse **culprit** for emitting pollutants, experts say the estimated 1.5 billion cattle in the world are also affecting the Earth's atmosphere. *MailOnline* November 6, 2013 Wednesday A solution to global warming? BYLINE: EMMA THOMAS
- 191- Leading climate scientists said this morning they were more certain than ever before that mankind was the main **culprit** for global warming and warned the impact of greenhouse gas emissions would linger for centuries. A report, by the Intergovernmental Panel on Climate Change (IPCC), played down the fact temperatures have risen more slowly in the past 15 years, saying there were substantial natural variations that masked a long-term warming trend. Commenting on the report, Telegraph columnist James Delingpole said: "All the computer models the IPCC has used in its 25 years have predicted global warming much greater than has been observed "This represents a problem because what it means is all these insistent claims they have been making that we need to take urgent measures now to deal with this unprecedented problem seem to be based on junk science. *telegraph.co.uk* September 27, 2013 Friday IPCC report: global warming theory is 'junk science'

- 192- But what if carbon dioxide isn't the **culprit**? What if all the expensive, economy-ravaging, job-killing, environmentally destructive measures we've taken have been a spectacular waste of money? *DAILY MAIL* January 10, 2013 Thursday THE CRAZY CLIMATE CHANGE OBSESSION THAT'S MADE THE MET OFFICE A MENACE BYLINE: JAMES DELINGPOLE
- 193- The fifth IPCC report, published in stages from last year to this autumn, sets out clearly the "human **fingerprint**" on the climate change that is happening, and is projected to get worse. All of these innovations are available for us to use here and now, not decades in the future. Yet still we are building fossil fuel power plants, exploring for gas that is ever harder and more expensive to find, steaming oil from tar sands. We do so - companies do so on our behalf - because it still, more than 20 years after the world vowed in 1992 to "avoid dangerous climate change", makes economic sense to burn carbon. As this report underlines, we know what we need to do. We have known it for years. What is stopping us? *Guardian.com* September 16, 2014 Tuesday Climate change report by Lord Stern shows there's still time – just BYLINE: Fiona Harvey
- 194- Ruminants' role Rodents are not the only animals contributing to climate change - ruminants have been known to play a role for years. The biggest **culprit** is the cow, which produces mind-boggling quantities of methane - a single cow is thought to produce anything between 250 and 500 litres of methane a day. *i-Independent* December 18, 2014 Squirrel poo may be 'major' factor in climate change BYLINE: Tom Bawden
- 195- The biggest **culprit** in this department is the cow, which through a combination of burping and breaking wind, and by virtue of its enormous population, produces mind-boggling quantities of methane - estimates vary, but a single cow is thought to produce anything between 250 and 500 litres of methane a day. That's 55 to 110 gallons. *Independent.co.uk* December 17, 2014 Wednesday Arctic squirrels blamed for climate change damage BYLINE: Tom Bawden
- 196- They might be fluffy faced, buck-toothed little creatures, but two species of rodent have been identified the latest **culprits** to be contributing to climate change. *MailOnline* December 17, 2014 Wednesday Forget humans, RODENTS are the climate **villains**: Squirrels and beavers are contributing to global warming far more than previously thought BYLINE: RICHARD GRAY
- 197- Surprisingly, the biggest **culprits** turned out to be some of the most innocent seeming substances ever invented. Inert and immensely stable, neither toxic nor flammable, cheap to produce and easy to store, CFCs were hailed as miracle substances *The Daily Telegraph* September 12, 2014 Friday We're saving the ozone layer, but climate change is a different matter; A deal to stop global warming will make CFCs look like small beer BYLINE: GEOFFREY LEAN
- 198- The latest IPCC report, the first update in seven years, confirms that climate scientists appear more certain than ever before that human behaviour is the key **culprit** for global warming. *The Daily Telegraph* April 1, 2014 Tuesday Act on Climate change, demands US BYLINE: Sarah Knapton; Danielle Demetriou
- 199- The fifth IPCC report, published in stages from last year to this autumn, sets out clearly the "human **fingerprint**" on the climate change that is happening, and is projected to get worse. All of these innovations are available for us to use here and now, not decades in the future. Yet still we are building fossil fuel power plants, exploring for gas that is ever harder and more expensive to find, steaming oil from tar sands. We do so - companies do so on our behalf - because it still, more than 20 years after the world vowed in 1992 to "avoid dangerous climate change", makes economic sense to burn carbon. As this report underlines, we know what we need to do. We have known it for years. What is stopping us? *The Guardian* April 7, 2015 Tuesday 4 Climate change report by Lord Stern shows there's still time BYLINE: Fiona Harvey
- 200- The heavier storms of recent years - snowfalls that shut down cities and brought heavy flooding to coastal areas of New England - carried the **imprints** of climate change, as researchers get better at

detecting the **fingerprints** of global warming, even from snow. *The Guardian* January 30, 2015 Friday Climate change responsible for super-charging winter storms BYLINE: Suzanne Goldenberg

- 201- Climate change is by nature ubiquitous, affecting every life on the planet to some degree. In this regard, its **fingerprint** on Syria's war is hard to argue against. In May this year, US president Barack Obama recognised the contribution of the drought in Syria's fall. *The Guardian* September 8, 2015 Tuesday Aylan Kurdi was not a climate refugee BYLINE: Karl Mathiesen
- 202- They might be fluffy faced, buck-toothed little creatures, but two species of rodent have been identified the latest **culprits** to be contributing to climate change *MailOnline* January 7, 2015 Wednesday Should fossil fuels remain dead and buried? BYLINE: RICHARD GRAY
- 203- More than three-quarters of the UK's native and migrant butterfly species have declined in the last 40 years - and climate change could be the **culprit**. *Independent.co.uk* December 15, 2015 Tuesday Three-quarters of the UK's butterfly species have declined in the last 40 years BYLINE: Doug Bolton
- 204- They might be fluffy faced, buck-toothed little creatures, but two species of rodent have been identified as the latest **culprits** to be contributing to climate change. *MailOnline* July 7, 2015 Tuesday Are SHRUBS causing global warming? BYLINE: RICHARD GRAY
- 205- The map that reveals global warming's '**fingerprints**' on 2015: Study links 24 weird weather events to climate change *MailOnline* December 16, 2016 Friday BYLINE: CHEYENNE MACDONALD
- 206- Unlike other spikes of extreme weather in recent years, Tippet and colleagues could not find the **fingerprints** of man-made global warming in the change. (...) But some of the other scientists said improved reporting and urban sprawl increases the number of recent tornadoes and negates some of the trend Tippet found. They also disagree with the particular type of measurements that Tippet used and some of his definitions. *MailOnline* December 1, 2016 Thursday Mystery as researchers find extreme tornado outbreaks are spawning MORE twisters than ever before - and say climate change ISN'T to blame
- 207- For years scientists have given almost a rote response to the question of whether an instance of weird weather was from global warming, insisting that they can't attribute any single event to climate change. (...) Climate science has progressed so much that experts can accurately detect global warming's **fingerprints** on certain extreme weather events, such as a heat wave, according to a high-level scientific advisory panel. (...) But other scientists don't like the idea of looking at single events. Climate change caused by man 'has fingerprints in every weather event we experience today,' wrote Oklahoma University meteorology professor Jason Furtado, who wasn't part of the study. 'Disentangling the contribution of climate change with natural variability for a single event is not fruitful or currently possible in my opinion.' *MailOnline* March 11, 2016 Friday Extreme weather events CAN be blamed on climate change: Panel says there is 'high confidence' some extreme heat and cold events are manmade
- 208- Richard Black, the director of the Energy and Climate Intelligence Unit thinktank said the emergence of attribution science - our ability to find the **fingerprints** of climate change in individual weather events - was "one of the most exciting developments in the climate change field". *The Guardian* January 14, 2016 Thursday Climate change 'made record UK rainfall in December more likely' BYLINE: Karl Mathiesen
- 209- The unmistakable **fingerprint** of extreme weather event[s] at the **crime scene** of global warming seems intuitively obvious: consider that Houston is reckoned to have been hit by three "500-year floods" in three years. *The Guardian* September 10, 2017 Sunday The Guardian view on climate change: see you in court (my addition in parenthesis)

- 210- Big Two '**culprits**' (China and America) back deal on climate change *Daily Mirror* September 4, 2016 Sunday (my addition in parenthesis)
- 211- Climate change is thought to be the main **culprit** behind mass coral bleaching, which causes the coral to expel the algae that lives within its branches. *MailOnline* February 10, 2016 Wednesday Our disappearing world BYLINE: RICHARD GRAY
- 212- PRESIDENT BUSH sought to placate Europe yesterday by pledging America's leadership in **the battle against global warming**, but once again he rejected the 1997 Kyoto accords, with their mandatory reductions in greenhouse gas emissions. *The Times* June 12, 2001, Tuesday President offers olive branch on global warming BYLINE: Martin Fletcher
- 213- Acid rain turns into an unlikely ally in the **battle** against global warming *The Times* August 3, 2004, Tuesday BYLINE: Mark Henderson
- 214- THE PRIME Minister's desire to put Britain at the forefront of the **battle** to cut global warming is expected to receive a dramatic setback today when figures will show that CO2 emissions in the UK rose last year. *The Independent* March 25, 2004, Thursday POLITICS: BLAIR'S DRIVE TO CUT GLOBAL WARMING HIT AS CO2 EMISSIONS RISE BYLINE: MARIE WOOLF
- 215- The land is sinking, the sea is rising and Britain faces some tough decisions. Alok Jha discovers the places being **sacrificed in our battle** with global warming: National phenomenon, regional problem and a local solution *The Guardian* June 12, 2003
- 216- Energy ministers from across the world gather in London today to begin the latest chapter in the increasingly urgent international **battle** against climate change. *The Independent* November 1, 2005, Tuesday GLOBAL WARMING: BRITAIN HOSTS ENERGY SUMMIT BYLINE: ANDY MCSMITH
- 217- 'Earthy evangelist' changes US climate Europe's environmental activists find an unexpected ally in **battle** against global warming, reports Alec Russell in Washington *THE DAILY TELEGRAPH* June 23, 2005, Thursday BYLINE: Alec Russell
- 218- TONY Blair's attempts to show international leadership in the **battle** to combat global warming were dismissed as inadequate yesterday by a committee of MPs. *THE DAILY TELEGRAPH* March 28, 2005, Monday Blair 'evading' tough decisions on global warming, warn MPs BYLINE: Andrew Sparrow
- 219- Financial: Europe to include airlines in **battle** on climate change: Flights to be covered by EU carbon trading scheme: Greens and US criticise commission's plans *The Guardian* December 21, 2006 Thursday BYLINE: David Gow
- 220- The ETS is central to Europe's claims to be leading the **battle** against global warming. It was undermined in May when emission permit prices plunged after Brussels admitted that the 9,000 power stations and industrial plants covered had emitted 66m tonnes less than their target in 2005, the first year of the scheme. *The Guardian* July 4, 2006 Tuesday Financial: Global warming: Emission permits: UK and 10 others miss deadline for setting targets BYLINE: David Gow
- 221- A groundbreaking step in the **battle** against climate change *The Independent* November 24, 2007 Saturday
- 222- pounds 300 m cutbacks threaten the **battle** against climate change *The Daily Telegraph* November 17, 2007 Saturday BYLINE: Sophie Borland

- 223- The **battle** against climate change has just got its toughest new recruit: Jack Bauer, the hero of the television show 24. Its creators, Fox, are promising their next series will introduce a host of environmentally friendly production measures, as the industry gropes for ways to make carbon-neutral television. *The Independent* August 6, 2007 Monday Jack Bauer, the hero of '24', takes on global warming BYLINE: Stephen Foley
- 224- SCIENTISTS UNVEILED a new **weapon** in the **battle** against global warming last week: a 16ft torpedo-shaped probe that will swoop over the atmosphere to measure Earth's gravity with unprecedented accuracy. *The Observer* July 29, 2007 'Ferrari' of probes to check Earth gravity: Elegant satellite is the latest weapon in the fight against global warming BYLINE: Robin McKie
- 225- US agrees to join **battle** against global warming *The Daily Telegraph* June 8, 2007 Friday BYLINE: David Blair and Toby Helm
- 226- HOW THE CO2 EMISSIONS COMPARE: GREENER BY MILES Conscientious consumers are being urged to buy locally sourced food in the **battle** against climate change. *The Sunday Telegraph* June 3, 2007 Sunday BYLINE: RICHARD GRAY
- 227- Blair and Merkel lean on Bush to join **battle** against climate change *The Independent on Sunday* April 15, 2007 BYLINE: Geoffrey Lean
- 228- Brussels lambasted the US and Australia yesterday for their inaction in cutting carbon dioxide emissions and stressed Europe's leading role in the **battle** against global warming. *The Guardian* April 3, 2007 Tuesday Financial: Global warming: Smoke alarm: EU shows carbon trading is not cutting emissions BYLINE: David Gow
- 229- Blair hails 'historic day' in **battle** against climate change *The Independent* March 14, 2007 Wednesday BYLINE: Andrew Grice
- 230- almost a decade as a pariah in the **battle** against global warming because of its refusal to join the Kyoto Protocol, Australia scored an environmental first yesterday by becoming the only large economy to ban the traditional incandescent lightbulb. *The Independent* February 21, 2007 Wednesday Q. How many Australians does it take to change all the light bulbs? BYLINE: Cahal Milmo
- 231- Almost two years after staking a claim to lead the **battle** against global warming, and after two days of hard haggling over how to spread the financial pain, European leaders today agreed a package of laws aimed at cutting greenhouse gases by one-fifth within 12 years. *Guardian.com* December 12, 2008 Two years of leading **battle** on climate change end in two days of hard haggling
- 232- COLLAPSING ANTARCTIC ice sheets, which have become potent symbols of global warming, may actually turn out to help in the **battle** against climate change and soaring carbon emissions. *The Observer* December 7, 2008 Home: News: Melting ice may slow global warming: Scientists discover that minerals found in collapsing ice sheets could feed plankton and cut CO2 emissions BYLINE: David Adam
- 233- OIL TO GO UP AGAIN; BROWN LAUNCHES POUNDS 100BN GREEN REVOLUTION IN THE **BATTLE** AGAINST CLIMATE CHANGE *The Mirror* June 27, 2008 Friday
- 234- What is carbon trading, and will it help in the **battle** against climate change?; The big question *The Independent* March 11, 2008 Tuesday BYLINE: MICHAEL MCCARTHY
- 235- Al Gore invoked the spirit of Winston Churchill yesterday when he urged political leaders to follow the example of Britain's wartime leader in the **battle** against climate change. The former US Vice-

President accused governments around the world of exploiting *The Times* July 8, 2009 Wednesday Blitz spirit? It will be needed again if we are to beat global warming, Gore says BYLINE: Ben Webster ; Robin Pagnamenta

- 236- US energy secretary Steven Chu will fly to Europe this week to begin talks that will be crucial in the global **battle** against climate change. The 61-year-old physicist will hold key discussions with energy ministers from the G8 nations in Rome before travelling to London to take part in a debate with Nobel prize winners on global warming. *The Observer* May 24, 2009 Home: News: America's new green guru sparks anger over climate change U-turns BYLINE: Robin McKie and Ed Helmore
- 237- Ecuador looks to its own people in the **battle** against climate change *Guardian.com* September 22, 2010 Wednesday BYLINE: John Vidal
- 238- After the despair of the great Copenhagen cop-out, here's a bit of good news: while the politicians bicker and backbite, thousands of people, organisations and companies have been quietly taking the **battle** against climate change into their own hands. *The Guardian* January 1, 2010 Friday G2: 10:10: Overview: The time for action BYLINE: Ian Katz
- 239- Without nuclear, the **battle** against global warming is as good as lost. Even many greens now admit this in private moments. We are already witnessing the first signs of the collapse in the biosphere this entails - with the Arctic in meltdown more solar radiation is being captured by the dark ocean surface, and the weather systems of the entire northern hemisphere are being thrown into chaos. *The Guardian* September 15, 2012 Saturday International: Analysis: Atomic energy is our only hope to beat climate change BYLINE: Mark Lynas
- 240- The certificates - one is the equivalent of one ton of carbon dioxide or an equivalent greenhouse gas - are bought and sold by companies as part of a scheme to encourage them to reduce pollution. They are designed to be a key weapon in the **battle** against global warming, giving companies a financial incentive to cut their emissions and sell for profit any spare certificates they have. *The Independent on Sunday* June 24, 2012 Carbon credit scam would have cost Britain £2bn BYLINE: David Connett
- 241- Monster power bills leave the public shivering; Consumers are having to bear the cost of big subsidies in the **battle** against climate change. *The Sunday Times* October 28, 2012 Sunday BYLINE: Danny Fortson
- 242- This nuclear deal is good for Britain and the **battle** against climate change *Guardian.com* February 17, 2012 Friday BYLINE: Mark Lynas
- 243- The financial markets are humanity's only hope in the **battle** against global warming, the world's top climate expert declared yesterday as he presented the most overwhelming case ever made that humans are responsible for rapidly increasing the Earth's temperature. *i-Independent* September 28, 2013 Financial markets 'best hope' for climate change BYLINE: Tom Bawden
- 244- How safe that vantage point is will be revealed in the new IPCC report. But whatever its findings and however politicians and nations respond, former environment minister Aslam is clear that, for better or worse, the Maldives is the frontline of the **battle** against climate change. *The Guardian* September 27, 2013 Friday Climate change: Paradise awash BYLINE: Damian Carrington
- 245- Duke turns the tables on son's **battle** against climate change *The Times* March 11, 2013 Monday BYLINE: Hannah Devlin
- 246- UN's Intergovernmental Panel on Climate Change (IPCC) prepares to release a major report that is expected to warn of catastrophic consequences to food supplies, livelihoods, health and security

across the world if climate change is allowed to continue unchecked. Leaked versions of the report, published in Japan tomorrow, warn that rising global temperatures, droughts and heat waves will threaten food supplies and human health, while hundreds of millions of people will be affected by coastal flooding. Climate change will cause economic losses, exacerbate poverty and increase migration and risks from violent conflict as well as causing damage to wildlife and habitats, the study by experts from around the world is expected to warn. In Europe, heatwaves, droughts and heavy rainstorms will increase and there will be a greater risk of coastal and river flooding, it is expected to say, while heat-related deaths will also increase. Energy Secretary Ed Davey has also declared that Britain must spearhead the worldwide **battle** against global warming. (...) Campaigners yesterday warned that the world faces a 'bleak future' without action to tackle climate change and leading environmentalists called on politicians to break the world's dependency on fossil fuels. Yesterday major landmarks in the UK and across the globe switched off their lights for 60 minutes to mark Earth Hour, the World Wildlife Fund campaign to raise environmental awareness. Big Ben, the Houses of Parliament and Buckingham Palace all went dark, along with Edinburgh Castle, Brighton Pier, the Eiffel Tower and Sydney Opera House. *MailOnline* March 30, 2014 Sunday Former archbishop of Canterbury Dr Rowan Williams warns winter floods which devastated parts of UK is sign fears linked to global warming are coming true
BYLINE: TARA BRADY

- 247- It is an unedifying experience but an illuminating one - for this once glamorous thoroughfare, a few blocks from Miami Beach's art deco waterfront and its white beaches, has taken on an unexpected role. It now lies on the front line of America's **battle** against climate change and the rise in sea levels that it has triggered. *The Observer* July 13, 2014 How long before the ocean claims Miami? BYLINE: ROBIN MCKIE
- 248- Mr Obama, who made the **battle** against climate change a core promise of this 2008 election campaign, tried but failed to implement this quota system on a federal level due to opposition from lawmakers. *telegraph.co.uk* June 2, 2014 Monday Barack Obama unveils historic plan to cut carbon emissions
- 249- Explosive intervention by Pope Francis set to transform climate change debate; The most anticipated papal letter for decades will be published in five languages on Thursday. It will call for an end to the 'tyrannical' exploitation of nature by mankind. Could it lead to a step-change in the **battle** against global warming? *The Observer* June 13, 2015 Saturday BYLINE: John Vidal
- 250- The **battle** against global warming was given a historic boost tonight as world leaders agreed a "transformational" action plan involving the toughest climate targets ever set and hundreds of billions of dollars to tackle the problem. *Independent.co.uk* December 12, 2015 Saturday COP21: Governments ratify French Agreement bringing in historic new climate change target BYLINE: Tom Bawden
- 251- Pope Francis: planet facing 'unprecedented destruction'; Landmark papal encyclical mobilises world's 1.2 billion Catholics in **battle** against climate change *telegraph.co.uk* June 18, 2015 Thursday BYLINE: Alice Philipson and John Bingham
- 252- Pope Francis gained a new ally in his **battle** against climate change deniers yesterday when the UN secretary-general Ban Ki Moon flew to the Vatican to pledge his backing. *The Times* April 29, 2015 Wednesday Row over papal vow on climate change BYLINE: Tom Kington
- 253- The Philippines is seen as a frontline state in the **battle** against climate change, having been battered by relentless storms in recent years that have emerged from the Pacific Ocean and claimed many thousands of lives. *MailOnline* February 26, 2015 Thursday Francois Hollande flies to the Philippines 'to raise awareness of climate change'... but why did he need to take two glamorous actresses with him? BYLINE: AFP and TED THORNHILL
- 254- Barack Obama's personal **battle** against climate change; The President's determination to tackle climate change is not merely political *telegraph.co.uk* January 23, 2015 Friday BYLINE: By Geoffrey Lean

- 255- The Pope has joined the **battle** against climate change after he criticised mankind for "lording" it over the environment and blamed humans for global warming. *i-Independent* January 17, 2015 Pope blames mankind for climate change; BYLINE: Tom Bawden
- 256- Known as a "ratchet mechanism", this provision is regarded as essential in the **battle** against climate change since the pledges that countries made to cut their carbon emissions in the run-up to the summit will only limit global warming to about 2.7C, against an official target of 2C. *The Independent* December 11, 2015 Friday Fatigue and frayed tempers on second night of talks as time runs out for deal BYLINE: TOM BAWDEN
- 257- Cameron's speech Critics deride hypocrisy David Cameron took the moral high ground over the **battle** against climate change yesterday, leaving some environmental campaigners and rival politicians angry. *i-Independent* December 1, 2015 We are reaching the point of no return, Obama warns summit BYLINE: Tom Bawden
- 258- Scientists turn carbon dioxide into CHALK in revolutionary breakthrough in **battle** against global warming; Greenhouse gases, which are believed to contribute to climate change, could be removed from the atmosphere according to a British-led team that has been carrying two-year-long research *mirror.co.uk* June 9, 2016 Thursday BYLINE: John von Radowitz
- 259- Vice President Gore, who shared the Nobel Peace Prize in 2007 for his work urging action against the risks of global warming, was kicking off on Monday a 24-hour talk-a-thon to urge action in the **battle** against climate change, which threatens to raise sea levels, spread diseases and increase droughts in more regions around the world. *Express Online* December 6, 2016 Tuesday Donald Trump meets Al Gore to discuss man-made global warming 'hoax'
- 260- Trump's joy is Obama's pain: Barack's legacy could be wiped out after the Donald's election pledge to scrap Obamacare, **battle** against climate change and Paris accord *MailOnline* November 9, 2016 Wednesday
- 261- France bans the use of plastic crockery and cutlery to aid **battle** against climate change *telegraph.co.uk* September 17, 2016 Saturday BYLINE: David Millward
- 262- Women working in financial services are opening a new front in the **battle** against climate change, with the launch of a UN-backed initiative to take global warming concerns into business boardrooms. *The Guardian* April 11, 2016 Monday UN launches campaign to enlist women in boardrooms to take up climate issue BYLINE: Fiona Harvey
- 263- Global carbon emissions stood still in 2016, offering climate hope; The new data is a welcome sign of progress in the **battle** against global warming but many challenges remain, including methane from cattle *The Guardian* September 28, 2017 Thursday BYLINE: Damian Carrington
- 264- Trump's top officials have gone to **battle** against climate change, with EPA chief Scott Pruitt challenging the notion and wanting scientists to debate climate on TV, it was revealed in July. *MailOnline* August 8, 2017 Tuesday Department of Agriculture tells employees to avoid using the term 'climate change' in their work and use 'weather extremes' instead BYLINE: CHEYENNE ROUNDTREE
- 265- Scottish drivers face pollution charges in **battle** against climate change *telegraph.co.uk* January 20, 2017 Friday
- 266- The scars of the island's **battle** against climate change are visible across this low-lying island. Local people recall playing baseball where boats now bob in the water; homes that once sat 20ft from the shore now teeter precariously close to the sea. *The Guardian* January 18, 2017 Wednesday Indigenous Canadians face a crisis as climate change eats away island home; BYLINE: Ashifa Kassam

- 267- Bull urged the energy and climate change secretary, Ed Davey, attending a conference in Ireland on hunger and **climate justice**, to commit the UK's fair share to international funds to help children adapt to the effects of climate change. *Guardian.com*. April 17, 2013 Wednesday British children 'deeply concerned' about the impact of climate change BYLINE: Damian Carrington
- 268- This travesty of global climate **justice**, say many developing countries, is largely the fault of the US, which, backed by Britain and others industrialised countries like Canada and Australia, has helped build up distrust in developing countries by continually trying to deregulate the international climate change regime by weakening the rules, shifting responsibility to the south and making derisory offers of financial help. *The Guardian* December 15, 2014 Monday **Is the Lima deal a travesty of global climate justice?**; Poorer countries likely to reject agreement in Paris next year if onus falls on them rather than those largely responsible for global warming BYLINE: John Vidal
- 269- Nobody in the referendum debate has bothered much about the hundreds of desperate migrants who try to storm the cross-Channel ferries at Calais, still less the nearly 2,000 would-be incomers to Europe who - according to the UN - have drowned this year in the waters between north Africa and Italy. Yet the Golden North and the Scorched South will need to negotiate with each other. The Scottish government already has a "**climate justice**" programme of water projects in Africa. *The Independent* September 13, 2014 Saturday The winds of climate change are blowing Scotland's way BYLINE: Boyd Tonkin
- 270- As priests speak out from the pulpit and the ranks, their advocacy on climate change could eventually help build the critical mass of public support needed to push political leaders to take the bold action. In return, the pope's support for **climate justice** - a cause that resonates strongly with a younger generation and the rapidly rising Latino population - could help stop people from drifting away from the church (...) From where Moore (Richard Moore, director of the Southwest Network for Environmental and Economic Justice) stood there was always a link between **the environment and economic justice**, long before the pope drew the connection. (...) **The struggle was about justice, not the environment.** "Take chemicals, there are 86,000 chemicals on the market, and less than 200 are regulated," Moore said. He said he fought for **environmental justice** every day. *The Guardian* June 27, 2015 Saturday On climate change, Hispanic Catholics hear pope's message - and it's personal; Long before Pope Francis called for the faithful to work toward **environmental justice**, water and drought were natural concerns for many in the western US and willing disciples may galvanize like never before BYLINE: Suzanne Goldenberg (my addition in parenthesis)
- 271- Congregants should fast once a month to protect against climate change; When the General Synod is held in July its members will be asked to vote on holding a day of prayer and fasting for '**climate justice**' *Independent.co.uk* June 19, 2015 Friday BYLINE: Emily Dugan
- 272- I cannot believe that they are gone. Like everyone who met Marc and Philip (climate researchers) there are parts of them that will stay with me forever. I will remember their great big belly laughs, which came easily and often. I will remember their kindness and their enthusiasm. I will remember their framing of climate change as a **justice** issue. *The Guardian* May 5, 2015 Tuesday Inspirational climate researchers feared dead on Arctic expedition BYLINE: Ruth Dawkins (my addition in parenthesis)
- 273- Women and climate change **injustice**: thoughts from the Paris talks; From presidents to poets, female delegates at the UN climate conference reflect on how global warming is affecting women, and how grassroots movements are leading the way in climate-proofing communities *The Guardian* December 14, 2015 Monday BYLINE: Nabeelah Shabbir
- 274- Ségolène Royal, former rival of Fabius for the presidential nomination, smiles as he announces the text on issues such as **climate justice** and emissions in a balance that is powerful but delicate and will

enable each country to leave Paris with their heads held high. *The Guardian* December 12, 2015 Saturday Paris climate talks: French hosts release text of final deal BYLINE: Adam Vaughan and James Randerson

- 275- But for poor countries there was deep disappointment that the draft dropped any mention of **climate or gender justice**. *The Guardian* December 12, 2015 Saturday Paris climate talks: delegates reach agreement on final draft text BYLINE: Suzanne Goldenberg, Lenore Taylor, Adam Vaughan and John Vidal
- 276- Although our economy is a fifth of America's size David Cameron plans to give twice as much as Barack Obama to **climate justice**. *The Times* December 7, 2015 Monday Climate change reparations are a ridiculous idea BYLINE: Tim Montgomerie
- 277- The pursuit of climate **justice** does not need to set a newcomer to the environmental movement apart from a longstanding campaigner; everyone should and can get involved, and it's the diverse and inclusive natures of university campuses that would allow this to happen. The strong political presence on UK campuses does not solely include parliamentary parties, but also pressure groups such as Amnesty International and Oxfam. These organisations tirelessly campaign for **climate and social justice** while retaining the fun, social culture of student life, and it is this element of such organisations that manages to draw in new students year after year. (...) There are so many ways to immerse yourself in student politics centred around **climate justice** - it's just about finding your niche and passion within these channels to eventually get you and the rest of our generation on its way to being more environmentally friendly. *Independent.co.uk* December 3, 2015 Thursday Climate change: Students can utilise socioeconomic and ethnic backgrounds present on university campuses to bring about environmental change BYLINE: Poppie Platt
- 278- It's a simple equation, really. Agree on mechanisms to enforce adherence to **environmental justice**, or consciously embrace injustice and add fuel to the fire of human division and pain. *The Guardian* December 1, 2015 Tuesday Global climate march 2015: hundreds of thousands march around the world - as it happened BYLINE: Claire Phipps, Adam Vaughan and Oliver Milman
- 279- If meaningful steps aren't taken to what has been dubbed "**climate justice**" then some countries may decide not to sign any agreement and people will come away with nothing. *Independent.co.uk* December 1, 2015 Tuesday COP21: Everything you need to know about the Paris Climate Change conference BYLINE: Tom Bawden
- 280- Placards warning the world's leaders that there is "No Planet B" were waved. People dressed as polar bears or angels to demand "**climate justice**". And the Pope, among others, sent a pair of his shoes to symbolise the marchers forced from the streets of Paris by terror. *Independent.co.uk* November 30, 2015 Monday Paris climate change talks: Worldwide protests as leaders prepare for start of COP21 summit BYLINE: Cahal Milmo, Tom Bawden
- 281- Many oil-producing countries, led by Saudi Arabia, will also want a weak deal that will not devalue their natural assets. Some Latin American countries, such as Venezuela and Bolivia, will hold out in the name of **climate justice** for a deal that forces the rich to cut more than the poor. *The Observer* November 30, 2015 Monday Reasons to be cheerful or fearful for climate change deal BYLINE: John Vidal
- 282- Developing countries also want "loss and damage" funds, for example to help repair the damage caused by climate change-related events, such as hurricanes. If meaningful steps aren't taken to what has been dubbed "**climate justice**" then some countries may decide not to sign any agreement and people will come away with nothing. *Independent.co.uk* November 26, 2015 Thursday Paris climate conference: Everything you need to know BYLINE: Tom Bawden
- 283- Developing countries also want "loss and damage" funds, for example to help repair the damage caused by climate change-related events, such as hurricanes. If meaningful steps aren't taken to what has been

dubbed the "**climate justice**" issue, some countries may refuse to sign an agreement and the whole treaty could be jeopardised - an unlikely but not implausible outcome. *Independent.co.uk* November 24, 2015 Tuesday Paris climate change talks: Four things you need to know about the upcoming meetings BYLINE: Tom Bawden

- 284- The letter was signed by groups such as the Environmental Defense Fund, Friends of the Earth, the Natural Resources Defense Council, Greenpeace and the Sierra Club, as well as bodies such as the Indigenous Environmental Network, which promotes **environmental and economic justice** issues affecting indigenous communities. *The Guardian* October 31, 2015 Saturday Environmental groups demand inquiry after Exxon 'misled public' on climate BYLINE: Joanna Walters
- 285- These grassroots activists are part of a powerful global movement for change that has continued to grow as crucial UN climate talks in Paris in December have drawn nearer, bolstered by interventions from other important global voices - Pope Francis, Graça Machel, Desmond Tutu and Mary Robinson, to name a few. The pope last week repeated his message of **climate justice** and change to world leaders at the UN. *The Guardian* October 12, 2015 Monday A story of hope: the Guardian launches phase II of its climate change campaign BYLINE: James Randerson
- 286- Wherever there's a global climate summit or protest, you'll find photographer Robert van Waarden. He tells the story of people mobilising for **climate justice** alongside his work documenting **battles** against fossil fuel, as with the 2014 series *Along the Pipeline*. He shifts his lens, and our understanding, away from clichéd environmental images like polar bears and on to people helping to humanise climate policy. That is no mean feat. *The Guardian* October 4, 2015 Sunday The eco guide to the ocean BYLINE: Lucy Siegle
- 287- The ever-expanding human population is putting stresses on the environment that are unique. I have begun to analyze my daily habits in a different way - how am I complicit in **environmental racism**, and how can I contribute to **environmental justice**? *The Guardian* September 21, 2015 Monday One bike and 1,001 stories on climate change BYLINE: Devi Lockwood
- 288- Hip-hop takes on climate change: artists drive the beat for **environmental justice**; The Act on Climate national bus tour is stopping in areas worst affected by high pollution and social inequality, driving the message that urban communities and people of color are most afflicted by climate change *The Guardian* September 16, 2015 Wednesday BYLINE: Anna Codrea-Rado
- 289- Speaking at an international meeting in Rome on **environmental justice** and climate change attended by senior Vatican officials, Stern said that the "moral arguments" for action to combat climate change were overwhelming. *The Guardian* September 10, 2015 Thursday Moral case to tackle climate change overwhelming, says Lord Stern; Rome conference speech describes inaction as discrimination that devalues lives of future generations BYLINE: Stephanie Kirchgaessner
- 290- There is an inevitable call for concerted political action for "drastic" and rapid cuts to carbon emissions with rich countries taking the lead and paying their "**carbon debt**" to the world. (...) None of these in themselves might seem like radical or novel ideas but his point is that they could be if people actually tried them. And here he (the Pope) pulls out his trump card. He invests in his message with something which the UN's climate change panel or celebrity eco-toffs of the western world will never be able to turn to - the power of a religious imperative. He tells people to view something as simple as reusing rather than discarding something as "an act of love" to mankind. *telegraph.co.uk* June 18, 2015 Thursday Pope Francis and the parable of the plankton BYLINE: John Bingham (my addition in parenthesis)
- 291- And if we really want **climate justice**; protest in the pursuit of this must be normalised; we must support rather than denounce those willing to put themselves on the line, since we all benefit from their actions. Not everyone is in a position to take civil disobedience, but we can all get behind it. *The Guardian* May 13, 2016 Friday Civil disobedience is the only way left to fight climate change BYLINE: Kara Moses

- 292- Finally, there will be equally great pressure to harness the most powerful force we can command to reverse environmental damage. That **weapon** is the market. The market cannot solve problems if it gets the wrong signals, and there are many examples where it gives the wrong signals now. The EU's common agricultural policy is one, US agricultural support another. Maybe the most useful thing the Genoa summit can do is to set a series of studies in train to find ways in which the market can work in favour of environmental concerns rather than against them. Independent on Sunday July 15, 2001
ECONOMIC VIEW: LET OUR LEADERS SORT OUT THE FUTURE OF THE PLANET. IF ONLY ...;BYLINE: Hamish Mcrae
- 293- How the wind could be our best **weapon** against global warming *The Independent* December 6, 2005 Tuesday
BYLINE: Andrew Buncombe
- 294- Your world. Your verdict; Last week, following the launch of an all-party inquiry into climate change, we invited Independent readers to send in suggestions for saving the planet. There was huge response. Today we publish a summary of the most popular ideas which, if put into practice, would be **potent weapons in the fight against global warming** *The Independent* April 3, 2006 Monday
- 295- The fact that the creator of the Gaia theory could make such a heretical pronouncement has not been without an impact. 'Popular opinion has gone from being totally against new nuclear power plants for Britain to being divided, 50-50, over its deployment here,' he claims. He is probably right. One convert appears to be Tony Blair, who has endorsed construction of a new generation of atomic plants for Britain. The man who changed our thinking about the world and its living beings may also have profoundly altered the way **it will fight the battle against environmental mayhem**. *The Observer* June 11, 2006 Energy: It's too late for the planet: or can we pull it from the fire? BYLINE: Robin McKie
- 296- Is this **the secret weapon to beat global warming?**; The French are mounting a transport revolution led by the humble horse, using it in more than 70 towns to pull schoolbuses and to collect refuse. *The Independent on Sunday* November 25, 2007
- 297- 'Ferrari' of probes to check Earth gravity: Elegant satellite is the latest **weapon in the fight** against global warming *The Observer* July 29, 2007 BYLINE: Robin McKie
- 298- Fatties may be our secret **weapon** against global warming *The Sun* April 20, 2007 Friday BYLINE: Fergus Shanahan
- 299- The IPCC report is only the end of the beginning: the **battle** to avert ecological disaster needs to move to a new, more urgent phase. *The Independent on Sunday* November 18, 2007 A global shift on climate change
- 300- ELECTRICITY is one of mankind's greatest discoveries. But, since it became taken for granted, it has generated little excitement. Until now, that is. Thanks to climate change, power suppliers are increasingly in the front line of the **battle** to save the human race. Or so thinks Vincent de Rivaz, chief executive of EDF Energy in Britain. Uppermost in his mind is a forthcoming trip to New York with London Mayor Ken Livingstone for a climate change summit of 40 of the world's largest cities. *The Daily Telegraph* May 7, 2007 Monday For my next mission: save the world EDF chief Vincent de Rivaz believes nuclear power is the answer to stopping climate change. BYLINE: Sophie Brodie
- 301- Weekend: THE BURNING ISSUE: A single chimney at Yorkshire's Drax power station pours out more pollution than entire countries. The company prides itself on its cleanliness; campaigners want the plant closed. John Harris reports from the frontline of the global warming **battle**. *The Guardian* April 14, 2007 Saturday BYLINE: John Harris

- 302- Village thats saving the world: You may never have heard of Ashton Hayes. But this tiny spot on the Cheshire map is leading a climate change **battle** *The Observer* March 25, 2007 BYLINE: Juliette Jowit
- 303- This is Shishmaref, the Eskimo village on a tiny Alaskan island that's in the frontline of a losing **battle** with global warming. *Sunday Mirror* March 4, 2007 MELT-TOWN BYLINE: SARAH ARNOLD AND BARRY WIGMORE
- 304- It looks like something out of a Dan Dare comic book, and it might just help to save the world. A scientist at the University of Edinburgh has devised a new **weapon** in the fight against global warming: a fleet of 1,500 unmanned sailing ships creating wakes that whiten clouds to reflect the heat of the Sun better. *The Times* September 1, 2008 Monday Ghost ship fleet could provide a silver lining to the cloud of climate change BYLINE: Frank Pope
- 305- A **battle** for the planet; The Polish city of Poznan, host of this week's vital climate change summit, may become known as the place where the Earth was saved - or doomed. *The Independent* December 10, 2008 Wednesday BYLINE: Michael McCarthy
- 306- News: Electric cars given official green light to boost climate change goals: Vehicles run on renewable energy will have a growing part in Britain's climate change **battle** *The Observer* June 22, 2008 BYLINE: Alok Jha
- 307- EU puts carbon trading at heart of climate change **battle** *The Guardian* January 23, 2008 Wednesday BYLINE: Ian Traynor, Brussels and Patrick Wintour
- 308- International: Climate change **weapon** completes underwater glide across Atlantic (...) When a shiny, winged yellow tube touches land in Spain this weekend it will be completing a transatlantic trip that scientists compare to Charles Lindbergh's famous flight across the same ocean. More crucially, this battery-powered underwater glider will have proved itself an effective **weapon** against climate change, according to scientists. *The Guardian* December 4, 2009 Friday BYLINE: Giles Tremlett, Madrid
- 309- As a **weapon** against global warming, it sounds so simple and low-tech that it could not possibly work. But the idea of using millions of buckets of whitewash to avert climate catastrophe has won the backing of one of the world's most influential scientists. *The Times* May 27, 2009 Wednesday Lighten up: a lick of white paint might just halt global warming BYLINE: Mark Henderson
- 310- Man-made eruptions - 'Plan B' in the **battle** for the planet; Royal Society says geo-engineering projects may help limit global warming *The Independent* September 2, 2009 Wednesday BYLINE: Steve Connor
- 311- Obama opens new front in climate change **battle**; President bids to wean US from gas-guzzling instincts with push for action to lower car emissions *The Independent* May 20, 2009 Wednesday BYLINE: David Osborne
- 312- Plugging cow farts key to climate change **battle** in Australia *telegraph.co.uk* February 26, 2009 Thursday
- 313- Obama's Chinese revolution; US President wants world's two biggest polluters to **battle** climate change together China signals 'co-operation' on energy issues ahead of Clinton visit to Beijing *The Independent on Sunday* February 8, 2009 BYLINE: Geoffrey Lean

- 314- The symbol of nature's **battle** with climate change (...) The giant panda for the age of climate change: such has become the fate, in emblematic terms, of *Ursus maritimus*, the great white bear of the north. As the panda logo of what was the World Wildlife Fund, 50 years ago, came to symbolise all threatened animals, so the image of a polar bear on a melting ice floe has come to stand for the dire consequences of global warming. *The Independent* July 15, 2010 Thursday BYLINE: Michael McCarthy
- 315- CLIMATE VICTIM: The trillion-dollar question is: who will now lead the climate **battle**?: Political and business leaders gather this week in an attempt to revive the world's faltering challenge to global warming. But they face a **battle** to lift the cloud of scepticism that has descended over climate science and chart a new way forward *The Observer* March 28, 2010
- 316- Front: Just like T-rex - world's species losing the new **battle** of evolution versus extinction: Global wipeout of nature is accelerating, expert warns Climate change and loss off habitat among causes: Vanishing breeds Probably extinct *The Guardian* March 8, 2010 Monday BYLINE: Juliette Jowit
- 317- BRITAIN'S organised crime squad has been brought in to tackle gangs who are mounting Mission Impossible style heists to steal carbon credits and crippling Europe's chief **weapon** against global warming. *The Sunday Times* March 13, 2011 Sunday Mission to stop carbon crooks BYLINE: Marie Woolf
- 318- THE GREAT CARBON TRADING SCANDAL; Carbon allowances, Europe's main **weapon** against climate change, have an impact on every household, yet the scheme is open to fraudsters and profiteers. Rowena Mason investigates *The Sunday Telegraph* January 30, 2011 BYLINE: Rowena Mason
- 319- Echoes of climate change **battles** are no accident *Independent.co.uk* September 1, 2011 Thursday Steve Connor
- 320- El Salvador in **battle** against tide of climate change; Rising sea levels and deforestation have destroyed the mangrove crops that villagers depend on to survive *Independent.co.uk* September 18, 2012 Tuesday BYLINE: Simeon Tegel
- 321- Little has changed in practical terms since 2011. The Spice balloon has been shipped back to its owners; the pressure washer is back in use spraying down cars. Yet, since the end of last month, the prospect of geoengineering has cast a giant shadow over the world of environmental campaigners and climate scientists. On 27 September, the Intergovernmental Panel on Climate Change (IPCC), the world's most respected authority on global warming, acknowledged for the first time the need to consider it as a **weapon** against rising temperatures. *Independent.co.uk* October 20, 2013 Sunday Let's play God: The scientific experiments that might save the world (or destroy it...); BYLINE: Memphis Barker
- 322- But while this deforestation would play a small role in exacerbating climate change, the much bigger loss is that the scheme's failure means it is far less likely to become a major **weapon** against global warming by being repeated elsewhere. *The Independent* August 17, 2013 Saturday The world has failed us: Ecuador ditches plan to save Amazon from oil drilling; Blow to climate change **battle** as President Correa tears up \$3.6bn UN agreement BYLINE: TOM BAWDEN
- 323- Ecological warriors are also fond of using severe weather incidents as **weapons** in their arsenal of scaremongering. Every flood, every storm, every prolonged burst of sunshine is cited as more evidence of climate change but in reality, our weather is no more extreme than it ever was. *The Express* January 14, 2013 Monday Global warming is nothing more than an expensive con BYLINE: Leo McKinstry
- 324- The Norwegian military has announced plans to introduce 'meatless Mondays' into army diets, in a bid to **battle** a more unusual enemy - climate change. *Independent.co.uk* November 20, 2013 Wednesday Norwegian army placed on strict vegetarian diet; BYLINE: Heather Saul

- 325- The **battle** to save the world from the ravages of climate change was given an unprecedented boost today as the US and China joined forces to announce secretly negotiated and radical actions to combat global warming. *Independent.co.uk* November 13, 2014 Thursday Secret deal to tackle emissions ushers in new era in the **fight** against global warming; Obama and Xi toast deal to bring Washington and Beijing in from the cold BYLINE: Tom Bowden
- 326- From aerosols that spray salt into the air, to machines that suck carbon from the atmosphere, scientists are conjuring up an increasing array of geoengineering techniques to **battle** climate change. *MailOnline* June 4, 2014 Wednesday Geoengineering WON'T stop global warming, warns study BYLINE: ELLIE ZOLFAGHARIFARD
- 327- A Dutch company has made a roofing product that has a layer of silicate rock that reacts with rainwater to store carbon dioxide. On a similar theme, cement manufacturing, a big contributor to greenhouse gas emissions, could become a **weapon** against global warming, through the manufacture of carbonnegative concrete. *The Sunday Times* November 29, 2015 Sunday Seaweed and cement, a planet-saving recipe BYLINE: Josh Glancy
- 328- We can't see the wood for the trees; THE BIG READ Next week's crucial climate summit in Paris will debate how we can cut carbon emissions before it's too late. But what about the natural **weapon** at our disposal in the **fight** against global warming: reforestation? *The Independent* November 27, 2015 Friday BYLINE: BOYD TONKIN
- 329- Yet the **battle** lost over climate change also suggests how hard it may be for critics to blunt the power of a man who has become something of a juggernaut in an institution where change tends to unfold over decades, even centuries. *Independent.co.uk* June 21, 2015 Sunday How climate-change doubters lost a papal fight BYLINE: Anthony Faiola and Chris Mooney
- 330- French ambassador urges Australia to join climate change **battle**; Christophe Lecourtier says he is optimistic about Australia's 'momentum' and it joining a 'coalition of countries' *The Guardian* May 6, 2015 Wednesday BYLINE: Oliver Milman
- 331- Why Corporate America is reluctant to take a stand on climate action; The EPA's Clean Power Plan might be the only hope the US has to make a real dent in the climate change **battle**. So why aren't more companies onboard? In their own words: 40 companies' positions on the EPA's clean power act *The Guardian* April 6, 2015 Monday BYLINE: Marc Gunther
- 332- Party leaders unite for climate-change **battle** *The Independent* February 14, 2015 Saturday BYLINE: EMILY BEAMENT
- 333- Cameron in plea for aid to **battle** climate change *The Daily Telegraph* November 30, 2015 Monday
- 334- Cameron urges world to follow UK on aid to tackle global warming: PM to outline how £5.8bn from British taxpayers will help poor countries **battle** climate change *MailOnline* November 30, 2015 Monday BYLINE: GERRI PEEV and JASON GROVES
- 335- 'A one-off in human history': Stern's warning on climate change **battle**; Speaking before Paris summit, expert says Europe must take urgent steps such as ending fossil fuel subsidies and encouraging electric car *The Guardian* November 10, 2015 Tuesday BYLINE: Juliette Jowit

- 336- Britain pledges £6billion in foreign aid to help developing countries **battle** climate change; Prime Minister David Cameron announced the increase in aid as he arrived for a gathering of world leaders in New York *mirror.co.uk* September 27, 2015 Sunday BYLINE: Joe Churcher
- 337- Indian farmers **fight** against climate change using trees as a **weapon**; As the world passes a critical barrier for climate change, radical techniques for turning farms into carbon sinks are growing in popularity in India *The Guardian* October 29, 2016 Saturday BYLINE: Cathy Watson
- 338- Tech billionaires unite to **battle** climate change; Bill Gates spearheads fund for new advances *i-Independent* Print Ltd December 13, 2016
- 339- DO you think environmentalists will ever win their **battle** to save the world from climate change? *Express Online* September 1, 2016 Thursday Will we ever be able to stop climate change? BYLINE: Alice Foster
- 340- UN climate chief urging 'universal support' in global warming **battle** *Express Online* June 28, 2016 Tuesday
- 341- One of the methods to **battle** climate change, in addition to reducing fossil fuel emissions, is to capture carbon dioxide from the air or power plants. *MailOnline* June 9, 2016 Thursday Icelandic project turns carbon dioxide into STONE in global warming breakthrough
- 342- UN climate science chief: it's not too late to avoid dangerous temperature rise; Hoesung Lee, head of the Intergovernmental Panel on Climate Change, voices hope in **battle** against 2C increase in warming but warns of 'phenomenal' costs *The Guardian* May 11, 2016 Wednesday BYLINE: Suzanne Goldenberg
- 343- Sydney switches off to **battle** climate change *The Sunday Telegraph* March 20, 2016
- 344- Congo basin's peaty swamps are new front in climate change **battle**; Ancient peatlands that store huge amounts of carbon are under threat from logging *The Observer* November 12, 2017 Sunday BYLINE: John Vidal
- 345- How India's **battle** with climate change could determine all of our fates; India's population and emissions are rising fast, and its ability to tackle poverty without massive fossil fuel use will decide the fate of the planet *The Guardian* November 6, 2017 Monday BYLINE: Damian Carrington and Michael Safi
- 346- Leonardo DiCaprio donates \$20m to **battle** climate change and reveals what happened when he met Trump; The actor will distribute the money through his foundation to nearly 100 organisations *The Independent* September 21, 2017 Thursday BYLINE: Mythili Sampathkumar
- 347- Trump's order signals end of US dominance in climate change **battle**; Trump's climate blitzkrieg is unlikely to herald the end of civilization, but it risks US geopolitical dominance and could help 'make China great again' *The Guardian* March 28, 2017 Tuesday BYLINE: Damian Carrington
- 348- The climate change **battle** dividing Trump's America; Climate change denial and energy conspiracy are high on the president's agenda, but US scientists are **fighting** back *The Observer* March 18, 2017 Saturday BYLINE: Andrew Anthony

SCI Extracts:

SCI - Eulogy scenarios

SCI - GREEN scenario:

- 1- “People like George and Markels claim that they can **make the oceans green and solve all our problems**, but it's not that easy,” says Paul Falkowski, a marine biologist at Rutgers University in New Brunswick, New Jersey. Climate change: The oresmen [Quirin Schiermeier](#) *Nature* **volume421**, pages109–110 (09 January 2003)

SCI - FAMILY/ HOME scenarios:

- 2- From the Archaean era onwards, abrupt changes in climate have been scorching one branch of the evolutionary tree only to **nurture** a new off-shoot somewhere else. *A Silent Spring* for climate change? [David S. Reay](#) *Nature* **volume440**, pages27–28 (02 March 2006)
- 3- This argument leads him to conclude that: “the present problem of global warming is neither proof of late capitalism's intent to commit industrial-strength **sins against Mother Earth** nor a hallucination imposed on the world by anti-business activists. It is simply a reflection of the scale of our vulnerability, the scale on which we must now think and act.” (Brian Fagan, archaeologist and anthropologist) Warming to a historical theme Jeremy A. Sabloff *Nature* **volume429**, pages25–26 (06 May 2004) (my addition in parenthesis)
- 4- Epstein is a pioneer in this field, one of a handful of medical graduates who, in the early 1990s, focused on the emerging links between climate change and human health. (...) In an excellent exposition, he discusses environmental microbiologist Rita Colwell's discovery in the 1990s of how algal blooms in warm waters **nurture** cholera bacteria, which then enter the marine food chain and, eventually, human consumers. Climate change: A dose of reality [Tony McMichael](#) *Nature* **volume472**, pages292–293 (21 April 2011)

SCI - RELIGION scenarios:

- 5- But we should not **sacrifice everything on the altar** of spatial resolution: ultra-high-resolution models are too expensive to be used systematically to identify the constraints (linking observable to predicted climate variables) that are essential to probabilistic climate forecasting. Constraints on future changes in climate and the hydrologic cycle [Myles R. Allen](#) & [William J. Ingram](#) *Nature* **volume419**, pages224–232 (12 September 2002)

SCI - Deterioration of nature scenarios:

SCI – DAMAGED BODY scenarios:

- 1- **A last-ditch remedy for an ailing planet**, or a reckless scheme that could be a greater threat to life on Earth than the problem it aims to solve? Opinions are sharply divided on geoengineering — potential massive interventions in the global climate system, intended to forestall the worst effects of climate change. Geoengineering faces ban Moratorium on schemes to reduce global warming clashes with reports urging more research. Jeff Tollefson 2 November 2010 | *Nature* 468, 13-14 (2010)
- 2- Environmentalists may remember 2003 as the year in which the Kyoto Protocol **died**. But even if the international community's first attempt at tackling climate change is **in terminal decline**, this isn't necessarily a defeat for the planet: it might force people to look more realistically at our ability to slow down — and adapt to — the changing climate. Climate change: The long road from Kyoto [Quirin Schiermeier](#) *Nature* **volume426**, page756 (18 December 2003)

- 3- The authors' second conclusion (Pearson et al.'s report) is that, although the newly formed ice cap may have shrunk somewhat, it largely **survived** a subsequent and rapid **recovery** of atmospheric CO₂ back to levels of 1,000 p.p.m.v. or more. Climate change: Early survival of Antarctic ice [Damien Lemarchand](#) *Nature* **volume461**, pages1065–1066 (22 October 2009) (my addition in parenthesis)

SCI - DAMAGED CONTAINER scenarios:

- 4- These differing seasonal trends suggest different underlying mechanisms, and many studies have attributed the summer warming on the eastern peninsula to atmospheric-circulation change associated with the Antarctic **ozone hole** in the stratosphere (the atmospheric layer immediately above the troposphere, the lowest portion of the atmosphere). (...) Mulvaney *et al.* provide a much longer record of temperature than is available from direct instrumental observations. Using the oxygen and hydrogen isotope ratios measured on the ice core as palaeothermometers, the authors show that warming began at James Ross Island in the 1920s, well before the advent of chlorofluorocarbon production and the development of the stratospheric **ozone hole**. Climate change: Brief but warm Antarctic summer [Eric J. Steig](#) *Nature* **volume489**, pages39–40 (06 September 2012)
- 5- Timing matters more for OZ and NAT because the former includes stabilization of the **ozone hole** in the 2000s and the latter includes volcanic eruptions, so we chose only those models providing output for the full 1983–2009 time period. Evidence for climate change in the satellite cloud record [Joel R. Norris](#), [Robert J. Allen](#), [Amato T. Evan](#), [Mark D. Zelinka](#), [Christopher W. O'Dell](#) & [Stephen A. Klein](#) *Nature* **volume536**, pages72–75 (04 August 2016)
- 6- The speed of those winds had increased during that time, probably as a result of the **hole** in the stratospheric ozone layer over Antarctica and possibly because of global warming. (...) But at some times of year and in specific places in this region, carbon-rich surface waters **release** CO₂ into the atmosphere. (...) Stronger winds are better able to pull up deep, ancient water, which **releases** CO₂ when it reaches the surface. That would have caused a net weakening of the carbon sink. How much longer can Antarctica's hostile ocean delay global warming? The waters of the Southern Ocean have absorbed much of the excess heat and carbon generated by humanity. [Jeff Tollefson](#) 16 November 2016 *Nature* 539, 346–348
- 7- Most chemicals in banks will ultimately **escape** to the atmosphere unless destroyed. Although global halocarbon banks of CFCs, HCFCs and HFCs were 19 Gt CO₂-eq in 2005, only a portion is likely to be recoverable (...) Yet the NF₃ that does **escape** has a larger GWP than the PFCs it replaces (...) Given the large size of this reservoir, small increases in the **release** of this carbon as CH₄ as the Arctic warms could substantially augment natural CH₄ emissions. (...) Other anthropogenic activities such as fossil fuel combustion, industrial processes (for example the production of adipic and nitric acids), biomass burning and waste management **release** N₂O directly. (...) Nitrous oxide mitigation efforts that reduce atmospheric NO_x, however, may also have indirect climate benefits because they could lead to reduced tropospheric ozone and, potentially, a terrestrial biosphere better able to **sequester** carbon Non-CO₂ greenhouse gases and climate change [S. A. Montzka](#), [E. J. Dlugokencky](#) & [J. H. Butler](#) *Nature* **volume476**, pages43–50 (04 August 2011)
- 8- The 'width' of the hysteresis loop in freshwater space is proportional to the oceanic heat transport, as it is the buoyancy gain related to **releasing** this heat to the atmosphere which has to overcome the buoyancy loss resulting from freshwater input in order to trigger convection. Rapid changes of glacial climate simulated in a coupled climate model [Andrey Ganopolski](#) & [Stefan Rahmstorf](#) *Nature* **volume409**, pages153–158 (11 January 2001)
- 9- The explanation for these model results is that changes in the overall intensity of the hydrologic cycle are controlled not by the availability of moisture, but by the availability of energy:

specifically, the ability of the troposphere to radiate away latent heat **released** by precipitation. (...) In the tropics, where the flows leading to precipitation are themselves driven largely by the latent heat **released** by precipitation, larger increases still might occur (...) Apparently significant positive trends in tropical precipitation and the strength of the Hadley circulation (the zonal-mean flow at low latitudes, fuelled by latent heat **release**) have been reported, although issues over decadal variability and the long-term stability of observationally based data sets remain Constraints on future changes in climate and the hydrologic cycle [Myles R. Allen & William J. Ingram](#) *Nature* **volume419**, pages224–232 (12 September 2002)

- 10- The well-known ‘urban heat island’ effect actually takes place at night, when buildings and streets **release** the solar heating absorbed during the day. Impact of urbanization and land-use change on climate [Eugenia Kalnay & Ming Cai](#) *Nature* **volume423**, pages528–531 (29 May 2003)
- 11- Global warming isn't a new phenomenon — sea-bed emissions of methane caused temperatures to soar in our geological past. But no one is sure what triggered the **release**. Quirin Schiermeier investigates. About 55 million years ago, our planet emitted a spectacular burp. Trillions of tonnes of methane, until then safely **locked up** in soils and beneath the ocean floor, were **released** into the oceans and atmosphere. Methane is a greenhouse gas, so the result was a global-warming incident that has not been matched since — within a few thousand years, average temperatures in some areas rose by up to 8 °C. Although the evidence for this warming is clear, what sparked the methane **release** is a mystery. (...) Researchers concluded that there must have been a massive **release** of carbon-12 into the ocean and atmosphere — an injection similar to, or perhaps exceeding, the total amount of carbon dioxide and other greenhouse-gas **releases** pumped into the atmosphere since the industrial revolution. (...) Hydrates are only stable in a narrow range of pressures and temperatures, so any ocean warming could disrupt these conditions, **releasing** more methane. Just a small amount of warming could kick-start a positive feedback loop between hydrate **release** and further warming, sending global temperatures soaring. (...) Methane **release**, which would have destabilized the ridge, is one possible cause. The burp theory is also backed by climate simulations. This January, for example, Gavin Schmidt and Drew Shindell, atmospheric chemists at Columbia University in New York, published a simulation confirming that the amount of methane thought to have been **released** from hydrates is consistent, in terms of its lifetime in the atmosphere and its greenhouse effects, with the estimated temperature changes at different latitudes during the PETM⁵. But this still begs the question of what prompted the methane **release**. A recent suggestion by Dennis Kent, a geologist at Rutgers University in New Jersey, invokes the impact of a comet containing large amounts of carbon-12 (ref. [6](#)). Kent says that the impact would have vaporized parts of the comet, adding carbon to the atmosphere and triggering methane **release** from the hydrates. (...) Other researchers argue that a change in ocean conditions could have caused the **release** (...) Katz has developed models to see whether a change in ocean circulation could **release** enough methane to start the warming, or whether other causes, such as sea floor landslides, could have triggered an abrupt degassing of methane reservoirs. “With existing data, neither mechanism can be identified unequivocally as triggering methane **release**,” she says. (...) If the methane **escapes** from its icy cage, it can combine with dissolved oxygen in the ocean, in a reaction probably driven by bacteria, to produce carbon dioxide and water. Some of the carbon dioxide will **escape** to the atmosphere, along with some unreacted methane, where both act as greenhouse gases. Rapid climate change: Gas leak! [Quirin Schiermeier](#) *Nature* **volume423**, pages681–682 (12 June 2003)
- 12- Most carbon dioxide **released** into the atmosphere as a result of the burning of fossil fuels will eventually be absorbed by the ocean, with potentially adverse consequences for marine biota. Here we quantify the changes in ocean pH that may result from this continued **release** of CO₂ and compare these with pH changes estimated from geological and historical records. (...) Our general circulation model results indicate that continued **release** of fossil-fuel CO₂ into the atmosphere could lead to a pH reduction of 0.7 units. Oceanography: Anthropogenic carbon and ocean pH [Ken Caldeira & Michael E. Wickett](#) *Nature* **volume425**, page365 (25 September 2003)
- 13- The process boosted atmospheric levels of carbon dioxide — the main greenhouse gas — by **releasing** carbon stored in the trees. (...) The prehistoric rise in greenhouse gases could easily be the result of other factors, they say, such as subtle changes in Earth's orbit or the **release** of carbon by the oceans. (...) Fortunat Joos of the University of Bern in Switzerland is also unconvinced. He

says that Ruddiman has underestimated the role of the oceans in absorbing carbon **released** through deforestation. Climate change: The hot hand of history [Betsy Mason](#) *Nature* **volume427**, pages582–583 (12 February 2004)

- 14- We propose that intrusion of voluminous mantle-derived melts in carbon-rich sedimentary strata in the northeast Atlantic may have caused an explosive **release** of methane—transported to the ocean or atmosphere through the vent complexes—close to the Palaeocene/Eocene boundary. (...) Hydrothermal vent complexes are interpreted to originate in contact aureoles around sill intrusions, and formed by explosive **release** of fluids and sediments shortly (tens of years) after sill emplacement (...) It has been estimated that a **release** of 1.1×10^{18} g of CH₄ ($\delta^{13}\text{C} = -60\text{‰}$) is sufficient to cause the $>2.5\text{‰}$ negative excursion in carbon isotopes during the IETM [3](#). Mass-balance calculations show that rapid **release** of the thermogenic methane produced in the metamorphic aureoles in the Vøring and Møre basins ($0.3\text{--}3.0 \times 10^{18}$ g CH₄) results in a carbon isotope excursion of -0.2 to -3.0‰ in the (present-day) exchangeable carbon reservoir (see ref. [3](#)). Correspondingly, the minimum excursion resulting from methane **release** in the entire NAVP is -1.0‰ . Recent work indicates that surface temperatures across all latitudes rose by 6 to 8 °C during the IETM, implying a rapid and massive **release** of carbon to the atmosphere. Extrusive volcanism accompanying and following the intrusive activity may have led to the **release** of vast amounts of greenhouse gases and aerosols in the NAVP (about 10^{20} g CO₂) (...) Degassing of one cubic metre of CO₂-saturated basaltic melt may **release** about 3.6 kg of carbon, whereas a melt intruded into organic-rich mudstones may trigger the **release** of 25–100 kg of carbon per cubic metre of magma. (...) In addition, gas from accumulations higher in the stratigraphy could be **released** when pierced by the hydrothermal vent complexes. (...) We conclude that explosive **release** of metamorphic thermogenic methane during the intrusive phase of NAVP may have caused the extraordinary warming during the IETM. For reference, the average anthropogenic **release** of carbon during the 1990s was 6.3×10^{15} g carbon per year (ref. [28](#)), which corresponds to a **release** of all the produced metamorphic CH₄ in the Vøring and Møre basins during a period of 35–360 yr. (...) Volcanic basins thus provide a setting for rapid perturbations of the otherwise steady **release** of carbon from the sedimentary reservoirs. **Release** of methane from a volcanic basin as a mechanism for initial Eocene global warming [Henrik Svensen, Sverre Planke, Anders Malthe-Sørensen, Bjørn Jamtveit, Reidun Myklebust, Torfinn Rasmussen Eidem & Sebastian S. Rey](#) *Nature* **volume429**, pages542–545 (03 June 2004)
- 15- A dramatic historical episode of global warming seems to have been driven by the **release** of huge amounts of hydrocarbons. New evidence for what might have happened comes from the sea floor off Norway. (...) Scientists have only reluctantly taken the IETM as an analogue for examining our planet's future, however, because direct evidence for the actual **release** of hydrocarbons, and the driving mechanism, has remained elusive. (...) The only satisfactory explanation for this is the **release** and oxidation of carbon from a large reservoir of organic material (the biological generation of organic compounds preferentially incorporates ¹²C). (...) the free methane thus **released** **escaped** from the sea floor, and was then oxidized to CO₂ in the ocean or atmosphere. Such a massive **release** of methane should have left physical traces, especially in North Atlantic sediments where the chemical evidence for such an event is strongest. However, other than sediment slumping along the North American margin, which might be explained by processes other than gas **release**, no such evidence has been forthcoming. There are also problems with identifying a plausible environmental trigger for hydrocarbon **release** from marine sediments (...) All this provides tantalizing support for massive hydrocarbon **discharge** from the sea floor during the IETM. The composition of the expelled fluids, and the timing of their **release**, need to be better defined, however. And a convincing link between the conduits and environmental changes at the IETM will require evidence that significant quantities of ¹³C-depleted carbon were actually produced in and **released** from sedimentary rather than volcanic features, and that this occurred during the 20,000-year onset of the carbon isotope anomaly. The simultaneous generation and **release** of methane by volcanic sills at the IETM solves the triggering problem. But it raises an equally contentious issue. (...) The mechanism proposed by Svensen *et al.* therefore requires the instantaneous generation and **release** of a truly stupendous amount of hydrocarbons. An alternative possibility is that the sills **released** biogenic methane that had already accumulated in North Atlantic strata and then, through the consequent environmental changes, carbon from other sources such as methane from widely dispersed gas hydrates. (...) In the hydrate-dissociation scenario, deep-ocean warming drove the massive **release** of carbon, making events at the IETM an intriguing but imperfect analogue of current fossil-fuel emissions. The volcanic triggering of methane **release** from the sea floor,

whether that methane was biogenic or thermogenic, instead implies that sudden hydrocarbon input caused extreme warming, a view consistent with analyses of temperatures at the IETM. Given the comparable estimates for carbon **release** at the IETM (1,500 to 3,000 Gt) , and anthropogenic **release** of carbon into the atmosphere over the coming centuries (3,000–4,000 Gt), environmental change during the IETM should become the subject of general investigation. Global change: Hydrocarbon-driven warming [Gerald R. Dickens](#) *Nature* **volume429**, pages513–515 (03 June 2004)

- 16- As these waters **release** their heat to the atmosphere they become cold and dense, then sink, and return south as a deep current. Climate change: Tropical flip-flop connections [John C. H. Chiang](#) & [Athanasios Koutavas](#) *Nature* **volume432**, pages684–685 (09 December 2004)
- 17- It had been thought by some that rising atmospheric temperatures would have no effect on the rate at which carbon is **released** from the soil. A study that revisits the data behind this theory now finds otherwise. Knorr *et al.* in this issue () claim that rising temperatures brought about by climate change will cause microorganisms in the world's soils to decompose organic matter more rapidly, **releasing** extra carbon dioxide (CO₂) and accelerating climate change. (...) However, current soil models predict that, in the longer term, rising temperatures will speed up the decomposition of organic carbon in soil, **releasing** CO₂ into the atmosphere in excess of any carbon **sequestered** in the soil, and adding to climate change. (...) To create their model, they used published data in which soil from a tropical rainforest in Brazil was incubated for 24 weeks at temperatures between 15 and 45 °C, and the CO₂ **release** was measured. (...) For long-lived plants such as trees, part of this carbon is **sequestered** for decades or centuries. With all plants, some organic carbon is transferred by roots and litter-fall into soil organic matter, some fractions of which are so strongly stabilized that they turn over on timescales of centuries or even millennia. This carbon **sequestration** would tend to slow climate change, so management practices such as re-forestation are considered as mitigation measures under the Kyoto Protocol on climate change. However, current soil models predict that, in the longer term, rising temperatures will speed up the decomposition of organic carbon in soil, **releasing** CO₂ into the atmosphere in excess of any carbon **sequestered** in the soil, and adding to climate change. Climatology: Will soil amplify climate change? [David Powlson](#) *Nature* **volume433**, pages204–205 (20 January 2005)
- 18- The collapse of communist economies in the late 1980s and the subsequent decrease in industrial pollutants **released** in the area was probably a major factor (of the atmosphere being cleaner). Cleaner skies leave global warming forecasts uncertain [Quirin Schiermeier](#) *Nature* **volume435**, page135 (12 May 2005) (my addition in parenthesis)
- 19- Hence, we suggest that the extreme seasonal contrast at both hemispheres during eccentricity maxima increased intermediate seawater temperatures, thereby triggering the **release** of oceanic methane hydrates. In this respect, the critical conjunction of short, long and very long eccentricity cycles and the long-term late Palaeocene to early Eocene warming trend may have favoured the build-up of a significant methane hydrate reservoir before its **release** during both events, thereby excluding unique mechanisms for explaining the PETM (...) Above ETM2 (H1) an increasing number of low-amplitude carbon transients occurred, of which the first, H2¹², seems to correspond with the two thin brown layers one 100-kyr cycle above the Elmo horizon (number 0 in [Fig. 3](#)), suggesting that the threshold for dissociation of clathrates was low during the early Eocene climatic optimum, enabling even the short eccentricity cycles to trigger minor methane **releases**. Astronomical pacing of late Palaeocene to early Eocene global warming events [Lucas J. Lourens](#), [Appy Sluijs](#), [Dick Kroon](#), [James C. Zachos](#), [Ellen Thomas](#), [Ursula Röhl](#), [Julie Bowles](#) & [Isabella Raffi](#) *Nature* **volume435**, pages1083–1087 (23 June 2005)
- 20- The atmosphere and continents are warming as we **release** carbon dioxide into the air through our habit of powering our society by oxidizing fossil carbon. Coping with interesting times [Paul Colinvaux](#) *Nature* **volume437**, page479 (22 September 2005)
- 21- This 'Palaeocene supergreenhouse' is believed to have been caused by a massive **release** of carbon to the oceans and atmosphere, either from methane present in deep-sea sediments or as organic carbon vaporized by volcanism during the opening of the North Atlantic Ocean. (...) Today, warm salty currents feed into the Arctic. There, by **releasing** their heat, these waters become dense

enough to sink into the deep ocean as North Atlantic Deepwater. Climate Change: The Arctic tells its story [Heather M. Stoll](#) *Nature* **volume441**, pages579–581 (01 June 2006)

- 22- Together these observations indicate a massive **release** of ¹³C-depleted carbon and greenhouse-gas-induced warming. (...) Greater carbon **release** and strong hydrological cycle feedbacks may help explain the maintenance of this unprecedented warmth. (...) Importantly, evidence for a CIE of about -4.5‰ to -5‰ nearly doubles the mass estimate for the **release** of carbon during this time, and more closely approximates the carbon concentration required to account for the observed shoaling of the ocean carbonate compensation depth, as well as changes in global temperatures. Arctic hydrology during global warming at the Palaeocene/Eocene thermal maximum [Mark Pagani](#), [Nikolai Pedentchouk](#), [Matthew Huber](#), [Appy Sluijs](#), [Stefan Schouten](#), [Henk Brinkhuis](#), [Jaap S. Sinninghe Damsté](#), [Gerald R. Dickens](#) & [Expedition 302 Scientists](#) *Nature* **volume442**, pages671–675 (10 August 2006)
- 23- At face value, these ‘isotopic’ inversions place a strong (tropical) **release** of CH₄ by fires in 1997, six months earlier than inferred from the remote sensing data ([Fig. 2](#)). (...) In particular, large abnormal peat fires in Indonesia could have **released** huge amounts of CH₄ to the atmosphere from smouldering combustion Contribution of anthropogenic and natural sources to atmospheric methane variability [P. Bousquet](#), [P. Ciais](#), [J. B. Miller](#), [E. J. Dlugokencky](#), [D. A. Hauglustaine](#), [C. Prigent](#), [G. R. Van der Werf](#), [P. Peylin](#), [E.-G. Brunke](#), [C. Carouge](#), [R. L. Langenfelds](#), [J. Lathière](#), [F. Papa](#), [M. Ramonet](#), [M. Schmidt](#), [L. P. Steele](#), S. C. Tyler & [J. White](#) *Nature* **volume443**, pages439–443 (28 September 2006)
- 24- Atmospheric methane is a factor in the amplification of climate change, because the amount of methane **released** by wetlands and vegetation responds sensitively to temperature and moisture conditions. This establishes a positive-feedback mechanism that has contributed to rapid climate shifts during the last glacial cycle. But Bousquet and colleagues' analysis also allows for a negative-feedback mechanism, put in place by atmospheric chemistry. In dry periods of reduced methane emissions, methane removal by hydroxyl radicals also decreases. The dryness aggravates vegetation fires, which **release** large amounts of carbon monoxide, and this pollutant gas also consumes hydroxyl. Climate change: A nasty surprise in the greenhouse [Jos Lelieveld](#) *Nature* **volume443**, pages405–406 (28 September 2006)
- 25- Solutions to its primary cause — the **release** of carbon dioxide from the burning of fossil fuels — are measured in terms of trillions of dollars of investment taking place over decades. Climate change, here and now *Nature* **volume446**, page701 (12 April 2007)
- 26- These activities consume large amounts of fossil fuel and hence **release** significant amounts of carbon dioxide and other greenhouse gases. A greener education [Peter Hopkinson](#) *Nature* **volume448**, page28 (05 July 2007)
- 27- This is a giant conveyor belt that brings warm water northwards into the North Atlantic, **releases** its heat to the atmosphere, and returns the cooled water to the south. Climate change: Natural ups and downs [Richard Wood](#) *Nature* **volume453**, pages43–45 (01 May 2008)
- 28- Much of the carbon dioxide **released** into Earth's atmosphere by human activities is absorbed by the oceans (...) Here, the **release** of CO₂ from under-sea volcanoes causes local acidification of sea water by as much as 1.5 pH units below the average ocean pH of 8.1–8.2. Climate change: Acid test for marine biodiversity [Ulf Riebesell](#) *Nature* **volume454**, pages46–47 (03 July 2008)
- 29- Hard on the heels of this warming, about 300 years later, CO₂ levels in the atmosphere started to rise as the deep ocean warmed and **released** CO₂ owing to decreased stratification or decreased Antarctic sea ice (...) This melting ice in turn kept the bipolar see-saw in its 'warm south' polarity in a positive feedback loop, wherein the sustained supply of meltwater ensured continued **release** of CO₂ and thereby continued warming and melting (...) Second, the predicted slowdown of Atlantic circulation in the coming century may cause an additional **release** of CO₂ from the ocean that adds to the human-made CO₂, a biogeochemical feedback that is not considered in current climate projections. Climate change: Southern see-saw seen [Jeffrey P. Severinghaus](#) *Nature* **volume457**, pages1093–1094 (26 February 2009)

- 30- The **release** of fossil fuel CO₂ to the atmosphere by human activity has been implicated as the predominant cause of recent global climate change (...) The ocean plays a crucial role in mitigating the effects of this perturbation to the climate system, **sequestering** 20 to 35 per cent of anthropogenic CO₂ emissions. Although much progress has been made in recent years in understanding and quantifying this sink, considerable uncertainties remain as to the distribution of anthropogenic CO₂ in the ocean, its rate of uptake over the industrial era, and the relative roles of the ocean and terrestrial biosphere in anthropogenic CO₂ **sequestration**. Reconstruction of the history of anthropogenic CO₂ concentrations in the ocean [S. Khatiwala, F. Primeau & T. Hall](#) *Nature* **volume462**, pages346–349 (19 November 2009)
- 31- Additional latent energy **released** within storms can invigorate vertical motion, increasing rainfall intensity to above 6–7% per °C (ref. [9](#)). Climate change: Human influence on rainfall [Richard P. Allan](#) *Nature* **volume470**, pages344–345 (17 February 2011)
- 32- The PETM is widely attributed to massive **release** of greenhouse gases from buried sedimentary carbon reservoirs, and other, comparatively modest, hyperthermals have also been linked to the **release** of sedimentary carbon (...) Specifically, we interpret our records to indicate repeated, large-scale **releases** of dissolved organic carbon (at least 1,600 gigatonnes) from the ocean by ventilation (strengthened oxidation) of the ocean interior. (...) Our findings suggest that these pronounced climate warming events were driven not by repeated **releases** of carbon from buried sedimentary sources, but, rather, by patterns of surficial carbon redistribution familiar from younger intervals of Earth history. (...) A long-standing hypothesis attributes this event to the **release** of massive amounts of methane from sedimentary gas hydrate deposits, with attendant oxidation to CO₂ causing climate warming through a greenhouse feedback (...) Although various mechanisms have been proposed for the origin of these comparatively modest events, it is widely considered that they too were triggered by large-scale **releases** of carbon from sedimentary reservoirs, probably methane hydrates (...) But this mass of carbon is far too small to have driven our corresponding deep ocean warmings of 2–4 °C ([Figs 1b, 2](#)), particularly given that deep ocean warming of 6–7 °C at the PETM [3](#) was triggered by **release** of 3,000 to 6,000 Gt of carbon (...) The δ¹³C composition of sedimentary C_{org} (about –25‰) permits a much larger carbon **release** (1,600 Gt) to be accommodated within the observed 1‰ δ¹³C excursions of hyperthermals, but problems also exist with this explanation. (...) It has recently become clear that the abyssal Southern Ocean has played a pivotal role in Pleistocene carbon cycling through its gradual amassing of respired CO₂ during glacials and subsequent **release** via increased ventilation during deglaciation. (...) Numerical modelling experiments indicate that CaCO₃ dissolution should be most intense close to the source of carbon **release** (...) First, the absence before our hyperthermals of either gradually decreasing benthic δ¹³C or increasing dissolution intensity ([Figs 1c, 2](#)) indicates that our mid-depth (2–3 km) sites did not ‘sense’ the gradual (10⁴–10⁵ year) build-up of a CO₂ reservoir until its final **release**. Second, early Eocene sediments from lower abyssal depths reveal lithological indications for relatively long intervals of carbon **storage** followed by short, intermittent intervals of carbon **release** ([Supplementary Discussion](#)). The relatively long 100-kyr or 400-kyr intervals between CO₂ **release** events ([Fig. 1](#)) would suggest an apparent means by which a large Eocene abyssal reservoir of DOC could intermittently grow. (...) We suggest that this persistent anoxia, perhaps in the severely undersampled early Eocene abyss, and at least partly driven by the lower solubility of oxygen at warmer abyssal temperatures ([Fig. 1a, b](#)), would have promoted the build-up of a reservoir of DOC large enough to have fuelled hyperthermal carbon **releases** of 1,600 Gt. (...) CO₂ ventilation is a viable mechanism with which to sustain the repeated, frequent carbon **releases** that define hyperthermals over a geologically extended interval ([Fig. 1b, c](#)) because the recharge times of the abyssal ocean (via decomposition of organic matter) are rapid compared to the slow, multi-million-year filling of sedimentary methane hydrate reservoirs (...) The rapid recovery of the carbon cycle following each Eocene hyperthermal strongly suggests that carbon was **re-sequestered** by the ocean, rather than the much slower process of silicate rock weathering proposed for the PETM (...) The 140-kyr residence time of carbon in Earth’s exchangeable reservoirs suggests that the liberation of a substantial quantity of isotopically light carbon from an external, deeply buried source should have a long imprint on oceanic and atmospheric δ¹³C (approaching the residence time) [18](#) until the excess carbon is ultimately **sequestered** back into the long-term sedimentary carbon reservoir by weathering reactions (...) The recoveries seen for other hyperthermals are also too rapid to represent **sequestration** of substantial amounts of sedimentary-

sourced carbon. Eocene global warming events driven by ventilation of oceanic dissolved organic carbon [Philip F. Sexton](#), [Richard D. Norris](#), [Paul A. Wilson](#), [Heiko Pälike](#), [Thomas Westerhold](#), [Ursula Röhl](#), [Clara T. Bolton](#) & Samantha Gibbs *Nature* **volume471**, pages349–352 (17 March 2011)

- 33- The documentation of abrupt climate change gleaned from its ice offers a sober warning of the consequences of a rapidly warming Arctic, including the summertime loss of Arctic sea ice, the accelerating thawing of the permafrost surrounding the Arctic Ocean, and other issues such as methane **release** and global sea-level rise. Climate change: Lands' End to the Arctic Henry Pollack *Nature* **volume472**, pages413–414 (28 April 2011)
- 34- In its new home, the beetle has started attacking jack pines, a dominant species of the boreal forest. Not only could the beetle move into other provinces, it could also cause Canadian forests to **release** massive amounts of carbon dioxide into the atmosphere as they die off. Climate Change: A planet in flux [John P. Smol](#) *Nature* **volume483**, pagesS12–S15 (01 March 2012)
- 35- Recent studies of the deglaciation have shown a strong correlation between times of minima in the AMOC and maxima in CO₂ **release**, consistent with our ΔT proxy for AMOC strength ([Fig. 4d](#)), suggesting that a change in the AMOC may have also contributed to CO₂ degassing from the deep Southern Ocean though its influence on the extent of Southern Ocean sea ice [33](#), the position of the southern westerlies or the efficiency of the biological pump Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation [Jeremy D. Shakun](#), [Peter U. Clark](#), [Feng He](#), [Shaun A. Marcott](#), [Alan C. Mix](#), [Zhengyu Liu](#), [Bette Otto-Bliesner](#), [Andreas Schmittner](#) & [Edouard Bard](#) *Nature* **volume484**, pages49–54 (05 April 2012)
- 36- Perhaps the only significant limitation of Rogelj and colleagues' analysis is that the exploration of geophysical uncertainties does not fully incorporate known positive feedbacks on climate change, particularly the effect of CO₂ and methane **releases** from warming permafrost. (This is a limitation of climate modelling generally.) Although the timing and magnitude of these **releases** are highly uncertain, on current temperature trends the cumulative emissions from permafrost are considered likely to be more than 30 gigatonnes CO₂e by 2040, with significant emissions continuing for more than two centuries (...) Here, the key results are that the development and deployment of **carbon capture and storage** technology for fossil fuels and, subsequently, bioenergy are essential for limiting temperature increases to 1.5 °C, and that failure to deploy such technology would reduce the chance of limiting temperature increases to 2 °C by 14–16 percentage points (with a 2020 carbon price of \$60–150). Climate change: All in the timing [Steve Hatfield-Dodds](#) *Nature* **volume493**, pages35–36 (03 January 2013)
- 37- This difference is consistent with the global tropospheric energy budget, which requires a balance between the latent heat **released** in precipitation and radiative cooling. Divergent global precipitation changes induced by natural versus anthropogenic forcing [Jian Liu](#), [Bin Wang](#), [Mark A. Cane](#), [So-Young Yim](#) & [June-Yi Lee](#) *Nature* **volume493**, pages656–659 (31 January 2013)
- 38- The **release** of carbon from tropical forests may exacerbate future climate change, but the magnitude of the effect in climate models remains uncertain (...) We estimate that over tropical land from latitude 30° north to 30° south, warming alone will **release** 53 ± 17 gigatonnes of carbon per kelvin. Sensitivity of tropical carbon to climate change constrained by carbon dioxide variability [Peter M. Cox](#), [David Pearson](#), [Ben B. Booth](#), [Pierre Friedlingstein](#), [Chris Huntingford](#), [Chris D. Jones](#) & [Catherine M. Luke](#) *Nature* **volume494**, pages341–344 (21 February 2013)
- 39- For instance, their predictions of CO₂ **release** from land ecosystems in response to changes in atmospheric CO₂, temperature and other climate variables diverge wildly (*et al. J. Clim.* **26**, 5289–5314; 2013). Land models put to climate test Study under way on Mongolian steppes aims to improve knowledge of warming effects on vegetation. [Jane Qiu](#) 04 June 2014 *Nature* **510**, 16–17
- 40- However, under the intermediate height of the ice sheets, the accumulated warm subsurface water mass can gradually destabilize the water column, triggering the **release** of subsurface heat and resuming a warm sea surface temporarily ([Fig. 1c–e](#)). (...) This is due to a **release** of additional subsurface heat (resulting from a weakened AMOC that exists in response to the increasing CO₂ level) to the atmosphere, thereafter triggering an abrupt warming of 7 °C in the northern North Atlantic within 20 years. (...) In particular, sea-ice melting due to the gradual CO₂ increases supports the **release**

of enhanced subsurface stored heat, promoting the vertical convection and causing an abrupt warming of 7 °C within 20 years in the northern North Atlantic. Abrupt glacial climate shifts controlled by ice sheet changes [Xu Zhang](#), [Gerrit Lohmann](#), [Gregor Knorr](#) & [Conor Purcell](#) *Nature* volume 512, pages 290–294 (21 August 2014)

41- A warming climate can induce environmental changes that accelerate the microbial breakdown of organic carbon and the **release** of the greenhouse gases carbon dioxide and methane. This feedback can accelerate climate change, but the magnitude and timing of greenhouse gas emission from these regions and their impact on climate change remain uncertain. Here we find that current evidence suggests a gradual and prolonged **release** of greenhouse gas emissions in a warming climate and present a research strategy with which to target poorly understood aspects of permafrost carbon dynamics. (...) Conversion of just a fraction of this frozen carbon pool into the greenhouse gases carbon dioxide (CO₂) and methane (CH₄) and their **release** into the atmosphere could increase the rate of future climate change (...) Abrupt **releases** of CH₄ forecast to cause trillions of dollars of economic damage to global society contrast with predictions of slower, sustained greenhouse gas **release** that, although substantial, would give society more time to adapt (...) Initial estimates of greenhouse gas **release** point towards the potential for substantial emissions of carbon from permafrost in a warmer world, but these could still be underestimates. Field observations reveal that abrupt thaw processes are common in northern landscapes, but our review shows that mechanisms that speed thawing of frozen ground and **release** of permafrost carbon are entirely absent from the large-scale models used to predict the rate of climate change. (...) Permafrost carbon stocks provide the basis for greenhouse gas **release** to the atmosphere, but the rate at which this can happen is also controlled by the overall decomposability of organic carbon. (...) A major cause of landscape-scale variation in decomposability across soils was linked to the carbon to nitrogen ratio of the organic matter, with higher values leading to more greenhouse gas **release**. (...) The metric takes into account the ability of microbes to process permafrost carbon for metabolism by breaking down organic carbon for energy, and to grow by acquiring nutrients such as nitrogen **released** during the decomposition process. (...) Specialized microbes **release** CH₄ along with CO₂ in these environments, and the more potent (that is, it affects climate change more powerfully) greenhouse gas CH₄ in the atmosphere can partially offset a decreased decomposition rate. (...) Controlled laboratory work is critical for identifying the key mechanisms for potential greenhouse gas **release** from permafrost carbon, but some important processes are difficult to address with incubation experiments. For example, CH₄ generated from permafrost carbon can be oxidized in aerobic soil layers above the water table and **released** to the atmosphere as CO₂ instead. (...) Incubation results, while needing to be interpreted carefully, are useful for scaling the potential of permafrost soils to **release** greenhouse gases upon thaw, and also for helping to quantify the fraction of soil carbon that is likely to remain relatively inert within the soil after thaw. (...) These improved models, which specifically address processes known to be important in permafrost ecosystems but that were missing from earlier model representations, have been key for forecasting the potential **release** of permafrost carbon with warming, and the impact this would have on the rate of climate change. Model scenarios show potential carbon release from the permafrost zone in the range 37–174 Pg carbon by 2100 under the current climate warming trajectory (Representative Concentration Pathway RCP 8.5), with an average across models of 92 ± 17 Pg carbon (mean ± s.e.) ([Fig. 3](#)) (...) While carbon **releases** over these time frames are understandably uncertain, they illustrate the momentum of a warming climate that thaws near-surface permafrost, causing a cascading **release** of greenhouse gases as microbes slowly decompose newly thawed permafrost carbon. (...) This has the effect, in the expert assessment, of increasing the warming potential of **released** carbon by 35%–48% when accounting for the more potent greenhouse gas CH₄ over a 100-year timescale. (...) These dynamic models also simultaneously assess the countering influence of plant carbon uptake, which may in part offset permafrost carbon **release**. Warmer temperatures, longer growing seasons, elevated CO₂, and increased nutrients **released** from decomposing organic carbon may all stimulate plant growth (...) Over longer timescales and with continued warming, however, microbial **release** of carbon overwhelms the capacity for plant carbon uptake, leading to net carbon emissions from permafrost ecosystems to the atmosphere. (...) Layers of permafrost may serve as a physical barrier to the **release** of this CH₄ gas from the sediment into the water column and eventually the atmosphere. (...) What is clear is that it would take thousands of years of CH₄ emissions at the current rate to **release** the same quantity of CH₄ (50 Pg) that was used in a modelled ten-year pulse to forecast tremendous global economic damage as a result of Arctic carbon **release**, making catastrophic impacts such as those appear highly unlikely (...) The exponential nature of microbial decomposition and CO₂ and CH₄ **release** over time means that the initial decades after thaw will be the most important for

greenhouse gas **release** from any particular unit of thawed soil. Our expert judgement is that estimates made by independent approaches, including laboratory incubations, dynamic models, and expert assessment, seem to be converging on 5%–15% of the terrestrial permafrost carbon pool being vulnerable to **release** in the form of greenhouse gases during this century under the current warming trajectory, with CO₂-carbon comprising the majority of the **release**. (...) That amount, if released primarily in the form of CO₂ at a constant rate over a century, would make it similar in magnitude to other historically important biospheric sources, such as land-use change (0.9 ± 0.5 Pg carbon per year; 2003–2012 average), but far less than fossil-fuel emissions (9.7 ± 0.5 Pg carbon per year in 2012). Considering CH₄ as a fraction of permafrost carbon **release** would increase the warming impact of these emissions. At these rates, the observed and projected emissions of CO₂ and CH₄ from thawing permafrost are unlikely to occur at a speed that could cause abrupt climate change over a period of a few years to a decade. A large pulse **release** of permafrost carbon on this timescale could cause climate change that would incur catastrophic costs to society, but there is little evidence from either current observations or model projections to support such a large and rapid pulse. (...) Although never likely to overshadow emissions from fossil fuel, each additional ton of carbon **released** from the permafrost region to the atmosphere will probably incur additional costs to society. (...) Additionally, many large-scale models do not distinguish CH₄ versus CO₂ **release** and project only total carbon emissions. (...) This effect can be modified by vegetation, for example, sedge stems acting as pipes provide a pathway for CH₄ to avoid oxidation and to escape to the atmosphere. A synthesis of field CH₄ emission rates showed that sedge-dominated sites had emission rates 2–5 times higher, due in part to sedges allowing the physical **escape** of CH₄, as well as providing more decomposable carbon to the microbial community. Climate change and the permafrost carbon feedback [E. A. G. Schuur, A. D. McGuire, C. Schädel, G. Grosse, J. W. Harden, D. J. Hayes, G. Hugelius, C. D. Koven, P. Kuhry, D. M. Lawrence, S. M. Natali, D. Olefeldt, V. E. Romanovsky, K. Schaefer, M. R. Turetsky, C. C. Treat & J. E. Vonk](#) *Nature* **volume520**, pages171–179 (09 April 2015)

- 42- Ocean carbon uptake is primarily a physico-chemical process in which the rate-limiting step is the transport of water from the surface to the deep, and in which the reaction of CO₂ with water **releases** hydrogen ions, causing ocean acidification (...) On land, thawing of permafrost carbon may lead to the **release** of CO₂ (ref. 8) and methane, processes not accounted for in the version of the CESM used by the authors. Global warming: Growing feedback from ocean carbon to climate [Fortunat Joos](#) *Nature* **volume522**, pages295–296 (18 June 2015)
- 43- A study confirms that volcanism set off one of Earth's fastest global-warming events. But the **release** of greenhouse gases was slow enough for negative feedbacks to mitigate impacts such as ocean acidification. (...) A reliable estimate of the amount of carbon **released** would constrain estimates of Earth's climate sensitivity (the change in the planet's equilibrium temperature in response to a doubling of atmospheric CO₂) and therefore refine projections of future temperature rise. Determining the sources of carbon is particularly crucial, because destabilization of 'fast-release' reservoirs of organic carbon (such as methane hydrates or permafrost) could cause more damage to terrestrial and marine organisms than '**slow-release**' mechanisms such as volcanism ([Fig. 1](#)). (...) The researchers concluded that the PETM was caused by a **release** of 10,200–12,200 petagrams of carbon (PgC; 1 Pg is 10¹⁵ grams). They also calculated that carbon-emission rates peaked at 0.58 PgC per year, which is less than one-tenth of current fossil-fuel emissions (about 10 PgC per year), and in agreement with earlier studies. Their results point to volcanism as the main source (up to 90%) of emissions, with the remainder coming from a reservoir of organic carbon. The proposed mixture makes geological sense, because volcanic activity in the Norwegian–Greenland Sea is known to have triggered the **release** of methane from organic-rich sediments and coal (...) It therefore cannot reveal changes that might have occurred over decadal or centennial intervals at the start of the PETM, including catastrophic, abrupt **releases** of massive amounts of carbon. (...) Second, the findings suggest it is unlikely that catastrophic **release** of carbon from methane hydrates or permafrost was the main trigger of the PETM, although such processes probably amplified the effects of climate change. Yet the risk of potential future destabilization of these fast-release reservoirs cannot be ruled out, because they might be more vulnerable in today's much more-quickly warming world than they were in the past. The relatively slow **release** of carbon during the PETM would have allowed time for amplified chemical breakdown of silicate and carbonate minerals in continental rocks under warm conditions. The carbon **release** would also have led to an extended period of corrosive conditions at the deep sea floor, which would have dissolved the calcium carbonate shells of marine organisms (calcifiers) buried in sediments. (...)

The effects described above constitute negative feedbacks that would have dampened the initial spike in atmospheric CO₂ concentrations resulting from a **fast-release** scenario. In the surface ocean, they would also have decoupled the decrease in pH and carbonate ions from each other — so sea-surface species were mostly affected by warming during the PETM, rather than by acidification. But much of the CO₂ initially **released** by volcanism was **sequestered** in the deep sea, where it caused severe acidification and resulted in one of the largest known extinctions of deep-sea species. The bad news is that any current or future rapid carbon **release** will result in much stronger surface acidification than occurred during the PETM, because there won't be time for negative feedbacks to take effect. Palaeoclimate: Volcanism caused ancient global warming [Katrin J. Meissner & Timothy J. Bralower](#) *Nature* **volume548**, pages531–533 (31 August 2017)

- 44- And cost alone is not the best way to choose between options — geoengineering, for example, is expensive in terms of risk but may be necessary if we are faced with a disaster scenario such as **runaway temperatures**. It makes more sense to think of the solutions as making up a portfolio of options, including others such as nuclear power, guided by risk analysis. (...) *Smart Solutions to Climate Change* presents economic analyses of eight proposed solutions to climate-related problems: climate engineering; mitigation of carbon dioxide, methane and black carbon; carbon **sequestration** by forests; market and policy-driven adaptation to climate change; technology-led climate policy; and technology transfer. Climate change: Insurance for a warming planet [Martin L. Weitzman](#) *Nature* **volume467**, pages784–785 (14 October 2010)
- 45- Four models that endogenously model **fugitive** methane emissions reported increased climate forcing with abundant gas. This is largely driven by increased forcing from **fugitive** methane emissions associated with increases in gas consumption. The WITCH model, with exogenously specified methane emissions, reported virtually no change in forcing (−0.3%). (...) **Fugitive** methane emissions associated with natural gas production, transmission, and distribution is another important factor. (...) In other words, the finding that abundant gas does not discernibly reduce climate forcing is consistently reported over a wide range of **fugitive** methane rates found in the literature. Furthermore, under high fugitive emission assumption, three models reported increased climate forcing of more than 5%. (...) **High fugitive methane emissions scenario** The **fugitive** methane emission rate is subject to large uncertainty. The rates used in the five models all fall within the range 0.3–0.6 kg of CH₄ per GJ ([Extended Data Table 3](#)). These values are similar to the values reported in conventional literature. However, some recent literature suggests that the **fugitive** methane rate may be substantially higher by up to a factor of four. To test our results' sensitivity to high **fugitive** methane rates, we select the upper bound of **fugitive** methane estimates (7.9%) found in the literature and re-estimate the climate forcing. We start from the original emission trajectories from each model. Then, while keeping all else equal, we recalculate the methane emission trajectory by applying the high **fugitive** methane emission rate to the natural gas use. These modified emission trajectories are then reprocessed through the common climate model MAGICC6. With the high **fugitive** methane assumptions, the abundant gas increases the total anthropogenic radiative forcing by 0.2% to 12% in 2050, which is 0.5% to 5% points higher than under the standard assumptions. A full comparison is shown in [Extended Data Table 4](#). (...) In this latter case we found that under a global low-carbon energy protection policy, the availability of more abundant gas can reduce climate forcing. We also explored the sensitivity of our results to the rates of **fugitive** methane emissions and found that with high **fugitive** methane emission rates, more abundant gas can discernibly increase climate forcing. (...) Non-combustion emissions, such as **fugitive** emissions from fossil fuel mining, enteric fermentation in livestock production and chemical transformation in manufacturing processes, are assumed to change in proportion to their production levels adjusted by EMF21 marginal abatement curves (...) [Extended Data Table 3](#) shows the calculated emissions coefficients of CO₂ and CH₄ emissions for each fossil fuel. **Fugitive** CH₄ emission for natural gas is modified in the sensitivity analysis to reflect the wide range of estimates in the literature. (...) **Fugitive** CH₄ emissions from natural gas extraction are assumed to be between close to zero to 5% of the extracted natural gas and increase for unconventional gas resources. Assumptions about energy losses and **fugitive** emissions are based on ref. [77](#). (...) For **carbon capture and storage** technologies, the power sector applications are based on ref. [70](#) and the liquid conversion processes are based on refs [71](#), [72](#), [73](#). (...) CO₂ emissions are modelled along the conversion chain and are either vented to the atmosphere or **sequestered** underground in the case of **carbon capture and storage**. (...) MESSAGE considers also the recovery of CH₄ in energy and non-energy sectors. In the energy sector CH₄ may be **captured** from coal mining (through degasification systems) which is fed into the energy

system. (...) Natural gas is used in the industry and residential sector as well as for generating electricity. Gas power is available with and without **carbon capture and storage**. (...) The physical quantity of carbon is preserved throughout the energy system process. Once natural gas is extracted, the carbon in the fuel is either emitted or **sequestered**. Non-CO₂ emissions are tracked separately. The next subsection describes the treatment of non-CO₂ emissions in detail. (...) CO₂ emissions are modelled along the conversion chain and are either vented to the atmosphere or **sequestered** underground in the case of carbon capture and storage. Limited impact on decadal-scale climate change from increased use of natural gas [Haewon McJeon, Jae Edmonds, Nico Bauer, Leon Clarke, Brian Fisher, Brian P. Flannery, Jérôme Hilaire, Volker Krey, Giacomo Marangoni, Raymond Mi, Keywan Riahi, Holger Rogner & Massimo Tavoni](#) *Nature* **volume514**, pages482–485 (23 October 2014)

- 46- Although more than 4,000 petagrams of carbon (Pg C) were **released** in less than 10,000 years (10 kyr), a high atmospheric partial pressure of CO₂ (exceeding 1,200 p.p.m.; ref. [5](#)) persisted for an additional 190 kyr or so before being **sequestered** Fluvial response to abrupt global warming at the Palaeocene/Eocene boundary [Brady Z. Foreman, Paul L. Heller & Mark T. Clementz](#) *Nature* **volume491**, pages92–95 (01 November 2012)
- 47- All the big oil companies now accept that greenhouse-gas emissions pose a potential threat. All have invested in technologies to reduce such emissions, from techniques for **capturing** CO₂ before it is **released** into the atmosphere, to alternative methods for producing energy, such as solar power. (...) All have invested in technologies to reduce such emissions, from techniques for **capturing** CO₂ before it is **released** into the atmosphere, to alternative methods for producing energy, such as solar power. (...) Other smaller oil companies are investigating carbon **sequestration** (see “The North Sea bubble”, overleaf). (...) The initial focus is on energy conservation, followed by advances in technologies that reduce CO₂ emissions, and finally breakthroughs in areas such as carbon **sequestration**, which aims to **lock emitted CO₂ away** so that it cannot enhance the greenhouse effect. A change of climate for big oil [Mark Schroppe](#) *Nature* **volume411**, pages516–518 (31 May 2001)
- 48- Steps are also being taken to build systems for large-scale **carbon capture and storage**, and to improve the efficiency with which energy is used. Light at the end of the tunnel *Nature* **volume445**, page567 (08 February 2007)
- 49- If we heed Barnosky's call to care about the impacts of climate change, we must reduce the greenhouse gases that we emit into the atmosphere and **capture** those already there. We could also help some species out. Managing nature as Earth warms Jessica J. Hellmann *Nature* **volume458**, pages1112–1113 (30 April 2009)
- 50- These include cap-and-trade regimes, carbon taxes, behavioural change, nuclear energy, **carbon capture and storage**, renewable-energy technologies, **sequestration** in forests, improving energy efficiency and geoeengineering. Tales from the climate-change crossroads [Roger Pielke Jr](#) *Nature* **volume464**, pages352–353 (18 March 2010)
- 51- In our worst-case technology-sensitivity assumption—that **capture and geological storage of carbon (CCS)** is entirely unavailable—the probability of staying below 2 °C at a carbon price of US\$40 tCO₂e⁻¹ decreases to around 50%. Probabilistic cost estimates for climate change mitigation [Joeri Rogelj, David L. McCollum, Andy Reisinger, Malte Meinshausen & Keywan Riahi](#) *Nature* **volume493**, pages79–83 (03 January 2013)
- 52- These span a broad range of assumptions on production costs, the availability of bio-energy, oil and gas, demand projections, and technology availability (one with no negative emissions technologies, and one with **no carbon capture and storage (CCS)**) ([Extended Data Table 2](#)). (...) Refined oil products can also be produced directly using Fischer–Tropsch processes with possible feedstocks of coal, gas, or biomass; these technologies can also be employed either with or without **carbon capture and storage**. The geographical distribution of fossil fuels unused when limiting global warming to 2 °C [Christophe McGlade & Paul Ekins](#) *Nature* **volume517**, pages187–190 (08 January 2015)
- 53- Such granular estimates are needed for several reasons: to verify emissions rates; to confirm progress towards reduction and support carbon trading, permits or taxation; to enable more-targeted and

financially efficient decisions about mitigation options; and to identify and fix unintentional **releases** from, for example, leaking gas pipes or malfunctioning methane-**capture** equipment in landfills. (...) These should be tracked at least yearly. Such granular estimates are needed for several reasons: to verify emissions rates; to confirm progress towards reduction and support carbon trading, permits or taxation; to enable more-targeted and financially efficient decisions about mitigation options; and to identify and fix unintentional **releases** from, for example, leaking gas pipes or malfunctioning methane-**capture** equipment in landfills. Climate change: Track urban emissions on a human scale [Kevin Robert Gurney](#), [Paty Romero-Lankao](#), [Karen C. Seto](#), [Lucy R. Hutyra](#), [Riley Duren](#), [Christopher Kennedy](#), [Nancy B. Grimm](#), [James R. Ehleringer](#), [Peter Marcotullio](#), [Sara Hughes](#), [Stephanie Pincetl](#), [Mikhail V. Chester](#), [Daniel M. Runfola](#), [Johannes J. Feddema](#) & [Joshua Sperling](#) 07 September 2015

- 54- Policymakers in the United Kingdom are still debating how to proceed in the wake of a government decision last November — just before the climate talks got under way — to pull the plug on a programme supporting the development of **carbon capture and sequestration** technologies. Climate changes The loss of three key facilitators must not impede progress on emissions mitigation. 23 February 2016 *Nature* **530**, 382
- 55- Climate policies might prove to be harmful and need revising; technology costs might not fall; **carbon capture and sequestration** might not work. Make climate-change assessments more relevant [Stéphane Hallegatte](#) & [Katharine J. Mach](#) 27 June 2016 Stéphane Hallegatte, Katharine J. Mach and colleagues urge researchers to gear their studies, and the way they present their results, to the needs of policymakers. *Nature* 534, 613–615
- 56- There is also room for debate over what precisely should be done about climate change. Most agree that it is necessary to **capture** carbon emissions at the source — power plants, for example — but plans to suck carbon dioxide directly from the air attract less support. What happens to the **captured** carbon is also contentious: some researchers would like to put it to use, whereas others prioritize its long-term storage. Climate change [Richard Hodson](#) *Nature* **volume550**, pageS53 (12 October 2017)
- 57- These estimates show the importance of rapid implementation of technologies to decrease greenhouse gas emissions and strategies for carbon **sequestration**. (...) These scenarios would diverge even more by 2100. In other words, minimizing greenhouse gas emissions and **sequestering** carbon to realize minimum, rather than mid-range or maximum, expected climate warming could save a substantial percentage of terrestrial species from extinction. Extinction risk from climate change [Chris D. Thomas](#), [Alison Cameron](#), [Rhys E. Green](#), [Michel Bakkenes](#), [Linda J. Beaumont](#), [Yvonne C. Collingham](#), [Barend F. N. Erasmus](#), [Marinez Ferreira de Siqueira](#), [Alan Grainger](#), [Lee Hannah](#), [Lesley Hughes](#), [Brian Huntley](#), [Albert S. van Jaarsveld](#), [Guy F. Midgley](#), [Lera Miles](#), [Miguel A. Ortega-Huerta](#), [A. Townsend Peterson](#), [Oliver L. Phillips](#) & [Stephen E. Williams](#) *Nature* **volume427**, pages145–148 (08 January 2004)
- 58- Likewise, growth of forest vegetation on previously flooded land could **sequester** significant amounts of CO₂ in wood, although the net carbon balance remains uncertain (...) Global warming would thus lead to a net increase of CO₂ **release** to the atmosphere by the terrestrial biosphere (or less net CO₂ uptake from the atmosphere by the terrestrial biosphere). (...) On the other hand, carbon in desiccated peat is also subject to natural and human fires, rapidly **releasing** huge amounts of carbon to the atmosphere. Temperature sensitivity of soil carbon decomposition and feedbacks to climate change [Eric A. Davidson](#) & [Ivan A. Janssens](#) *Nature* **volume440**, pages165–173 (09 March 2006)
- 59- It is perhaps Sweet's underestimation of the magnitude of the challenge that leads him to dismiss the prospects for renewables and **carbon sequestration** in favour of a focus on reducing the emissions from coal. If stabilization at twice pre-industrial levels is to happen, not only will a focus on coal, renewables and **sequestration** be needed, but many experts argue that there will need to be a fundamental transformation of the global energy system. What just ain't so [Roger A. Pielke Jr](#) *Nature* **volume443**, pages753–754 (19 October 2006)
- 60- There are large potential impacts of elevated future [O₃] on the ability of many ecosystems to **sequester** carbon ([Table 1](#)). (...) The indirect radiative forcing due to O₃ is diagnosed for comparison to the direct forcing due to tropospheric O₃([Fig. 2b](#)), assuming 50% of the extra CO₂ from the land is **sequestered** by the oceans Indirect radiative forcing of climate change through ozone effects on the land-carbon sink [S. Sitch](#), [P. M. Cox](#), [W. J. Collins](#) & [C. Huntingford](#) *Nature* **volume448**, pages791–794 (16 August 2007)

- 61- You might say that the Kyoto Protocol was misconceived and that the world should develop a bolder programme of action, with much higher carbon taxes, international cooperation to reduce hunger, disease and habitat destruction, and development of clean technologies and ways to **sequester** carbon. A challenge to Kyoto [Partha Dasgupta](#) *Nature* **volume449**, pages143–144 (13 September 2007)
- 62- Using biomass fuel on a massive scale in combination with carbon **sequestration** could return atmospheric carbon dioxide to pre-industrial levels within decades, according to a new analysis. (...) Read envisions an array of plantations supplying commodities such as energy and timber, as well as a livelihood for countless communities. A second phase could combine biomass energy with carbon **sequestration**, moving society to the point where it **sequestered** more carbon than it emitted. Could global gardening fix climate change? Biomass proposal could hugely reduce carbon dioxide levels. Jeff Tollefson 9 January 2008 | *Nature* 451, 113
- 63- This failure to resolve the contributions of forests has meant that rules formulated since then are not conducive to improving the ability of forests to **sequester** large amounts of additional carbon. The book provides an excellent historical background and describes the process and logic of negotiations, past and present. The multiple analyses of technical problems associated with carbon **sequestration** and forests make it valuable to both newcomers and veterans in the field. (...) *Climate Change and Forests* emphasizes the difficulty of **sequestering** carbon in forests, given their vulnerability to disturbances that re-emit carbon, such as forest fires. But the book neglects issues of climate adaptation. **Storing carbon** in forests [Michael Obersteiner](#) *Nature* **volume458**, page151 (12 March 2009)
- 64- When delegates convene in Copenhagen next month to strengthen the UN Framework Convention on Climate Change (UNFCCC), an initiative to preserve the world's forests to **store and sequester** carbon will take centre stage. (...) The oceans alone **sequester** about 2 gigatonnes of carbon a year. Reducing deforestation and forest degradation rates would slash global emissions by up to 1 gigatonne of carbon a year, more than the emissions of all passenger cars combined. Restoring the world's marginal and degraded lands to natural habitats could **sequester** an additional 0.65 gigatonnes annually. A force to fight global warming [Will R. Turner](#) , [Michael Oppenheimer](#) & [David S. Wilcove](#) *Nature* **volume462**, pages278–279 (19 November 2009)
- 65- Published on 14 June, the results show that increased greenhouse-gas emissions resulting from intensive farming are more than offset by the effects of land preservation, which keeps carbon **sequestered** in native soils, savannahs and forests Intensive farming may ease climate change Land saved from cultivation offsets carbon emissions. Jeff Tollefson 15 June 2010 | *Nature* 465, 853
- 66- Making use of existing sectoral planning, for example, the “green wall policy” (or Three-North Shelterbelt Reforestation programme) and the “grain for green programme” (or Conversion of Cropland to Forest Programme) was also stressed in China’s national climate change programme to protect existing forest **carbon stock and enhance carbon sequestration** The impacts of climate change on water resources and agriculture in China [Shilong Piao](#), [Philippe Ciais](#), [Yao Huang](#), [Zehao Shen](#), Shushi Peng, [Junsheng Li](#), [Liping Zhou](#), [Hongyan Liu](#), Yuecun Ma, [Yihui Ding](#), [Pierre Friedlingstein](#), [Chunzhen Liu](#), [Kun Tan](#), [Yongqiang Yu](#), [Tianyi Zhang](#) & [Jingyun Fang](#) *Nature* **volume467**, pages43–51 (02 September 2010)
- 67- The threat posed by climate change to biological diversity has been clear for years, however, and calls for **carbon sequestration** and reduction of emissions to conserve species have largely gone unheeded. Climate change: The prospects for polar bears [Andrew E. Derocher](#) *Nature* **volume468**, pages905–906 (16 December 2010)
- 68- If the technology advances sufficiently, many hope that artificial life can be used for a variety of tasks, including **carbon sequestration**, biofuel production or the clean-up of chemicals. 2010: The year in which ... A round-up of the top science news stories of the past 12 months. Adam Mann 22 December 2010 | *Nature* 468, 1014-1016
- 69- Recent work suggests that some individual aspects of global change may increase the resiliency of coastal wetlands facing sea level rise and their ability to **sequester** carbon. (...) However, accelerated sea level rise also leads to more mineral sediment deposition, which influences the elevation of coastal wetlands in ways that might limit their ability to **sequester** carbon Response of

salt-marsh carbon accumulation to climate change [Matthew L. Kirwan](#) & [Simon M. Mudd](#) *Nature* **volume489**, pages550–553 (27 September 2012)

- 70- Some argue that more extremes are already starting to decrease the ability of terrestrial ecosystems to **sequester** carbon and offset carbon dioxide emissions Earth science: The timing of climate change [Chris Huntingford](#), [Lina Mercado](#) & [Eric Post](#) *Nature* **volume502**, pages174–175 (10 October 2013)
- 71- These plantations **sequester** CO₂ from the atmosphere, so that Chinese forests are now a net sink of this gas. (...) Air pollutants also interact in complex ways with ecosystems: land-use change alters air quality, and deposition of pollution can alter forest growth and carbon **sequestration**. Global warming: China's contribution to climate change [Dominick V. Spracklen](#) *Nature* **volume531**, pages310–312 (17 March 2016)
- 72- This indicates that this intermediate layer has warmed, thus suggesting that heat is **sequestered** in the intermediate ocean. (...) Increased heat content is **sequestered** in the deep ocean owing to a weakened deep convection; hence, less cold water is produced by decreasing the heat loss to the atmosphere Reconciling controversies about the 'global warming hiatus' [Iselin Medhaug](#), [Martin B. Stolpe](#), [Erich M. Fischer](#) & [Reto Knutti](#) *Nature* **volume545**, pages41–47 (04 May 2017)

SCI - Materialisation scenarios

SCI - TRANSFORMED HOUSE scenarios:

- 1- Tropospheric ozone (O₃) is a **naturally occurring greenhouse gas** formed as a product of photochemical reactions with precursors: NO_x, CH₄, CO and volatile organic compounds. Indirect radiative forcing of climate change through ozone effects on the land-carbon sink [S. Sitch](#), [P. M. Cox](#), [W. J. Collins](#) & [C. Huntingford](#) *Nature* **volume448**, pages791–794 (16 August 2007)
- 2- Using a global climate model we predict that, in response to the projected changes in **greenhouse-gas concentrations** during the first half of the twenty-first century, this rate of mass exchange will increase by 3% per decade. (...) The effects of increasing **greenhouse-gas concentrations** on the transport between the troposphere and stratosphere have not previously been quantified in any stratospheric climate change experiment. (...) Starting from conditions representative of the early 1990s, the model was run for the 60 years 1992 to 2051 (run A) assuming the Intergovernmental Panel on Climate Change IS92a scenario for **greenhouse-gas concentrations**, but no changes in the concentrations of stratospheric ozone or water vapour. (...) Previous studies have concluded that climate change owing to **increasing greenhouse-gas concentrations** will have a detrimental effect on the ozone layer over the next few decades (...) We emphasize, however, that while CFC levels remain artificially high, the ozone layer will continue to be vulnerable to **the enhanced destruction resulting from a greenhouse cooling** of the stratosphere (...) This is **because the abundance of any greenhouse gas** which, like the CFCs, is transported from the troposphere and then **destroyed** in the stratosphere (for example, CH₄ and N₂O) will likewise be reduced by an acceleration of the transport from the troposphere into the stratosphere. (...) Heating rates included **the effects of minor greenhouse gases**—CH₄, N₂O, CFC11 (CCl₃F) and CFC12 (CCl₂F₂), as well as CO₂ (ref. 3). Removal of chlorofluorocarbons by increased mass exchange between the stratosphere and troposphere in a changing climate [Neal Butchart](#) & [Adam A. Scaife](#) *Nature* **volume410**, pages799–802 (12 April 2001)
- 3- The coincidental timing of global cooling, African aridity and human evolution invites speculation about a common link. For that, we must look to the oceans — in redistributing heat and **influencing greenhouse-gas concentrations** globally, they are the main component in determining climate change. Climate change: The Indonesian valve [James D. Wright](#) *Nature* **volume411**, pages142–143 (10 May 2001)

- 4- This increase in CO₂ is somewhat faster than is anticipated for the twenty-first century, but its use can be justified from the neglect of **other anthropogenic greenhouse gases** in CMIP2. Quantifying the risk of extreme seasonal precipitation events in a changing climate [T. N. Palmer](#) & J. Räisänen *Nature* **volume415**, pages512–514 (31 January 2002)

- 5- In particular, the sensitivity of climate to **changing greenhouse-gas concentrations** in the atmosphere and the radiative forcing effects by aerosols are not well constrained, leading to large uncertainties in global warming simulations. (...) The evidence that part of the observed warming of both atmosphere and ocean **is caused by anthropogenic emissions of greenhouse gases** and aerosols may help assess climate models, and has been used to scale model projections for the next few decades. (...) Albedo changes due to land use, radiative forcing by dust and the uncertainty in converting future **greenhouse-gas emissions into concentrations** are not considered. Constraints on radiative forcing and future climate change from observations and climate model ensembles [Reto Knutti](#), [Thomas F. Stocker](#), [Fortunat Joos](#) & [Gian-Kasper Plattner](#) *Nature* **volume416**, pages719–723 (18 April 2002)

- 6- For example, the recent Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC TAR) concluded: “most of the observed warming over the past 50 years is likely [meaning, specifically, a better than two-in-three chance] to have been due to the **increase in greenhouse gas concentrations.**” Liability for climate change [Myles Allen](#) *Nature* **volume421**, pages891–892 (27 February 2003)

- 7- It then simulates 15 years of current climate conditions, and finally a world with increased **greenhouse-gas concentrations.** Global effort to plot climate change [Heike Langenberg](#) *Nature* **volume425**, page112 (11 September 2003)

- 8- Many argue that this range is too large to justify action to reduce **the rising concentrations of greenhouse gases**, principally carbon dioxide, in the atmosphere. (...) Murphy *et al.* quantify how the choice of parameterizations affects the results of modelling the evolution of temperature, precipitation and other climate variables when the **greenhouse-gas concentration increases.** Climate change: Models change their tune [Thomas F. Stocker](#) *Nature* **volume430**, pages737–738 (12 August 2004)

- 9- The first set accounts for the past effects on climate that were due to variations in solar and volcanic activity, as well as to **man-made influences** (including increases in **greenhouse-gas concentrations**). Climate change: Hot news from summer 2003 [Christoph Schär](#) & [Gerd Jendritzky](#) *Nature* **volume432**, pages559–560 (02 December 2004)

- 10- **The accumulation of greenhouse gases** in the atmosphere during the past few hundred years is likely to result in a sea-level rise of up to half a metre, possibly more, by 2050 (R. J. Nicholls & J. A. Lowe, *Glob. Environ. Change*, in the press). (...) One of the ironies of climate change is that,

although wealthy countries are responsible for most of the **accumulated greenhouse gases** in the atmosphere, they will probably face less damage than poor countries. (...) The number of vulnerable '**climate-change exiles**' received by a host country would be in approximate proportion to **that country's cumulative greenhouse-gas emissions**. Immigration could ease climate-change impact [Sujatha Byravan & Sudhir Chella Rajan](#) *Nature* **volume434**, page435 (24 March 2005)

- 11- The question now is how the trend towards **cleaner** air will affect global temperatures. "It is clear that **the greenhouse effect** has been partly masked in the past by **air pollution**," says Macke (a meteorologist at the Leibniz Institute of Marine Sciences in Kiel, Germany). Cleaner skies leave global warming forecasts uncertain [Quirin Schiermeier](#) *Nature* **volume435**, page135 (12 May 2005) (my addition in parenthesis)

- 12- In the model, a comparison between simulations with and without **greenhouse gases** reveals that the increased **discharge** is clearly **associated with warming induced by rising concentrations of greenhouse gases**. (...) **The natural greenhouse effect** is caused primarily by water vapour; the radiative balance at the Earth's surface is modified by snow and ice cover; the distribution of vegetation types is sensitive to the local water balance; and regional climate patterns are influenced by ocean currents. Climate change: Water cycle shifts gear [Thomas F. Stocker & Christoph C. Raible](#) *Nature* **volume434**, pages830–833 (14 April 2005)

- 13- But the authors corralled by Tom Lovejoy and Lee Hannah talk of times even more 'interesting' than these: they discuss **the grotesque climate changes of the greenhouse Earth**. These are interesting enough for the chances of human happiness but are truly desperate for the survival of the remaining diversity of life on Earth. (...) The politics will be difficult. Some of the book's authors pin their hopes on trying **to stop us building the greenhouse**. Coping with interesting times [Paul Colinvaux](#) *Nature* **volume437**, page479 (22 September 2005)

- 14- Susan Solomon, who chairs the IPCC's Working Group I, emphasizes this point. "Existing scenarios cover a very wide range of emissions trajectories," she says. "They are perfectly suited to physical tests of how the climate responds **to fixed concentrations of greenhouse gas**. In the simplified view of science it does not matter how the gas gets into the atmosphere, only how much of it is there." The costs of global warming [Quirin Schiermeier](#) *Nature* **volume439**, pages374–375 (26 January 2006)

- 15- **Increasing greenhouse gas concentrations** are expected to enhance the interannual variability of summer climate in Europe and other mid-latitude regions, potentially causing more frequent heatwaves (...) Furthermore, they suggest that land–atmosphere interactions increase climate variability in this region because climatic regimes in Europe shift northwards in response to **increasing greenhouse gas concentrations**, creating a new transitional climate zone with strong land–atmosphere coupling in central and eastern Europe. (...) In principle, these events are consistent with climate-change projections for this region: simulations driven by **increasing greenhouse gas concentrations** predict a considerable enhancement of interannual (year-to-year) variability of the European summer climate, both for temperature and precipitation, associated with higher risks of heatwaves, droughts and heavy precipitation events. (...) However, no similar analysis was performed to investigate possible changes of land–atmosphere coupling with **increasing greenhouse gas concentrations**. (...) **Enhanced greenhouse gas concentrations** lead to

a northwards shift of climatic zones within the European continent. Land–atmosphere coupling and climate change in Europe [Sonia I. Seneviratne](#), [Daniel Lüthi](#), [Michael Litschi](#) & Christoph Schär *Nature* **volume443**, pages205–209 (14 September 2006)

- 16- Methane is an important **greenhouse gas, and its atmospheric concentration** has nearly tripled since pre-industrial times. Contribution of anthropogenic and natural sources to atmospheric methane variability [P. Bousquet](#), [P. Ciais](#), [J. B. Miller](#), [E. J. Dlugokencky](#), [D. A. Hauglustaine](#), [C. Prigent](#), [G. R. Van der Werf](#), [P. Peylin](#), [E.-G. Brunke](#), [C. Carouge](#), [R. L. Langenfelds](#), [J. Lathière](#), [F. Papa](#), [M. Ramonet](#), [M. Schmidt](#), [L. P. Steele](#), [S. C. Tyler](#) & [J. White](#) *Nature* **volume443**, pages439–443 (28 September 2006)

- 17- With a simple model of the **absorption** of infrared radiation, he worked out the amount of global warming to be expected from his predicted CO₂ levels, concluding that temperature would then have been increasing at a rate of about 0.03 °C per decade. **A lone voice in the greenhouse** [Robert J. Charlson](#) *Nature* **volume448**, page254 (19 July 2007)

- 18- He (Bjorn Lomborg) doesn't question the science, which says that **rising concentrations of greenhouse gases** in Earth's atmosphere are affecting our climate system; he questions whether we should do much about it. A challenge to Kyoto [Partha Dasgupta](#) *Nature* **volume449**, pages143–144 (13 September 2007)

- 19- Even so, the first attempts at decadal prediction suggest that reasonably accurate forecasts of the combined effects of **increasing greenhouse-gas concentrations** and natural climate variations can be made. Climate change: Natural ups and downs [Richard Wood](#) *Nature* **volume453**, pages43–45 (01 May 2008)

- 20- The authors use the analogy that **dumping greenhouse gases into the atmosphere is akin to the sewage problem** faced in the nineteenth century, an issue that also invited vehement debate at the time. (...) Arrhenius did not foresee how quickly we would pump **greenhouse gases** into the air and took a benign (if naive) view of **climate-change effects**: “Our descendants, albeit after many generations, might live under a milder sky and in less barren natural surroundings than is our lot at present.” Learning from climates past [Chris Turney](#) *Nature* **volume453**, page158 (08 May 2008)

- 21- Given the conclusions from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report that most of the observed increase in global average temperatures since the mid-twentieth century is very likely to be due to the observed increase in **anthropogenic greenhouse gas concentrations**, and furthermore that it is likely that there has been significant anthropogenic warming over the past 50 years averaged over each continent except Antarctica, we conclude that anthropogenic climate change is having a significant impact on physical and biological systems globally and in some continents.(...) The IPCC Working Group I Fourth Assessment Report concluded that most of the observed increase in global average temperatures since the mid-twentieth century is very likely (> 90% probability of occurrence) to be due to the observed increase in **anthropogenic greenhouse gas concentrations** Attributing physical and biological impacts to anthropogenic

climate change [Cynthia Rosenzweig](#), [David Karoly](#), [Marta Vicarelli](#), [Peter Neofotis](#), [Qigang Wu](#), [Gino Casassa](#), [Annette Menzel](#), [Terry L. Root](#), [Nicole Estrella](#), [Bernard Seguin](#), [Piotr Tryjanowski](#), [Chunzhen Liu](#), [Samuel Rawlins](#) & [Anton Imeson](#) *Nature* **volume453**, pages353–357 (15 May 2008)

- 22- By surveying a huge literature, Rosenzweig *et al.* demonstrate that changes in physical and biological systems are pervasive; that these impacts lie mainly in directions consistent with warming of the climate system; and that, at least partly, they are likely to be the result of **climate change caused by increasing concentrations of greenhouse gases**. Climate change: Attributing cause and effect [Francis Zwiers](#) & [Gabriele Hegerl](#) *Nature* **volume453**, pages296–297 (15 May 2008)
- 23- This was when **Earth changed from a generally ice-free 'greenhouse world'** to a more heavily glaciated **'icehouse world'**, with atmospheric CO₂ gradually decreasing from more than 1,000 p.p.m. to near pre-industrial levels (280 p.p.m.)¹. (...) Fortunately, help is on its way, as several upcoming projects will target strata from **the greenhouse–icehouse transition** in Antarctica, and are expected to provide additional insight into ice-sheet development in the region during this critical time interval. Climate change: When did the icehouse cometh? [Stephen F. Pekar](#) *Nature* **volume455**, pages602–603 (02 October 2008)
- 24- Ten years ago the consensus became that, compared with modern values, tropical temperatures were at most only slightly warmer during **the various hot, 'greenhouse' climates** that have occurred over the past 145 million years and that they cooled by at most a couple of degrees during the ice ages. (...) For their part, climate modellers have concluded that hot tropical temperatures, **and the high concentrations of greenhouse gases that cause them**, are required to reproduce warm extratropics, because standard models and dynamical theory do not produce Equator-to-pole temperature gradients much weaker than they have been in modern times (...) The tropics, defined broadly (30° N to 30° S), make up half of Earth's surface area and so play an outsized part in determining past variations in global mean temperature and the sensitivity of this variable to forcing factors such as **greenhouse-gas concentrations**. (...) That implies either that global **average temperatures were very sensitive to greenhouse-gas forcing**, or that **concentrations of greenhouse gases** were at the upper end of their reconstructed range¹⁵. (...) For the moment, however, the burden of proof is on those who argue that the tropics do not warm substantially **in a greenhouse world**. Climate change: Snakes tell a torrid tale [Matthew Huber](#) *Nature* **volume457**, pages669–671 (05 February 2009)
- 25- Such a trust would use a cap, auction and trade system, reducing the cap over time to stabilize **greenhouse gas concentrations** at the desired target. Could climate change capitalism? [Robert Costanza](#) *Nature* **volume458**, pages1107–1108 (30 April 2009)
- 26- In the tortured history of climate-change negotiations, enlightened thinking has translated into positive action all too rarely. But governments have recently seen the light on a crucial issue: they have recognized the vital role that intact natural ecosystems have in limiting **the build-up of atmospheric greenhouse gases**. A force to fight global warming [Will R. Turner](#), [Michael Oppenheimer](#) & David S. Wilcove *Nature* **volume462**, pages278–279 (19 November 2009)

- 27- The earliest model-based ‘scenarios’ were stylized representations of increases in the atmospheric concentrations of carbon dioxide (**a greenhouse gas that retains energy radiating from the Earth’s surface**). (...) This allows exploration of what changes in technologies, economic development, policy, or other factors would be required to shift emissions from a baseline to a lower path—for example, **keeping greenhouse gas concentrations** (or global average surface air temperature increases) below a specified level. (...) The long-term focus is necessary for evaluating the slow response of the climate system (centuries) to **changing concentrations of greenhouse gases**. (...) New climate-policy-intervention scenarios will provide insights on reducing or stabilizing **concentrations of greenhouse gases**. The next generation of scenarios for climate change research and assessment [Richard H. Moss](#), [Jae A. Edmonds](#), [Kathy A. Hibbard](#), [Martin R. Manning](#), [Steven K. Rose](#), [Detlef P. van Vuuren](#), [Timothy R. Carter](#), [Seita Emori](#), [Mikiko Kainuma](#), [Tom Kram](#), [Gerald A. Meehl](#), [John F. B. Mitchell](#), [Nebojsa Nakicenovic](#), [Keywan Riahi](#), [Steven J. Smith](#), [Ronald J. Stouffer](#), [Allison M. Thomson](#), [John P. Weyant](#) & [Thomas J. Wilbanks](#) *Nature* **volume463**, pages747–756 (11 February 2010)
- 28- These results may provide clues to understanding not only the climate of the early Pliocene, but also the **nature of future climate change in a greenhouse world**. Climate change: Tropical cyclones in the mix [Ryan L. Sriver](#) *Nature* **volume463**, pages1032–1033 (25 February 2010)
- 29- In *The Economics and Politics of Climate Change*, Helm, an economist at the University of Oxford, UK, agrees that the policy outlook for stabilizing **atmospheric concentrations of carbon dioxide and other greenhouse gases** is “very grim” owing to the myriad complexities and contradictions of policies for reducing emissions globally. Tales from the climate-change crossroads [Roger Pielke Jr](#) *Nature* **volume464**, pages352–353 (18 March 2010)
- 30- A large (10^{23} J) multi-decadal globally averaged warming signal in the upper 300 m of the world’s oceans was reported roughly a decade ago and is attributed to **warming associated with anthropogenic greenhouse gases** Robust warming of the global upper ocean [John M. Lyman](#), [Simon A. Good](#), [Viktor V. Gouretski](#), [Masayoshi Ishii](#), [Gregory C. Johnson](#), [Matthew D. Palmer](#), [Doug M. Smith](#) & [Josh K. Willis](#) *Nature* **volume465**, pages334–337 (20 May 2010)
- 31- Our ability to pin down such regional thresholds is hindered today by the uncertainty of global climate in response to **rising greenhouse gas concentrations**, and of regional climates in response to aerosols and ozone forcing. The impacts of climate change on water resources and agriculture in China [Shilong Piao](#), [Philippe Ciais](#), [Yao Huang](#), [Zehao Shen](#), [Shushi Peng](#), [Junsheng Li](#), [Liping Zhou](#), [Hongyan Liu](#), [Yuecun Ma](#), [Yihui Ding](#), [Pierre Friedlingstein](#), [Chunzhen Liu](#), [Kun Tan](#), [Yongqiang Yu](#), [Tianyi Zhang](#) & [Jingyun Fang](#) *Nature* **volume467**, pages43–51 (02 September 2010)
- 32- That would offset more than half of the global warming so far **caused by anthropogenic greenhouse gases**, and could be scaled up. Geengineering faces ban Moratorium on schemes to reduce global warming clashes with reports urging more research. Jeff Tollefson 2 November 2010 | *Nature* 468, 13-14

- 33- Tietsche *et al.* do not argue against the mainstream view that a seasonally ice-free Arctic Ocean is inevitable if **greenhouse-gas concentrations** continue to rise. The issue is how we get there — with or without a tipping point. (...) Although the paper by Tietsche and colleagues brings a more optimistic view of the Arctic's future, the troubling interpretation from other recent modelling studies is that periods of rapid twenty-first-century sea-ice loss, hastening the evolution to ice-free summers, don't need to be preceded by a critical threshold of sea-ice thickness, **greenhouse-gas concentration** or combination of factors that lie at the heart of the tipping-point argument. Climate change: Rethinking the sea-ice tipping point [Mark C. Serreze](#) *Nature* **volume471**, pages47–48 (03 March 2011)
- 34- Initial measurements of air bubbles in Antarctic ice cores in the 1980s revealed that **greenhouse gas concentrations** also increased and decreased over the last glacial cycle, suggesting they too may be part of the explanation. Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation [Jeremy D. Shakun](#), [Peter U. Clark](#), [Feng He](#), [Shaun A. Marcott](#), [Alan C. Mix](#), [Zhengyu Liu](#), [Bette Otto-Bliesner](#), [Andreas Schmittner](#) & [Edouard Bard](#) *Nature* **volume484**, pages49–54 (05 April 2012)
- 35- Climate change: **Flowering in the greenhouse** [This Rutishauser](#), [Reto Stöckli](#), [John Harte](#) & [Lara Kueppers](#) *Nature* **volume485**, pages448–449 (24 May 2012)
- 36- The fate of this carbon pool could influence future atmospheric carbon levels and thus our ability to **stabilize greenhouse gases at levels that do not dangerously interfere** with the climate system. Climate science: Global warming and tropical carbon [James T. Randerson](#) *Nature* **volume494**, pages319–320 (21 February 2013)
- 37- Positive phases of the SAM index, increasingly common during the last two decades ([Fig. 3](#)), and linked to both **increased greenhouse gas concentrations** and ozone depletion, are associated with cooler temperatures over East Antarctica, increased sea-ice concentrations and enhanced westerly airflows Rapid, climate-driven changes in outlet glaciers on the Pacific coast of East Antarctica [B. W. J. Miles](#), [C. R. Stokes](#), [A. Vieli](#) & [N. J. Cox](#) *Nature* **volume500**, pages563–566 (29 August 2013)
- 38- Despite the **continued increase in atmospheric greenhouse gas concentrations**, the annual-mean global temperature has not risen in the twenty-first century, challenging the prevailing view that anthropogenic forcing causes climate warming. (...)all the climate models project a tropical Pacific warming in response to **increased greenhouse gas concentrations** Recent global-warming hiatus tied to equatorial Pacific surface cooling [Yu Kosaka](#) & [Shang-Ping Xie](#) *Nature* **volume501**, pages403–407 (19 September 2013)
- 39- Grubb briefly notes the scale of the problem: for **atmospheric levels of greenhouse gases** to be stabilized, net emissions must fall to zero. His focus, however, is on reducing energy consumption and carbon emissions, irrespective of the need to meet any particular target for **greenhouse-gas concentrations**. It is unclear how much emissions would fall if the book's ideas were actually implemented. (...) It is true that **greenhouse-gas concentrations** have continued to creep up,

threatening any possibility of achieving the target. (...) But for the immense scale of action needed to stabilize **concentrations of greenhouse gases** — even at a level allowing global temperatures to rise by more than 2 °C — collective action is essential. Climate Economics: A strained relationship Scott Barrett *Nature* **volume508**, pages179–180 (10 April 2014)

- 40- Once the change in global temperature between the pre-industrial period and the Eocene caused by the action of all known slow feedbacks (apart from those associated with the carbon cycle) is removed, both the EECO and the late Eocene exhibit an equilibrium climate sensitivity relative to the pre-industrial period of 2.1 to 4.6 degrees Celsius per CO₂ doubling (66 per cent confidence), which is similar to the canonical range (1.5 to 4.5 degrees Celsius), indicating that a large fraction of the warmth of **the early Eocene greenhouse was driven by increased CO₂ concentrations**, and that climate sensitivity was relatively constant throughout this period. (...) Over the past 540 million years, Earth's climate has **oscillated between a globally warm 'greenhouse state' and an 'icehouse state'** with substantial continental glaciation. The most recent of these transitions occurred between the warmest time interval of the last 65 million years—the EECO (about 14 ± 3 °C warmer than pre-industrial times)—and the rapid growth of ice on Antarctica in the **earliest icehouse state** of the Oligocene (~33.6 Myr ago¹). It has been suggested that variations in the **concentration of the greenhouse gas CO₂** were responsible for both the overall warmth of the Eocene and the subsequent cooling Changing atmospheric CO₂ concentration was the primary driver of early Cenozoic climate [Eleni Anagnostou, Eleanor H. John, Kirsty M. Edgar, Gavin L. Foster, Andy Ridgwell, Gordon N. Inglis, Richard D. Pancost, Daniel J. Lunt & Paul N. Pearson](#) *Nature* **volume533**, pages380–384 (19 May 2016)
- 41- The primary drivers of these cloud changes appear to be **increasing greenhouse gas concentrations** and a recovery from volcanic radiative cooling. (...) Historical simulations included **anthropogenic greenhouse gas concentrations**, ozone, land-use changes, anthropogenic aerosols, volcanic aerosols, and solar output and thus represent our best estimate of the climate response to recent external radiative forcing. (...) As cloud tops rise, **their greenhouse effect becomes stronger**. Both of these cloud changes have a warming effect on climate. Our results suggest that radiative forcing by a combination of **anthropogenic greenhouse gases** and volcanic aerosol has produced observed cloud changes during the past several decades that exert positive feedbacks on the climate system. We expect that **increasing greenhouse gases** will cause these cloud trends to continue in the future, unless offset by unpredictable large volcanic eruptions. Evidence for climate change in the satellite cloud record [Joel R. Norris, Robert J. Allen, Amato T. Evan, Mark D. Zelinka, Christopher W. O'Dell & Stephen A. Klein](#) *Nature* **volume536**, pages72–75 (04 August 2016)
- 42- In this study, we use data from two types of simulation: (i) 'historical' simulations for which past known climate forcings such as observed **greenhouse gas concentrations** are used; and (ii) future scenario Representative Concentration Pathway (RCP) simulations for which a number of different possible future outcomes in terms of anthropogenic climate forcing are defined Climate change drives expansion of Antarctic ice-free habitat [Jasmine R. Lee, Ben Raymond, Thomas J. Bracegirdle, Iadine Chadès, Richard A. Fuller, Justine D. Shaw & Aleks Terauds](#) *Nature* **volume547**, pages49–54 (06 July 2017)
- 43- Gutjahr *et al.* report a fundamental breakthrough in our understanding of a global-warming event that occurred 56 million years ago and was caused by an increase in **concentrations of**

atmospheric greenhouse gases. Palaeoclimate: Volcanism caused ancient global warming [Katrin J. Meissner](#) & [Timothy J. Bralower](#) *Nature* **volume548**, pages531–533 (31 August 2017)

- 44- (The representative concentration pathways (RCPs) are four **greenhouse gas concentration** trajectories adopted by the Intergovernmental Panel on Climate Change, IPCC.) Greater future global warming inferred from Earth's recent energy budget [Patrick T. Brown](#) & [Ken Caldeira](#) *Nature* **volume552**, pages45–50 (07 December 2017)
- 45- Speaking at Stanford University in California, Browne was the first senior executive of an oil company to acknowledge that carbon dioxide and **other greenhouse gases probably caused global warming**, and to recommend that action be taken. (...) All the big oil companies now accept that **greenhouse-gas emissions pose a potential threat**. (...) Credit is also given for lowering emissions of **other greenhouse gases, based on their warming potential relative to CO₂**. (...) The latest IPCC report, issued earlier this year, stated that global temperatures were rising faster than previously thought and that there was strong evidence that **greenhouse gases were the cause** (see *Nature*409, 445; 2001). But Frank Sprow, vice-president of safety, health and the environment at ExxonMobil, says that most of the evidence **linking greenhouse gases to global warming** comes from climate models, rather than empirical data (...) Sprow does not deny that **the build up of greenhouse gases poses long-term risks**, but he argues that the Kyoto Protocol is not the way to deal with them. Instead, ExxonMobil advocates a three-tiered voluntary response to climate change. The initial focus is on energy conservation, followed by advances in technologies that reduce CO₂ emissions, and finally breakthroughs in areas such as carbon sequestration, which aims to lock emitted CO₂ away so that **it cannot enhance the greenhouse effect**. A change of climate for big oil [Mark Schrope](#) *Nature* **volume411**, pages516–518 (31 May 2001)
- 46- In fact, a risk-management approach requires not an assessment of the probability of a particular **amount of greenhouse-gas emission or global warming** at some future time, but rather an estimate of the likelihood of exceeding an identified critical impact threshold Probabilities will help us plan for climate change [A. Barrie Pittock](#) , [Roger N. Jones](#) & Chris D. Mitchell *Nature* **volume413**, page249 (20 September 2001)
- 47- But it remains difficult to assess the likelihood of future changes in the thermohaline circulation, mainly owing to poorly constrained model parameterizations and uncertainties in the response of the climate system to **greenhouse warming**. (...) The possibility of a reduced Atlantic thermohaline circulation in response to increases in **greenhouse-gas concentrations** has been demonstrated in a number of simulations with general circulation models of the coupled ocean–atmosphere system. (...) Most, but not all, coupled GCM projections of the twenty-first century climate show a reduction in the strength of the Atlantic overturning circulation with increasing **concentrations of greenhouse gases**—if the warming is strong enough and sustained long enough, a complete collapse cannot be excluded (...) The fate of the THC in the coming century largely depends on the response of air–sea heat and freshwater fluxes to **the increased load of greenhouse gases**. The role of the thermohaline circulation in abrupt climate change [Peter U. Clark](#), [Nicklas G. Piasias](#), [Thomas F. Stocker](#) & [Andrew J. Weaver](#) *Nature* **volume415**, pages863–869 (21 February 2002)

- 48- Sulphate aerosols produced from sulphur-dioxide emissions partially counteract the **warming effect of greenhouse-gas emissions** — both directly, by reflecting some solar radiation back into space, and indirectly, by increasing the reflectivity and longevity of clouds. (...) It produces natural variability in weather and climate, on timescales from hours to centuries, similar to that observed; and it incorporates the main feedback mechanisms that are thought to have determined the climatic response to natural influences (such as variations in solar output and the occurrence of explosive volcanic activity), as well as to **anthropogenic greenhouse-gas** and aerosol emissions during the twentieth century. (...) That is partly because the large thermal inertia of the oceans means that a good proportion of the change in the next two decades will result from the climate's adjustment to changes in **the greenhouse-gas content of the atmosphere** that have already occurred. It is also partly because **the effects of greenhouse-gas** and sulphur-dioxide emissions offset each other in a similar way in the various scenarios. Climate change: The 20-year forecast [Francis W. Zwiers](#) *Nature* **volume416**, pages690–691 (18 April 2002)
- 49- Regional details of the precipitation response to **greenhouse warming** are much less clear, as are hydrologic feedbacks on other aspects of the climate system, notably the strength of the oceanic thermohaline circulation (refs [13](#), [14](#), and see review in this issue by Rahmstorf, pages). (...) Although models (and simple theory) indicate that such a change, which would increase mid-latitude land precipitation, might be expected to accompany an **anthropogenic greenhouse warming**, most models seem to underestimate the magnitude of this circulation change. (...) Most climate models show some weakening of the THC under **greenhouse-gas-induced warming**, but the amount of weakening is model-dependent, and no constraint analogous to that shown in [Fig. 2](#) has yet been found when comparing different models. (...) Eventually, perhaps, a great deal: the overall climate response to **increasing atmospheric concentrations of greenhouse gases** may prove much simpler and more predictable than the chaos of short-term weather. (...) The distribution of moisture in the troposphere (the part of the atmosphere that is strongly coupled to the surface) is complex, but there is one clear and strong control: moisture condenses out of **supersaturated** air. This constraint broadly accounts for the humidity of tropospheric air parcels above the boundary layer, because almost all such parcels will have reached **saturation** at some point in their recent history. Physically, therefore, it has long seemed plausible that the distribution of relative humidity would remain roughly constant under climate change, in which case the Clausius–Clapeyron relation implies that specific humidity would increase roughly exponentially with temperature. This reasoning is strongest at higher latitudes where air is usually closer to **saturation**, and where relative humidity is indeed roughly constant through the substantial temperature changes of the seasonal cycle. Constraints on future changes in climate and the hydrologic cycle [Myles R. Allen](#) & [William J. Ingram](#) *Nature* **volume419**, pages224–232 (12 September 2002)
- 50- George's idea is workable in theory. Phytoplanktonic algae are responsible for about half of all of the biological **absorption** of CO₂. Most of the organisms pass through the marine food web and the CO₂ they have **absorbed** is returned to the atmosphere by respiration. But some will eventually sink to the ocean floor and remain there for hundreds of years, preventing the CO₂ from **causing greenhouse warming**. (...) The organisms are also believed to increase the amount of sunlight **absorbed** by the oceans. And they produce compounds such as methyl halides, which cause ozone depletion. Climate change: The oresmen [Quirin Schiermeier](#) *Nature* **volume421**, pages109–110 (09 January 2003)
- 51- The finding that atmospheric temperatures as measured by satellites and weather balloons have smaller warming trends than surface observations has been the subject of much discussion centred mostly on the quality of the data, but it could be partially explained by a predominance of land-use effects over **greenhouse warming** near the surface. (...) The well-known ‘urban heat island’ effect

actually takes place at night, when buildings and streets release the solar heating **absorbed** during the day. Impact of urbanization and land-use change on climate [Eugenia Kalnay & Ming Cai](#) *Nature* **volume423**, pages528–531 (29 May 2003)

52- The gas fits the bill as it causes **greenhouse warming**, and the methane in hydrates is rich in carbon. Rapid climate change: Gas leak! [Quirin Schiermeier](#) *Nature* **volume423**, pages681–682 (12 June 2003)

53- We do not deny the obvious importance of global warming and decrease in diurnal temperature range (DTR) **due to greenhouse effects**, which are present in both surface-station observations and the NCEP/NCAR 50-year reanalysis (NNR). Moreover, the NNR shows the largest warming trend over the past two decades, as reported in the surface-station data, suggesting that the NNR captures **the dominant greenhouse-warming effect**. (...) Trenberth's comment that the reanalyses do not include the effects of the changing atmospheric composition seems to be based on the common misunderstanding that if the model used as a first guess does not have a carbon dioxide trend, for example, then the reanalysis may at best include only a **'watered-down' greenhouse-warming trend**. (...) Reforestation, **saturation** of urban heat-island effects, and more regulated land-use changes could be leading factors resulting in such a decrease in land-use change. Climate (communication arising): Impact of land-use change on climate [Ming Cai & Eugenia Kalnay](#) *Nature* **volume427**, page214 (15 January 2004)

54- It is the unwritten duty of a book reviewer to complain about something. So let me do it with full narcissism. In citing my first atmospheric-science paper in 1971, which suggested that aerosol cooling could **dominate greenhouse-gas warming**, Weart says that the “equations and data were rudimentary, and critics swiftly pointed out crippling flaws”. Warning of warming [Stephen H. Schneider](#) *Nature* **volume427**, pages197–198 (15 January 2004)

55- How fast the world needs to address the issue of **greenhouse-gas warming** still depends on which of these two paths is correct. (...)The conundrum may be solved in one of three ways. Some particles, especially the ‘black carbon’ produced by biomass and fossil-fuel burning, can **absorb** radiation rather than reflect it, and so counteract cooling. Perhaps this effect has been underestimated: if these particles are much more abundant than thought, or if they cause more **absorption** of solar radiation after deposition on snow (which is normally highly reflective), they may be counteracting the effects of particles on precipitation efficiency to a greater extent than expected. Or perhaps the effects of particles on ‘ice clouds’ — clouds high in the atmosphere — have been underestimated. Because high clouds tend to **absorb** more energy in the form of thermal radiation than they reflect in the form of solar radiation, an increase in ice-cloud amount and particle number would warm the climate. Climate change: The cloud conundrum [Joyce E. Penner](#) *Nature* **volume432**, pages962–963 (23 December 2004)

56- But he says it is needed to counter pressure groups funded by the US energy industry that deny that global warming is happening and is being **caused by greenhouse-gas emissions**. Such groups are “truly abusing scientific results”, according to Schmidt. Climatologists get real over global warming [Jim Giles](#) *Nature* **volume432**, page937 (23 December 2004)

- 57- Indeed, the prospect of enforceable migration threatens voluntary processes, such as the UNFCCC, as they may deter large **greenhouse-gas polluters** from participating in the process. Compensation for climate change must meet needs [W. Neil Adger](#) & [Jon Barnett](#) *Nature* **volume436**, page328 (21 July 2005)
- 58- On local and regional scales, changes in land cover can sometimes **exacerbate the effect of greenhouse-gas-induced warming**, or even exert the largest impact on climatic conditions. (...) Africa—the continent where an estimated 90% of malaria occurs—has some of the lowest per capita emissions of the **greenhouse gases that cause global warming**. (...)To meet this challenge, precautionary approaches to **mitigating anthropogenic greenhouse gases** will be necessary, while research continues on the full range of climate–health mechanisms and potential future health impacts. Impact of regional climate change on human health [Jonathan A. Patz](#), [Diarmid Campbell-Lendrum](#), [Tracey Holloway](#) & [Jonathan A. Foley](#) *Nature* **volume438**, pages310–317 (17 November 2005)
- 59- The case illustrates how **greenhouse warming** and the resultant intensification of the hydrological cycle, together with aerosol pollution, may affect life on Earth. (...) With climate change promoting infectious disease and eroding biodiversity, the urgency of reducing **greenhouse-gas concentrations** is now undeniable. (...) Whereas nearby lowland deforestation might have influenced conditions, temperatures in Central and South America agree with simulated responses to **greenhouse-gas accumulation**. Widespread amphibian extinctions from epidemic disease driven by global warming [J. Alan Pounds](#), [Martin R. Bustamante](#), [Luis A. Coloma](#), [Jamie A. Consuegra](#), [Michael P. L. Fogden](#), [Pru N. Foster](#), [Enrique La Marca](#), [Karen L. Masters](#), [Andrés Merino-Viteri](#), [Robert Puschendorf](#), [Santiago R. Ron](#), [G. Arturo Sánchez-Azofeifa](#), [Christopher J. Still](#) & [Bruce E. Young](#) *Nature* **volume439**, pages161–167 (12 January 2006)
- 60- **The greenhouse warming** potential of CH₄ on a per molecule basis is 23 times higher than CO₂ on a 100-year timescale. Temperature sensitivity of soil carbon decomposition and feedbacks to climate change [Eric A. Davidson](#) & [Ivan A. Janssens](#) *Nature* **volume440**, pages165–173 (09 March 2006)
- 61- The emissions of CO₂ and other **greenhouse gases will further accelerate global warming...** Climate change: All in the game [Thomas Pfeiffer](#) & [Martin A. Nowak](#) *Nature* **volume441**, pages583–584 (01 June 2006)
- 62- Together these observations indicate a massive release of ¹³C-depleted carbon and **greenhouse-gas-induced warming**. (...) Enhanced moisture and latent heat transport from the subtropics to the Arctic region could have resulted from the nonlinear dependence of the **saturation** specific humidity of subtropical air parcels as a function of temperature, and/or a reduction of mid-latitude precipitation. (...) The hydrocarbon fraction was dried under a stream of N₂ and dissolved in a mixture of methanol-**saturated** area, pentane and acetone (200 µl each). Arctic hydrology during global warming at the Palaeocene/Eocene thermal maximum [Mark Pagani](#), [Nikolai Pedentchouk](#), [Matthew Huber](#), [Appy Sluijs](#), [Stefan Schouten](#), [Henk Brinkhuis](#), [Jaap S. Sinninghe Damsté](#), [Gerald R. Dickens](#) & [Expedition 302 Scientists](#) *Nature* **volume442**, pages671–675 (10 August 2006)

- 63- Methane is a **potent greenhouse gas** — per molecule, more than 20 times as powerful as carbon dioxide. (...) It is as yet unclear to what extent the melting of permafrost and increasing ocean temperature will affect these methane reservoirs, destabilize the hydrates and **exacerbate greenhouse warming**. Climate change: A nasty surprise in the greenhouse [Jos Lelieveld](#) *Nature* volume443, pages405–406 (28 September 2006)
- 64- Carbon dioxide is, of course, known as one of the main drivers of **the greenhouse effect**, and so of increasing temperatures. Biodiversity: Climate change and the ecologist [Wilfried Thuiller](#) *Nature* volume448, pages550–552 (02 August 2007)
- 65- It (Hurricane Katrina) also triggered a maelstrom of media coverage that resulted in the US National Oceanic and Atmospheric Administration (NOAA) closing ranks and claiming unequivocally that the increase in Atlantic hurricane activity since 1995 could be attributed solely to an ocean cycle unrelated to **greenhouse warming**. In the eye of the storm [James Elsner](#) *Nature* volume448, page648 (09 August 2007) (my addition in parenthesis)
- 66- Carbon dioxide then warmed the entire planet through **the greenhouse effect** and contributed to further melting of the great ice sheets. Climate change: Southern see-saw seen [Jeffrey P. Severinghaus](#) *Nature* volume457, pages1093–1094 (26 February 2009)
- 67- There are various — and confusing — targets to limit **global warming due to emissions of greenhouse gases**. Estimates based on the total slug of carbon emitted are possibly the most robust, and are worrisome. Climate change: Too much of a bad thing [Gavin Schmidt](#) & [David Archer](#) *Nature* volume458, pages1117–1118 (30 April 2009)
- 68- Hence the full A2000N scenario actually comprises four scenarios with a range of SST patterns and sea ice, reflecting the uncertainty in large-scale **anthropogenic greenhouse gas warming**. (...) To construct corresponding A2000N SSTs, A2000 SSTs were altered by subtracting estimated twentieth-century **warming attributable to greenhouse gas emissions**. (...) The A2000N scenario attempts to represent hypothetical autumn 2000 conditions in the model by altering the A2000 scenario as follows: **greenhouse gas concentrations** are reduced to year 1900 levels; SSTs are altered by subtracting estimated twentieth-century **warming attributable to greenhouse gas emissions**, accounting for uncertainty; and sea ice is altered correspondingly using a simple empirical SST–sea ice relationship determined from observed SST and sea ice. (...) Each perturbed simulation then ran under the A2000 scenario that prescribed the following conditions in the model for the period April 2000 to March 2001: global-mean time-mean major **greenhouse gas and halocarbon concentrations**, obtained via the Carbon Dioxide Information Analysis Center (...) To construct A2000N gases, A2000 **greenhouse gas and halocarbon concentrations** were reduced to year 1900 annual-mean global-mean estimates taken from historical forcing data sets. (...) Autumn 2000 flood episodes involved sequences of intense weather systems bringing heavy multi-day precipitation pulses to catchments that became **saturated**. **Anthropogenic greenhouse gas contribution** to flood risk in England and Wales in autumn 2000 [Pardeep Pall](#), [Tolu Aina](#), [Dáithí A. Stone](#), [Peter A. Stott](#), [Toru Nozawa](#), [Arno G. J. Hilberts](#), [Dag Lohmann](#) & [Myles R. Allen](#) *Nature* volume470, pages382–385 (17 February 2011)

- 69- In the meantime, as these two papers demonstrate, robust physics, combined with carefully constructed observing systems and detailed modelling, indicate that the frequency of intense rainfall events is likely to increase with **anthropogenic greenhouse-gas-induced warming**. (...) Rising **concentrations of anthropogenic greenhouse gases** in the atmosphere may already be influencing the intensity of rainfall and increasing the risk of substantial damage from the associated flooding. (...) Min *et al.* () provide evidence that human-induced increases in **greenhouse-gas concentrations** led to the intensification of heavy precipitation events over large swathes of land in the Northern Hemisphere during the latter half of the twentieth century. (...) One other possibility to explore is the role of atmospheric aerosols (especially those that **absorb** sunlight), which may influence global and regional precipitation by modulating the energy balance between the atmosphere and Earth's surface. Climate change: Human influence on rainfall [Richard P. Allan](#) *Nature* **volume470**, pages344–345 (17 February 2011)
- 70- Methane, which is emitted by industry, bogs, rice paddies and belching cows, makes up just 1.8 p.p.m. of the atmosphere but is about 20 times more powerful as a **greenhouse gas** than carbon dioxide. Despite their small contribution to the composition of the atmosphere, **greenhouse gases have a huge effect on climate**. (...) Even if we manage to curb emissions, future generations will have to deal with **the legacy of these greenhouse gases**: temperature extremes, floods, droughts, storms and rising sea-level. (...) What additional biological changes can we expect to see in the future? The answer depends a lot on what action we take. **We have already polluted our atmosphere with high concentrations of greenhouse gases**. (...) **Greenhouse gases absorb the heat** emitted by Earth, warming the atmosphere and the planet. (...) Land, vegetation and open ocean, being darker, have low albedos because they **absorb** most of the energy. Think about two plastic chairs on a hot summer day, one white and one black. The white one will be much more comfortable to sit on; the black one, having **absorbed** more of the Sun's energy, may be too hot. Warmer temperatures can trigger a warming cycle in the Arctic. As the air temperature increases, the ice melts and reveals darker ocean and land, which **absorb** solar energy during summers when the Sun never sets. These surfaces, which once reflected solar energy, now **absorb** it. Climate Change: A planet in flux [John P. Smol](#) *Nature* **volume483**, pagesS12–S15 (01 March 2012)
- 71- Global dust forcing is poorly constrained, however, and we cannot dismiss it as a potentially important driver of global temperature independent of **greenhouse warming**. Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation [Jeremy D. Shakun](#), [Peter U. Clark](#), [Feng He](#), [Shaun A. Marcott](#), [Alan C. Mix](#), [Zhengyu Liu](#), [Bette Otto-Bliesner](#), [Andreas Schmittner](#) & [Edouard Bard](#) *Nature* **volume484**, pages49–54 (05 April 2012)
- 72- The first approach relies on observations over time or space to quantify sensitivities to temperature variability and change, including recent **warming that is at least partly associated with greenhouse gas emissions**. Warming experiments underpredict plant phenological responses to climate change [E. M. Wolfovich](#), [B. I. Cook](#), [J. M. Allen](#), T. M. Crimmins, [J. L. Betancourt](#), [S. E. Travers](#), [S. Pau](#), [J. Regetz](#), [T. J. Davies](#), [N. J. B. Kraft](#), [T. R. Ault](#), [K. Bolmgren](#), [S. J. Mazer](#), [G. J. McCabe](#), [B. J. McGill](#), [C. Parmesan](#), [N. Salamin](#), [M. D. Schwartz](#) & [E. E. Cleland](#) *Nature* **volume485**, pages494–497 (24 May 2012)

- 73- NASA climatologist James Hansen made headlines during the US heatwave of 1988, declaring in testimony to Congress and during interviews on prime-time television that **a build-up of greenhouse gases** was increasing the probability of weather extremes. (...) The study is not the first to show a link between global warming and extreme weather, but it goes well beyond its predecessors, concluding that **greenhouse gases alone are responsible** for the hot summers and heatwaves. Heatwaves blamed on global warming Unusually high frequency points to human influence. Jeff Tollefson 07 August 2012 *C Nature* 488, 143–144
- 74- Our results, combined with evidence for increased dissolved loads and terrestrial clay export to world oceans, indicate that the transient **hyper-greenhouse climate** of the PETM may represent a major geomorphic ‘system-clearing event’, involving a global mobilization of dissolved and solid sediment **loads on Earth’s surface**. Fluvial response to abrupt global warming at the Palaeocene/Eocene boundary [Brady Z. Foreman, Paul L. Heller & Mark T. Clementz](#) *Nature* **volume491**, pages92–95 (01 November 2012)
- 75- In contrast, in most model projections of **future greenhouse warming** this gradient weakens (...) a forced run, named ERIK, covering the period AD 1000–1990, which is externally forced by solar variability, the effective radiative effects from stratospheric volcanic aerosols, and **greenhouse-gas concentrations** in the atmosphere, including CO₂ and CH₄, for the period AD 1000–1990 (...) The global total precipitation increase for a given temperature increase due to **greenhouse-gas warming** (about 1.2% to 1.3% per °C) is about 40% less than that due to solar–volcanic warming (2.1% per °C) ([Fig. 2](#)). (...) [Figures 3](#) and [4](#) show that solar heating led to a stronger SST gradient, whereas **greenhouse-gas heating** led to a weaker one, demonstrating that there is no contradiction between the palaeoclimate records and the IPCC simulations and that both theories may have a realm of validity. (...) All other things being equal, an increase in surface temperature, whether it is due to increased solar flux or increased **greenhouse trapping**, will increase this flux divergence and hence increase precipitation. (...) The tropospheric cooling is less for increased **greenhouse gases, which add radiative absorbers** to the troposphere, than for increased solar heating, which is concentrated at the Earth’s surface. Divergent global precipitation changes induced by natural versus anthropogenic forcing [Jian Liu, Bin Wang, Mark A. Cane, So-Young Yim & June-Yi Lee](#) *Nature* **volume493**, pages656–659 (31 January 2013)
- 76- Policy makers have generally agreed that the average global temperature rise **caused by greenhouse gas emissions** should not exceed 2 °C above the average global temperature of pre-industrial times (...) The climate module of TIAM-UCL is calibrated to the MAGICC model. This module can be used to project **the effects of greenhouse gas emissions on: atmospheric concentrations of greenhouse gas**, radiative forcing, and average global temperature rises. The geographical distribution of fossil fuels unused when limiting global warming to 2 °C [Christophe McGlade & Paul Ekins](#) *Nature* **volume517**, pages187–190 (08 January 2015)
- 77- Although enhanced land–ocean differential heating **due to greenhouse warming** has been proposed to intensify coastal upwelling by strengthening alongshore winds, analyses of observations and previous climate models have provided little consensus on historical and projected trends in coastal upwelling (...) Bakun proposed a mechanism whereby **greenhouse warming** would intensify the summertime alongshore winds and coastal upwelling by strengthening the land–sea thermal difference and surface pressure gradient in upwelling regions (...) Here we present a complementary prospective analysis using state-of-the-art climate models to understand how coastal upwelling will change under **future greenhouse warming** over the course of the twenty-first century. (...) Despite regional differences, the lengthening of the upwelling season at high

latitudes in the EBUSs is a robust global response to **greenhouse warming** among the CMIP5 models. (...) These **greenhouse-warming-induced** trends in upwelling intensity are consistent and statistically robust across the climate models in the CanCS and BCS and, to a lesser degree, in the CalCS and HCS also ([Extended Data Fig. 3m–p](#)). (...) Bakun proposed that **greenhouse warming** would strengthen upwelling across the globe through differential land–sea surface heating because excessive summertime warming over land relative to the ocean intensifies the continental thermal lows adjacent to upwelling regions, thus increasing atmospheric pressure gradients and alongshore upwelling-favourable winds (...) This robust relationship between the land–sea temperature difference and upwelling intensity supports Bakun’s hypothesis, and suggests **a link between greenhouse warming and the intensification of upwelling**. (...) However, increased solar heating due to **greenhouse warming** could enhance stratification, deepen the thermocline and thus prevent cool and nutrient-rich waters from being upwelled (...) In this study, we chose to focus on the robust changes found in the majority of the EBUSs because they are most probably associated with **global greenhouse warming**. Intensification and spatial homogenization of coastal upwelling under climate change [Daiwei Wang, Tarik C. Gouhier, Bruce A. Menge & Auroop R. Ganguly *Nature* volume518, pages390–394 \(19 February 2015\)](#)

- 78- Specialized microbes release CH₄ along with CO₂ in these environments, and **the more potent** (that is, it affects climate change more powerfully) **greenhouse gas** CH₄ in the atmosphere can partially offset a decreased decomposition rate. (...) Across the mosaic of ecosystems in the permafrost region, controlled laboratory observations brought together here imply that, in spite of **the more potent greenhouse gas** CH₄, a unit of newly thawed permafrost carbon could have a greater impact on climate over a century if it thaws and decomposes within a drier, aerobic soil as compared to an equivalent amount of carbon within a waterlogged soil or sediment. (...) This has the effect, in the expert assessment, of increasing the warming potential of released carbon by 35%–48% when accounting for the **more potent greenhouse gas** CH₄ over a 100-year timescale. Climate change and the permafrost carbon feedback [E. A. G. Schuur, A. D. McGuire, C. Schädel, G. Grosse, J. W. Harden, D. J. Hayes, G. Hugelius, C. D. Koven, P. Kuhry, D. M. Lawrence, S. M. Natali, D. Olefeldt, V. E. Romanovsky, K. Schaefer, M. R. Turetsky, C. C. Treat & J. E. Vonk *Nature* volume520, pages171–179 \(09 April 2015\)](#)
- 79- It takes long periods of time for alterations in **atmospheric concentrations of greenhouse gases** to cause change. Bring climate change back from the future The ‘shock’ over an Australian extinction shows that we still don’t accept that global warming is a problem for now, says [James Watson](#). 21 June 2016 *Nature* 534, 437
- 80- These emissions came mostly from coal combustions in Asia, and they partly compensated for the **greenhouse gas warming** during the hiatus (...) The TOA radiation and ocean heat uptake reacts differently depending on whether the changes **come from greenhouse gas warming** or from natural variability. The TOA radiation is a response in the natural variability (for example, increased radiation back to space as a result of higher surface temperatures) whereas it is a driver in **the greenhouse warming** case (increased surface temperatures as a response to increased **trapping** of radiation). (...) The ‘global warming hiatus’ often refers to the period starting around 1998 and ending around 2012, during which the annual-mean area-weighted GMST did not seem to increase as much as was expected from increasing **atmospheric greenhouse gas concentrations**. Reconciling controversies about the ‘global warming hiatus’ [Iselin Medhaug, Martin B. Stolpe, Erich M. Fischer & Reto Knutti *Nature* volume545, pages41–47 \(04 May 2017\)](#)

- 81- And as the world's largest **greenhouse polluter**, the United States, has backed out despite its much stronger economy, it is even more unreasonable to expect Russia to sign the Kyoto treaty, Illarionov argues. (...) Observers considered the move to be politically motivated, as all the key scientific issues had already been addressed in great detail by the Intergovernmental Panel on Climate Change (IPCC), of which Izrael is a vice-president. The last IPCC report in 2001, *Climate Change 2001: The Scientific Basis*, quoted extensive evidence that **anthropogenic greenhouse warming** is real and could dangerously alter the climate. Climate change: Crunch time for Kyoto [Quirin Schiermeier & Bryon MacWilliams](#) *Nature* **volume431**, pages12–13 (02 September 2004)
- 82- This indicates that tectonic changes could have triggered a **progressive transition from a 'greenhouse' to an 'icehouse' climate** during the Neoproterozoic era. (...) Hence, our model results provide an explanation for the severe cooling observed during the Sturtian interval, and highlight the complex interplay between atmospheric CO₂ **content**, the dispersal of Rodinia, and the silicate/basaltic weathering feedback as the primary causes of **the 'greenhouse'–'icehouse' climate transition**. A 'snowball Earth' climate triggered by continental break-up through changes in runoff [Yannick Donnadieu, Yves Godd ris, Gilles Ramstein, Anne N d lec & Joseph Meert](#) *Nature* **volume428**, pages303–306 (18 March 2004)
- 83- So the researchers turned instead to studying a natural plume of CO₂ that bubbles up from a subsea volcano called Loihi, near Hawaii. They wanted to assess fears that adding CO₂ to the ocean might create a 'mortality sink' — a spot where marine organisms die, attracting scavenging creatures that would in turn be killed. (...) But **this kind of death trap** is unlikely to occur, says Jeffrey Summers, a physicist with the Office of Fossil Energy at the US energy department in Washington DC. Ocean fix for climate change finds tentative support [Jim Giles](#) *Nature* **volume431**, page115 (09 September 2004)
- 84- Delegates to the protocol will meet in Port Ghalib, Egypt, on 4–8 November to discuss proposals to reduce the use of hydrofluorocarbons (HFCs), common refrigerants that were deployed to **replace ozone-destroying** chemicals such as chlorofluorocarbons. Although HFCs do not damage the ozone layer, some are up to 12,000 times more effective than carbon dioxide at **trapping** heat. Ozone protocol squares up to climate Europeans back efforts to amend the Montreal Protocol to address global warming. Jeff Tollefson 28 October 2009 | *Nature* 461, 1184
- 85- **Greenhouse gases**, most prominently carbon dioxide, warm the planet by **trapping** infrared radiation. (...) The authors split the temperature responses as estimated using these simulations into four groups — temperature changes due to natural forcings; changes due to **anthropogenic greenhouse gases**; changes due to other anthropogenic factors (aerosols other than black carbon, ozone, and land-use alteration); and changes due to black carbon. (...) This was previously known for the **warming by greenhouse gases** and the relative cooling by aerosols. But Jones *et al.* for the first time show that black carbon has warmed Earth by a statistically significant amount. (...) It is also noteworthy that other anthropogenic climate forcings had a much stronger impact on the global temperature — Jones *et al.* find a three to four times **greater warming by greenhouse gases**. (...) Black carbon, however, is a special aerosol because it also strongly **absorbs** sunlight ([Fig. 1](#)) — precisely the reason it looks black. The immediate effect of **this absorption** of sunlight is to warm the atmosphere and cool the surface. But because the Earth system as a whole **absorbs** sunlight rather than reflecting it, the overall result is a warming. Clouds may serve as a medium that strongly enhances this effect: if the atmosphere is heated as a result of the **absorption** of radiation, clouds may dissolve, which would probably constitute a further net warming. (...) The scientific

debate on this topic focuses on the net effect of a reduction in anthropogenic black carbon because, in addition to the warming caused by **absorption** of sunlight, black carbon may affect climate by other means. (...) However, if either the cooling effect by enhanced cloud reflectivity was large enough to compensate for the warming due to the **absorption** of sunlight plus potential dissolution of clouds, or the warming by pollution of snow was greater than the other effects, the simulated pattern of temperature change probably would not have been detectable in the observations. Global warming: The soot factor [Johannes Quaas](#) *Nature* **volume471**, pages456–457 (24 March 2011)

86- The Arctic is one of the sensitive pressure points for Earth's climate. A new sediment core reveals much more about the region's role in a long-term **transition from 'greenhouse' to 'icehouse' conditions**. (...) Over the past 55 million years or so, the Earth has experienced a major cooling, from a **greenhouse climate to the current icehouse climate**. The results of a remarkable scientific project in the Arctic, as reported in three papers in this issue, provide a detailed picture of the Arctic's role in the long-term cooling and its response during oscillations of **the preceding greenhouse climates**. (...) Although Moran and colleagues' paper reveals a closer link between atmospheric CO₂ and the **greenhouse-icehouse transition**, results from older sediments in the Arctic core expose some surprising gaps in our understanding of the workings of climate **in a greenhouse world**. (...) This '**Palaeocene supergreenhouse**' is believed to have been caused by a massive release of carbon to the oceans and atmosphere, either from methane present in deep-sea sediments or as organic carbon vaporized by volcanism during the opening of the North Atlantic Ocean. (...) Unlike the situation observed over recent swings into and out of ice ages, where temperatures in the Arctic change by at least twice as much as those in the tropics, the warming in the Arctic during **the Palaeocene supergreenhouse** is about the same as that observed in tropical and subtropical regions. In this respect, paradoxically, this result confirms one aspect of our understanding of **icehouse climates** — that sea ice and ice sheets are responsible for the larger temperature swings in the polar regions, and in ice-free **greenhouse climates** the poles respond to climate changes just like everywhere else. This result reaffirms that, although the rate of CO₂ change and warming during **the Palaeocene supergreenhouse may be similar to that expected in the coming centuries**, in one respect future warming will be different — it will be strongly amplified at high latitudes by the reduction in snow and sea ice cover. (...) Also, given that the modelled effect of CO₂ is not sufficient to **explain the Palaeocene supergreenhouse and some other (possibly greenhouse) agent** is required, then the demise of this other factor may also have affected the growth of ice sheets and the global cooling. Climate Change: The Arctic tells its story Heather M. Stoll *Nature* **volume441**, pages579–581 (01 June 2006)

87- The amount of ice melting every year depends on the amount of solar energy **absorbed** during the warm season; the total ice mass is therefore expected to decrease when obliquity is high and perihelion is reached around summer. Global change: Climate's astronomical sensors [Michel Crucifix](#) *Nature* **volume456**, pages47–48 (06 November 2008)

88- **Greenhouse gases (GHGs)** alter Earth's climate by **absorbing** energy in the lower atmosphere and re-emitting it. (...) **The influence of an emitted GHG on future climate** is estimated from its ability to **absorb** available infrared radiation and its persistence in the atmosphere. (...) The direct climate forcing of a trace gas is proportional to its global **concentration** change since 1750 and how efficiently it **absorbs** available infrared radiation (its radiative efficiency as watts per square metre per p.p.b.). Non-CO₂ greenhouse gases and climate change [S. A. Montzka](#), [E. J. Dlugokencky](#) & [J. H. Butler](#) *Nature* **volume476**, pages43–50 (04 August 2011)

- 89- Climate simulations show that interactions between particles of black carbon and convective and cloud processes in the atmosphere must be considered when assessing the full climatic effects of these **light-absorbing** particulates. Black carbon, often referred to as soot, is emitted during the incomplete combustion of fossil fuels, biofuels or wood. In contrast to other particulates emitted into the atmosphere by human activities, black carbon **absorbs** sunlight efficiently. This **absorption** leads to local heating of the atmosphere, warming the planet. Black carbon has received particular interest recently in the context of changes in climate policy. Climate change: Black carbon and atmospheric feedbacks [Ben Booth](#) & [Nicolas Bellouin](#) *Nature* **volume519**, pages167–168 (12 March 2015)
- 90- We used a gridded climate data set, including daily maximum and minimum air temperature, precipitation and **absorbed** downward solar radiation, with a spatial resolution of 0.25° (approximately 25 km) Declining global warming effects on the phenology of spring leaf unfolding [Yongshuo H. Fu](#), [Hongfang Zhao](#), [Shilong Piao](#), [Marc Peaucelle](#), [Shushi Peng](#), [Guiyun Zhou](#), [Philippe Ciais](#), [Mengtian Huang](#), [Annette Menzel](#), [Josep Peñuelas](#), [Yang Song](#), [Yann Vitasse](#), [Zhenzhong Zeng](#) & [Ivan A. Janssens](#) *Nature* **volume526**, pages104–107 (01 October 2015)
- 91- Some components of air pollution, such as black-carbon particles, **absorb** sunlight and warm Earth's climate. By contrast, sulfate particles scatter light, resulting in climate cooling. (...) Recent work has shown that fast-growing forest plantations in Europe store less biomass and **absorb** more sunlight than do natural forests; both of these features reduce the forests' benefit to the climate. Global warming: China's contribution to climate change [Dominick V. Spracklen](#) *Nature* **volume531**, pages310–312 (17 March 2016)
- 92- Carbon is only part of the story in the Southern Ocean. Scientists are also beginning to pin down what happens to all the heat that gets **absorbed** there. (...) In 2010, when researchers analysed data from the surveys, they found a pronounced warming trend in abyssal waters, which were somehow **absorbing** about 10% of the excess heat arising from global warming. How much longer can Antarctica's hostile ocean delay global warming? The waters of the Southern Ocean have **absorbed** much of the excess heat and carbon generated by humanity. Jeff Tollefson 16 November 2016 *Nature* 539, 346–348
- 93- Commonly, measurements of dissolved inorganic carbon (DIC) and total alkalinity (TA) in the ocean surface mixed layer are used to calculate $p_{\text{CO}_2\text{oce}}$, while $p_{\text{CO}_2\text{atm}}$ may be obtained from nearby atmospheric sampling stations and corrected for water vapour **saturation** at *in situ* sea surface temperature. Climate-driven changes to the atmospheric CO₂ sink in the subtropical North Pacific Ocean [John E. Dore](#), [Roger Lukas](#), [Daniel W. Sadler](#) & [David M. Karl](#) *Nature* **volume424**, pages754–757 (14 August 2003)
- 94- Melt intruded into organic-rich sedimentary basins may cause considerably higher carbon fluxes into the atmosphere than a similar volume of erupted magma. Degassing of one cubic metre of CO₂-**saturated** basaltic melt may release about 3.6 kg of carbon, whereas a melt intruded into organic-rich mudstones may trigger the release of 25–100 kg of carbon per cubic metre of magma. Release of methane from a volcanic basin as a mechanism for initial Eocene global warming [Henrik Svensen](#), [Sverre Planke](#), [Anders Malthes](#)

- 95- Anthropogenic addition of bioavailable nitrogen to the biosphere is increasing and terrestrial ecosystems are becoming increasingly **nitrogen-saturated**, causing more bioavailable nitrogen to enter groundwater and surface waters Stream denitrification across biomes and its response to anthropogenic nitrate loading [Patrick J. Mulholland, Ashley M. Helton](#) [Suzanne M. Thomas](#) *Nature* **volume452**, pages202–205 (13 March 2008)
- 96- This scenario independence emerges owing to the approximate cancellation of the **saturation** of carbon sinks and the **saturation** of CO₂ radiative forcing with increasing atmospheric CO₂. (...) We began with a multi-model estimate of **greenhouse-gas-attributable warming** for each decade of the twentieth century. This was derived by scaling the mean simulated temperature response to prescribed historical well-mixed **greenhouse-gas concentrations** from HadCM3, GFDL and PCM to best-fit HadCRUT2v temperature observations, based on a multiple regression together with the response to sulphate aerosol and natural forcing. The calculated uncertainty in this **greenhouse-gas-attributable warming** includes an estimate of internal variability based on control simulations and an estimate of model uncertainty based on inter-model differences in forcings and simulated responses. (...) Uncertainties in **greenhouse-gas-attributable warming** were calculated following ref. [12](#); uncertainties in radiative forcings were estimated from ref. [22](#) (FAQ 2.1, [Fig. 2](#)) and were assumed to be normally distributed; uncertainties in efficacies were estimated from figure 2.19 of ref. [22](#), and were assumed to be Student-*t* distributed. (...) Uncertainties in the overall magnitude of aerosol forcing are fully accounted for in our estimate of **greenhouse-gas-attributable warming**; however, uncertainties in the temporal or spatial pattern of the response to aerosol forcing are only accounted for to the extent that they are sampled in the three global climate models we used, and errors in these patterns could lead to values of CCR outside our estimated uncertainty range. The proportionality of global warming to cumulative carbon emissions [H. Damon Matthews, Nathan P. Gillett, Peter A. Stott & Kirsten Zickfeld](#) *Nature* **volume459**, pages829–832 (11 June 2009)
- 97-But although the phenomenon of technological and sociological **lock-in** is frequently remarked on, so too is the observation that most innovations fail. Research may show that stratospheric aerosols are far from a satisfactory solution. Hulme argues that their action is unreliable, reeling off a long list of known environmental, social, political and ethical issues, and anticipating others yet unknown. Hulme argues that this list is so overwhelming that it is not worth even starting such an exploration. Climate science: Stratospheric folly [Tim Kruger](#) *Nature* **volume508**, page457 (24 April 2014)
- 98- The reason is that in the modern climate NADW formation is geographically **locked** into the Nordic Seas—it cannot jump to the south of the sill near Iceland, because temperatures there are too warm. NADW formation must occur near the sea-ice margin, otherwise it is not dense enough to compete with Antarctic Bottom Water (AABW). In the glacial mode, in contrast, it is cold enough for NADW to form south of Iceland (see [Fig. 2d](#)) in the open Atlantic. There it is not geographically **locked** into place, and the conveyor belt is able to respond to surface freshwater input by gradually retreating southwards and becoming shallower. (...) This is why convection in the cold (stadial) mode is **locked** southward of this ‘**barrier**’ and at the same time a relatively small negative freshwater flux applied to the Nordic Seas can start convection there. Rapid changes of glacial climate

simulated in a coupled climate model [Andrey Ganopolski & Stefan Rahmstorf](#) *Nature* **volume409**, pages153–158 (11 January 2001)

99- In this case, given our calculated shear stresses τ ([Fig. 2b](#)) and relevant subduction parameters ([Fig. 2](#)) between 0 and 45° S ([Fig. 1](#)), we predict that the thermal structure does not change significantly with latitude, with a nearly constant combined average heat-source term ($q_0 + \tau V$) of 160 mW m⁻² ([Fig. 3](#)) because enhanced shear heating in the high shear stress segments more-or-less compensates for the lower heat flux from older oceanic lithosphere—**the blanketing effect of trench sediment** may also help to keep this balance (see below). (...) In the sediment-starved sections, where there is **no extensive or thick blanketing** of the rough oceanic basaltic basement, and tectonic erosion may have been active, significant portions of the plate interface could be between relatively strong basalt in the oceanic plate and relatively dry mafic and felsic basement rocks in the overlying prism¹⁶, with relatively low pore fluid pressures and minimal lubrication from fine-grained subducted trench sediments (...) Conversely, in sediment-rich trenches, **the blanketing of the trench** in several kilometres of sediment will raise oceanic basement temperatures near the toe of the overriding prism by up to 100 °C (ref. [24](#), for Andean subduction parameters), which would make up for any thermal deficit from reduced shear heating, without important surface slumping so that sediment is carried much farther down the plate interface ([Fig. 3b](#)). Cenozoic climate change as a possible cause for the rise of the Andes [Simon Lamb & Paul Davis](#) *Nature* **volume425**, pages792–797 (23 October 2003)

SCI - FOOTPRINT scenario:

100- Sustainability is no longer a fringe topic. Corporations are routinely **taking steps to reduce their carbon footprints** and investing in green business measures. Climate economics: Corporate greening falls short [Gail Whiteman](#) *Nature* **volume473**, pages149–150 (12 May 2011)

101- **The distinctive geographic footprints** of recurrent bleaching on the Great Barrier Reef in 1998, 2002 and 2016 were determined by the spatial pattern of sea temperatures in each year. (...) **The geographic footprints** of mass bleaching of corals on the Great Barrier Reef have varied markedly during three major events in 1998, 2002 and 2016 ([Fig. 1a](#)). (...) **The cumulative, combined footprint** of all three major bleaching events now covers almost the entire Great Barrier Reef Marine Park, with the exception of southern, offshore reefs ([Fig. 1d](#)). (...) **The severity and distinctive geographic footprints** of bleaching in each of the three years can be explained by differences in the magnitude and spatial distribution of sea surface temperature anomalies ([Fig. 1a, b](#) and [Extended Data Table 1](#)). (...) We conclude that **the overlap of disparate geographic footprints** of heat stress explains why different reefs have bleached 0–3 times, that is, the repeated exposure to unusually hot conditions is the primary driver of the likelihood of recurrent bleaching at the scale of both individual reefs and the entire Great Barrier Reef ([Fig. 1a, b](#)). (...) Identifying and protecting spatial refugia is a common strategy for conservation of threatened species and ecosystems, including coral reefs. However, our analyses indicate that **the cumulative footprint** of recurrent bleachings is expanding, and the number of potential refugia on the Great Barrier Reef is rapidly diminishing. Indeed, the remote northern region escaped serious damage in 1998 and 2002, but bore the brunt of extreme bleaching in 2016. Global warming and recurrent mass bleaching of corals [Terry P. Hughes, James T. Kerry & Shaun K. Wilson](#) *Nature* **volume543**, pages373–377 (16 March 2017)

102- When framing debates, policy-makers should prioritize discussion of social benefits as well as science: there are many good non-scientific reasons **to reduce global environmental footprints** and consumption frenzy, and to pursue greater justice, for instance. When doubt becomes a weapon [Brian Wynne](#) *Nature* **volume466**, pages441–442 (22 July 2010)

103- The low coincidence between regions projected to have high prevalence of chytridiomycosis and climate or land-use change emphasizes the potential for silent extinctions away from the regions

where **the current human footprint is larger**. Additive threats from pathogens, climate and land-use change for global amphibian diversity [Christian Hof](#), [Miguel B. Araújo](#), [Walter Jetz](#) & [Carsten Rahbek](#) *Nature* **volume480**, pages516–519 (22 December 2011)

- 104- **The city has calculated its carbon 'footprint'** and found that road vehicles constitute 47% of total carbon dioxide emissions, and that electricity consumption constitutes 32%. So how should Los Angeles target its policies? Climate change: Track urban emissions on a human scale [Kevin Robert Gurney](#), [Paty Romero-Lankao](#), [Karen C. Seto](#), [Lucy R. Hutyra](#), [Riley Duren](#), [Christopher Kennedy](#), [Nancy B. Grimm](#), [James R. Ehleringer](#), [Peter Marcotullio](#), [Sara Hughes](#), [Stephanie Pincetl](#), [Mikhail V. Chester](#), [Daniel M. Runfola](#), [Johannes J. Feddema](#) & [Joshua Sperling](#) *Nature* 525(7568): 179-81 07 September 2015

SCI - Doom Prediction scenarios

SCI - CONFLICT scenarios:

- 1- The stability diagrams reveal a number of important differences between the modern and glacial climates. As in most other models, for present-day forcing ([Fig. 1a, c](#)) there are two fundamentally different climate modes in the CLIMBER-2 model: with and without NADW formation, that is, the 'warm' conveyor belt mode ([Fig. 2a](#)) and the 'off' mode ([Fig. 2c](#)). (...) Another important difference between glacial and modern climates is seen **in the response to freshwater forcing** in the latitudes of the Nordic Seas (red curves). (...) To test this hypothesis, we imposed a periodic variation in **the freshwater forcing** of the Atlantic in the latitude belt 50–80° N ([Fig. 5a](#)) The amplitude of this **forcing** is very small (about 30 cm yr⁻¹ in surface flux or 0.03 Sv in total, compare to [Fig. 1](#)); it could, for example, represent changes in river runoff, sea-ice export, shifts in the Atlantic storm track or changes in mass balance of the adjacent ice sheets. **The response to the imposed forcing** is shown in [Fig. 5](#). (...) This cycle has a characteristic salinity signal ([Fig. 5c](#)) in the high latitudes as a result of the salt-water incursions, which far exceeds the direct salinity changes due to **the imposed freshwater forcing** and which matches the observed salinity variations at this latitude (...) It is important that the characteristics of the simulated D/O events do not depend on the imposed **forcing** cycle. The **forcing** only acts as a trigger; once an event is set off it follows its own internal dynamics. If the same experiment is performed with different amplitudes of the **forcing** cycle, then the threshold behaviour becomes clear: for an amplitude of 0.015 Sv no D/O events are triggered and the Greenland temperature remains constant, whereas for a **forcing** amplitude of 0.045 Sv the events evolve in the same way and with the same amplitude as shown for 0.03 Sv ([Fig. 5b–e](#)), except that they are triggered slightly earlier in the cycle. (...) A low-amplitude cycle in **freshwater forcing** is sufficient to trigger these events. (...) Once the system is in the 'warm' mode with convection in latitudes north of Iceland, it becomes insensitive to the applied, weak 1,500-year **forcing** cycle (this experiment was performed but is not detailed here). The freshwater budget of the Nordic Seas is then dominated by the vigorous circulation; anomalies in **surface forcing** cannot accumulate to create noticeable salinity anomalies as in the stratified 'cold' mode. For this reason, the Holocene climate in our model is stable with respect to the 1,500-year **forcing** cycle, while the glacial climate is not. Rapid changes of glacial climate simulated in a coupled climate model [Andrey Ganopolski](#) & [Stefan Rahmstorf](#) *Nature* **volume409**, pages153–158 (11 January 2001)
- 2- Rather, the change from a virtually unchanging climate to one that has been changing rapidly, as dictated by Milankovitch **forcing** (related to changes in the orbital parameters of the Earth) and amplified by a periodically ice-covered Earth, might maintain a state in which erosive processes never reach equilibrium with the evolving landscape. (...) Consider first a simple linear system that approaches equilibrium exponentially, after a step change in **forcing**. Following Bull, we let the erosion rate \dot{E} vary with time as for a half-cycle of oscillatory **forcing**, where τ_e quantifies to time to reach an equilibrium with negligible erosion when forcing is steady, and T is the period of the oscillating amplitude of **forcing**. Maximum erosion per half period occurs for a vanishing ratio T/τ_e and therefore infinitely rapid oscillations. This pattern will hold for any process whose rate decreases monotonically after a step function in **forcing**, including soil production (...) Suppose that the response to a step-

function change in **forcing** included an increase over a finite interval, before decaying exponentially: For this case, maximum erosion during a half cycle occurs for $T \approx 3.9\tau_e$. Because the times necessary for landscapes to respond to changes in climate are comparable to those of Milankovitch **forcing**, and not orders of magnitude larger or smaller, Milankovitch **forcing** might even show resonances with natural periods in the erosive response of a landscape to changes in **forcing**. Both fluvial and glacial processes are notoriously nonlinear. Even if the thickness of the ice varied linearly with climate **forcing**, the rate of flow of a glacier scales as the fifth power of that thickness, and surely erosion does not scale with the fifth root of the flow rate. Similarly, most characteristics of rivers depend in a nonlinear fashion on discharge, which limits sediment transport. Thus, the arguments above that exploit a linear dependence of erosion on an oscillatory **forcing** must oversimplify the effect of changing climate on erosion. We could include a nonlinear process simply by allowing τ_e in equation (1) to be time-dependent. (For instance, by defining $\tau_e = \tau/[1-(\tau/t)\ln(t/\tau)]$, equation (1) is transformed to equation (2).) Until the physical processes that govern erosion are better understood, however, it is premature to calculate erosion rates for forcings varying differently with time. Tropical climate changes at millennial and orbital timescales on the Bolivian Altiplano Paul A. Baker, Catherine A. Rigsby, [Geoffrey O. Seltzer](#), [Sherilyn C. Fritz](#), [Tim K. Lowenstein](#), [Niklas P. Bacher](#) & [Carlos Veliz](#) *Nature* **volume409**, pages698–701 (08 February 2001)

- 3- Working group 1 transferred this broad range of emission projections into radiative **forcings** of the climate system (see [Box 1](#) and Fig. 18 in the technical summary of ref. [2](#)), producing a wide range of temperature projections by means of a simple model tuned to seven general circulation models (out of a possible 18 cited by working group 1 — Table 9.1 of ref. [2](#)). What is 'dangerous' climate change? [Stephen H. Schneider](#) *Nature* **volume411**, pages17–19 (03 May 2001)

- 4- Our records are consistent with **greenhouse forcing** being responsible for the warm temperatures, but are inconsistent both with explanations for OAEs based on ocean stagnation, and with the traditional view (reviewed in ref. [12](#)) that past warm periods were more stable than today's climate. (...) If substantiated by data from other low-latitude sites, our finding would lend support to the widely suggested role of **greenhouse-gas forcing** as one of the main contributors to global warmth during the mid-Cretaceous. Warm tropical ocean surface and global anoxia during the mid-Cretaceous period [Paul A. Wilson](#) & [Richard D. Norris](#) *Nature* **volume412**, pages425–429 (26 July 2001)

- 5- To estimate the probability density function of Z under constant climate, we used output from a 900-yr 'control' (constant radiative forcing) experiment with a coupled ocean–atmosphere–land model. (...) The apparent increase in flood risk might be associated with radiatively **forced** climate change. To assess flood-risk sensitivity to radiative **forcing**, we used a 300-yr 'idealized CO₂ quadrupling' experiment with a 1%-per-year growth (for 140 yr) of atmospheric CO₂ concentration from the control level to a stable, quadrupled level [8](#) (maintained for 160 yr). (...) Given the substantial modelled sensitivity of flood risk to radiative **forcing**, we framed the hypothesis that historical changes in radiative **forcing** may explain the significant observed increase in flood risk. We examined the detectability of flood-risk change in five transient 'scenario' climate experiments (225 yr, 1865–2089) that shared common estimates of historical and projected future changes in radiative **forcing** by greenhouse gases and direct effects of sulphate aerosols, each with a distinct initial condition (...) Absent from the model are **forcings** such as solar variability, volcanic activity, land-cover change, and water-resource development, and potential biospheric feedbacks such as CO₂-induced stomatal closure and water-stress-induced root extension Increasing risk of great floods in a changing climate [P. C. D. Milly](#), [R. T. Wetherald](#), [K. A. Dunne](#) & [T. L. Delworth](#) *Nature* **volume415**, pages514–517 (31 January 2002)

- 6- In attempting to address such societal concerns, we pose the question: how does anthropogenic **forcing** influence the probability of occurrence of unusually large seasonal precipitation amounts? (...) More specifically, the global-mean radiative **forcing** due to the 70-year doubling of CO₂ in the CMIP2 experiments (3.7 W m⁻²) is in the mid-range of the IPCC projections of the change in radiative **forcing** from 1990 to 2060 (2.6–5.0 W m⁻² for different forcing scenarios). (...) In [Fig. 1c](#) we show the ratio of the probabilities in [Fig. 1b](#) and [a](#), giving a measure of the changing risk of E_2 resulting from anthropogenic **forcing**. Over parts of northern Europe, including much of the United Kingdom, $r \approx 5$. Defining a ‘very wet’ winter as one in which E_2 occurs, and with the caveats that the greenhouse ensemble is based on an idealized anthropogenic **forcing** scenario, and that the CMIP2 ensemble may not necessarily span all model uncertainties Quantifying the risk of extreme seasonal precipitation events in a changing climate [T. N. Palmer & J. Räisänen](#) *Nature* **volume415**, pages512–514 (31 January 2002)
- 7- In the North Atlantic, differential solar heating between high and low latitudes tends to accelerate surface waters polewards whereas freshwater input to high latitudes together with low-latitude evaporation tend to brake this flow. Today, the former thermal **forcing** dominates the latter haline (freshwater) forcing and the meridional overturning in the Atlantic drives surface waters northward, while deep water that forms in the Nordic Seas flows southward as North Atlantic Deep Water (NADW). (...) Paradoxically, although the THC in current models responds to freshwater **forcings** without delay, the largest deglacial meltwater event on record, referred to as meltwater pulse 1A (MWP-1A), occurs more than 1,000 years before the next significant change in the THC associated with the Younger Dryas cold interval (...) Greenland ice-core records of methane and $\delta^{18}\text{O}$ strongly support the hypothesis of North Atlantic **forcing** in showing a nearly instantaneous **response** of the tropical water balance to changes in high-latitude temperature (...) Although at present there exists no self-consistent model that simulates, without prescribed **forcing**, changes that resemble the palaeoclimatic record, important progress has been made. Abrupt change manifests itself in two different ways in climate models: an abrupt transition across a threshold to a new equilibrium state, or **a response to a fast forcing**. (...) Recent modelling ideas postulate an atmosphere–ocean system during the last glaciation that was extremely close to a threshold, thus requiring very weak freshwater **forcing** to trigger abrupt changes of the THC. Whether the sequence of abrupt events originates from unknown periodic forcing or instabilities and **feedbacks** associated with circum-Atlantic ice sheets remains an open question. (...) On the other hand, other experiments suggest little or no reduction of the THC to the same greenhouse gas **forcing** Climate change and the resurgence of malaria in the East African highlands [Simon I. Hay, Jonathan Cox, David J. Rogers, Sarah E. Randolph, David I. Stern, G. Dennis Shanks, Monica F. Myers & Robert W. Snow](#) *Nature* **volume415**, pages905–909 (21 February 2002)
- 8- The HHGSDX50 scenario assumes an increase of 0.5% CO₂ per year (IS92d), and incorporates sulphate aerosol **forcing**, making it a relatively conservative estimate of climate change. Future projections for Mexican faunas under global climate change scenarios [A. Townsend Peterson, Miguel A. Ortega-Huerta, Jeremy Bartley, Victor Sánchez-Cordero, Jorge Soberón, Robert H. Buddemeier & David R. B. Stockwell](#) *Nature* **volume416**, pages626–629 (11 April 2002)
- 9- In particular, the sensitivity of climate to changing greenhouse-gas concentrations in the atmosphere and the radiative **forcing** effects by aerosols are not well constrained, leading to large uncertainties in global warming simulations. Here we present a Monte Carlo approach to produce

probabilistic climate projections, using a climate model of reduced complexity. The uncertainties in the input parameters and in the model itself are taken into account, and past observations of oceanic and atmospheric warming are used to constrain the range of realistic model responses. We obtain a probability density function for the present-day total radiative **forcing**, giving 1.4 to 2.4 W m⁻² for the 5–95 per cent confidence range, narrowing the global-mean indirect aerosol effect to the range of 0 to –1.2 W m⁻². (...) Here we determine constraints on the climate sensitivity, on the radiative **forcing** and on the future warming that arise from the requirement that the modelled large-scale surface warming and ocean heat uptake both match observations. We do this by using the reconstructed and projected radiative **forcing** of all major **forcing** components in combination with ensemble simulations of a coupled ocean–atmosphere model of reduced complexity (see Methods section). To illustrate the relationship between radiative **forcing**, climate sensitivity, ocean mixing and the resulting model response, we have first calculated the global ocean heat uptake (Fig. 1a) and global-mean surface warming (Fig. 1b) for various set-ups of the ocean model and climate **sensitivities**. (...) Additional uncertainties arise from uncertainties in radiative **forcing**. The global-mean indirect aerosol **forcing**, for example, is estimated by IPCC to be in the range of 0 to –2 W m⁻² for the year 2000. We have performed simulations where either the indirect aerosol effect (Fig. 1c and d, dash-dotted) or the natural (solar and volcanic) **forcings** (Fig. 1c and d, dashed) were neglected. (...) From Fig. 1c and d we estimate a climate **sensitivity** of about 6 K required to match the observed warming trend when applying anthropogenic and natural **forcings**. Similarly, about 4 K and 2 K are appropriate when neglecting natural **forcings** or the indirect aerosol effect. The evolution with time of surface warming and ocean heat uptake for these three **forcing** cases and the standard ocean model set-up shows that the model is able to reasonably reproduce the observed temporal evolution of global-mean surface warming for the past 140 years with and without the indirect aerosol **forcing** (see Supplementary Information). The model has difficulties in reproducing the almost constant temperature between 1940 and 1970 and the strong warming after 1980, indicating that either the assumed radiative **forcing** is not correct, or part of the observed temperature evolution is due to internal climate variability which is not resolved in this model. When the natural **forcing** is neglected, much of the variability in the surface warming is lost and the agreement is significantly worse, consistent with earlier model studies (...) To attach probabilities to our results, we have simulated a Monte Carlo set of 25,000 global warming simulations using five ocean model set-ups and taking into account the uncertainties in radiative **forcings** and climate sensitivity (see Methods section). (...) This indicates that given the uncertainties in the radiative forcing, in the temperature records, and in currently used ocean models, it is impossible at this stage to strongly constrain the climate **sensitivity**, as proposed by Barnett *et al.* 10. However, we can strongly constrain the sum of the radiative **forcing** and thereby the indirect aerosol **forcing**, the most uncertain of the individual **forcing** components. If we demand consistency with the temperature records, the PDF of the total radiative **forcing** for the year 2000 is considerably narrowed (1.4–2.4 W m⁻² for the 5–95% confidence range, Fig. 2b), compared to the initially assumed PDF (Fig. 2a). Furthermore, all results from comprehensive 3D climate models suggest a range for the climate **sensitivity** of about 1.5 to 4.5 K (ref. 1). By adopting this range as an additional constraint, which is completely independent of this study, a narrower **forcing** range results (1.6–2.5 W m⁻², Fig. 2c). Assuming the PDFs for the other **forcing** components to be correct estimates, the procedure reduces the initially assumed uniform PDF for the indirect aerosol **forcing** (Fig. 2d) considerably. Our analysis suggests that the negative indirect aerosol **forcing** plus any **forcing** not explicitly considered for the year 2000 is smaller than 1.2 W m⁻² in magnitude with a probability of 95% (Fig. 2e) for any climate **sensitivity**, and over 99% if the climate **sensitivity** is restricted to 1.5 K–4.5 K (Fig. 2f). Even for much less restrictive assumptions regarding the **forcing** PDFs, these probabilities decrease only slightly to 85% and 95%, respectively (for example, when all IPCC uncertainties are taken as one standard deviation and/or when using a broader PDF for the indirect aerosol **forcing**). Further simulations suggest that a slightly positive indirect aerosol **forcing** (plus any **forcing** not considered) at year 2000 cannot be excluded by this method, if the corresponding PDF assumption is extended to positive values. But although the uncertainty about its magnitude is large, there is general agreement that the indirect aerosol **forcing** is indeed negative (...) Second, the IPCC results are obtained using different models but a single radiative **forcing** evolution for a certain scenario. Here we circumvent this limitation, and consider uncertainties in climate **sensitivities**, ocean mixing, and the reconstructed or projected radiative **forcing**. (...) The consistency with the observed warming is a strong constraint in our ensemble simulations for at least the next few decades, when the **forcing** is the main uncertainty. (...) Furthermore, the necessary

assumption that the current balance of greenhouse warming and sulphate cooling remains approximately constant makes that method particularly useful for the near future, but not for long-term projections where sulphate **forcing** is expected to decrease substantially. (...) Whereas the climate sensitivity of comprehensive models is determined by the strength of the resolved **feedback** mechanisms, we specify the radiative perturbation at the tropopause as $\Delta F(t) = \Delta F_{\text{RF}}(t) + \lambda \Delta T_s(t)$, where ΔF_{RF} is the radiative **forcing**. Feedback processes are parameterized in terms of the global-mean surface temperature increase ΔT_s , and the constant factor λ is prescribed to obtain different climate sensitivities. We diagnose the climate **sensitivity** after 3,000 years of integration. The time history of radiative **forcing** is prescribed from changes in well-mixed greenhouse gases (CO₂, CH₄, N₂O, SF₆ and 28 halocarbons including those controlled by the Montreal Protocol), stratospheric and tropospheric O₃, the direct forcing of black and organic carbon and sulphate, stratospheric H₂O owing to CH₄ changes, and the indirect effects of aerosols, all based on simplified expressions that are summarized in refs 1 and 25. Anthropogenic radiative **forcing** is prescribed from reconstructions for the time 1765–2000, follows a SRES scenario 20 from 2000 to 2100, and is kept constant thereafter. For the simulations in Fig. 1, a standard value of -0.8 W m^{-2} is assumed for the indirect aerosol **forcing** at year 2000, as in earlier studies. Radiative **forcing** by volcanoes and variations in solar irradiance are prescribed for the historical period. Albedo changes due to land use, radiative **forcing** by dust and the uncertainty in converting future greenhouse-gas emissions into concentrations are not considered. For the Monte Carlo simulations, we have calculated 25,000 global warming simulations using five ocean model set-ups and taking into account the uncertainties in radiative **forcings** and climate **sensitivity**. For each **forcing** component of every individual simulation, a random number (representing the radiative **forcing** for year 2000) is determined, to which the time history and future projection of that **forcing** component is scaled. These random numbers are chosen in such a way that their distribution follows the prescribed PDF of the **forcing** for the year 2000. A gaussian PDF is assumed where absolute uncertainties are given, a log-normal PDF where the uncertainty is expressed as a factor. We assume the uncertainties given by IPCC to be two standard deviations, although the IPCC attaches no statistical meaning to them. For the indirect aerosol **forcing**, the probability is assumed to be uniform between 0 and -2 W m^{-2} (see refs 25 and 28 for details about the radiative **forcing** assumptions). For each simulation, a climate **sensitivity** is randomly chosen between 1 and 10 K (uniform PDF). (...) However, we implicitly assume that the long-term trends in observed surface warming and ocean heat uptake are due to natural and anthropogenic **forcings**, and that internal variability only contributes to decadal changes. Further, the results of this study are only weakly sensitive to the assumed **forcing** PDFs and ocean mixing properties, as unrealistic input/model combinations due to less restrictive input assumptions are usually eliminated by the observational constraints. For example, the indicated limits of surface temperature ranges at year 2100 change by less than $\pm 0.2 \text{ K}$ when assuming different ocean model versions or less restrictive PDFs of the radiative **forcing**. Constraints on radiative **forcing** and future climate change from observations and climate model ensembles [Reto Knutti, Thomas F. Stocker, Fortunat Joos & Gian-Kasper Plattner](#) *Nature* volume 416, pages 719–723 (18 April 2002)

- 10- In the absence of a sudden nonlinear climate change (in, say, ocean circulation) these properties of the climate may be expected to change slowly, if at all, in response to an imposed external **forcing**. Indeed, they are assumed to be constant in most simple and intermediate prognostic models of climate. Even the most complex climate models suggest that strong nonlinearities are unlikely to be important in global-mean temperature change over the next half-century or so. For example, in all but one of the 19 coupled atmosphere–ocean general circulation models (AOGCMs) in CMIP-2 (the second Coupled Model Intercomparison Project), an annual 1% compound increase in CO₂ concentrations (a linear increase in radiative **forcing**) results in a near-linear global-mean temperature **response** up to and beyond the time of CO₂ doubling after a few years' initial adjustment (ref. 26; and see Fig. 9.3a of ref. 4). Likewise, global-mean precipitation increases roughly linearly in these experiments (Fig. 9.3b of ref. 4), albeit with rather stronger **unforced** and effectively random variations from year to year. The net radiative **forcing** in the CMIP-2 experiments is at the high end of projected anthropogenic changes over the coming decades. Hence current AOGCMs suggest that a strongly nonlinear global-mean temperature **response to greenhouse forcing** is unlikely over the next few decades at least. In that case, the constraint of

global energy conservation means that estimates of past radiative **forcing**, recent observed near-surface temperature change and the accumulation of heat in the global oceans place objective, albeit still rather weak, constraints on the overall strength of atmospheric **feedbacks** (...) Note that this empirical distribution is, if anything, likely to underestimate the range of uncertainty in TCR, as the analysis on which it was based assumed a negligible impact of natural **forcing** on temperature changes in the twentieth century (...) A further consequence of equation is that the expected precipitation change per degree of global warming, $\Delta P/\Delta T$, depends on the nature of the **forcing**. In a change driven by short-wave heating at the surface (for example, resulting from solar variability or scattering aerosols), ΔR_C is small and $\Delta P/\Delta T$ is likely to be larger than in a CO₂-induced change. This effect is illustrated in [Fig. 3](#) where observed global-mean temperature ([Fig. 3a](#)) and observed terrestrial precipitation ([Fig. 3b](#)) are compared over the past 55 years with the corresponding quantities diagnosed from an ensemble of four simulations using the Met Office's HadCM3 climate model **forced** with a combination of estimated anthropogenic and natural **forcing**. Ensemble members and observations seem to move together, suggesting that both global-mean temperature and, to a surprising extent, also continental-mean precipitation seem to be controlled by the external **forcing**. The correlation between the observed (5-year smoothed) precipitation time-series and the ensemble mean over this period is 0.55. This is greater than any correlation found in 98% of cases if we replace the observations with a similar-length, similarly sampled and smoothed segment of the HadCM3 control integration. Hence we can claim to have detected, in the simplest possible sense, the influence of external **forcing** on global-mean land precipitation. It is, however, clear that terrestrial precipitation is not simply following the global temperature **response**. Precipitation changes seem to be dominated by the natural (solar and volcanic) **forcing**, which varies on shorter timescales, whereas the temperature **response** is dominated by the anthropogenic **forcing**, which increases comparatively steadily over this period. This is to be expected, as CO₂ is less effective in driving changes in global precipitation than is short-wave **forcing** of a similar magnitude because, in the former case, ΔR_C and ΔR_T in equation tend to cancel each other out. Of course, both **forcings** could alter the distribution of precipitation between land and sea: we would prefer to compare global precipitation changes, but the necessary long-term data sets are not available (...) How, therefore, can we set about constraining the future transient **response** of the hydrologic cycle to anthropogenic **forcing**? (...) It may seem counterintuitive to use temperature and ocean heat content rather than precipitation observations to constrain future precipitation, but with global precipitation controlled by energetic constraints, and with **the precipitation response to anthropogenic forcing** being difficult to disentangle from other signals in the observations, this could be the best strategy available. (...) Although the large-scale **temperature response to climate-change forcings** is predicted to be relatively smooth (usually with the same sign everywhere), precipitation varies much more in space and time and is notoriously much harder to simulate correctly in models. (...) But this is only a qualitative comparison, given that the land-based data sample less than a third of the world, the strongest precipitation changes in [Fig. 5](#) seem to be occurring over the oceans, the **forcing** over the twentieth century is very different from the CMIP-2 experiments, and different forcings may well be associated with different patterns of **response**. (...) An important factor for the regional details of the precipitation **response** to external **forcing** is the change in atmospheric circulation (...) Extra-tropical circulation and precipitation anomalies may well be strongly influenced by driving from the tropics (refs [85](#), [86](#), and M. Blackburn and B. Hoskins, personal communication), and it remains very doubtful whether current AOGCMs respond correctly to localized but remote **forcing** (...) It should be noted, however, that calculating the **forcing** due to well-mixed greenhouse gases, with well-defined spectral properties that can be measured in the laboratory, is much easier than the **forcing** due to the many possible types of aerosol, with their shorter lifetimes and complex distribution, so here we must expect rather more modelling uncertainty. (...) We have, nominally, detected the influence of external **forcing** on recent terrestrial precipitation changes, but isolating the anthropogenic contribution is difficult as observed large-scale changes in precipitation — unlike temperature — seem to be dominated by natural **forcing**. Climate change: The 20-year forecast [Francis W. Zwiers](#) *Nature* **volume**416, pages690–691 (18 April 2002)

- 11- Strong positive **feedbacks** between uplift, strengthening of the southeastern Pacific anticyclone, and the development of a pronounced orographic barrier to moist air from the Amazon basin, would have further promoted the increasing aridity, making this region even more **sensitive to the forcing** of global climate change. Cenozoic climate change as a possible cause for the rise of the Andes [Simon Lamb](#) & [Paul Davis](#) *Nature* **volume425**, pages792–797 (23 October 2003)
- 12- We showed by using an analytical study that the reanalysis can capture essentially the full strength of climate trends caused by the increase in greenhouse gases, even if this **forcing** is absent from the model used in the data assimilation (our unpublished data). Climate (communication arising): Impact of land-use change on climate [Ming Cai](#) & [Eugenia Kalnay](#) *Nature* **volume427**, page214 (15 January 2004)
- 13- We focus on uncertainties in the equilibrium **response** to a doubling of atmospheric CO₂ assuming no changes in other external **forcing** agents. (...) Previously, PDFs of climate **sensitivity** have been obtained by exploring the range of predictions of simpler climate models consistent with uncertainties in observed transient climate change and **forcing** (...) generated by assuming a uniform prior for each parameter within the range specified by experts. Predictions of climate **sensitivity** (ΔT) were made in terms of the **feedback** strength λ , defined as $\lambda = \Delta Q / \Delta T$, ΔQ being the radiative **forcing** due to doubling CO₂. Quantification of modelling uncertainties in a large ensemble of climate change simulations [James M. Murphy](#), [David M. H. Sexton](#), [David N. Barnett](#), [Gareth S. Jones](#), [Mark J. Webb](#), [Matthew Collins](#) & [David A. Stainforth](#) *Nature* **volume430**, pages768–772 (12 August 2004)
- 14- This view resonates with basic notions of how climate adjusts to **forcings** to maintain energy balance, necessitating changes to the Equator-to-pole temperature gradients and global transports of energy and moisture. Climate change: Tropical flip-flop connections [John C. H. Chiang](#) & [Athanasios Koutavas](#) *Nature* **volume432**, pages684–685 (09 December 2004)
- 15- If so, then the net radiative **forcing** that is the cause of the 0.6 °C average temperature increase of the past 100 years must be small, and climate models must be much more sensitive to this small difference if they are to agree with past observations. Climate change: The cloud conundrum [Joyce E. Penner](#) *Nature* **volume432**, pages962–963 (23 December 2004)
- 16- Possible triggering mechanisms for this event include crossing a threshold temperature as the Earth warmed gradually, comet impact, explosive volcanism or ocean current reorganization and erosion at continental slopes, whereas orbital **forcing** has been excluded (...) Orbital tuning suggested that these transients were controlled by maxima in the short-term eccentricity cycles, whereas the PETM carbon isotope excursion allegedly occurred near a minimum in the 405-kyr eccentricity cycle, excluding orbital **forcing** as a triggering mechanism for the latter Astronomical pacing of late Palaeocene to early Eocene global warming events [Lucas J. Lourens](#), [Appy Sluijs](#), [Dick Kroon](#), [James C. Zachos](#), [Ellen Thomas](#), [Ursula Röhl](#), [Julie Bowles](#) & [Isabella Raffi](#) *Nature* **volume435**, pages1083–1087 (23 June 2005)

- 17- In agreement with the Milankovitch orbital **forcing** hypothesis it is often assumed that glacial–interglacial climate transitions occurred synchronously in the Northern and Southern hemispheres of the Earth. (...) Our record largely corroborates the Milankovitch model of orbital **forcing** but also exhibits some differences: in particular, an earlier onset and longer duration of the Last Glacial Maximum. (...) This assertion implies a southern ‘trigger’, perhaps involving local insolation **forcing**, amplified in some way by the Antarctic ice sheet and its influence on global sea level, ocean circulation or atmospheric circulation in the form of the circum-Antarctic westerly winds (...) [Figure 2](#) also compares our record with an oxygen isotope record from the Indian Ocean, MD 90-0963, thought to be driven principally by orbital **forcing** at high Northern Hemisphere latitudes, and with the temperature record derived from the Vostok ice core. (...) If local insolation was responsible for a Southern Hemisphere lead into the LGM, then similar departures from the orbital **forcing** model may occur at other times of Southern Hemisphere insolation minima. **Regional insolation forcing** of late Quaternary climate change in the Southern Hemisphere [Marcus J. Vandergoes, Rewi M. Newnham, Frank Preusser, Chris H. Hendy, Thomas V. Lowell, Sean J. Fitzsimons, Alan G. Hogg, Haino Uwe Kasper & Christian Schlüchter *Nature* volume436, pages242–245 \(14 July 2005\)](#)
- 18- In support of an assessment of forced climate change conducted by the Intergovernmental Panel on Climate Change (IPCC), many climate-modelling centres recently performed ‘20C3M’ simulations of climate with prescribed external **forcing** (variations in atmospheric composition and solar irradiance) for the late nineteenth century and the whole of the twentieth century. **Forcing** was not identical across models, but generally included estimated historical variations of radiatively active atmospheric gases and aerosols (including volcanic emissions) and solar irradiance. Control simulations with temporally invariant preindustrial **forcing** (‘PICNTRL’) were also performed, as were integrations into the future with an assumed **forcing** model (‘SRESA1B’). (...) If so, we can conclude that external **forcing** explains a significant part of global streamflow change for the twentieth century. Global pattern of trends in streamflow and water availability in a changing climate [P. C. D. Milly, K. A. Dunne & A. V. Vecchia *Nature* volume438, pages347–350 \(17 November 2005\)](#)
- 19- Reference 1 uses only temperature **forcing** in the form of anomalies and we do likewise, on the basis of the 1961–1990 reference period. We apply **forcing** annually by perturbing the ELA from its reference state for each grid cell by the temperature anomaly for each year divided by the lapse rate. (...) We made further experiments to illustrate the glacier and icecap **response** to spatially differentiated **forcing**, using results from two climate models, the GFDL and the PCM. The model simulations for GFDL_CM2_0_run1 and for NCAR_PCM1_run2 run through the 20th century, based on historical radiative **forcing**, followed by the 21st-century mid-range A1B scenario. [Figure 4a](#) shows the 21st-century area-averaged mountain glacier and icecap temperature **forcing** from these two models; the idealized **forcing** is shown for comparison. The temperature **response** to radiative **forcing** of the GFDL model is greater than that of the PCM model, but both models show markedly greater warming over the mountain glacier regions compared with the icecap regions; there is a warming difference of about 1 K by 2100 Low sea level rise projections from mountain glaciers and icecaps under global warming [Sarah C. B. Raper & Roger J. Braithwaite *Nature* volume439, pages311–313 \(19 January 2006\)](#)
- 20- The size of this trend is consistent with theoretical predictions, is accurately reproduced by climate model simulations and, within the climate models, is largely due to anthropogenic **forcing**. (...) Ensembles of global climate model (GCM) experiments—with different radiative **forcings**—serve to explore the origin of the observed circulation changes, and allow for the estimation of the statistical significance of the observed changes. The model used here is the US National Oceanic

and Atmospheric Administration (NOAA) Geophysical Fluid Dynamics Laboratory (GFDL) CM2.1 GCM, with three historical integration sets over the period 1861–2000: (1) a five-member ensemble including estimates of natural (solar variations, volcanoes) and anthropogenic (well-mixed greenhouse gases, ozone, direct aerosol **forcing** and land use) sources of climate change; (2) a three-member ensemble applying only natural **forcing**; and (3) a three-member ensemble applying only anthropogenic **forcing** (see Methods and [Supplementary Information](#)). (...) The naturally **forced** GCM experiments are unable to recover these observed patterns in the SLP trends ([Fig. 1c](#)); however, the GCM recovers many of the principal observed SLP trend patterns using only anthropogenic **forcing** ([Fig. 1d](#)). Trends computed from observed Δ SLP are inconsistent with those expected from the variability in the pre-industrial control simulation, and they are inconsistent with the trends from the ‘**natural-forcing**’ GCM ensemble experiment ([Fig. 2](#)). However, the trends in observed Δ SLP fall within the range of trends from the ‘**all-forcing**’ GCM ensemble, and within that of the ‘**anthropogenic-forcing**’ GCM ensemble ([Fig. 2](#)). Thus, within the framework of this GCM, a significant part of the observed reduction of Δ SLP since the mid-nineteenth century resulted from **anthropogenic forcing**. (...) Internal climate variability can be isolated from that **forced** by changes to atmospheric composition through ensemble experiments, in which the same model physics and **forcing** fields are applied to different initial conditions. The model used here is the NOAA GFDL CM2.1 GCM, which uses estimated radiative **forcings** over the period 1861–2000. The principal historical integration set is a five-member ensemble including estimates of natural (solar variations, volcanoes), and anthropogenic (well-mixed greenhouse gases, ozone, direct aerosol **forcing** and land use) sources of climate change. Two additional sets of experiments isolate the effects of each set of **forcing** elements, by applying only natural or anthropogenic **forcing**; each consists of a three-member ensemble. Statistical significance estimates are computed from a 2,000-year control integration with invariant radiative conditions from the 1860s (see [Supplementary Information](#)). Weakening of tropical Pacific atmospheric circulation due to **anthropogenic forcing** [Gabriel A. Vecchi, Brian J. Soden, Andrew T. Wittenberg, Isaac M. Held, Ants Leetmaa & Matthew J. Harrison](#) *Nature* **volume441**, pages73–76 (04 May 2006)

- 21- Finally, this investigation reveals how profoundly greenhouse gas **forcing** may affect the functioning of the regional climate system and the role of land-surface processes. Land–atmosphere coupling and climate change in Europe [Sonia I. Seneviratne, Daniel Lüthi, Michael Litschi & Christoph Schär](#) *Nature* **volume443**, pages205–209 (14 September 2006)
- 22- Analyses of the existing records have generally shown that the relationship between the Greenland and Antarctic records is weak and not statistically significant, except on the very longest timescales associated with well-understood astronomical factors (the Milankovich **forcing** of ice ages). So it has been difficult to rule out the null hypothesis that the variability in these records largely reflects regional phenomena such as variations in wind patterns or sea-ice extent. Climate change: The south–north connection [Eric J. Steig](#) *Nature* **volume444**, pages152–153 (09 November 2006)
- 23- The effect of aerosols and greenhouse gases on the climate is usually described as '**radiative forcing**', an often-used but frequently misunderstood term. Simply put, it is the perturbation to the net rate of radiative energy flow in the atmosphere caused by atmospheric constituents such as clouds, aerosol particles or gases. Aerosol particles, for example, scatter solar radiation in all directions, so more solar radiation should be reflected back into space when aerosols are present. Thus, aerosol particles have a net cooling effect, and their radiative **forcing** is negative. Radiative **forcing** is usually defined at the top of the atmosphere, or more specifically, at the top of the troposphere (this is the lowest 8–12 km of the atmosphere, which contains most of the aerosol particles, clouds and water vapour). Thus calculated, radiative **forcing** is a useful parameter in climate modelling both because the globally averaged temperature at Earth's surface **responds**

linearly to forcing, and because a model's response can be tested and compared in the absence of **feedback** mechanisms and independently of the **forcing** agent. But for aerosol particles that absorb radiation (for example, soot produced by combustion), top-of-atmosphere **forcing** tells only part of the story. When solar radiation is absorbed, it heats the atmospheric layer in which the particles reside, even though the net effect for the entire atmospheric column may still be cooling. Ramanathan *et al.* obtained the crucial data missing from model- and satellite-derived **forcing** estimates that are needed to determine the extent of this heating of the lower atmosphere. (...) The authors therefore infer that the MAC results are representative of the larger-scale regional **forcing** that affects global climate. To assess the longer-term picture, Ramanathan and colleagues simulated heating caused by atmospheric brown clouds during the period 1950–2000 by imposing the estimated **forcing** during 2000–03 on the US National Center for Atmospheric Research's general circulation model CCM3. (...) These findings might seem to contradict the general notion of aerosol particles as cooling agents in the global climate system, but they also emphasize the importance of resolving how aerosol radiative **forcing** varies with altitude. Climate change: Aerosols heat up [Peter Pilewskie](#) *Nature* **volume448**, pages541–542 (02 August 2007)

- 24- We suggest that the resulting indirect radiative **forcing** by ozone effects on plants could contribute more to global warming than the direct radiative **forcing** due to tropospheric ozone increases. (...) Over the industrial period, anthropogenic precursor emissions from fossil fuel and biomass burning have led to elevated ambient ozone concentrations ($[O_3]$) over a large portion of the Earth's surface ([Fig. 1](#)), resulting in a direct radiative **forcing** of climate change of $W m^{-2}$ (ref. [8](#)). (...) There have been few global modelling studies of the impact of tropospheric ozone on plant production and global land-carbon storage, and no study has estimated the indirect radiative **forcing** of tropospheric ozone through feedbacks on the global carbon cycle. (...) Over the period 1900–2100, changes in $[O_3]$ with all other **forcings** fixed are projected to reduce land-carbon storage accumulation by between 143 Pg C and 263 Pg C ([Fig. 2a](#), [Supplementary Fig. 4](#)). (...) Suppression of the land-carbon sink results in additional anthropogenic CO_2 emissions accumulating in the atmosphere, and therefore an indirect radiative **forcing** of climate change by O_3 effects on the terrestrial biosphere. The indirect radiative **forcing** due to O_3 is diagnosed for comparison to the direct **forcing** due to tropospheric O_3 ([Fig. 2b](#)), assuming 50% of the extra CO_2 from the land is sequestered by the oceans. The indirect **forcing** by 2100 is estimated at $0.62 W m^{-2}$ and $1.09 W m^{-2}$ for the 'low' and 'high' plant ozone sensitivity runs, respectively, which compares with a **mean direct radiative forcing** from 11 atmospheric chemistry models of $0.89 W m^{-2}$ (refs [3](#), [4](#), [27](#), [28](#)). Although the absolute values of **radiative forcing** are dependent on our choice of emissions scenario, the relative importance of **direct and indirect radiative forcing** is much less sensitive to the uncertainty in emissions. As such, these results suggest that ozone effects on vegetation could double the **effective radiative forcing** due to increases in tropospheric ozone, significantly increasing the importance of changes in atmospheric chemistry as a driver of twenty-first-century climate change. **Indirect radiative forcing** of climate change through ozone effects on the land-carbon sink [S. Sitch, P. M. Cox, W. J. Collins & C. Huntingford](#) *Nature* **volume448**, pages791–794 (16 August 2007)
- 25- This approach involves linking climate models with process-based or statistical models to simulate changes in natural systems caused by different **climate forcing** factors, and comparing these directly with observed changes in natural systems. When temperature data from the HadCM3 global climate model were used to examine the likely cause for changes in the timing of spring events of Northern Hemisphere wild animals and plants, results show the strongest agreement when the modelled temperatures were derived from simulations incorporating **anthropogenic forcings** (...) Combined with the attribution of global and continental-scale warming to **anthropogenic climate forcing** demonstrated by IPCC Working Group I Fourth Assessment Report, this analysis provides strong support for joint attribution of observed impacts. (...) It is very likely that the observed warming patterns cannot be explained by changes in **natural external forcing** factors, such as changes in solar

irradiance or volcanic aerosols; the latter is likely to have had a cooling influence during this period. (...) The far fewer data series in Africa, Australia and Latin America are closely co-located with warming, but these cannot yet be attributed to **anthropogenic climate forcing**. Attributing physical and biological impacts to anthropogenic climate change [Cynthia Rosenzweig](#), [David Karoly](#), [Marta Vicarelli](#), Peter Neofotis, [Qigang Wu](#), [Gino Casassa](#), [Annette Menzel](#), [Terry L. Root](#), [Nicole Estrella](#), [Bernard Seguin](#), [Piotr Tryjanowski](#), [Chunzhen Liu](#), [Samuel Rawlins](#) & [Anton Imeson](#) *Nature* **volume453**, pages353–357 (15 May 2008)

- 26- Climate modellers have explained **the warming as a response to natural forcings**, and the cooling as due to an increase in tropospheric aerosols, principally sulphates, as a result of increased economic activity in the decades following the Second World War. Climate change: Hot questions of temperature bias [Chris E. Forest](#) & [Richard W. Reynolds](#) *Nature* **volume453**, pages601–602 (29 May 2008)
- 27- More convincing evidence for the attribution of a human effect on climate is emerging from pattern based studies, in which the modelled **climate response to combined forcing** by greenhouse gases and anthropogenic sulphate aerosols is compared with observed geographical, seasonal and vertical patterns of atmospheric temperature change. Meetings that changed the world: Madrid 1995: Diagnosing climate change [John Houghton](#) *Nature* **volume455**, pages737–738 (09 October 2008)
- 28- In my opinion, chaos, fractals, long-memory processes and their ilk should be invoked only when all of the various **climate forcings** have been carefully studied and all simpler explanations eliminated. We are not even close to meeting that goal. Climate change: Shifts in season [David J. Thomson](#) *Nature* **volume457**, pages391–392 (22 January 2009)
- 29- The tropics, defined broadly (30° N to 30° S), make up half of Earth's surface area and so play an outsized part in determining past variations in global mean temperature and the **sensitivity of this variable to forcing** factors such as greenhouse-gas concentrations. (...) That implies either that global average temperatures were very **sensitive to greenhouse-gas forcing**, or that concentrations of greenhouse gases were at the upper end of their reconstructed range Climate change: Snakes tell a torrid tale Matthew Huber *Nature* **volume457**, pages669–671 (05 February 2009)
- 30- Determining probabilistic climate change for future emission scenarios is challenging, as it requires a synthesis of uncertainties along the cause–effect chain from emissions to temperatures; for example, uncertainties in the carbon cycle, **radiative forcing** and **climate responses**. Uncertainties in future climate projections can be quantified by constraining climate model parameters to reproduce historical observations of temperature, ocean heat uptake and independent estimates of **radiative forcing**. By focusing on emission budgets (the cumulative emissions to stay below a certain warming level) and their probabilistic implications for the climate, we build on pioneering mitigation studies. Previous probabilistic studies—while sometimes based on more complex models—either considered uncertainties only in a few **forcing** components, applied relatively simple likelihood estimators ignoring the correlation structure of the observational errors or constrained only model parameters like **climate sensitivity** rather than allowed emissions. (...) new ocean heat uptake estimates are incorporated; a constraint on changes in effective climate **sensitivity** is introduced; and the most recent **radiative forcing** uncertainty estimates for **individual forcing agents** are considered. The data constraints provide us with likelihood estimates for the chosen 82-dimensional space of **climate response**, gas-cycle and **radiative forcing parameters**

([Supplementary Fig. 3](#)). (...) We emulate these C4MIP models individually by calibrating 18 parameters in our carbon-cycle model, and combine these settings with the other gas cycles, **radiative forcing and climate response** parameter uncertainties gained from our historical constraining. (...) Consequently, IPCC AR4 Working Group III²³ provided equilibrium warming estimates corresponding to 2100 **radiative forcing** levels for some multi-gas mitigation scenarios, using simplified regressions ([Supplementary Fig. 6](#)). Thus, 15 years after the first pioneering mitigation studies, there is still an important gap in the literature relating emission budgets for lower emission profiles to the probability of exceeding maximal warming levels; a gap that this study intends to fill. We compute time-evolving distributions of **radiative forcing** and surface air temperature implications for the set of 26 IPCC SRES²¹ and 20 EMF-21 scenarios shown in [Fig. 2a and b](#). (...) Under our illustrative distribution for climate system properties, and taking into account all **positive and negative forcing agents** as provided by Table 2.12 in AR4¹⁷, the cumulative Kyoto-gas emission budget for 2000–50 is 1,500 (2,000) Gt CO₂ equiv., if the probability of exceeding 2 °C is to be limited to approximately 25% (50%) ([Table 1](#)). For the lower scenarios, Kyoto-gas emissions in the year 2050 are a remarkably good indicator for probabilities of exceeding 2 °C, because for these scenarios (with emissions in 2050 below 30 Gt CO₂ equiv.), **radiative forcing** peaks around 2050 and temperature soon thereafter. (...) Out of more than 400 parameters, we vary 9 **climate response parameters** (one of which is **climate sensitivity**), 33 gas-cycle and **global radiative forcing parameters** (not including 18 carbon-cycle parameters, which are calibrated separately to C4MIP carbon-cycle models), and 40 scaling factors determining the regional 4 box pattern of **key forcings** ([Supplementary Table 1](#)). Other parameters are set to default values (...) To constrain the parameters, we use observational data of surface air temperature in 4 spatial grid boxes from 1850 to 2006, the linear trend in ocean heat content changes from 1961 to 2003 and year 2005 **radiative forcing estimates for 18 forcing agents**, in addition to a constraint on the twenty-first century change of **effective climate sensitivity** derived from AOGCM CMIP3 emulations (...) We use a reduced complexity coupled carbon cycle climate model (MAGICC 6.0), requiring (hemispheric) emissions of GHGs, aerosols, and tropospheric ozone precursors as inputs for calculating atmospheric concentrations, **radiative forcings**, surface air temperatures, and ocean heat uptake. (...) **Radiative forcing** estimates as listed in ref. 17 (Table 2.12 therein) provide an additional set of 17 constraints Z_2, \dots, Z_{18} ([Supplementary Table 2](#)). The error of 14 of these **radiative forcing** estimates is assumed to have a Gaussian distribution. The remaining 3 observational constraints, however, exhibit skewness, which we model by a distribution we call here ‘skewed normal’ ([Supplementary Information](#)). All **radiative forcing** uncertainties are assumed to be independent. Greenhouse-gas emission targets for limiting global warming to 2 °C [Malte Meinshausen, Nicolai Meinshausen, William Hare, Sarah C. B. Raper, Katja Frieler, Reto Knutti, David J. Frame & Myles R. Allen Nature volume 458, pages 1158–1162 \(30 April 2009\)](#)

- 31- From observational constraints, we estimate CCR to be in the range 1.0–2.1 °C per trillion tonnes of carbon (Tt C) emitted (5th to 95th percentiles), consistent with twenty-first-century CCR values simulated by climate–carbon models. Uncertainty in land-use CO₂ emissions and **aerosol forcing**, however, means that higher observationally constrained values cannot be excluded. (...) This scenario independence emerges owing to the approximate cancellation of the saturation of carbon sinks and the **saturation of CO₂ radiative forcing** with increasing atmospheric CO₂. (...) To calculate CCR from observations, we first estimated decadal-mean CO₂-attributable warming relative to 1900–09 by scaling an estimate of greenhouse-gas-attributable warming by the ratio of CO₂ to **greenhouse-gas forcing**. (...) We estimated CO₂-attributable warming using an estimate of greenhouse-gas-attributable warming, scaled by the ratio of CO₂ to **total greenhouse-gas forcing, where greenhouse-gas forcing was first scaled by an estimate of the mean efficacy of long-lived greenhouse gases**. We calculated uncertainties in greenhouse-gas-attributable warming, accounting for internal variability and inter-model uncertainty, and assumed normally and Student-*t* distributed uncertainties for **radiative forcings and greenhouse-gas efficacy**, respectively (...) This was derived by scaling the mean simulated **temperature response** to prescribed historical well-mixed greenhouse-gas concentrations from HadCM3, GFDL and PCM to best-fit HadCRUT2v temperature observations, based on a multiple regression together with the **response** to sulphate aerosol and **natural forcing**. The calculated uncertainty in this greenhouse-gas-attributable warming includes an estimate of internal variability based on control simulations and an estimate of model uncertainty based on inter-model

differences in forcings and simulated responses. We scaled the greenhouse-gas-attributable warming by the ratio of **CO₂ forcing** to total well-mixed **greenhouse gas forcing, with all forcings expressed** as differences between 1900–09 and subsequent decades of the twentieth century. Before this scaling, we multiplied **the well-mixed greenhouse-gas forcing** by the mean efficacy for long-lived greenhouse gases (shown in figure 2.19 of ref. [22](#)) to account for **the larger temperature response** per unit **radiative forcing for other greenhouse gases** compared to CO₂. Tropospheric ozone changes were not specified in the simulations used by ref. [12](#), so we did not include them in our estimate of **total greenhouse gas forcing**, under the assumption that the **response** to tropospheric ozone is spatially and temporally dissimilar to that due to the well-mixed greenhouse gases and is therefore unlikely to be aliased in the multiple regression (the inclusion of **tropospheric ozone forcing in the total greenhouse-gas forcing** estimate reduces our observational estimate of CCR to 0.9–1.8 °C per Tt C). Our calculation also assumes that **climate forcings** other than CO₂ emissions have had little influence on atmospheric CO₂ concentration. This is a reasonable assumption given a near-cancellation over the past century of **positive non-CO₂ greenhouse-gas forcing and negative aerosol forcing**. (...) Uncertainties in the overall magnitude of **aerosol forcing** are fully accounted for in our estimate of greenhouse-gas-attributable warming; however, uncertainties in the **temporal or spatial pattern of the response to aerosol forcing** are only accounted for to the extent that they are sampled in the three global climate models we used, and errors in these patterns could lead to values of CCR outside our estimated uncertainty range. The proportionality of global warming to cumulative carbon emissions [H. Damon Matthews, Nathan P. Gillett, Peter A. Stott & Kirsten Zickfeld Nature volume459, pages829–832 \(11 June 2009\)](#)

- 32- It is clear that anomalous rainfall is largely enhanced in the central and eastern equatorial Pacific and reduced in the western equatorial Pacific during the EP-El Niño compared to the CP-El Niño. Changes in **the atmospheric diabatic forcing** over the tropics have the potential to modify the tropical–midlatitude teleconnections to the El Niño (...) The control run is the twentieth-century climate change model simulation to year 2000 with **anthropogenic and natural forcing** (that is, 20C3M). (...) Furthermore, we expect that such frequent CP-El Niño occurrence under global warming could lead to **more effective forcing of drought** over India and Australia (...) In other words, the SST warms as a result of **thermal forcing**, which leads to weaker easterlies and enhanced poleward Sverdrup transport and hence a shoaling of the thermocline depth. How might this affect the stability of the CP-El Niño? El Niño in a changing climate [Sang-Wook Yeh, Jong-Seong Kug, Boris Dewitte, Min-Ho Kwon, Ben P. Kirtman & Fei-Fei Jin Nature volume461, pages511–514 \(24 September 2009\)](#)
- 33- The control run represents twentieth-century climate change with **anthropogenic and natural forcing up** to 2000. Climate change: The El Niño with a difference [Karumuri Ashok & Toshio Yamagata Nature volume461, pages481–484 \(24 September 2009\)](#)
- 34- The implications of climate change for the environment and society will depend not only on **the response of the Earth system to changes in radiative forcings**, but also on how humankind **responds** through changes in technology, economies, lifestyle and policy. Extensive uncertainties exist in **future forcings of and responses to climate change**, necessitating the use of scenarios of the future to explore the potential consequences of **different response options**. (...) This starts with four scenarios of **future radiative forcings** (the change in the balance between incoming and outgoing radiation to the atmosphere caused by changes in atmospheric constituents, such as carbon dioxide). (...) Central to the new parallel process is the concept that **the four radiative forcing pathways** can be achieved by a diverse range of socioeconomic and technological development scenarios. Among other issues, the parallel process facilitates exploration of the question ‘What are the ways in which the world could develop in order to reach a particular **radiative forcing pathway**?’ (...) They can be used to analyse the need for and the value of technology, and the

implications of choices to **limit radiative forcing** to prescribed limits. (...) An underlying key issue is whether probabilities can be usefully associated with scenarios or different levels of **radiative forcing**; for example, the probability that concentrations will stabilize above or below a specified level (...) As a result, an increasing number of scenarios are being developed to explore conditions consistent with managed long-run climate outcomes, including a 2 °C maximum global average surface temperature increase over pre-industrial levels, as well as ‘overshoot’ scenarios in which **radiative forcing** peaks and then declines to a target level (...) This sequential process involved developing emissions scenarios based on different socioeconomic futures, estimating concentrations and **radiative forcing** from emissions, projecting the ensuing climate, and then using those scenarios in impact research. (...) Rather than starting with detailed socioeconomic storylines to generate emissions and then climate scenarios, the parallel process begins with the identification of important characteristics for scenarios of **radiative forcings** for climate modelling, the most prominent of which is the level of **radiative forcing** in the year 2100. These **radiative forcing trajectories** are not associated with unique socioeconomic or emissions scenarios, and instead can result from different combinations of economic, technological, demographic, policy and institutional futures (for comparisons of how different emissions scenarios generated with different integrated assessment models stabilize at specified target levels, see refs [47](#), [48](#)). (...) The research community identified a specific emission scenario (including data on land use and land cover) from the peer-reviewed literature as a plausible pathway towards reaching **each target radiative forcing trajectory** ([Table 1](#); the selection process and criteria are described more fully below). These were given the label ‘representative concentration pathways’ (RCPs). The word ‘representative’ signifies that each RCP provides only one of many possible scenarios that would lead to **the specific radiative forcing characteristics**. The term ‘pathway’ emphasizes that not only the long-term concentration levels are of interest, but also the trajectory taken over time to reach that outcome. In summary, the new parallel process starts with the selection of four RCPs, each of which corresponds to **a specific radiative forcing pathway**. (...) In addition, the integrated assessment modellers will develop entirely new scenarios with **different radiative forcing pathways** to explore additional issues and uncertainties. (...) It is an open research question how wide a range of socioeconomic conditions could be consistent with a given **forcing pathway**, including its ultimate level, pathway over time and spatial pattern (...) an adequate separation of **the radiative forcing pathways** in the long term in order to provide **distinguishable forcing pathways** for the climate models; and the availability of model outputs for **all relevant forcing agents** and land use. The scientific community used these criteria to identify **four radiative forcing pathways**, and a new Integrated Assessment Modelling Consortium (IAMC), comprising 45 participating organizations (), then assembled a list of candidate scenarios for each **radiative forcing level** from the peer-reviewed literature. (...) [Figure 5](#) illustrates how the selected RCPs represent the literature in terms of **radiative forcing** ([Fig. 5a](#)) and energy and industry CO₂ emissions ([Fig. 5b](#)). The selected set of RCPs spans **the range of radiative forcing scenarios** in the published literature at September 2007. (...) Because multiple scenarios do not need to be run **to span radiative forcing uncertainties**, it is possible to run the models at higher resolution and to prepare larger ensembles (a group of model experiments used to analyse uncertainty) to improve understanding of likely extremes, thereby aiding evaluation of impacts and adaptation needs for the coming decades. (...) Managing the cascade of uncertainties that span different types of scenarios and improving characterization of uncertainties and probabilities for **ranges of future forcing** and climate change is necessary to make scenarios more useful to decision makers. The next generation of scenarios for climate change research and assessment [Richard H. Moss](#), [Jae A. Edmonds](#), Kathy A. Hibbard, [Martin R. Manning](#), [Steven K. Rose](#), Detlef P. van Vuuren, [Timothy R. Carter](#), Seita Emori, Mikiko Kainuma, [Tom Kram](#), [Gerald A. Meehl](#), [John F. B. Mitchell](#), [Nebojsa Nakicenovic](#), [Keywan Riahi](#), [Steven J. Smith](#), [Ronald J. Stouffer](#), [Allison M. Thomson](#), [John P. Weyant](#) & [Thomas J. Wilbanks](#) *Nature* **volume463**, pages747–756 (11 February 2010)

- 35- Additional insight into the question could be provided by using, for example, a more sophisticated ocean-modelling approach that incorporates tropical-cyclone **wind-forcing** on a global scale. Climate change: Tropical cyclones in the mix [Ryan L. Sriver](#) *Nature* **volume463**, pages1032–1033 (25 February 2010)

- 36- Earth's history tells us that climate has often **responded to forcing** in a sensitive, nonlinear and unpredictable way. How ocean stirring affects climate Stefan Rahmstorf *Nature* **volume464**, page681 (01 April 2010)
- 37- The second section addresses past and projected future trends in water resources, investigates whether the recent changes are unusual or within the bounds of normal climatic variability, and assesses the contribution of human withdrawals of water versus **climate forcing**. (...) Models logically simulate a globally more intense hydrological cycle when **forced by increasing greenhouse gases**, but over a region like northern China, they may not accurately reflect synoptic and orographic rainfall processes, nor **regional climate forcing** by dust and pollution aerosols (...) Our ability to pin down such regional thresholds is hindered today by the uncertainty of global climate in response to rising greenhouse gas concentrations, and of regional climates **in response to aerosols and ozone forcing**. The impacts of climate change on water resources and agriculture in China [Shilong Piao](#), [Philippe Ciais](#), [Yao Huang](#), [Zehao Shen](#), Shushi Peng, [Junsheng Li](#), [Liping Zhou](#), [Hongyan Liu](#), Yuecun Ma, [Yihui Ding](#), [Pierre Friedlingstein](#), [Chunzhen Liu](#), Kun Tan, [Yongqiang Yu](#), Tianyi Zhang & [Jingyun Fang](#) *Nature* **volume467**, pages43–51 (02 September 2010)
- 38- Kaplan *et al.* unambiguously resolve the competing hypotheses about the timing of glacier advance. Their principal contribution is to demonstrate a **'forcing'** of the main glacier advance during the Antarctic cold reversal, peaking at $13,100 \pm 500$ years ago, a finding that reinforces other evidence from land and ocean for cooling of the southern climate at this time Climate change: A glacial test of timing [Martin P. Kirkbride](#) *Nature* **volume467**, pages160–161 (09 September 2010)
- 39- The effects of **climate forcing** on primary and secondary production of the short austral food webs may be integrated at higher levels, and thus amplified in top-level predators such as seabirds. Reliability of flipper-banded penguins as indicators of climate change [Claire Saraux](#), [Céline Le Bohec](#), [Joël M. Durant](#), [Vincent A. Viblanc](#), [Michel Gauthier-Clerc](#), [David Beaune](#), [Young-Hyang Park](#), [Nigel G. Yoccoz](#), [Nils C. Stenseth](#) & [Yvon Le Maho](#) *Nature* **volume469**, pages203–206 (13 January 2011)
- 40- All other conditions (for example, **solar forcing**, land surface properties) were kept at the base state or at model default settings. (...) To construct A2000N gases, A2000 greenhouse gas and halocarbon concentrations were reduced to year 1900 annual-mean global-mean estimates taken from **historical forcing** data sets Anthropogenic greenhouse gas contribution to flood risk in England and Wales in autumn 2000 [Pardeep Pall](#), [Tolu Aina](#), [Dáithí A. Stone](#), [Peter A. Stott](#), [Toru Nozawa](#), [Arno G. J. Hilberts](#), [Dag Lohmann](#) & [Myles R. Allen](#) *Nature* **volume470**, pages382–385 (17 February 2011)
- 41- Precisely dated polar ice cores have allowed examination of the 'bipolar see-saw' relationship of air temperatures between the hemispheres on millennial timescales, as well as of longer-term, glacial–interglacial climate change paced by variations in Earth's orbit — the Milankovitch **forcing** of ice ages Climate change: Another Antarctic rhythm [Koji Fujita](#) *Nature* **volume471**, pages45–46 (03 March 2011)

- 42- These findings point to the operation of fundamentally **different forcing and feedback mechanisms** than for the PETM, involving redistribution of carbon among Earth's readily exchangeable surface reservoirs rather than carbon exhumation from, and subsequent burial back into, the sedimentary reservoir. (...) The similarity of this period to the 41-kyr obliquity cycle suggests that the **forcing** for individual hyperthermal events had its origin at high latitudes. Eocene global warming events driven by ventilation of oceanic dissolved organic carbon [Philip F. Sexton, Richard D. Norris, Paul A. Wilson, Heiko Pälike, Thomas Westerhold, Ursula Röhl, Clara T. Bolton & Samantha Gibbs](#) *Nature* **volume471**, pages349–352 (17 March 2011)
- 43- Anthropogenic emissions affect global climate. In a paper published in *Atmospheric Chemistry and Physics*, Jones *et al.* add to understanding of this '**forcing**' of climate in a study of one of the factors involved — black carbon, or soot. Greenhouse gases, most prominently carbon dioxide, warm the planet by trapping infrared radiation. A less-recognized, but important, **climate forcing** is that caused by aerosols, small particles emitted during the combustion of fossil fuel and biofuel such as wood (...) The pattern of the forcing by anthropogenic aerosols thus reflects their main source regions. Jones *et al.* now identify the pattern of surface warming produced by anthropogenic black carbon in the observational record for the second half of the twentieth century. The analysis involved performing a set of climate-change simulations for the twentieth century, using a coupled atmosphere–ocean general circulation model and considering various combinations of **individual forcings** (greenhouse gases, aerosols including black carbon, ozone and land-use changes, as well as **natural forcings** such as volcanic emissions and changes in solar irradiation). The authors split the **temperature responses** as estimated using these simulations into four groups — temperature changes due to **natural forcings**; changes due to anthropogenic greenhouse gases; changes due to other anthropogenic factors (aerosols other than black carbon, ozone, and land-use alteration); and changes due to black carbon. The 'detection and attribution' method to identify a temperature signal due to a **specific forcing** was then applied to try to discern the corresponding simulated patterns of temperature change in the observational record. Focusing on the second half of the twentieth century (1950–99), Jones *et al.* find that **natural forcing** did not contribute significantly to the temperature trends, whereas all three groups of **anthropogenic forcings** did contribute significantly. This was previously known for the warming by greenhouse gases and the relative cooling by aerosols. But Jones *et al.* for the first time show that black carbon has warmed Earth by a statistically significant amount. (...) It is also noteworthy that **other anthropogenic climate forcings** had a much stronger impact on the global temperature — Jones *et al.* find a three to four times greater warming by greenhouse gases. Global warming: The soot factor [Johannes Quaas](#) *Nature* **volume471**, pages456–457 (24 March 2011)
- 44- Here we review human activities and natural processes that emit non-CO₂ GHGs, and explore the **time-dependent responses** of the warming influence (also called climate forcing or **radiative forcing**) of these chemicals to emissions reductions. Large cuts in anthropogenic emissions of both long- and short-lived GHGs could stabilize **climate forcing** fairly rapidly, though the exact impacts of such cuts are uncertain because of feedbacks between climate change and GHG emissions from natural processes. (...) Very short-lived substances (for example NO_x and tropospheric ozone, which have lifetimes of days to months) can still affect **climate forcing** on longer timescales through their influence on [OH[•]] and, therefore, CH₄ (ref. 22). (...) First, although HFCs are included in the Kyoto Protocol, their atmospheric burden and, consequently, their radiative **forcing** could increase substantially owing to their increased use as ODS replacements, particularly in developing countries (...) Recent atmospheric changes and inventory estimates indicate fairly small CO₂-eq emissions of these gases as compared with other LLGHGs ([Fig. 1](#)), although emissions for most are increasing, necessitating continued monitoring to ensure that their **climate forcings** remain small. (...) **Climate forcing** from non CO₂ gases. The direct **climate forcing** of a trace gas is proportional to its global concentration change since 1750 and how efficiently it absorbs available infrared radiation (its

radiative efficiency as watts per square metre per p.p.b.). By 2009, the increase since 1750 in long-lived, non-CO₂ GHGs contributed a direct **radiative forcing** of 1.0 W m⁻², or 57% of that from CO₂ (Fig. 3). The concurrent increase in CH₄ accounted for half of **this direct climate forcing** (0.5 W m⁻²), that in ODSs accounted for about a third (0.32 W m⁻²) and that in N₂O contributed most of the remainder (0.17 W m⁻²). **Smaller forcings** (<0.02 W m⁻²) stem from increases in HFCs, PFCs, SF₆ and NF₃ (Fig. 3). 0.159 W m⁻²) from mid 2004 to mid 2009; the increase in **direct radiative forcing** from the sum of all non-CO₂ GHGs was only 20% as large (Fig. 3). Increases in N₂O (0.012 W m⁻²), CH₄ (0.006 W m⁻²) and HFCs (0.006 W m⁻²) account for most of the change in **radiative forcing** attributable to non-CO₂ GHGs during this recent five-year period. Increases in **direct radiative forcing** from SF₆, PFCs and NF₃ were smaller (<0.001 W m⁻² each), and no net change was observed in **direct radiative forcing** from ODSs, as increases in HCFCs (0.008 W m⁻²) were offset by comparable decreases in CFCs during this same period. Some non-CO₂ GHGs also **influence climate indirectly**. For example, increased atmospheric CH₄ enhances stratospheric water vapour and tropospheric ozone, and also affects aerosols. Including these indirect influences augments **the present climate forcing** of CH₄ from 0.5 to 0.8–1.0 W m⁻² (refs 9, 22, 67). Human-derived, short-lived reactive nitrogen (for example NO_x) affects aerosol abundances, tropospheric ozone, global [OH[•]] and, therefore, atmospheric lifetimes of CH₄, HCFCs and HFCs. During the past century, enhanced OH[•] production from increases in anthropogenic NO_x may have offset increased OH[•] losses due to higher concentrations of carbon monoxide and CH₄ (ref. 59). Decreases in stratospheric ozone, mostly from enhanced abundances of ODSs, have **caused a climate forcing** of -0.05 ± 0.1 W m⁻² (ref. 9; uncertainty, 90% confidence interval). Including these indirect influences suggests a net climate forcing in 2009 from non-CO₂ GHGs that is 0.2–0.4 W m⁻² higher than when only direct influences are considered. Managing **climate forcing** with non-CO₂ gases. Without substantial mitigation efforts, emissions of non-CO₂ GHGs will probably increase as needs for energy and food increase globally and developing countries continue to modernize. An average projected increase of 50% for emissions of CH₄ and N₂O by 2050 (relative to 2000 values) and larger relative increases for HFCs correspond to the emission of an additional 10 Gt CO₂-eq yr⁻¹ by 2050. Decreases of 2 Gt CO₂ yr⁻¹ are expected for ODS emissions by 2050 with continued adherence to controls set by the Montreal protocol. Considered together, such emissions changes could cause direct **climate forcing** from all long-lived, non-CO₂ GHGs to reach 1.5 W m⁻² by 2050 (a 50% increase over their **direct radiative forcing** today). To what extent could reductions of non-CO₂ GHG emissions affect **climate forcing** during the next 50–yr? A 25% reduction in anthropogenic emissions, phased in during 2009–2020, illustrates the range of sensitivities GHG concentrations have to emission reductions owing to their different lifetimes. Reducing anthropogenic emissions of all non-CO₂ GHGs in this manner would cause **total radiative forcing from these gases** to peak during the next decade (Fig. 4). This turnover stems primarily from declines in CH₄ concentration and demonstrates how CH₄ emissions reductions could offset a portion of the increases in **radiative forcing** from longer-lived GHGs on fairly short timescales. Methane's large influence and rapid response stems from its relatively short lifetime (9 yr), its near balance of present total emissions and losses, and **its large contribution to present climate forcing**. This influence depends on the stability of atmospheric [OH[•]] (Fig. 3), although [OH[•]] is thought to be buffered against large changes; increases (or decreases) in both CH₄ and NO_x, for example, have offsetting influences on [OH[•]] (refs 21, 30, 59). By contrast, a 25% drop in emissions of N₂O or CO₂ only slightly slows **the increase in radiative forcing from each of these long-lived gases**, for which present total emissions substantially exceed losses (Fig. 4). Reversing **continued increases in radiative forcing** from all LLGHGs will require much larger emissions reductions. An 80% reduction in anthropogenic emissions of CO₂ is required just to stabilize **its direct radiative forcing** (Fig. 3). Such a large relative decrease is needed because CO₂ in today's atmosphere is long lived and because its present total emissions far outweigh losses. Provided that non-CO₂GHG emissions were also to remain constant, this 80% cut in CO₂emissions could eventually stabilize **climate forcing** from all LLGHGs (Fig. 3, line 'c'). By contrast with **the time response of CO₂**, an 80% reduction in emissions of all non-CO₂ GHGs by 2050 would cause **their radiative forcing** to decrease substantially, not just stabilize, mainly owing to **the rapid response** of CH₄ to emissions decreases. When combined with similar relative cuts in CO₂ emissions, **the direct radiative forcing** from the sum of all LLGHGs actually peaks and begins decreasing well before 2050 (Fig. 3, line 'd'). But a sustained stabilization of **climate forcing** cannot be achieved with cuts in only non-CO₂ GHGs (Fig. 3, line 'b'). A 50–80% cut in CO₂ emissions by 2050 (relative to 1990) has been discussed as a means to limit GHG abundance to <500 p.p.m. CO₂-eq and mean, global temperature increases to 2–2.4 °C above pre-industrial values. Such large cuts in CO₂ emissions would probably require substantial changes to future energy production. We considered

comparable reductions in non-CO₂ GHG emissions here primarily to demonstrate rough upper limits to and the timescales of **climate forcing** benefits associated with large cuts in their emissions. Although emissions of non-CO₂ GHGs could be reduced substantially with minimal net cost given present technologies (40% cuts in CH₄, 10–15% cuts in N₂O and 40% cuts in gases containing fluorine, relative to 2010 values), achieving larger cuts in emissions will depend on cost incentives (for example the price of carbon) and future technological advances. Multifaceted modelling analyses that consider abatement costs, mitigation potentials and their potential future evolution demonstrate that a multi-gas approach to stabilizing **radiative forcing** reduces the required initial cuts in CO₂ emissions and achieves stabilization of **climate forcing** at a substantially reduced cost relative to mitigating emissions of CO₂ alone. These illustrative examples demonstrate the implications of different LLGHG loss timescales for stabilizing and reducing **future radiative forcing**. But although large cuts in anthropogenic emissions of LLGHGs are clearly needed to stabilize or reduce **total direct climate forcing**, the exact reductions needed remain somewhat uncertain because natural fluxes of CO₂, CH₄ and N₂O, and a significant fraction of anthropogenic N₂O emissions, are **sensitive to climate**. Furthermore, some natural and anthropogenic emissions of N₂O and CH₄ could increase in response to increasing atmospheric concentrations of CO₂, although **the magnitude of this sensitivity** is uncertain. (...) The considerations described in this Review highlight a number of important principles and scientific needs for **managing future climate forcing**. First, because non-CO₂ GHGs at present account for about one-third of total CO₂-eq emissions and 35–45% of **total climate forcing** from all LLGHGs (range represents direct forcing to **the sum of direct and indirect forcing**), cuts in their emissions could substantially lessen **future climate forcing**. Ancillary benefits to mitigating non-CO₂ GHG emissions include reduced costs for climate mitigation relative to CO₂-only approaches, improvements in air and water quality, reduced acid deposition and decreased eutrophication of aquatic ecosystems. Second, cuts in emissions of the shorter-lived, non-CO₂ GHGs, primarily CH₄, could cause a rapid decrease in **the radiative forcing** attributable to these gases. **Such a quick response** is not possible from cuts in emissions of CO₂ alone. Reducing **peak climate forcing** and minimizing the time during which it is enhanced could lessen the possibility that the climate irreversibly crosses a tipping point into a new state. Although not explicitly considered here owing to their very short lifetimes (<1 yr), other atmospheric constituents such as tropospheric ozone, aerosols and black carbon also affect climate. Efforts to reduce their abundances can lead to significant cooling or warming on even shorter timescales than can cuts in CH₄ emissions, although both long- and short-lived GHGs influence climate for longer periods than suggested by their lifetimes, owing to time lags associated with heat exchange between the ocean and the atmosphere. Third, the potential benefits of cuts in non-CO₂ GHG emissions have limits. If, for example, anthropogenic emissions of all non-CO₂ GHGs considered here had been reduced to zero in 2010 and in subsequent years, the decline in **direct radiative forcing** between 2010 and 2050 would not be sufficient to completely offset continued CO₂ increases at present rates (1 W m⁻² per 40 yr). Because of these limits, the sustained stabilization of **future climate forcing** from LLGHGs is only possible with substantial decreases in emissions of CO₂. Fourth, **the stabilization of climate forcing** will be managed more effectively with scientific advances that enhance our understanding of the **sensitivities** of natural GHG fluxes to climate change and that improve our ability to quantify both natural and anthropogenic GHG fluxes. With such advances, the overall effectiveness of mitigation efforts could be assessed and optimized over time. Improved scientific capabilities could also increase our ability to reduce GHG emissions and may provide a better understanding of the precise cuts in anthropogenic emissions needed to **stabilize climate forcing** during this century. The principles outlined above suggest that a research agenda for managing **future radiative forcing** would include additional process-based studies to elucidate better the mechanisms, **sensitivities** and linkages likely to affect future non-CO₂ GHG emissions and improve methods of deriving inventory-based emission estimates that form the basis for treaty compliance, carbon-based trading markets and the initialization of top-down estimation techniques. (...) Lifetimes of GHGs are similarly varied, and managing emissions reductions in consideration of these timescales could provide **a sustained stabilization of climate forcing** earlier and at lower peak values than might otherwise be achieved. Non-CO₂ greenhouse gases and climate change [S. A. Montzka, E. J. Dlugokencky & J. H. Butler](#) *Nature* volume 476, pages 43–50 (04 August 2011)

- 45- The identification of orbital frequencies in the marine $^{18}\text{O}/^{16}\text{O}$ record, a proxy for global ice volume, in the 1970s demonstrated that glacial cycles are **ultimately paced by astronomical forcing** (...) Moreover, models have generally used **prescribed forcings** to simulate snapshots in time and thus by design do not distinguish the timing of changes in **various forcings relative to responses**. (...) Although spatial and temporal asymmetries in albedo could convert insolation to **a non-zero forcing at Earth's surface**, it is unlikely to account for much of the step-like structure and global nature of the temperature stack. Similarly, although ice-sheet extent and its associated albedo (from ice cover and emergent continental shelves) and **orographic forcing** decreased through the deglaciation, global ice volume and area changed only slowly or not at all during intervals of pronounced global warming such as the Oldest Dryas and Younger Dryas, and the greatest volume or area loss in fact occurred during intervals of little or no warming around 19 kyr ago and the Bølling–Allerød ([Fig. 3a, b](#)). This distinction is particularly notable during the early Holocene, when the temperature stack had reached interglacial levels while nearly one-third of the excess global ice still remained, although we note that any ice-driven warming would have been partly offset by **decreasing greenhouse gas forcing** ([Fig. 3c](#) and [Supplementary Fig. 29a](#)). The apparently **small influence of ice-sheet forcing** on the temperature stack is consistent with general circulation models that suggest its effect was largely confined to the northern mid to high latitudes and was otherwise modest in the areas sampled by our proxy network, which is biased away from the ice sheets. Our results, therefore, do not preclude an important contribution to global mean warming from ice-sheet retreat, but suggest that much of this warming was spatially restricted and may be inherently under-represented owing to the lack of suitable palaeotemperature records from and proximal to areas formerly covered by ice. Unlike **these regional-scale forcings**, methane, nitrous oxide and possibly dust are global in nature. Because **greenhouse gas forcing** was dominated by CO_2 (ref. 19; [Supplementary Fig. 29a](#)), and because at the onsets of the Bølling–Allerød, Younger Dryas and Holocene the methane and nitrous oxide records have small step changes like those of the global temperature stack, including these greenhouse gases leaves the correlation with the stack essentially unchanged ($r^2 = 0.93$) and slightly decreases the temperature lag (250 ± 340 yr) ([Supplementary Fig. 29](#)). **Global dust forcing** is poorly constrained, however, and we cannot dismiss it as a potentially important driver of global temperature independent of greenhouse warming. **Vegetation forcing** is likewise difficult to assess and may have significantly contributed to global warming. (...) All other **forcing factors** for the second and third simulations, which run from 17 to 7 kyr ago, are held constant at their values at 17 kyr ago. All three simulations include dynamic vegetation feedback and **a fixed annual cycle of aerosol forcing**. (...) The ALL model stack is also similar to the CO_2 model stack in shape and amplitude ($r^2 = 0.98$; [Fig. 3e](#)). Because the CO_2 model stack reflects **a response to only greenhouse gas forcing**, its similarity to the ALL stack suggests that greenhouse gases can explain most of the mean warming at these 80 sites. The ORB model stack, by contrast, shows only minor warming, consistent with **a modest role for orbital forcing in directly driving global temperature changes**. (...) These results suggest that ocean circulation changes driven primarily by freshwater flux, rather than by **direct forcing from greenhouse gases or orbits**, are plausible causes of the hemispheric differences in temperature change seen in the proxy records. (...) A possible forcing model to explain this sequence of events starts with rising boreal summer insolation driving northern warming. This leads to the observed retreat of Northern Hemisphere ice sheets and the increase in sea level commencing 19 kyr ago ([Fig. 3a, b](#)), with **the attendant freshwater forcing causing a reduction in the AMOC that warms the Southern Hemisphere** through the bipolar seesaw (...) Model **freshwater forcing** Whereas the **forcing** from insolation, greenhouse gases and ice sheets during the deglaciation are fairly well constrained, **freshwater forcing** is comparatively uncertain. Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation [Jeremy D. Shakun](#), Peter U. Clark, [Feng He](#), [Shaun A. Marcott](#), [Alan C. Mix](#), [Zhengyu Liu](#), [Bette Otto-Bliesner](#), [Andreas Schmittner](#) & [Edouard Bard](#) *Nature* **volume 484**, pages 49–54 (05 April 2012)
- 46- Thus, it has been thought that if human agency has played a part in the demise of Antarctic Peninsula ice shelves, it has primarily been through our destruction of stratospheric ozone rather than through **the increased radiative forcing from greenhouse gases in the troposphere**. (...) A pivotal influence on Antarctic Peninsula climate, in addition to **the effects of greenhouse-gas forcing and ozone changes**, are the atmospheric-circulation anomalies that result from climate changes elsewhere, particularly in the tropical Pacific. How such anomalies will evolve in the

future is highly uncertain. Nevertheless, the unusual temperature increase over the past century suggests that **relatively modest radiative forcing** from the global increase in greenhouse gases has had a significant effect on the Antarctic Peninsula. Climate change: Brief but warm Antarctic summer [Eric J. Steig Nature volume489](#), pages39–40 (06 September 2012)

- 47- It has not been clear how to reconcile these two findings. Here we show in climate model simulations that the tropical Pacific sea-surface-temperature gradient increases when the warming is due to **increased solar radiation and decreases when it is due to increased greenhouse-gas forcing**. (...) Will the greenhouse-warming-induced precipitation change be different from that **induced by natural forcing**? (...) Here we examine differences over the last millennium between global precipitation changes due to natural changes in the **solar–volcanic forcing**, that is, the sum of the radiative effects of variations in solar irradiance and volcanic aerosols, and precipitation changes **resulting from greenhouse-gas forcing**. (...) Because it is difficult to extract an unambiguous pattern for **the response to greenhouse gases** from a simulation that ends in the twentieth century and that also includes **solar forcing**, we turn to results from a simulation with the same ECHO-G model of the twenty-first century forced by the A1B scenario of greenhouse-gas increases and from a simulation **forced** by observed greenhouse gases only from 1860–2000 ([Supplementary Information](#)). (...) [Figure 2](#) also shows that in two runs with the same model **forced** only by greenhouse gases (Methods), the ratio is close to but less than that for the industrial period and is again distinct from that in the pre-industrial period when the **only significant forcing is solar**. (...) To focus on **the forced response**, we first removed the leading internal mode component from the millennium run (Methods and [Supplementary Figs 3 and 4](#)) and then applied a maximum covariance analysis (that is, a singular value decomposition) to the precipitation and SST fields for the period AD1000–1850, when the only appreciable **forcing is solar–volcanic**. The leading coupled spatial patterns of SST and precipitation ([Fig. 3b](#)) are markedly similar to the strong gradient patterns of the solar–volcanic mode ([Fig. 3a](#)); spatial correlation coefficients are 0.98 and 0.92 for the SST and precipitation fields, respectively. The time expansion coefficients of the precipitation and SST ([Supplementary Fig. 5](#)) show a prominent centennial–millennial fluctuation, with a substantial dry and cold epoch during the Little Ice Age (AD 1450–1850), when **radiance at the surface due to solar–volcanic forcing is low**, and a wet and warm epoch occurring in the Medieval Warm Period (AD 1000–1250), when radiance is high. (...) With **increased solar–volcanic forcing** the rainfall increases over the climatological ‘wet’ regions, resulting in an overall increase in global mean precipitation ([Fig. 3](#)). **To estimate the response induced by greenhouse-gas forcing**, we examined **two greenhouse-gas-only forcing runs**, one for the industrial period (AD 1860–2000) with **observed greenhouse-gas concentration as the only forcing**, and the other for AD 1990–2100, **forced** by the A1B scenario of increased greenhouse gases ([Supplementary Fig. 6](#)). The resultant trend patterns of SST and precipitation for the two runs are similar except that the A1B run has substantially larger amplitudes than the industrial run, **owing to stronger greenhouse-gas forcing**. [Figure 4a](#) shows the greenhouse-gas mode estimated from the ECHO-G A1B run, which is similar to the Coupled Model Intercomparison Project Phase 5 (CMIP5) multi-model mean projection ([Fig. 4b](#)), showing that this pattern in **response to greenhouse-gas forcing** is common among models. In contrast to the strong zonal SST gradient **forced** by solar warming, this **greenhouse-gas forced mode** shows a reduced equatorial Pacific zonal SST gradient. (...) We found that, consistent with the earlier argument for less precipitation with **greenhouse-gas forcing than with solar–volcanic forcing**, the increase in atmospheric static stability is noticeably greater with **greenhouse-gas forcing** ([Supplementary Fig. 7](#)). The increased atmospheric stability favours a weaker zonal circulation and the accompanying weaker SST gradient characterizing the greenhouse-gas mode. We suggest that although the thermostat and associated stronger gradient pattern dominated in the past when the external warming was solar–volcanic, the weaker gradient pattern associated with **greenhouse-gas forcing will dominate future change**. (...) Two millennial simulations and two greenhouse-gas-only forcing runs with the ECHO-G coupled climate model were analysed: (1) a 1,000-year control (free) simulation generated using fixed **annually cycling forcing set** at present-day values (...) The climate modelling community, on the other hand, has spent years improving its understanding of **the geophysical response of the Earth system** to emissions of greenhouse gases. **This geophysical response** remains a key uncertainty in

the cost of mitigation scenarios but has been integrated with assessments of other uncertainties in only a rudimentary manner, that is, for equilibrium conditions (...). To gain insight into how assumptions regarding technological and social uncertainties influence our cost distribution, we create **a large set of sensitivity cases** ([Table 1](#)), in which we vary some salient features of the scenarios, namely the availability and use of specific mitigation technologies; future social development and, by extension, global energy demand; and the international political context surrounding climate mitigation action, specifically delays in the implementation of **a globally comprehensive mitigation response**. Divergent global precipitation changes induced by **natural versus anthropogenic forcing** [Jian Liu, Bin Wang, Mark A. Cane, So-Young Yim & June-Yi Lee](#) *Nature* volume493, pages656–659 (31 January 2013)

- 48- Emergent constraints of this type make use of the often bewildering spread among Earth-system model projections to reduce uncertainties in **the sensitivities of the real Earth system to anthropogenic forcing**. (...) The IAV constraint also gives strong confirmation that tropical land carbon **is vulnerable to warming caused by non-CO₂ forcing factors** (...) All ensemble members were driven by the SRES A1B emissions scenarios, including **changes in non-CO₂ forcing factors** (most notably changes in anthropogenic sulphate aerosols) Sensitivity of tropical carbon to climate change constrained by carbon dioxide variability [Peter M. Cox, David Pearson, Ben B. Booth](#), Pierre Friedlingstein, [Chris Huntingford, Chris D. Jones & Catherine M. Luke](#) *Nature* volume494, pages341–344 (21 February 2013)
- 49- However, the mass loss from increasing surface melt will be dominant over the GIS. For Antarctica, although the SMB is projected to increase, there remain major uncertainties **concerning the response of the marine ice sheets and ice shelves to ocean forcing**. (...) Higher-order ice flow modelling of observed retreat of GIS glaciers over the past decade and subsequent upscaling (extrapolation of these model results to the whole GIS) leads to a minimum additional SLR of 6 ± 2 mm by 2100, with an upper bound of 45 mm when recurring forcing is applied, while **similar upscaling of realistic atmospheric and oceanic forcing** of four GIS glaciers with a calving model leads to a maximum dynamic contribution of 40–85 mm by 2100 (...) So far, a continental-scale Antarctic ice-sheet model assessment taking into account those fundamental processes is lacking, although one assessment—based on a wide variety of model complexities—does report **large inter-model variability in response to ocean forcing** Ice-sheet mass balance and climate change [Edward Hanna, Francisco J. Navarro, Frank Pattyn, Catia M. Domingues, Xavier Fettweis, Erik R. Ivins, Robert J. Nicholls, Catherine Ritz, Ben Smith, Slawek Tulaczyk, Pippa L. Whitehouse & H. Jay Zwally](#) *Nature* volume498, pages51–59 (06 June 2013)
- 50- Thinning has also been reported along the margin of the much larger East Antarctic ice sheet, but whether glaciers are advancing or retreating there is largely unknown, and there has been no attempt to place such changes in the context of localized mass loss or **climatic or oceanic forcing**. (...) We conclude that parts of the world’s largest ice sheet **may be more vulnerable to external forcing** than recognized previously. (...) This region represents about a third of the EAIS margin and was selected because it encompasses two regions of mass loss (Wilkes Land and northern Victoria Land); because large parts are grounded below sea level, which **may enhance its vulnerability to oceanic forcing**; and because the absence of large ice shelves makes individual glacier termini readily identifiable. (...) Several large glaciers (for example those >15 km wide) experienced major calving events that caused retreats of tens of kilometres followed by re-advance, indicating **cyclic behaviour potentially unrelated to external forcing** ([Supplementary Figs 2 and 3](#)). (...) Thus, there is a regional difference between Pacific-facing glaciers, which generally lie along the Antarctic circle ($66^\circ 33' S$), and those farther south that face the Ross Sea ([Fig. 1](#)), suggesting a potential link **to climate forcing**. (...) Although it is appealing to invoke this

relationship between terminus change and air temperatures, it is unlikely that air temperature is **the only or most important forcing**. Rapid, climate-driven changes in outlet glaciers on the Pacific coast of East Antarctica [B. W. J. Miles, C. R. Stokes, A. Vieli & N. J. Cox Nature volume500](#), pages563–566 (29 August 2013)

- 51- Despite the continued increase in atmospheric greenhouse gas concentrations, the annual-mean global temperature has not risen in the twenty-first century, challenging the prevailing view **that anthropogenic forcing causes climate warming**. (...) We present a novel method of uncovering mechanisms for global temperature change by prescribing, in addition **to radiative forcing**, the observed history of sea surface temperature over the central to eastern tropical Pacific in a climate model. (...) Two schools of thought exist regarding the cause of this hiatus in global warming: one suggests **a slowdown in radiative forcing** due to the stratospheric water vapour, the rapid increase of stratospheric and tropospheric aerosols, and the solar minimum around 2009 (ref. [5](#)) (...) Here we used an advanced climate model that takes **radiative forcing and tropical Pacific sea surface temperature (SST)** as inputs. (...) In POGA-H, **the radiative forcing** is identical to HIST, and in the POGA control experiment (POGA-C) it is fixed at the 1990 value. Outside the equatorial eastern Pacific, the atmosphere and ocean are fully coupled and free to evolve. [Figure 1](#) compares the observed and simulated global near-surface temperature. In HIST, **the annual-mean temperature keeps rising in response to the increased radiative forcing**, with expanding departures from observations for the recent decade ([Fig. 1a](#)). (...) POGA-C illustrates the tropical control of the global temperature with **constant radiative forcing**, with the global-mean temperature closely following tropical Pacific variability ([Fig. 1b](#)). (...) For the recent decade, the decrease in tropical Pacific SST has lowered the global temperature by about 0.15 °C compared to the 1990s ([Fig. 1b](#)), opposing **the radiative forcing effect** and causing the hiatus. (...) Our results show that the two-parameter (**radiative forcing and tropical Pacific SST**) system is remarkably good at reproducing the observed global-mean temperature record, better than the HIST results with **radiative forcing** alone. (...) The tropical influence on the Northern Hemisphere extratropics is weak during the summer, allowing **the radiative forcing to continue the warming trend** during the recent decade ([Extended Data Fig. 4b](#)). (...) The model fails to simulate the SAT and sea-level pressure (SLP) changes over Eurasia, suggesting that they are due to internal variability **unrelated to tropical forcing** ([Extended Data Fig. 5a and c](#)). In summer, the broad agreement between simulated and observed SST remains over the Pacific ([Fig. 3a, b](#)) but the tropical influence on SAT over extratropical Eurasia and Arctic is weak ([Extended Data Fig. 5b](#)), and **the increasing radiative forcing permits heatwaves to develop** in Northern Hemisphere continents and Arctic sea ice to melt. (...) In boreal summer, in contrast, the Northern Hemisphere extratropics is largely **shielded from the influence of the tropics, and the temperature continues to rise in response to the increased radiative forcing**. (...) **The forcing includes greenhouse gases, aerosols, ozone, the solar activity cycle** (repeating the cycle for 1996–2008 after 2009) **and land use**. Recent global-warming hiatus tied to equatorial Pacific surface cooling [Yu Kosaka & Shang-Ping Xie Nature volume501](#), pages403–407 (19 September 2013)
- 52- A common explanation for DO cycles involves changes in the Atlantic meridional overturning circulation (AMOC), perhaps **triggered by freshwater forcing** (...) However, the ice sheets in our study are prescribed according to the Last Glacial Maximum configuration and are thus decoupled from changes in **external forcing and the internal atmosphere–ocean system**. Further studies with similar climate models, preferably including dynamic **interactive** ice sheet components, should be able to test whether rapid changes in glacial climate can be triggered by variability in ice sheets related to **internal feedbacks** within atmosphere–ocean–cryosphere systems and to **weak external forcing** (...) All other model parameters and **forcing** are identical to LGMctl, and the area out of the NHISs is fixed to the LGM orography. (...) A number of problems exist with regard to using **freshwater forcing alone to explain the recorded abrupt climate shifts** during the glacial period. Listed below are some of these controversies. (...) However, given evidence for the existence of IRD data during some DO

cycles, it remains important to investigate **the role of freshwater forcing** on the millennial-scale climate variability during glacial times. We therefore also perform four sensitivity experiments by imposing a relatively weak (0.02 Sv) **freshwater/saltwater forcing** over the northern North Atlantic (50–65° N, 5°–30° W), testing whether the lower limit of estimated release of freshwater during Heinrich events **can trigger significant changes** in the glacial ocean circulation, under varying intermediate NHIS heights ([Extended Data Table 1](#)). (...) This will help to improve our understanding of the role of **freshwater forcing** on millennial-scale variability during the glacial period. Abrupt glacial climate shifts controlled by ice sheet changes [Xu Zhang, Gerrit Lohmann, Gregor Knorr & Conor Purcell](#) *Nature* **volume512**, pages290–294 (21 August 2014)

- 53- Here we show that market-driven increases in global supplies of unconventional natural gas do not discernibly reduce the trajectory of greenhouse gas emissions or **climate forcing**. (...) The impact on CO₂ emissions, however, is found to be much smaller (from –2 per cent to +11 per cent), and a majority of the models reported **a small increase in climate forcing** (from –0.3 per cent to +7 per cent) associated with the increased use of abundant gas. (...) These IAMs belong to a class of models designed to assess the implications of changes in the global energy system on **climate forcing**. (...) The capability to simulate the effects of price changes on the scale and the composition of the future energy system is crucial for this study, because these effects determine the **changes in emissions and corresponding changes in climate forcing**. (...) The emissions data from the models were processed through a simple climate model, MAGICC6 (Model for the Assessment of Greenhouse-Gas Induced Climate Change), to assess the **combined effects of all greenhouse gases and climate forcing agents** (see Methods). The results echoed those that were observed for CO₂ emissions: **climate forcing and associated temperature change** are not discernibly reduced under the Abundant Gas scenario ([Fig. 2c, d](#) and [Fig. 3b, c](#)). Four models that endogenously model fugitive methane emissions reported **increased climate forcing with abundant gas**. This is largely driven by **increased forcing** from fugitive methane emissions associated with increases in gas consumption. The WITCH model, with exogenously specified methane emissions, reported virtually **no change in forcing** (–0.3%). Furthermore, four models reported the net change in **forcing** to be less than 3%. REMIND reported **radiative forcing increase** of 7%; more than half of that increase came from reductions in coal use and associated aerosol emissions (reduced cooling). Two other models that also simulate aerosol emissions endogenously (GCAM and MESSAGE), also reported a reduced cooling effect from aerosols, but at a smaller scale. The core finding of this research is that increases in unconventional gas supply in the energy market could substantially change the global energy system over the decades ahead without producing **commensurate changes in emissions or climate forcing**. (...) Extending the analysis to oil as well as gas production would not be expected to lower future CO₂ emissions or **climate forcing** because the carbon-to-energy ratio for oil is approximately 35% higher than that of natural gas. (...) We then **recalculated climate forcing** and found that the effect of abundant gas is to **increase climate forcing** by 0.2% to 12% in 2050, which is 0.5% to 5% higher than in our central scenario ([Extended Data Fig. 1](#)). In other words, the finding that abundant gas does not discernibly reduce **climate forcing** is consistently reported over a wide range of fugitive methane rates found in the literature. Furthermore, under high fugitive emission assumption, three models reported increased **climate forcing** of more than 5%. (...) In all cases considered, we found that more abundant natural gas could substantially change the global energy system over the decades ahead without producing commensurate changes in emissions or **climate forcing**. GCAM reported +13% to +82% additional natural gas consumption in 2050, while the change in CO₂ emissions is found to be in the –0.9% to –2.0% range and the change in **radiative forcing** is found to be in the +0.3% to +1.1% range. MESSAGE reported +56% to +170% additional natural gas consumption in 2050, while its change in CO₂ emissions is found to be in the –1.0% to +0.6% range and its change in **radiative forcing** is found to be in the +0.7% to +3.4% range. (...) Once we consider the combined effect of all greenhouse gases, the two models consistently agree on the direction of the change: the lower the natural gas production cost, **the higher the total radiative forcing and associated temperature change**. Our main finding that increased use of abundant gas does not produce **a discernible reduction effect on climate forcing** is found to be consistent across the range of cost reduction sensitivities. (...) From the two simulations that differ only in terms of natural gas supply, we report the differences in the output variables, such as energy system composition, emissions, and **climate forcing**. (...) However, it is also possible to

imagine a policy architecture in which a normative policy protects low-carbon energy sources, thus **effectively forcing additional natural gas** to exclusively substitute coal. (...) To test our results' sensitivity to high fugitive methane rates, we select the upper bound of fugitive methane estimates (7.9%) found in the literature and re-estimate **the climate forcing**. (...) With the high fugitive methane assumptions, the abundant gas increases **the total anthropogenic radiative forcing** by 0.2% to 12% in 2050, which is 0.5% to 5% points higher than under the standard assumptions. (...) The five models employed in this study are well equipped to assess **the impact of abundant natural gas on climate forcing**. Each contains a state-of-the-art energy–economy systems model coupled to a simple climate model. Each of the five models represents energy and economic systems differently. Below, we provide a general description of the strengths and limitations the five models bring to the issue of assessing **the impact of abundant natural gas on climate forcing**. This is followed by more detailed descriptions of the five models. The IAMs of energy–economy–climate systems employed in this study bring a number of strengths to the issue of **the global long-term climate forcing implications of abundant natural gas**. (...) As such, the models do not span the full range of all possible methods that could potentially be employed to assess **the impact of more abundant natural gas for climate forcing**. (...) Future research could employ a broader suite of modelling methods to shed further light on the implications of abundant natural gas for **climate forcing**, and examine whether other modelling approaches would yield a qualitatively different result. (...) The energy policy environment exerts a strong influence on energy production and use and thereby on **climate forcing**. Our default assumption is that no new policies and measures are introduced after the calibration period. Alternative assumptions can produce different results for energy, for the economy and for **climate forcing**. We tested one energy policy that can potentially change the results. We found that exogenously specifying the quantity of low-carbon energy sources and **forcing natural gas** to substitute exclusively for coal results in emissions being reduced in the models. (...) In this latter case we found that under a global low-carbon energy protection policy, the availability of more abundant gas can reduce **climate forcing**. We also explored the sensitivity of our results to the rates of fugitive methane emissions and found that with high fugitive methane emission rates, more abundant gas can **discernibly increase climate forcing**. (...) However, the models all agree on the most potent conclusion: increased supply of abundant gas does not discernibly **reduce either CO₂ emissions or climate forcing**. Some models report **a discernible increase in emissions or climate forcing**, and others report negligible change. But none of the models report more than a 2% **reduction in emissions or climate forcing**. (...) The projections of **radiative forcing agents** other than Kyoto gases are selected from emission scenarios in MAGICC according to modelling criteria, assumptions and applications. (...) Throughout the analysis we use MAGICC6 for simulating **radiative forcing and temperature change**. (...) The coverage of **greenhouses gases and other forcing agents** differs widely across five models. **The range of forcing agents** covered by each model is available in [Supplementary Tables 2, 4, 6, 8, and 10](#). (...) For the **minor forcing agents** that the models do not endogenously simulate, we have used exogenous emissions trajectories from the RCP8.5 scenario because it best approximates our baseline scenario. **Forcing the secondary effect of emissions**, such as **indirect cloud formation or atmospheric chemistry feedback** from non-methane hydrocarbons and other reactive gases, is modelled natively in MAGICC Limited impact on decadal-scale climate change from increased use of natural gas [Haewon McJeon, Jae Edmonds, Nico Bauer, Leon Clarke, Brian Fisher, Brian P. Flannery, Jérôme Hilaire, Volker Krey, Giacomo Marangoni, Raymond Mi, Keywan Riahi, Holger Rogner & Massimo Tavoni Nature volume514, pages482–485 \(23 October 2014\)](#)

54- This module can be used to project the effects of greenhouse gas emissions on: atmospheric concentrations of greenhouse gas, **radiative forcing**, and average global temperature rises. The geographical distribution of fossil fuels unused when limiting global warming to 2 °C [Christophe McGlade & Paul Ekins Nature volume517, pages187–190 \(08 January 2015\)](#)

55- Additionally, the poleward shift of subtropical anticyclones also tends to weaken upwelling-favourable winds at low latitudes. Describing how such regional processes **interact with global greenhouse forcing** will be critical to further resolve the dynamics of upwelling in a warming climate. (...)

Determining the relative contribution of these two processes to the overall patterns of upwelling will be an important next step for understanding how **climate forcing influences** both onshore and offshore oceanographic processes. Intensification and spatial homogenization of coastal upwelling under climate change [Daiwei Wang, Tarik C. Gouhier, Bruce A. Menge & Auroop R. Ganguly](#) *Nature* **volume518**, pages390–394 (19 February 2015)

- 56- We repeat the stacking procedure for the WDC sea-salt sodium record ([Extended Data Fig. 7](#)), and find that this tracer, which has been interpreted as a proxy for sea-ice production, changes almost synchronously with WDC $\delta^{18}\text{O}$ —possibly reflecting **a common forcing by Southern Ocean temperatures**. (...) This is consistent with several proposed DO mechanisms, such as North Atlantic sea-ice dynamics, **freshwater forcing** or ice shelf collapse (...) The synchronicity of WDC ssNa and $\delta^{18}\text{O}$ variations suggests that Antarctic climate and sea-ice extent are closely linked on centennial, or perhaps even sub-centennial timescales. This may reflect **a common forcing and/or a feedback** between Southern Ocean surface temperatures and sea-ice extent. The sea-ice extent may furthermore be important **in forcing Antarctic temperatures** (and $\delta^{18}\text{O}$), particularly at the WAIS Divide site, where the marine influence is stronger than on the East Antarctic plateau. Precise inter-polar phasing of abrupt climate change during the last ice age [WAIS Divide Project Members](#) *Nature* **volume520**, pages661–665 (30 April 2015)
- 57- Writing in *Global Biogeochemical Cycles*, Randerson *et al.* report that this idea needs to be revisited and refined: in the long term, the ocean will have a larger role than land in climate–carbon coupling. The authors combined results from long-term simulations using an Earth-system model — specifically the Community Earth System Model (CESM)— with an established analysis of feedbacks in the carbon–climate system. They ran the model up to the year 2300 using contrasting set-ups in which the **greenhouse-gas forcing of CO_2 was turned on or off**. They report that the ocean **carbon–climate feedback** (measured as the difference in the amount of carbon cumulatively taken up by the ocean for the set-up that accounts for **forcing from all the main anthropogenic emissions, including CO_2 , and for the set-up that omits such forcing**) is 3% for 1999 and increases to a staggering 23% by 2300. (...) More work is needed to address changes in the extent of wetlands and peatlands in model projections, and to better quantify emissions of methane, nitrous oxide and organic compounds from the land biosphere, because **these changes and emissions all contribute to climate forcing** Global warming: Growing feedback from ocean carbon to climate [Fortunat Joos](#) *Nature* **volume522**, pages295–296 (18 June 2015)
- 58- All three models captured the declining S_T after their calibration at each site and their integration with observed **climate forcing**, irrespective of species ([Fig. 3](#)). (...) We also applied another **climate forcing data set** (CRU-NCEP v5, with spatial resolution of 0.5° and temporal resolution of 6 h, ()), and returned very similar results ([Extended Data Fig. 5c](#)). Declining global warming effects on the phenology of spring leaf unfolding [Yongshuo H. Fu, Hongfang Zhao, Shilong Piao, Marc Peaucelle, Shushi Peng, Guiyun Zhou, Philippe Ciais, Mengtian Huang, Annette Menzel, Josep Peñuelas, Yang Song, Yann Vitasse, Zhenzhong Zeng & Ivan A. Janssens](#) *Nature* **volume526**, pages104–107 (01 October 2015)
- 59- The relative strengths of these different drivers can be compared through a metric known as **radiative forcing**, which quantifies the impact of each process on Earth's energy budget. Li *et al.* used a model that couples biogeochemistry and climate to estimate China's contribution to **global radiative forcing** over the period 1980–2010. Crucially, they account for almost all anthropogenic drivers of climate change. They find that China's relative contribution to **global radiative forcing** from carbon dioxide emissions associated with fossil-fuel use increased almost threefold in these 30

years. This is to be expected, given the surge in China's economy over this period. More surprisingly, they find that China's relative contribution to **total global radiative forcing** has remained at 10% over this time. To understand the reasons behind this remarkable result, Li and colleagues made a detailed analysis of the different drivers of **radiative forcing**. They found that the air pollutants that cause China's notorious pollution haze have had complex effects on climate, counteracting some of the increase in **radiative forcing from greenhouse gases**. Some components of air pollution, such as black-carbon particles, absorb sunlight and warm Earth's climate. By contrast, sulfate particles scatter light, resulting in climate cooling. Over the past few decades, China's relative contribution to **global radiative forcing from sulfate has increased dramatically**. This is because Chinese sulfate emissions soared at the same time that Europe and the United States instigated controls that slashed their sulfate emissions. It has long been known that some air pollutants cool the climate; what is remarkable in the present study is that the concurrent changes in different emissions have led to a stable overall contribution of China to **global radiative forcing** (Fig. 1). (...) Li *et al.* find that the current composition of Chinese air pollution **causes almost no net radiative forcing** — the cooling effects of sulfate aerosols balance the warming impacts of black-carbon emissions. (...) They find that China's relative contribution to **radiative forcing from these greenhouse gases** has remained remarkably constant over this much longer period as well.

Global warming: China's contribution to climate change [Dominick V. Spracklen](#) *Nature* **volume531**, pages310–312 (17 March 2016)

- 60- Provided the latitudinal dependency of sea surface temperature change for **a given climate forcing** in the Eocene was similar to that of the late Quaternary period, this CO₂ decline was sufficient to drive the well documented high- and low-latitude cooling that occurred through the Eocene (...) Using our new CO₂ record, the possible role of CO₂ in driving Eocene cooling can be quantitatively examined. **The relative change in climate forcing attributable to CO₂ change** through the Eocene can be estimated (...). The **CO₂ forcing** based on our reconstructions for the Eocene is well correlated with the contemporaneous proxy-derived sea surface cooling, albeit with considerably larger cooling at high latitudes (Fig 4a, Extended Data Fig. 5a, $R^2 = 0.8$ at low latitudes and 0.9 at high latitudes). The apparent latitudinal dependency of SST change for a given change in **radiative forcing** has recently been determined for the last 520,000 years (that is, 520 kyr; ref. 13), using CO₂, ice-sheet albedo (which are **slow feedbacks**), **dust and mean annual insolation as forcing terms**. Assuming that this latitudinal dependency for **a given forcing** (Fig. 4b and Methods) is also appropriate for the Eocene, we can calculate the expected SST change as a result of **the climate forcing** (...) Our CO₂ reconstructions also allow us to examine **the sensitivity of the Earth's temperature to changes in radiative forcing**. (...) Equation (1), replacing C_{ECCO} with pre-industrial CO₂ (278 p.p.m.) because we are interested in **forcing change relative to the pre-industrial period** (Fig. 4e, Extended Data Fig. 5e); and 3.87 is the **climate forcing of a CO₂ doubling** (in units of W m^{-2}), calculated using Equation (1). (...) However, if other **climate feedbacks** were important that we have not accounted for in our correction of **the 'slow' feedbacks, or if the forcing is not due to CO₂ alone**, then the calculated ECS value would be different from that reported by the IPCC. (...) **Climate forcing** compared to the early Eocene timeslice at 53.2 Myr ago is calculated from equation (1) for our two CO₂ scenarios. (...) We use the ratio of high- or low-latitude SST **sensitivity and forcing** for each timeslice to calculate the SST change expected as a result of **our reconstructed CO₂ forcing**. (...) To test the importance of CO₂ to early and late Eocene warmth, we calculated **the sensitivity of the Earth system to radiative forcing**, the ECS. Changing atmospheric CO₂ concentration was the primary driver of early Cenozoic climate [Eleni Anagnostou, Eleanor H. John, Kirsty M. Edgar, Gavin L. Foster, Andy Ridgwell, Gordon N. Inglis, Richard D. Pancost, Daniel J. Lunt & Paul N. Pearson](#) *Nature* **volume533**, pages380–384 (19 May 2016)
- 61- Here we show that several independent, empirically corrected satellite records exhibit large-scale patterns of cloud change between the 1980s and the 2000s that are similar to those produced by model simulations of climate with **recent historical external radiative forcing**. (...) Are the

observed cloud changes solely a manifestation of natural internal variability or are they also **a response to external radiative forcing of the climate system**? We addressed this question by examining simulations from the Coupled Model Intercomparison Project Phase 5 (CMIP5) multi-model dataset. Historical simulations included anthropogenic greenhouse gas concentrations, ozone, land-use changes, anthropogenic aerosols, volcanic aerosols, and solar output and thus represent our best **estimate of the climate response to recent external radiative forcing** ([Extended Data Table 1](#)). [Figure 1c](#) displays the spatial distribution of trends in ensemble mean modelled total cloud amount during the 27-year period 1983–2009 for **all radiative forcings** (ALL). (...) We assessed the likelihood of this outcome by examining cloud trends during 27-year periods from CMIP5 preindustrial simulations **without external radiative forcing** ([Extended Data Table 2](#)). (...) We found that no 27-year period in more than 15,000 years of preindustrial simulations exhibits a correlation coefficient as positive as that between the observed and ensemble mean ALL trend patterns, suggesting that **external radiative forcing was a driving factor in large-scale cloud changes** from the 1980s to the 2000s. (...) The pattern of modelled cloud trends is highly correlated with the satellite record in the 50–180 hPa and 180–310 hPa intervals, suggesting that the observed rise in cloud top is at least **partly due to external radiative forcing**. (...) What specific factors are contributing to the observed cloud changes? We addressed this question by examining the additional CMIP5 simulations listed in [Extended Data Table 1](#) with **external radiative forcing** only from greenhouse gases (GHG), only from anthropogenic aerosol (AA), only from ozone (OZ), and only from natural solar variations and volcanic aerosol (NAT). (...) Our results suggest that **radiative forcing** by a combination of anthropogenic greenhouse gases and volcanic aerosol has produced observed cloud changes during the past several decades that exert **positive feedbacks on the climate system**. (...) The CMIP5 multi-model dataset provides a large number of global climate model simulations for **various forcing scenarios**. The historical simulations span ~1850–2005 and include **time-varying radiative forcings** such as greenhouse gases, ozone, anthropogenic and volcanic aerosols, solar output, and land use changes (ALL). We extended the CMIP5 ALL simulations beyond their nominal ending year of 2005 by adding follow-on years through to 2009 with **radiative forcing** from representative concentration pathway 4.5 (or if not available, the historical extended experiment or representative concentration pathway 8.5). (...) Some models provided only one realization and other models provided up to ten realizations for **the same external forcing**. (...) A smaller set of CMIP5 models provided additional simulations with **external radiative forcing only from anthropogenic greenhouse gases (GHG)**, only from anthropogenic aerosol (AA), only from ozone (OZ), and only from natural solar variability and volcanic aerosol (NAT) ([Extended Data Table 1](#)). A few models included ozone variability in GHG simulations, but we excluded these from our analysis to avoid confusion about **forcing** factors. (...) . We chose to use all available simulations from each **forcing** scenario because restricting our comparison to only those models and numbers of realizations in common would result in a much smaller sample size. Most CMIP5 models provided multicentury simulations of preindustrial conditions with **no anthropogenic or natural external radiative forcing** as a control case ([Extended Data Table 2](#)). (...) If so, there should be no systematic relationship between the spatial pattern of cloud trends generated by natural internal variability and the spatial pattern of cloud trends **generated by external radiative forcing**. The former is represented by individual preindustrial simulations, each with different realizations of natural internal variability, and the latter is represented by the ensemble mean of simulations **with external radiative forcing**, in which natural variability has been largely averaged out. (...) Our alternative hypothesis is that **external radiative forcing was a contributing factor in producing the observed cloud trends**. If so, we expect a positive spatial correlation between the observed trend pattern and the trend pattern from the ensemble mean of simulations **with external radiative forcing** (values shown as vertical lines in [Extended Data Fig. 3](#)). Evidence for climate change in the satellite cloud record [Joel R. Norris, Robert J. Allen, Amato T. Evan, Mark D. Zelinka, Christopher W. O’Dell & Stephen A. Klein](#) *Nature* **volume**536, pages72–75 (04 August 2016)

- 62- **A combination of changes in forcing**, uptake of heat by the oceans, natural variability and incomplete observational coverage reconciles models and data. (...) This long-term period includes part of the mid-twentieth-century period of slight cooling, **when radiative forcing was much lower than present-day** (...) During the period 1993–2003, around 90% of the excess energy put into

the climate system as a result of greenhouse gas forcing was stored in the ocean (...). The proposed reasons for the global warming hiatus can broadly be categorized into four classes: external drivers, **the Earth's climate response to CO₂ and other radiative forcings**, and internal variability, which all affect the actual global temperature, and observational coverage, which affects only the observational estimate of global temperature. (...) **Radiative forcing**. During the hiatus, **weaker solar forcing**, increased tropospheric and stratospheric aerosol loadings and increased water vapour were all proposed as reasons for the reduced temperature increase or for discrepancies between models and observations. Tropospheric aerosols might have had a regional effect on the pattern of warming and cooling during the hiatus, but their negative and positive contributions cancelled on a global scale (see Methods). Owing to the large natural variability of stratospheric water vapour content, the importance of the effect on the surface temperature has been questioned. Several of these aspects are not taken fully into account in the models, and after 2005 **the forcing used in the models starts to diverge from the current best estimate of the radiative forcing** (see Methods for details and references). (...) Regarding definition (iii), one suggestion for the larger-than-observed temperature trend in the CMIP5 models during the hiatus was that their equilibrium **climate sensitivity or transient climate response (TCR)—the magnitude of the temperature response to CO₂—was too high compared to values inferred from radiative forcing and observed warming**. This conclusion assumes that **global feedbacks are constant over time and across forcing agents** (...) The multi-model mean represents **the forced temperature response to radiative forcing** and is therefore not expected to coincide with observations. (...) Consistency with the observed warming can never prove that **the underlying forcings and feedbacks**—such as those due to compensating biases, for example **between climate sensitivity and aerosol forcing**—are correct, so the fact that the ensemble encompasses the observations provides support, but does not prove that the models are correct. For the period after 2005, **the forcing** used in the CMIP5 models differs from the current best estimate of **the forcing**. Consequently, models are expected to diverge to some degree from observations. **The two main forcings** that are missing or biased in the simulations are small but prolonged volcanic eruptions and **solar forcing** (see Methods). (...) Consistency is expected if the natural variability of the climate system is the main cause of the hiatus, but not necessarily if **the forcing is biased. If the forcing imposed on models is biased towards additional warming**, while the natural internal variability stays the same, then the frequency of simulated hiatus periods would be lower than in the observations. (...) The remaining discrepancy, after accounting for internal variability and **incorrect forcing**, is eliminated when additionally taking into account an incomplete observational spatial coverage and the effect of blending SSTs with air temperatures in the observations ([Fig. 5](#), dark orange line). (...) Most discrepancies between models and observations can therefore be explained by the state of **the natural variability, incomplete or biased forcings**, and observational limitations; a complete explanation requires a combination of all of these ([Fig. 5](#)). (...) It was already recognized in 1959 that the ocean could store large amounts of heat in the subsurface, but that this would be only temporary, although **other factors such as aerosol forcing probably played a part in the halted warming**. (...) But the phasing of the variability might still be **influenced by external forcing** and volcanic aerosols (...) Historical simulations seem to disagree on the relationship between the two variables, but better agreement between models is obtained when accounting for **the effect of external forcing** (...) Since 1987 **the solar forcing** has resulted in a slight cooling of the GMST (...) **The combined tropospheric aerosol forcing, acting mainly through indirect aerosol effects, was nearly zero, with positive and negative contributions cancelling globally** (...) An intermediate complexity model suggests that this decrease could **reduce the total radiative forcing** and contribute a small amount to the hiatus over this period (...) **Feedbacks change over time and may differ for different forcing agents**. Accounting for this partly closes **the gap between climate sensitivity or TCR** estimates from energy budget considerations (that do not account for **inhomogeneous forcing distributions**) and from global climate models. (...) Reasons for this underestimation include observed temperature biases resulting from limited coverage and from blending SSTs rather than air temperature over the oceans with air temperatures over land, **the forcing efficacies used (the combined effect of forcings is larger than the sum of the effect of individual forcings), overestimated and underestimated forcing**, and how efficient the ocean heat uptake is in models. Other studies do not find evidence for **overestimated climate sensitivity or TCR** in the models when natural variability and updated **forcings** are taken into account (...) First, we update the modelled **response to solar and stratospheric radiative forcing** with estimates until 2012 from ref. [28](#). Reconciling controversies about the 'global warming hiatus' [Iselin Medhaug, Martin B. Stolpe, Erich M. Fischer & Reto Knutti Nature volume 545, pages 41–47 \(04 May 2017\)](#)

- 63- Here we quantify the impact of twenty-first century climate change on ice-free areas under two Intergovernmental Panel on Climate Change (IPCC) **climate forcing scenarios** using temperature-index melt modelling. **Under the strongest forcing scenario**, ice-free areas could expand by over 17,000 km² by the end of the century, close to a 25% increase. (...) We used the projected melt and the Bedmap ice thickness layer to determine which areas would melt under different **climate forcing scenarios** and combined these with the current ice-free areas to determine future configuration. (...) In this study, we use data from two types of simulation: (i) ‘historical’ simulations for which **past known climate forcings such as observed greenhouse gas concentrations** are used; and (ii) future scenario Representative Concentration Pathway (RCP) simulations for which a number of different possible future outcomes in terms of **anthropogenic climate forcing** are defined. Here we use **a medium-forcing scenario** (RCP4.5) and **the most extreme, high-forcing scenario** (RCP8.5). Climate change drives expansion of Antarctic ice-free habitat [Jasmine R. Lee, Ben Raymond, Thomas J. Bracegirdle, Iadine Chadès, Richard A. Fuller, Justine D. Shaw & Aleks Terauds](#) *Nature* **volume547**, pages49–54 (06 July 2017)
- 64- Climate models provide the principal means of projecting global warming over the remainder of the twenty-first century but modelled estimates of warming vary by a factor of approximately two even under **the same radiative forcing scenarios**. (...) When we constrain the model projections with observations, we obtain **greater means and narrower ranges of future global warming across the major radiative forcing scenarios**, in general. In particular, we find that the observationally informed warming projection for the end of the twenty-first century for the steepest radiative forcing scenario is about 15 per cent warmer (+0.5 degrees Celsius) with a reduction of about a third in the two-standard-deviation spread (–1.2 degrees Celsius) relative to the raw model projections reported by the Intergovernmental Panel on Climate Change. (...) Here, we address these issues by defining our predictand to be the ultimate variable of interest (change in GMSAT from **the present to various times in the future and under various radiative forcing scenarios**: ΔT ; see Methods) and by using as our predictors the full global spatial distribution of fundamental components of Earth’s top-of-atmosphere energy budget—its outgoing (that is, reflected) shortwave radiation (OSR), outgoing longwave radiation (OLR) and net downward energy imbalance ($\downarrow N$). Greater future global warming inferred from Earth’s recent energy budget [Patrick T. Brown & Ken Caldeira](#) *Nature* **volume552**, pages45–50 (07 December 2017)
- 65- Australia has now committed to surveying Heard Island every two years for the next decade as part of an international programme to measure **the response of ecosystems to climate change in the Antarctic**. Climate change transforms island ecosystem [Peter Pockley](#) *Nature* **volume410**, page616 (05 April 2001)
- 66- Possible changes to the spatial distributions of the various reactive species may also affect details of **the ozone response** but, ultimately, ozone depletion will recover sooner as a result of the faster removal of CFCs. Removal of chlorofluorocarbons by increased mass exchange between the stratosphere and troposphere in a changing climate [Neal Butchart & Adam A. Scaife](#) *Nature* **volume410**, pages799–802 (12 April 2001)
- 67- Because rates of soil production decrease as soil thickness increases, a long duration of either soil production or aridity is unlikely to lead to sustained rapid erosion, but an alternation between them takes advantage of the initial, **rapid response** to new, disequilibrium conditions (...) Suppose that **the response to a step-function change in forcing** included an increase over a finite interval, before

decaying exponentially: For this case, maximum erosion during a half cycle occurs for $T \approx 3.9\tau_e$. Because the times necessary for landscapes **to respond to changes in climate** are comparable to those of **Milankovitch forcing**, and not orders of magnitude larger or smaller, **Milankovitch forcing** might even show **resonances** with natural periods in **the erosive response of a landscape to changes in forcing**. Increased sedimentation rates and grain sizes 2–4 Myr ago due to the influence of climate change on erosion rates [Zhang Peizhen, Peter Molnar & William R. Downs](#) *Nature* **volume410**, pages891–897 (19 April 2001)

- 68- For the great tits, which start egg-laying about 2 weeks earlier than the flycatchers, **the lack of a sufficient response is due to increasing temperatures** in late, but not in early spring. (...) Climatic factors may be important in fine-tuning the onset and speed of migration, but climate change differs between temperate and tropical latitudes, and therefore **a response to environmental cues** such as temperature for the onset and speed of migration may not lead to an adequate arrival date on the breeding grounds. (...) In the analysis of **the response of individual females to temperature**, we used females that bred in at least 2 years ($n = 273$). Adjustment to climate change is constrained by arrival date in a long-distance migrant bird [Christiaan Both & Marcel E. Visser](#) *Nature* **volume411**, pages296–298 (17 May 2001)
- 69- These insects might be expected to **have responded positively to climate warming** over the past 30 years, yet three-quarters of them declined: **negative responses to habitat loss have outweighed positive responses to climate warming**. (...) These analyses suggest that most sedentary and specialized species, and at least half of the other species, are limited by factors other than climate. We studied this by **fitting climate response surface models** at 50-km grid resolution to the distributions of British butterflies throughout Europe to estimate the extent of climatically suitable areas potentially available for each species in Britain. (...) We fitted **climate response surfaces** describing each species' European distribution using these variables. **Climate response surfaces** generated at 50-km grid resolution were applied to finer-scale (10-km grid) climate data to simulate the 1961–90 extent of climatically suitable areas for each species in Britain. **Rapid responses** of British butterflies to opposing forces of climate and habitat change [M. S. Warren, J. K. Hill, J. A. Thomas, J. Asher, R. Fox, B. Huntley, D. B. Roy, M. G. Telfer, S. Jeffcoate, P. Harding, G. Jeffcoate, S. G. Willis, J. N. Greatorex-Davies, D. Moss & C. D. Thomas](#) *Nature* **volume414**, pages65–69 (01 November 2001)
- 70- **Atmospheric and oceanic responses** to these changes were then transmitted globally through a number of **feedbacks**. (...) A large decrease in $\Delta^{14}C_{\text{atm}}$ to interglacial levels coincides with the onset of the Bølling–Allerød warm interval at around 14.7 kyr BP; the abrupt warming recorded in the GISP2 ice core ([Fig. 2d](#)) appears to be **a nonlinear response** to the more gradual increase in the THC ([Fig. 2c](#)). (...) Greenland ice-core records of methane and $\delta^{18}O$ strongly support **the hypothesis of North Atlantic forcing** in showing **a nearly instantaneous response of the tropical water balance** to changes in high-latitude temperature. Palaeoclimate records identify **additional atmospheric responses** to North Atlantic climate that would potentially further amplify and transmit the D–O signal. (...) We thus expect to see two mechanisms of variability in climate related to changes in the THC: one associated with atmospheric transmission and one associated with an oceanic seesaw, although these are not independent as an oceanic change necessarily implies **an atmospheric response and vice versa**. (...) Our analysis indicates that the last deglaciation was dominated by **two climate responses**. (...) The spatial pattern of this EOF, with negative scores over Antarctica (except Taylor Dome) and in the South Atlantic and positive scores at all other sites ([Fig. 4b](#)), is consistent with **an atmospheric transmission** of the North Atlantic signal except for those areas in the Southern Hemisphere where operation of the seesaw during the last deglaciation produced **an antiphased response** as predicted by a large change in the THC (...) Abrupt change manifests itself in two different ways in climate models: an abrupt transition across a threshold to a new equilibrium state, or **a response to a fast forcing**. (...) The resulting palaeoclimate records clearly reveal the global extent of millennial-scale climate

variability, with **varying responses that are consistent with atmospheric and oceanic changes associated with changes in the Atlantic THC** (Figs 3, 4). (...) In particular, palaeoclimate records and modelling experiments are providing a framework for the possible magnitude of future warming and **the response of the interconnected Earth system to such a warming**. (...) Some modelling experiments find that during the next few centuries, the THC moves to **an 'off' state in response to increasing greenhouse gases** (...) The fate of the THC in the coming century largely depends on **the response of air–sea heat and freshwater fluxes** to the increased load of greenhouse gases.

Uncertainties in modelled responses are particularly large for the latter The role of the thermohaline circulation in abrupt climate change Peter U. Clark, [Nicklas G. Pisias](#), [Thomas F. Stocker](#) & [Andrew J. Weaver](#) *Nature* **volume415**, pages863–869 (21 February 2002)

- 71- **The responses of both flora and fauna** span an array of ecosystems and organizational hierarchies, from the species to the community levels. Despite continued uncertainty as to community and ecosystem trajectories under global change, our review exposes a coherent pattern of ecological change across systems. Although we are only at an early stage in the projected trends of global warming, **ecological responses to recent climate change are already clearly visible**. (...) Rather, regional changes, which are highly spatially heterogeneous ([Fig. 1](#)), are more relevant in the context of **ecological response to climatic change**. (...) Studies in Europe and North America have revealed phenological trends that very probably **reflect responses to recent climate change** (...) An analysis of 50 years of data on 13 plant species in 137 localities **revealed responses** to the NAO in 71% of the total, with early-blooming and herbaceous species showing **greater responses to winter warming** than late-blooming and woody plants. **The temperature response** of bird arrival may be modified by photoperiodic control, genetic regulatory systems and/or population size. (...) For plants, strong seasonal variation is reported with the highest advances in early spring (and notable advances of succeeding phenophases) and almost **no response in summer and early autumn**. Similarly, short-distance migrating birds, which tend to migrate early in the season, often exhibit a trend towards earlier arrival, whereas the later arrivals by long-distance migrants show **a more complex response**, with many species not changing their arrival times or even delaying them (...) **Responses by individual species to climate change** may disrupt their interactions with others at the same or adjacent trophic levels. When closely interacting or competing species display divergent **responses or susceptibilities to change**, the outcome of their interactions may be altered, as long-term data on both terrestrial and marine organisms indicate (...) Such examples illustrate the **higher-order consequences of phenological responses to climate change** described above. (...) The mechanistic bases for **the observed biotic responses to climate change** have been well established through experimental and observational studies on the behaviour, ecology and physiology of many wild species. (...) It is not simply the magnitude of change of global average temperature over the last century but the inherent asymmetry in change processes that **complicates predictions of ecological responses**, especially for complex systems. However, it is clear that communities are already undergoing re-assembly that is attributable to climate change, as several of the studies cited in this review demonstrate. The implications of such large-scale, **consistent responses to relatively low average rates of climate change are large** and the projected warming for the coming decades raises even more concern about its ecological and also socio-economic consequences. **Ecological responses to recent climate change** [Gian-Reto Walther](#), [Eric Post](#), [Peter Convey](#), [Annette Menzel](#), [Camille Parmesan](#), Trevor J. C. Beebee, [Jean-Marc Fromentin](#), Ove Hoegh-Guldberg & [Franz Bairlein](#) *Nature* **volume416**, pages389–395 (28 March 2002)
- 72- Doran et al. reply — Turner et al. do not find fault with our main focus — **the rapid ecological response to recent cooling** in the McMurdo Dry Valleys. The essence of their comment is that the spatial interpolation of the Antarctic continental data set (our Fig. 2) does not provide a meaningful picture of recent temperature trends. Climate change (Communication arising): Recent temperature trends in the Antarctic [J. E. Walsh](#), [P. T. Doran](#), [J. C. Prisco](#), [W. B. Lyons](#), [A. G. Fountain](#), [D. M. McKnight](#), [D. L. Moorhead](#), [R. A. Virginia](#), [D. H. Wall](#), [G. D. Clow](#), [C. H. Fritsen](#), [C. P. McKay](#) & [A. N. Parsons](#) *Nature* **volume418**, page292 (18 July 2002)

73- What can we say about changes in the hydrologic cycle on 50-year timescales when we cannot predict rainfall next week? Eventually, perhaps, a great deal: **the overall climate response to increasing atmospheric concentrations of greenhouse gases** may prove much simpler and more predictable than the chaos of short-term weather. Quantifying the **diversity of possible responses** is essential for any objective, probability-based climate forecast, and this task will require a new generation of climate modelling experiments, systematically exploring the range of model behaviour that is consistent with observations. (...) Regional details of **the precipitation response to greenhouse warming** are much less clear, as are hydrologic feedbacks on other aspects of the climate system, notably the strength of the oceanic thermohaline circulation (refs [13](#), [14](#), and see review in this issue by Rahmstorf, pages). (...) The constraint of global energy conservation means that **the global-mean temperature response to an increase in CO₂** is controlled largely by three basic properties of the climate system: (1) **the strength of atmospheric and surface feedbacks, which determine the so-called 'climate sensitivity'** (equilibrium warming on doubling CO₂); (2) the effective heat capacity of the fraction of the oceans in contact with the atmosphere on short (sub- to inter-annual) timescales; and (3) how heat export to the ocean depths depends on recent changes at the surface. (...) These in turn provide the basis for **an objective probabilistic forecast of the temperature response** to a given emissions scenario of the type we would like, ultimately, to provide for the hydrologic cycle. The curve in [Fig. 1](#) shows an estimate of the probability distribution of global-mean warming at the time of CO₂ doubling under a scenario of CO₂ concentration increasing by 1% annually (**the 'transient climate response', or TCR**), which is consistent with recent observations of large-scale surface, atmospheric and oceanic temperature change (...) Warming accelerates in this particular model owing to some form of **nonlinearity in the response**. The empirical distribution (which assumes that **both climate sensitivity and the nature of the ocean response are constant over these timescales**) would immediately become much broader if it were to allow for such nonlinearity, pushing even **this high-response model** down into a relatively low percentile. If current models underestimate **the range of global-mean temperature responses** consistent with recent observations, the problem can be expected to be worse for variables such as precipitation, which are not so well constrained by the available data. Hence any assessment of the risk of precipitation change exceeding a given threshold by a given date based solely on **the spread of responses of currently available climate models** will be underestimated, perhaps by a substantial margin. Of course, the fact that current climate models do not span **the range of responses consistent with recent warming** is no indictment of the models: they were not designed to do so. (...) Because we cannot quantify the extent of this clustering bias *a priori*, **we cannot predict the likelihood of the response in the real world** lying above or below the range of model simulations with modelling alone. (...) This reasoning is strongest at higher latitudes where air is usually closer to saturation, and where relative humidity is indeed roughly constant through the substantial temperature changes of the seasonal cycle. For lower latitudes it has been argued that **the real-world response might be different** (see ref. [34](#) and references therein). (...) ΔR_C is the change in R that is due directly to external drivers of climate change (that is, change in R that is not mediated via **the temperature response to these drivers**, and hence approximately independent of ΔT). (...) Both ΔR_C and ΔR_T are determined largely by **basic features of the radiative and (in the case of ΔR_T) thermal response**. (...) This simple picture can explain the main features of the equilibrium responses shown in [Fig. 2](#), including a slope much less than that implied by the Clausius–Clapeyron relation and the line not intersecting the origin. It also has some interesting implications. (...) Translating this into a range in the equilibrium **precipitation response** using the best-fit line shown in [Fig. 2](#) gives a 10–90% range of 0.6–18% (accounting for the scatter of points about the best-fit line, but ignoring uncertainty in the estimated slope, which would make the range slightly larger). Hence we cannot rule out, at even the 10% level, precipitation changes either above or below all currently available model predictions. **As for the temperature response**, the spread of available AOGCMs underestimates the only available objective estimates of uncertainty in future precipitation change. (...) It is, however, clear that terrestrial precipitation is not simply following the **global temperature response**. (...) The scatter of CMIP-2 results is consistent with what we would **expect** from the equilibrium **response experiments**. (...) We translate this into a distribution for ΔP (red dashed curve in [Fig. 2](#)) using the best-fit line through the equilibrium **response experiments**, including additional variance to account for the scatter. (...) The precise distributions shown on [Fig. 2](#) naturally depend on details of the analysis, but the key conclusion is that the current range of uncertainty in ΔP is considerably larger than **the spread of current model responses**. (...) Moreover, the use of an intermediate-complexity model to derive the forecast temperature distribution **may underestimate the**

complexity of responses that are consistent with recent observations. (...) The ensemble-mean precipitation change conceals **a wide variety of responses** across the CMIP-2 ensemble. Only 30% of the variance between models of predicted precipitation changes on a 5°×5° grid is accounted for by **a single common response pattern**, compared to over 90% for temperature. The standard deviation between the various models' predictions is greater than **the mean response** shown in [Fig. 5](#) everywhere between 50° N and 50° S apart from a small region in the equatorial West Pacific. (...) **The zonal-mean response** ([Fig. 6](#)) is more coherent across models, with strong increase in precipitation near the Equator, some reduction in sub-tropical subsidence regions and a smaller but more consistent increase in mid-latitudes. (...) Thus, their primary effect is to provide a surface cooling and so **a greater precipitation response compared to changes in CO₂ concentrations**. (...) In the absence of objective probabilistic forecasts with numerical models that systematically investigate **the range of possible responses of the hydrologic cycle to anthropogenic climate change**, we have here attempted to constrain the expected changes by other means. (...) This exceeds **the range of simulations of the precipitation response** given by current 'best guess' climate models. Constraints on future changes in climate and the hydrologic cycle [Myles R. Allen & William J. Ingram](#) *Nature* volume419, pages224–232 (12 September 2002)

- 74- Given that higher latitudes have warmed more than the lower latitudes in the past half century (see Fig. 3d of ref. [1](#)), we expect **phenological responses to be larger nearer the poles and not as pronounced closer to the equator**. (...) Because anticipation of changes improves the capacity to manage—by acting proactively rather than reactively—it behoves us to increase our understanding about **the responses of plants and animals to a changing climate**. Fingerprints of global warming on wild animals and plants [Terry L. Root, Jeff T. Price, Kimberly R. Hall, Stephen H. Schneider, Cynthia Rosenzweig & J. Alan Pounds](#) *Nature* volume421, pages57–60 (02 January 2003)
- 75- We define a diagnostic fingerprint of **temporal and spatial 'sign-switching' responses uniquely predicted by twentieth century climate trends**. (...) A few studies indicate **evolutionary responses of particular species to climate change**, but the generality of **evolutionary response remains unknown**. Here, we focus on phenological (timing) shifts, range boundary shifts, and community studies on species abundances ([Table 1](#)). (...) Such failure could stem from anthropogenic barriers to dispersal (habitat fragmentation) or from **a lag in response time**. Lags are expected when limited dispersal capabilities retard poleward/upward colonization, or when a necessary resource has **slower response time** than the focal species. (...) Sufficient data to quantify the differential impacts on species' distributions or phenologies across time periods or geographic regions were available for 334 species, among which 84% showed a **sign-switching diagnostic of climate change response** ($P < 0.1 \times 10^{-12}$; [Table 3](#)). (...) Community studies in regions of overlapping 'polar' and 'temperate' species base their climate change attribution on **differential responses** of these two categories. (...) Long-term studies encompass periods of climate cooling as well as warming. If the distributions of species are truly driven by climate trends, these species should show **opposite responses to cooling and warming periods**. (...) In particular, a clear pattern emerges of temporal and spatial sign switches in biotic trends uniquely predicted as **responses to climate change**. (...) **Response to climate warming predicts** a preponderance of poleward/upward shifts. (...) **Response to climate warming predicts** that southerly species should outperform northerly species at the same site. A globally coherent fingerprint of climate change impacts across natural systems [Camille Parmesan & Gary Yohe](#) *Nature* volume421, pages37–42 (02 January 2003)
- 76- Although the effects of climate warming on the chemical and physical properties of lakes have been documented, **biotic and ecosystem-scale responses to climate change** have been only estimated or predicted by manipulations and models Climate change decreases aquatic ecosystem productivity of Lake

- 77- In addition, recent biogeochemical and fisheries data suggest a **biological response** to a potential late-1990s shift in North Pacific climate (...) Moreover, there is reason to be concerned about the influence of hydrologic changes on **the response of the oceanic CO₂ sink to anthropogenic climate change**. Climate-driven changes to the atmospheric CO₂ sink in the subtropical North Pacific Ocean [John E. Dore](#), [Roger Lukas](#), [Daniel W. Sadler](#) & [David M. Karl](#) *Nature* **volume424**, pages754–757 (14 August 2003)
- 78- As **the response time of sediment** ²³¹Pa/²³⁰Th to changes in circulation is 500 yr (refs [4](#), [5](#)), the ²³¹Pa/²³⁰Th profile can be interpreted as reflecting a quasi-total and nearly instantaneous cessation of the Atlantic MOC at 17.5 kyr ago. (...) Model simulations suggest that the MOC is **sensitive to buoyancy forcing** through surface salinity perturbations, with a sufficiently **marked response** in some experiments to resemble a 'drop-dead circulation' with negligible overturning. (...) However, because of the brevity of **the slowdown and the response time** of ²³¹Pa/²³⁰Th to circulation shutdowns (500 yr), the Younger Dryas reduction in the rate of MOC may have been larger than indicated by the maximum in ²³¹Pa/²³⁰Th, and the possibility of a total, albeit very brief, shutdown cannot be ruled out Collapse and rapid resumption of Atlantic meridional circulation linked to deglacial climate changes [J. F. McManus](#), [R. Francois](#), [J.-M. Gherardi](#), [L. D. Keigwin](#) & [S. Brown-Leger](#) *Nature* **volume428**, pages834–837 (22 April 2004)
- 79- **Evolutionary responses provide additional uncertainty**. If Harte *et al.* [4](#) are correct about limitations imposed by ecotypic variation, our estimates of extinction risk will be conservative. Biodiversity conservation: Uncertainty in predictions of extinction risk/Effects of changes in climate and land use/Climate change and extinction risk (reply) [Chris D. Thomas](#), [Stephen E. Williams](#), [Alison Cameron](#), [Rhys E. Green](#), [Michel Bakkenes](#), [Linda J. Beaumont](#), [Yvonne C. Collingham](#), [Barend F. N. Erasmus](#), [Marinez Ferreira de Siqueira](#), [Alan Grainger](#), [Lee Hannah](#), [Lesley Hughes](#), [Brian Huntley](#), [Albert S. van Jaarsveld](#), [Guy F. Midgley](#), [Lera Miles](#), [Miguel A. Ortega-Huerta](#), [A. Townsend Peterson](#) & [Oliver L. Phillips](#) *Nature* **volume430**, page34 (01 July 2004)
- 80- This approach is based on the reasonable assumption that species differ in **their response to the effects of climate change**. Biodiversity conservation: Climate change and extinction risk John Harte, [Annette Ostling](#), [Jessica L. Green](#) & [Ann Kinzig](#) *Nature* **volume430**, page34 (01 July 2004)
- 81- And finally, there are time lags associated with **the lake's response to warming**, which may be magnified as one travels up the foodweb. Ecology: Climate-change effect on Lake Tanganyika? (reply) [C. M. O'Reilly](#), [P.-D. Plisnier](#), [A. S. Cohen](#) & [S. R. Alin](#) *Nature* **volume430**, page310 (15 July 2004)
- 82- **The long-term response of coral reefs to climate change** depends on the ability of reef-building coral symbioses to adapt or acclimatize to warmer temperatures, but there has been **no direct evidence that such a response can occur**. (...) Although acclimatization and/or adaptation of reef coral hosts and/or their algal symbionts are recognized as potentially mitigating the frequency and severity of these bleaching events, no studies have been undertaken to test whether **such responses actually occur** on affected reefs. (...) Because corals containing different symbionts can vary in their **sensitivity** to bleaching and can modify their symbiont communities **in response to environmental change**, we investigated whether severe bleaching and mortality can select for stable host–symbiont combinations that are more thermally tolerant, raising the overall bleaching

resistance of the reef as a result. Coral reefs: **Corals' adaptive response to climate change** [Andrew C. Baker](#), [Craig J. Starger](#), [Tim R. McClanahan](#) & [Peter W. Glynn](#) *Nature* **volume430**, page741 (12 August 2004)

- 83- In predicting climate changes in the next several decades — **the transient climate response** — the ocean cannot be neglected (...) In spite of the relatively wide range of systematic parameter variation, **the fundamental response** of the climate model is consistent with the range reported by the Intergovernmental Panel Climate change: Models change their tune [Thomas F. Stocker](#) *Nature* **volume430**, pages737–738 (12 August 2004)
- 84- Multiple events that occurred hours to several years after a single fire may appear as a single thick deposit that would be recognized as a ‘large event’, and still represent **a major geomorphic response to a severe fire**. (...) Nonetheless, **limited geomorphic response** indicates that fires in the LIA were overall less severe than in either the MCA or recent decades. Fire-induced erosion and millennial-scale climate change in northern ponderosa pine forests Jennifer L. Pierce, [Grant A. Meyer](#) & [A. J. Timothy Jull](#) *Nature* **volume432**, pages87–90 (04 November 2004)
- 85- Such experiments rarely continue for more than a few years, and so never provide information **on the response of the large, slower pools that will dominate feedbacks from soil to atmosphere** over timescales of decades or more. (...) As a final twist, Knorr *et al.* predict that, over a timescale of decades to centuries, the dominant slow pools will be **more sensitive to temperature** than the faster pools ([Fig. 1b](#)), **causing a larger positive feedback in response to global warming than previously thought**. Climatology: Will soil amplify climate change? [David Powlson](#) *Nature* **volume433**, pages204–205 (20 January 2005)
- 86- Thus the development of a seasonally layered, or stratified, surface ocean 2.7 million years ago, which was probably **a regional response to the large-scale climatic changes** at this time, allowed late summer/autumn warming of the sea surface and provided a moisture source for ice growth. Climate change: Snow maker for the ice ages [Katharina Billups](#) *Nature* **volume433**, pages809–810 (24 February 2005)
- 87- The prevailing idea—that lower temperatures benefit the chytrid—might be an oversimplification of **the pathogen's response to climate**. (...) Whereas nearby lowland deforestation might have influenced conditions, temperatures in Central and South America agree with **simulated responses to greenhouse-gas accumulation**. Widespread amphibian extinctions from epidemic disease driven by global warming [J. Alan Pounds](#), [Martín R. Bustamante](#), [Luis A. Coloma](#), [Jamie A. Consuegra](#), [Michael P. L. Fogden](#), [Pru N. Foster](#), [Enrique La Marca](#), [Karen L. Masters](#), [Andrés Merino-Viteri](#), [Robert Puschendorf](#), [Santiago R. Ron](#), [G. Arturo Sánchez-Azofeifa](#), [Christopher J. Still](#) & [Bruce E. Young](#) *Nature* **volume439**, pages161–167 (12 January 2006)
- 88- The **observed response to temperature** under these environmental constraints, which we shall call **the ‘apparent temperature sensitivity’**, may be much **lower** than the **intrinsic temperature sensitivity** of the substrate ([Fig. 2](#)). (...) When analysing any geographical trend, it is important to remember that **instantaneous temperature responses** of decomposition of current C stocks reflect the relative abundances of organic-C substrates of differing kinetic properties. (...) Nonetheless, one

interpretation of these **ephemeral responses** has been that only decomposition of the most labile soil C pool was **sensitive to the warming treatment**, and that decomposition of the older, more recalcitrant soil C was not **temperature sensitive**. (...) Peat fires could thus have larger effects on the soil **carbon feedback** than any of **the biotic responses** presented above (...) Such studies have yielded valuable insight into soil carbon dynamics, but they have not resolved **the overall response** of global soil C stocks or the magnitude of expected feedbacks to climatic disruption. Temperature sensitivity of soil carbon decomposition and **feedbacks** to climate change [Eric A. Davidson](#) & [Ivan A. Janssens](#) *Nature* **volume440**, pages165–173 (09 March 2006)

- 89- **Phenological responses to climate change** differ across trophic levels, which may lead to birds failing to breed at the time of maximal food abundance. (...) Despite this general advancement, some species may not cope with climate change because **their response differs from the response of organisms** at lower levels of the food chain, leading to a mismatch between the timing of reproduction and the main food supply Climate change and population declines in a long-distance migratory bird Christiaan Both, [Sandra Bouwhuis](#), [C. M. Lessells](#) & [Marcel E. Visser](#) *Nature* **volume441**, pages81–83 (04 May 2006)
- 90- The results of a remarkable scientific project in the Arctic, as reported in three papers in this issue, provide a detailed picture of the Arctic's role in the long-term cooling and **its response during oscillations of the preceding greenhouse climates**. Climate Change: The Arctic tells its story [Heather M. Stoll](#) *Nature* **volume441**, pages579–581 (01 June 2006)
- 91- Recently, sediments were recovered from the central Arctic Ocean, providing the first opportunity **to evaluate the environmental response** at the North Pole at this time. (...) Previously, this offset was explained by **the physiological response** of plants to increases in surface humidity (...) Interestingly, changes in primary productivity appear to have occurred in other ocean regions and are thought to have played a critical role in the **carbon cycle response** to environmental change. Arctic hydrology during global warming at the Palaeocene/Eocene thermal maximum [Mark Pagani](#), [Nikolai Pedentchouk](#), [Matthew Huber](#), [Appy Sluijs](#), [Stefan Schouten](#), [Henk Brinkhuis](#), [Jaap S. Sinninghe Damsté](#), [Gerald R. Dickens](#) & [Expedition 302 Scientists](#) *Nature* **volume442**, pages671–675 (10 August 2006)
- 92- But these models contain only a small component of **the dynamic response** of glaciers, and the GRACE results indicate that more rapid changes are occurring than the models predict. The GRACE results can thus help us to re-evaluate the rates of loss from the ice sheet that we should expect through climate warming. It is clear that **there is much we don't understand about the current response** of the Greenland ice sheet. (...) It is vital that we use a variety of instruments and techniques to make continued observations of the **ice sheet's response**, and complement these with studies aimed at understanding the processes that are driving the observed changes. Climate change: Greenland's ice on the scales [Tavi Murray](#) *Nature* **volume443**, pages277–278 (21 September 2006)
- 93- For the period 1984–2003, **the CH₄ concentration responses** to the action of OH sinks and regional surface sources were simulated each month with the three-dimensional chemistry transport model LMDZ-INCA. Contribution of anthropogenic and natural sources to atmospheric methane variability [P. Bousquet](#), [P. Ciais](#), [J. B. Miller](#), [E. J. Dlugokencky](#), [D. A. Hauglustaine](#), [C. Prigent](#), [G. R. Van der Werf](#), [P. Peylin](#), [E.-G. Brunke](#), [C. Carouge](#), [R. L. Langenfelds](#), [J. Lathière](#), [F. Papa](#), [M. Ramonet](#), [M. Schmidt](#), [L. P. Steele](#), [S. C. Tyler](#) & [J. White](#) *Nature* **volume443**, pages439–443 (28 September 2006)

- 94- Unfortunately, **the response times of most greenhouse gases** in the atmosphere and their climatic effects are **slow** — decades to centuries. Climate change: A nasty surprise in the greenhouse [Jos Lelieveld](#) *Nature* **volume443**, pages405–406 (28 September 2006)
- 95- In these experiments, temperature, precipitation and even CO₂ concentration can be manipulated, and such work often reveals **unexpected responses** arising from the complex interplay of different factors. But for obvious reasons these experiments are difficult to carry out on large spatial and temporal scales. **What responses to climate change are actually documented? (...) There is also our cruel lack of knowledge about the response of biota to rapid climate change. (...)** Mountains lend themselves to being natural laboratories, given that research can be carried out over steep gradients **to investigate the differential response** of species and the influence of local adaptations. Biodiversity: Climate change and the ecologist [Wilfried Thuiller](#) *Nature* **volume448**, pages550–552 (02 August 2007)
- 96- The break-up, says Box, was “exceptional” in that the ice would have taken years to grow back to its previous state. And it suggests that the sort of **rapid response to warming** seen in recent years is **the glaciers' expected response to warming**. Climate change: Losing Greenland Is the Arctic's biggest ice sheet in irreversible meltdown? And would we know if it were? Alexandra Witze reports. Alexandra Witze *Nature* 16 April 2008 | 452, 798-802
- 97- Although we can expect that forests will eventually recover from the beetle outbreak, we are reluctant to extend projections beyond 2020 or to speculate on the rate of recovery beyond 2020 given uncertainties about **non-host responses**, rates of regeneration, and future fires in a region **in which major climate change impacts are forecast**. (...) The additional harvest is considered to be part of the beetle impact because it is a **management response** to the vast quantities of beetle-killed trees. (...) NBP was reduced in the affected landscape by the beetle and the associated additional **harvest response** because of reduced net primary production (NPP) and increased heterotrophic respiration. Mountain pine beetle and forest **carbon feedback** to climate change [W. A. Kurz](#), [C. C. Dymond](#), [G. Stinson](#), [G. J. Rampley](#), [E. T. Neilson](#), [A. L. Carroll](#), [T. Ebata](#) & [L. Safranyik](#) *Nature* **volume452**, pages987–990 (24 April 2008)
- 98- Direct attribution would require an 'end-to-end' modelling system that includes explicit representations of all of the main processes (climatic and non-climatic) that contribute to the variability of the system under study, and **can simulate the response to greenhouse-gas increases** as well as other factors that can cause changes in the observed impact. Climate change: Attributing cause and effect [Francis Zwiers](#) & [Gabriele Hegerl](#) *Nature* **volume453**, pages296–297 (15 May 2008)
- 99- Such experiments rely almost exclusively on abrupt and short-term changes in CO₂ concentrations, raising questions about the relevance of **the observed responses** to marine ecosystems exposed to high CO₂ and low pH over periods of years or decades. (...) This further complicates the extrapolation of CO₂ effects from volcanic vents to global-scale ocean acidification. Invasion of

non-adapted organisms may also cause short-term stress to those organisms, **possibly amplifying the range of high-CO₂ responses**. (...) There is an urgent need to develop tools to assess and quantify such impacts across the **entire range of biological responses**, from subcellular regulation to ecosystem reorganization, and from short-term physiological acclimation to evolutionary adaptation. Climate change: Acid test for marine biodiversity [Ulf Riebesell](#) *Nature* **volume454**, pages46–47 (03 July 2008)

- 100- The effect of snow duration on cyclicality seemed markedly lower, consistent with the Fennoscandian rodents exhibiting cyclical tendencies and **responses to changing snow conditions** over a wide range of altitudes and, thus, snow cover durations. (...) Although the issue is still debated, **their numerical response** is probably a key causal link between rodent demography and system dynamics. Linking climate change to lemming cycles [Kyrre L. Kausrud](#), [Atle Mysterud](#), [Harald Steen](#), [Jon Olav Vik](#), [Eivind Østbye](#), [Bernard Cazelles](#), [Erik Framstad](#), [Anne Maria Eikeset](#), [Ivar Mysterud](#), [Torstein Solhøy](#) & [Nils Chr. Stenseth](#) *Nature* **volume456**, pages93–97 (06 November 2008)
- 101- In that respect, **the response of ice sheets** immediately comes to mind. (...) History records the name of Milutin Milankovitch as the father of this theory, however, because of the firm mathematical foundation he provided for it (although he missed some crucial aspects of **the ice sheets' response**). (...) These papers downgraded the Milankovitch mechanism to a second-order effect, and attributed the prime cause of glacial–interglacial cycles to **the response of Arctic sea ice** to northern summer insolation. **This Arctic response would have led to** the development of northern ice sheets through a somewhat convoluted causal pathway involving circulation in the North Atlantic Ocean and changes in the concentration of atmospheric carbon dioxide. (...) **How could they lead to opposite ocean responses?** Global change: Climate's astronomical sensors [Michel Crucifix](#) *Nature* **volume456**, pages47–48 (06 November 2008)
- 102- We chose the fine spatial grain because both yearly dispersal capabilities for many species and large temperature changes often occur on the order of a few kilometres. In some cases, even **finer resolution responses on the scale of metres may be sufficient to offset climate change** as populations move from south to north facing slopes within a habitat. The velocity of climate change [Scott R. Loarie](#), [Philip B. Duffy](#), [Healy Hamilton](#), [Gregory P. Asner](#), [Christopher B. Field](#) & [David D. Ackerly](#) *Nature* **volume462**, pages1052–1055 (24 December 2009)
- 103- This suggests that such an assumption would not have been valid for predicting the **response of malaria to the warming climate** of the last 100 years. (...) Biological modelling provides an alternative to empirical approaches, enabling **the magnitude of potential disease responses to future climate scenarios to be estimated** directly and then compared formally with observed or predicted effects from non-climatic influences. Climate change and the global malaria recession [Peter W. Gething](#), [David L. Smith](#), [Anand P. Patil](#), [Andrew J. Tatem](#), [Robert W. Snow](#) & [Simon I. Hay](#) *Nature* **volume465**, pages342–345 (20 May 2010)
- 104- One way to circumvent this geographical sampling bias is to use temperature data with broad geographical coverage to predict global patterns of **physiological responses to observed temperature change**. (...) In fact, the patterns of **metabolic responses** shown in [Fig. 1b](#) hold even

when we shift these parameters over a large range of biologically reasonable values to simulate extreme metabolic compensation at high latitude (Methods and [Supplementary Fig. 4](#)). Global metabolic impacts of recent climate warming Michael E. Dillon, [George Wang](#) & [Raymond B. Huey](#) *Nature* **volume467**, pages704–706 (07 October 2010)

105- Understanding **the regional responses of rainfall patterns to global warming** is therefore crucial. Climate change: Human influence on rainfall [Richard P. Allan](#) *Nature* **volume470**, pages344–345 (17 February 2011)

106- However, with few exceptions, the importance of evolution tends to be ignored both in broader discussions about the effects of climate change on biodiversity and in models for **predicting species responses to climate change**. (...) **Plastic responses themselves can evolve and contribute to climatic adaptation**, as in the case of cabbage white butterfly populations, which differ in their **plastic responses** to temperature. In an attempt to demonstrate **evolutionary responses to climate change**, genetic differences in space have been compared over time in a few cases (that is, combining the first two approaches listed in [Table 1](#)). These have provided the strongest evidence for **evolutionary responses** in traits related to the timing of activity or reproduction, including shifts in diapause patterns in mosquitoes, flowering time in plants and migration patterns in birds. (...) It has been suggested that climate change adaptation is more likely to involve altered timing of life history traits rather than **evolved physiological responses, but this assertion seems premature**. (...) The absence of genetic adaptation to recent climate change now documented in some populations raises questions about the conditions under which evolution might be expected. **Which factors might constrain or promote evolutionary responses?** When they occur, **will these responses be sufficient to keep up with rapid climate change?** (...) A simple model for interpreting the results of these experiments involves the breeder's equation, which **predicts the size of the selection response** given a certain selection pressure and trait heritability ([Box 1](#) and [Table 2](#)). This equation applies across a single generation, although it has also been applied across multiple generations on the assumption that heritability and selection intensity remain constant. It can help highlight cases where **a selection response is not possible** owing to a low level of heritable variation and/or rapid environmental changes and strong selection pressures. A low genetic variance is usually regarded as unlikely to account for **a poor selection response** because most traits have quite high levels of genetic variation. Widespread species often have abundant genetic variation for numerous traits likely to be involved in climatic adaptation including seasonal timing, morphological variation **affecting thermal responses**, and resistance to stressful climatic conditions both in insects and in plants. (...) Evolutionary changes take place in a multivariate space, where both genetic interactions between traits and the direction of selection across multiple traits dictate **the potential for selection responses** ([Table 2](#)). (...) Genetic interactions between traits may **slow selection responses** owing to tradeoffs or when there is a low genetic variance for traits in the direction of selection. (...) Some models that **predict evolutionary responses to climate change** include details about population size and shifting patterns of stabilizing selection on populations ([Table 2](#)), emphasizing the importance of demographic factors in limiting **adaptive responses in populations**. (...) Demographic factors have been emphasized in models of asexual populations where mutational input enables **adaptive responses** and beneficial mutations (already present in populations or newly arisen) increase in frequency to rescue populations by providing new genetic variation ([Table 2](#)). (...) Gene flow among populations also influences the potential for **evolutionary responses** ([Table 2](#)), particularly at species margins that often represent sinks for dispersers from within the centre of species ranges. These dispersers may be maladapted to the conditions experienced at range margins, resulting in a fitness cost that prevents adaptation. **This might constrain evolutionary responses**, as recently suggested for barnacles. Gene flow may act in combination with other factors like trait interactions and demographic effects to constrain evolution. (...) **Evolutionary responses might only be sufficient** to allow changes of a few per cent per generation unless there are also plastic effects acting alongside evolution, whereas bird breeding dates have shifted almost 20% in the last few years. (...) **This could theoretically lead to a faster evolutionary response**. Using the breeder's equation ([Box 1](#)), stronger directional selection should **increase the rate of response** across a generation because the selection differential will increase if

heritability remains constant. (...) In nature, selection will fluctuate from generation to generation, and **selection responses** will depend not only on the intensity of selection but also on the way environmental fluctuations are correlated. (...) Evolutionary models of **climate change responses** need to be extended to incorporate stochastic climatic conditions. Climate change and evolutionary adaptation [Ary A. Hoffmann & Carla M. Sgrò](#) *Nature* **volume470**, pages479–485 (24 February 2011)

- 107- To gain insight into the mechanisms of **the potentially long response times** of ice sheets, it is necessary to study them from a long-term geological perspective. Climate change: Ancient Antarctic fjords [Sandra Passchier](#) *Nature* **volume474**, pages46–47 (02 June 2011)
- 108- Lags between these **biotic responses and contemporary climate changes** have been reported for plants and animals. Theoretically, the magnitude of these lags should be greatest in lowland areas, where the velocity of climate change is expected to be much greater than that in highland areas. (...) Despite the general pattern of poleward and upward range shifts, the timing, magnitude and **direction of these biotic responses** vary greatly among species and geographic conditions. This variation can prevent biotic communities from migrating as intact units in response to climate change. (...) In contrast, during the current climate warming period (1987–2008), we found significant differences between floristically and climatically reconstructed temperatures in lowland and highland forests ([Table 1](#)), indicating **a lag in the response of herbaceous forest species to climate change**. (...) In contrast, the floristically reconstructed temperatures of highland forests increased by +0.54 °C, with climate warming reaching +1.07 °C over the same period (Table 1b). This discrepancy indicates **an important lag in the response of herbaceous forest species to climate change**, being 3.1 times larger in lowland forests (temperature lag = 1.29 °C on average) than in highland forests (temperature lag = 0.42 °C on average; [Table 1](#)). Changes in plant community composition lag behind climate warming in lowland forests [Romain Bertrand, Jonathan Lenoir, Christian Piedallu, Gabriela Riofrío-Dillon, Patrice de Ruffray, Claude Vidal, Jean-Claude Pierrat & Jean-Claude Gégout](#) *Nature* **volume479**, pages517–520 (24 November 2011)
- 109- Size, local topography, altitude range, aspect and microclimate all affect **the response of individual glaciers in complex ways**. Even the seasonality of changes in temperature and precipitation **strongly influence the glaciers' response**, and those that terminate in a lake or ocean behave differently again. (...) Estimates of the future response of GICs to climate change are, in general, based on what we know about how **they have responded in the past**. (...) Now we need to work out what this means for **estimating their future response**. Climate change: Shrinking glaciers under scrutiny [Jonathan Bamber](#) *Nature* **volume482**, pages482–483 (23 February 2012)
- 110- On this issue, Shakun *et al.* use a global reconstruction of temperature to show that the transition from the glacial period to the current interglacial consisted of an **antiphased temperature response of Earth's two hemispheres**, superimposed on a globally coherent warming. Ocean-circulation changes, **controlling the contrasting response in each hemisphere**, seem to have been crucial to the glacial termination. (...) Both hemispheres then warmed together, **largely in response to the rise in carbon dioxide**, but with further oscillations in the hemispheric contrast as the strength of the AMOC varied. (...) But one caveat is that the magnitude of fresh water injected into the Atlantic Ocean in the model was tuned to produce the inferred strength of the AMOC and **the magnitude of interhemispheric climate response**; the result does not imply that the ocean

circulation in the model has **the correct sensitivity** to the volume of freshwater input. Climate change: A tale of two hemispheres [Eric W. Wolff](#) *Nature* volume484, pages41–42 (05 April 2012)

- 111- Warming experiments are increasingly relied on **to estimate plant responses to global climate change**. For experiments to provide meaningful predictions of **future responses**, they should reflect the empirical record of **responses to temperature variability** and recent warming, including advances in the timing of flowering and leafing. (...) The discrepancy between experiments and observations, however, could **arise from complex interactions among multiple drivers** in the observational data, or it could arise from remediable artefacts in the experiments that result in lower irradiance and drier soils, thus **dampening the phenological responses to manipulated warming**. Our results introduce uncertainty into ecosystem models that are informed solely by experiments and suggest that responses to climate change that are predicted using such models should be re-evaluated. (...) **Predicting species' responses to climate change is a major challenge in ecology**. Plants have been a focus of study because **their responses can affect entire food webs**, disturbance regimes and crucial ecosystem services, including pollination, carbon and nutrient cycling, and water supply. Researchers have adopted two main approaches **to predict plant responses to climate change**. (...) Results from both methods suggest that advancing phenology (for example, earlier flowering and leafing) is one of **the most sensitive plant responses to warming**. (...) Warming experiments have been used to extrapolate to future climate conditions for more than 20 years. This approach rests on **the critical but little-tested assumption that plant responses to experimental warming match long-term responses to global warming**. Testing this assumption is an important first step in assessing the utility of warming experiments for long-term forecasting and prediction. Recent studies have compared experimental and observational results at single sites, and one study found coherence across methods in **plant responses to warming**; however, cross-site comparisons have proved more challenging. (...) The databases were developed specifically to test how accurately short-term warming experiments predict **the long-term responses of wild plants**. (...) Warming experiments **underpredicted observational responses to climate change** ([Fig. 2](#)). Across all species, the experiments underpredicted the magnitude of the advance—for both leafing and flowering—that results from temperature increases ([Fig. 2a](#); flowering, $F_{1,34} = 9.7$, $P = 0.004$; leafing, $F_{1,18} = 2.8$, $P = 0.1$). The estimates for observations were based on **plant responses to interannual temperature variability**, yet they were similar to estimates calculated from long-term trends ([Fig. 3](#)) and were consistent across alternative approaches to **calculating mean sensitivities** ([Supplementary Information](#)). (...) Given the difference in time frames between the experimental and observational studies (3.8 years and 31.0 years, respectively; $F_{1,49} = 72.0$, $P < 0.0001$), the experiments may capture predominantly **plastic responses to temperature change**, whereas the observational studies may also integrate shifts in genotypes, community composition and ecosystem dynamics. Furthermore, **plant responses may have shifted fundamentally** following the significant Northern Hemisphere warming in all seasons starting in the 1970s, thus the experiments (which have been conducted relatively recently) may capture only these shifted dynamics. (...) Accurate models of **biotic responses to climate change require comparable methods to estimate** how plants shift with increasing temperatures. (...) Furthermore, when sampling the same species, the experiments failed to predict both **the magnitude and the direction of plant responses to warming**. (...) Although long-term observational data are currently **the best measures of biotic responses to anthropogenic climate change**, our results suggest that researchers **may not understand these responses well enough** to replicate them experimentally. Warming experiments **underpredict plant phenological responses to climate change** [E. M. Wolkovich, B. I. Cook, J. M. Allen, T. M. Crimmins, J. L. Betancourt, S. E. Travers, S. Pau, J. Regetz, T. J. Davies, N. J. B. Kraft, T. R. Ault, K. Bolmgren, S. J. Mazer, G. J. McCabe, B. J. McGill, C. Parmesan, N. Salamin, M. D. Schwartz & E. E. Cleland](#) *Nature* volume485, pages494–497 (24 May 2012)
- 112- **Predicting plant responses to increasing temperatures** is integral to assessing the global impact of climate change. (...) Wolkovich *et al.* compare existing data on **the responses of 1,634 plant species**, across four continents, to observed and **experimental warming**. (...) It is not surprising that **plant responses to warming-only** field experiments are lower than to real-world variance occurring over many decades. (...) Anthropogenic climate change, **a massive uncontrolled**

planetary disruption, is under way, and a **predictive understanding** of how it will affect ecosystems and how these **ecosystem responses will feed back to the climate** is badly needed. (...) Here, **we urge caution** in the use of meta-analyses to assess different approaches **to predicting ecosystem responses to climate change**, and we describe how integrating multiple investigative methods can better advance understanding. **To predict ecosystem responses**, scientists can observe correlations between climate and ecosystem properties, and can conduct controlled experimental manipulations of climate. (...) **Predictions of ecosystem responses** should strive to make use of information from differing approaches in a way that considers the strengths and drawbacks of each. (...) Alternatively, integrating observational and experimental methods within a single study can simultaneously provide insight into issues that are **obscured by meta-analyses and the mechanisms driving ecosystem responses**. (...) We found that **the timing of flowering, and many other ecological responses, are remarkably similarly sensitive** to each of these four sources of climate change, provided that snow-melt date is used as an explanatory variable, rather than mean annual temperature, as used by Wolkovich and colleagues. (...) Had we used passive heating methods, such as open-top chambers ([Fig. 1](#)) deployed only during the growing season, we might have increased the mean annual temperature, but our experimental heating would not have advanced snow melt and we would not have observed a **strong phenological response**. Thus, meta-analyses should carefully consider both the appropriate explanatory variables and methodological differences across experimental studies. Explanatory variables are likely to differ from one type of habitat to another, and **from one type of response variable to another**. In lowland tropical regions, where snow is not a factor, there is a great need for integrative methods to determine which variables drive plant and animal, as well as biogeochemical, **responses to climate change**. (...) **Diverse ecosystem responses play out over a range of timescales** and require persistent multi-year manipulations to uncover causal mechanisms. (...) These examples demonstrate how controlled warming experiments, particularly those that proceed for longer than the typical research-funding cycle of 3–5 years, can provide **a means of understanding both patterns in ecosystem responses** and the multiple mechanisms that govern these changes. Climate change: Flowering in the greenhouse [This Rutishauser, Reto Stöckli, John Harte & Lara Kueppers](#) *Nature* **volume485**, pages448–449 (24 May 2012)

- 113- **The response was most pronounced when the effect of temperature** on decomposition was not modelled (dashed line in [Fig. 1b, d](#)), analogous to increased-CO₂ experiments that do not warm soil temperatures. (...) A second implication of our results is that the rate of sea level rise, and its influence on ambient plant productivity, **determines the net response of organic accumulation rates to climate change**. (...) Vertical accretion rates equilibrate to the rate of sea level rise within 100 years, so the **response of carbon accumulation rates to warming** is driven by competition between organic-matter production and mineral sediment trapping efficiency. (...) From a latitudinal gradient of *S. alterniflora* productivity in 56 North American marshes, we determine that $\sigma_B \approx 0.06 \text{ }^\circ\text{C}^{-1}$, in general agreement with experimental warming studies that also demonstrate **a positive response to warming** Response of salt-marsh carbon accumulation to climate change [Matthew L. Kirwan & Simon M. Mudd](#) *Nature* **volume489**, pages550–553 (27 September 2012)
- 114- Our results show that **plastic responses to climate change** may be driven by climatic trends other than increasing temperature, and may be associated with declines in individual fitness and, hence, population viability. (...) Phenological shifts are indeed the most often cited **ecological responses to climate change, with estimates of the mean responses across groups of species** ranging from advances of 0.23 days (ref. [7](#)) to 0.55 days (ref. [8](#)) per year. (...) To investigate the environmental factors contributing to this delay, we quantified **the phenotypic responses of individuals to variation in two weather variables** (date of snowmelt and spring temperature; see Methods for definitions) previously shown to influence emergence date in hibernating mammals, as well as the annual trends in these **predictors**. (...) Because we wished to quantify the extent of within-**individual**

plastic responses to environmental variation, we used a within-subject mean centring approach that decomposes the environmental effects into those associated with the average environment experienced by an individual over its lifetime (a ‘between-individual’ effect), versus deviations of the environment in a given year from the individual’s lifetime average (the ‘within-individual’ plastic effect).

Emergence date (y_{ij}) for each individual i in year j was modelled as **a continuous response to**

variation in the two weather variables, T_a and snow Delayed phenology and reduced fitness associated with

climate change in a wild hibernator [Jeffrey E. Lane](#), [Loeske E. B. Kruuk](#), [Anne Charmantier](#), [Jan O. Murie](#) & [F. Stephen Dobson](#) *Nature* volume489, pages554–557 (27 September 2012)

- 115- Here we **evaluate the fluvial response** in western Colorado to the PETM. (...) While increases in dissolved loads and clay export to oceans are restricted to the PETM interval, which implies **fast response times in step with the climate change, the fluvial response** in western Colorado persists 30 m beyond the isotope excursion ([Fig. 2](#)). (...) More importantly, we emphasize the overall coherency in western Colorado with simplified and scaled-down model and **experimental predictions**, and that we expect future studies to find **similar responses in other terrestrial sequences**. **Fluvial response to abrupt global warming** at the Palaeocene/Eocene boundary [Brady Z. Foreman](#), [Paul L. Heller](#) & [Mark T. Clementz](#) *Nature* volume491, pages92–95 (01 November 2012)
- 116- An innovative use of measurements of atmospheric carbon dioxide constrains the possible range of **carbon–cycle responses to climate change** during the twenty-first century, lowering expectations of tropical-forest dieback. (...) In most models, **the response of tropical ecosystems dominates** the strength of the global-scale climate–carbon feedbacks, although losses from high-latitude carbon pools are also important in models that incorporate the best current representation of permafrost-soil physics. (...) Obtaining **the correct magnitude of year-to-year atmospheric CO₂ responses to climate modes** is necessary, but not sufficient, for accurate, longer-term **carbon-cycle predictions** over decades to centuries. (...) But they probably have only moderate effects on tree recruitment, competition and mortality, which are likely to shape ecosystem responses to climate change on longer timescales. Climate science: Global warming and tropical carbon [James T. Randerson](#) *Nature* volume494, pages319–320 (21 February 2013)
- 117- **Potential phenotypic and evolutionary responses of species to warming**, if occurring, would reduce the rate of change in MTC. Signature of ocean warming in global fisheries catch [William W. L. Cheung](#), [Reg Watson](#) & [Daniel Pauly](#) *Nature* volume497, pages365–368 (16 May 2013)
- 118- In fact, the closer scientists look at **species' ongoing responses to our warming planet, the more surprises they uncover**. Ecosystems: Climate change must not blow conservation off course [Morgan W. Tingley](#), [Lyndon D. Estes](#) & [David S. Wilcove](#) *Nature* volume500, pages271–272 (15 August 2013)
- 119- An unprecedented opportunity to investigate the relationship between **individual heterozygosity and demographic response to climate change** is afforded by three decades of biometric, life history and genetic data from a population of Antarctic fur seals (*Arctocephalus gazella*). (...) To explore **this species' response to climate change**, we analysed biometric data and used population models based on estimated vital rates including survival, recruitment and fecundity. (...)

Heterozygosity is not heritable from mothers to daughters, so the shift towards older, more heterozygous breeding females is not **an evolutionary response to climate change**. Climate change selects for heterozygosity in a declining fur seal population [Jaume Forcada & Joseph Ivan Hoffman](#) *Nature* **volume511**, pages462–465 (24 July 2014)

- 120- **The response of heavy snowfall events to a changing climate, however, is unclear.** (...) However, it is not clear what this means for **the response to climate change**, and previous studies have differed in their findings as to whether heavy snowfall events are predominantly associated with anomalously cold or warm years (or seasons) in the present climate (...) In contrast, the snowfall extremes have **a relatively muted response**, with substantially smaller fractional changes than for mean snowfall in many regions ([Fig. 1b](#)). (...) **The response to climate change** is first presented for surface elevations below 1,000 m ([Extended Data Fig. 4](#)). Fractional decreases are greater for mean snowfall than for snowfall extremes for much of the temperature range considered here ([Fig. 2a](#)), which demonstrates **the contrasting responses of mean and extreme snowfall** even when monthly variations in climatological temperature are controlled for. (...) I next present a simple theory that **accounts for the main features of the response of snowfall extremes to climate change**. The theory does not include **the response of mean snowfall**, but this has been explained previously in terms of changes in mean precipitation and temperature. (...) I applied the theory introduced above to the simulations (Methods; [Extended Data Fig. 8](#)), and it captures **the important features of the response of the snowfall extremes to climate change** as a function of climatological monthly temperature ([Fig. 2b](#)). (...) Many mountainous regions experience heavy snowfall, but the accuracy of the theory is not as good for regions with surface elevations above 1,000 m ([Extended Data Fig. 10](#)), possibly because of variations in **the thermodynamic response of orographic precipitation to climate change** or the difficulty in simulating orographic snowfall. (...) This refinement to the theory is not attempted here because of the additional complexity and assumptions needed and because the current form of the theory adequately captures **the main features of the response of daily snowfall extremes to climate change**. (...) Inaccuracy in simulating Arctic sea-ice loss could affect the warming pattern and circulation, but this would not be expected to alter the contrast between **the responses of mean and extreme daily snowfall substantially**, and similar results are found here for the subset of models that have previously been identified as performing well when simulating Arctic sea ice (not shown). **Contrasting responses of mean and extreme snowfall to climate change** [Paul A. O’Gorman](#) *Nature* **volume512**, pages416–418 (28 August 2014)
- 121- We can no longer **ignore feedbacks between global warming and how people respond**, say Paul I. Palmer and Matthew J. Smith. Earth systems: Model human adaptation to climate change [Paul I. Palmer & Matthew J. Smith](#) 27 August 2014 *Nature* **512**, 365–366
- 122- One word of caution, however, is that **the climate-system response to freshening** in a cold climate may be very different from that in a warm climate. Earth science: Ocean circulation and rapid climate change [Ellen E. Martin](#) *Nature* **volume517**, pages30–31 (01 January 2015)
- 123- This result confirms **the importance of rapid responses in the atmosphere** to changes in black carbon. **These responses manifest themselves as warming** at height and changes in cloud properties that lead to a net decrease in mid- and high-level cloud ([Fig. 1](#)). Moreover, they act to offset the initial artificially large perturbation, mainly because the warming and cloud loss at altitude effectively radiate energy to space, **before the surface climate is able to respond**. However, **the magnitude of the rapid responses** reported by Sand *et al.* — roughly seven times

stronger than those to carbon dioxide — will come as a surprise to many climate scientists. The researchers also highlight another result, which has implications for numerical simulations of climate change. By using a pair of experiments, both of which explore the climate impacts of black carbon and differ only in whether black-carbon changes can also **adjust to atmospheric-circulation responses**, Sand *et al.* demonstrate **the role of the two-way black carbon–atmosphere interactions in driving the full climate response. Their findings are unexpected because these interactions seem to be the dominant cause of the climate response to changes in black carbon.** The change in global surface temperature varies by a factor of two between the two experiments, with considerably larger differences at altitude. Indeed, **many rainfall responses appear only when feedbacks of black carbon-to-atmosphere-to-black carbon** are included. The authors point out that **the feedback loop** of black carbon to itself through changes in climate may be particularly strong in their simulations because their model contains an unusually active atmospheric convection. Moreover, this strength may be exacerbated further by the artificially large perturbation imposed. **Experiments with other numerical models may find weaker responses.** (...) Plans are already under way to design climate-model experiments under the Coupled Model Intercomparison Project, Phase 6 (ref. 4), which will **provide improved knowledge of future climate responses** and feed results to the next assessment report of the Intergovernmental Panel on Climate Change. Climate change: **Black carbon and atmospheric feedbacks** [Ben Booth](#) & [Nicolas Bellouin](#) *Nature* **volume519**, pages167–168 (12 March 2015)

- 124- However, **sensitivity to both modelled Arctic climate change, as well as the responses of soil temperature**, moisture and carbon dynamics, are important controls over emissions predictions within these complex models, not pool size alone **Climate change and the permafrost carbon feedback** [E. A. G. Schuur](#), [A. D. McGuire](#), [C. Schädel](#), [G. Grosse](#), [J. W. Harden](#), [D. J. Hayes](#), [G. Hugelius](#), [C. D. Koven](#), [P. Kuhry](#), [D. M. Lawrence](#), [S. M. Natali](#), [D. Olefeldt](#), [V. E. Romanovsky](#), [K. Schaefer](#), [M. R. Turetsky](#), [C. C. Treat](#) & [J. E. Vonk](#) *Nature* **volume520**, pages171–179 (09 April 2015)
- 125- Although ecologists have long acknowledged **species’ direct physiological and demographic responses to climate**, more recent work suggests that **these direct responses can be overwhelmed by indirect effects mediated via other interacting community members (...)** **To explore how species’ responses to climate warming** depend on how their competitors migrate to track climate, we transplanted alpine plant species and intact plant communities along a climate gradient in the Swiss Alps. (...) We conclude that accounting for novel competitive interactions may be essential to predict **species’ responses to climate change accurately.** (...) Elevation gradients in mountains provide a unique opportunity to test how changing competitor identity **will affect species’ responses to climate change.** (...) While abrupt climate change experiments, as imposed here, mimic future conditions, **testing more gradual species’ responses**, such as adaptation, requires other approaches. (...) **The response of the focal species** to novel competitors depended on whether they grew at the experimental site with warmer or current climate conditions. (...) The one exception was **the strong response of *A. alpestris* biomass** to novel competitors, but **this response was replicated** when it grew without any competitors on the soils from the two elevations ($\chi^2 = 7.31$, d.f. = 1, $P = 0.007$; [Extended Data Fig. 3](#)), suggesting a limited role for shifting competitor identity. (...) We found that focal species tended to grow better at lower- versus higher-elevation (site $\chi^2 = 24.31$, d.f. = 1, $P < 0.001$) on a common 2,000 m soil, but **their response to soil origin never matched significant biomass responses** to novel competitors, suggesting that the observed changes in performance in [Fig. 2](#) were indeed due to shifting plant competition (with the exception of *A. alpestris* as mentioned above; [Extended Data Fig. 3](#)). (...) Our study provides some of the first empirical evidence that accounting for novel competitors may be important **to predicting species’ responses to climate change.** (...) Future work combining species’ functional traits, detailed distribution information and ecological theory may prove particularly useful for forecasting how novel competitive interactions determine **the response of biological diversity to climate change.** (...) When

the direction of a **species' significant biomass response** to novel competitors paralleled **its response to the bare soil** from the two competitor communities, we also tested the effect of soil itself. (...) A different statistical model was used to compare **the response of each focal species** to competition from its current competitors under current versus warmer climate, or to novel competitors under warmer climate. Novel competitors shape **species' responses** to climate change [Jake M. Alexander, Jeffrey M. Diez & Jonathan M. Levine](#) *Nature* **volume525**, pages515–518 (24 September 2015)

126- A small, but increasing, number of studies have shown that various micro-level components of the economy exhibit a **highly nonlinear response to local temperature** in a wide variety of countries, both rich and poor (see, for instance, refs [2](#) and [3](#)). (...) Almost all low-income countries are in 'warm' regions, and thus are predicted to suffer strong effects when temperatures go even higher, whereas rich industrialized countries are typically closer to the 'optimal' average temperature and thus show a **weaker and more varied response**. (...) Although these relationships vary and are typically strongly nonlinear, aggregation of these effects can smooth the pattern, **resulting in a nonlinear macro-level response to temperature** that is essentially applicable to all countries ([Fig. 1](#)). Economics: Higher costs of climate change [Thomas Sterner](#) *Nature* **volume527**, pages177–178 (12 November 2015)

127- But, to complicate matters further, species' climate sensitivity is not fixed. The phenological mismatches lead to selection on the timing of phenological events. And, because phenology is often heritable, this leads to genetic change in sensitivity. It will be a major challenge to combine genetic change with a food-web approach, and to include the necessary detailed climatological projections. But it is one that must be undertaken to forecast the effects of climate change, through **phenological responses**, on ecosystem function. Phenology: Interactions of climate change and species [Marcel E. Visser](#) *Nature* **volume535**, pages236–237 (14 July 2016)

128- Despite evidence that warming enhances carbon fluxes to and from the soil, the net global balance between **these responses remains uncertain**. (...) Under the conservative assumption that the **response of soil carbon to warming** occurs within a year, a business-as-usual climate scenario would drive the loss of 55 ± 50 petagrams of carbon from the upper soil horizons by 2050. (...) . Despite the considerable uncertainty in our estimates, **the direction of the global soil carbon response** is consistent across all scenarios. (...) There is growing confidence that warming generally enhances fluxes to and from the soil, but the net global balance between **these responses remains uncertain** and direct estimates of soil C stocks are limited to single-site experiments that generally reveal no detectable effects. Given **the paucity of direct measurements of the responses of soil C stocks to warming**, Earth system models (ESMs) must rely heavily on **the short-term temperature responses of soil respiration (Q_{10})** to infer long-term changes in global C stocks. (...) We took advantage of the growing number of climate change experiments around the world to compile a global database of soil C stock **responses to warming**. (...) By linking **these soil C responses to climatic and soil characteristics**, we are able to generate a spatial understanding of the temperature sensitivity of soil C stocks at a global scale. (...) No other environmental characteristics (mean annual temperature, precipitation, soil texture or pH) significantly ($P > 0.1$) **influenced the responses of soil C stocks to warming** in our statistical models. (...) By combining **our measured soil C responses** with spatially explicit estimates of standing C stocks and soil surface temperature change, we reveal the global patterns in the vulnerability of soil C stocks ([Fig. 3](#)). (...) The warming-induced losses of soil C that we observe have the potential **to offset these vegetation responses**, emphasizing the importance of representing soil C vulnerability in the process-based models that are used in **climate change projections**. (...) These limitations fall into two distinct categories: more data are necessary to improve both **our current global estimates of**

the temperature sensitivity of soil C and modelling efforts **to project these soil C responses into the future**. First, along with the limited spatial and temporal scale of current warming experiments, perhaps **the most critical limitation** to our present analysis is the paucity of information about **the responses of soil C stocks at depth** (below 10 cm). Quantifying global soil carbon losses in response to warming [T. W. Crowther, K. E. O. Todd-Brown & M. A. Bradford](#) *Nature* **volume540**, pages104–108 (01 December 2016)

- 129- These data show how **interactions between different climatic factors** result in complex dynamics, and that the effects of climate change may take many years to become apparent in long-lived marine top predators. (...) Given the observed effects of the winter NAO on attendance at the colony ([Fig. 1](#)) and breeding performance ([Fig. 2](#)), and of temperature on subsequent recruitment ([Fig. 3](#)), one would predict that colony size will be influenced by **a complex interaction between these different climate indices**. Lagged effects of ocean climate change on fulmar population dynamics [Paul M. Thompson & Janet C. Ollason](#) *Nature* **volume413**, pages417–420 (27 September 2001)
- 130- It is evident that **several interacting factors determine the outcome of climate effects** on DOC export, and that correlative experimental studies that base their conclusions on temperature or any other single parameter may be overly simplistic. Climate change (Communication arising): Terrestrial export of organic carbon [L. J. Tranvik & M. Jansson](#) *Nature* **volume415**, pages861–862 (21 February 2002)
- 131- These issues raise the profile of different proposed mechanisms for climate change, such as **the dynamics of air–sea interaction in the tropics and the sensitivity of the global system to changing greenhouse gases**. (...) Return of these chilly subpolar water masses to the sea surface at low latitudes provides a mechanism for cooling along the eastern boundary and the Equator, and points **to possible interactions between low-latitude and high-latitude controls of climate**. Climate change: Chilled out in the ice-age Atlantic [Alan C. Mix](#) *Nature* **volume425**, pages32–33 (04 September 2003)
- 132- Equally importantly, all parts of the world will have historically unprecedented CO₂ levels, which will affect plant species and ecosystems and herbivores, **resulting in novel species assemblages and interactions**. (...) Furthermore, many of the most severe impacts of climate-change are likely to stem **from interactions between threats**, factors not taken into account in our calculations, rather than from climate acting in isolation. Extinction risk from climate change [Chris D. Thomas, Alison Cameron, Rhys E. Green, Michel Bakkenes, Linda J. Beaumont, Yvonne C. Collingham, Barend F. N. Erasmus, Marinez Ferreira de Siqueira, Alan Grainger, Lee Hannah, Lesley Hughes, Brian Huntley, Albert S. van Jaarsveld, Guy F. Midgley, Lera Miles, Miguel A. Ortega-Huerta, A. Townsend Peterson, Oliver L. Phillips & Stephen E. Williams](#) *Nature* **volume427**, pages145–148 (08 January 2004)
- 133- Clearly this needs to be improved, but we have very little empirical understanding of how **rainfall, humidity and their interactions with temperature** influence vector populations. Malaria: A changed climate in Africa? [Christopher Thomas](#) *Nature* **volume427**, pages690–691 (19 February 2004)

- 134- For years, climate researchers have struggled with an apparent discrepancy in the data on global warming: temperatures in the lower atmosphere have been rising far slower than models predict, given how fast the Earth's surface is heating. The discrepancy has been central to the arguments of sceptics about global warming. But according to a study in this issue of *Nature* (see) it can be explained by **interactions between the troposphere** — the first 11 km of the atmosphere — and the stratosphere above it. Global warming anomaly may succumb to microwave study *Nature* **volume429**, page7 (06 May 2004)
- 135- Research is now under way to address the issue. As a follow-up to the *Science* paper, the authors have started to investigate **how oceans interact with the atmosphere** in different parts of the world. Hurricane link to climate change is hazy [Quirin Schiermeier](#) *Nature* **volume437**, page461 (22 September 2005)
- 136- In discussing the ‘gears’ of the earth's climate, he expertly and succinctly describes the **natural cycles that control climate and the many ways they interact**. The costs of global warming [Quirin Schiermeier](#) *Nature* **volume439**, pages374–375 (26 January 2006)
- 137- Future monsoon behaviour will also depend on how **such natural variations interact with the combined anthropogenic effect from aerosols** (thought to weaken monsoon intensity) **and greenhouse gases** (thought to strengthen it). Climate change: Lessons from a distant monsoon [Jonathan T. Overpeck](#) & [Julia E. Cole](#) *Nature* **volume445**, pages270–271 (18 January 2007)
- 138- **Climate is a major determinant** of where a species lives and **how species interact**. Managing nature as Earth warms [Jessica J. Hellmann](#) *Nature* **volume458**, pages1112–1113 (30 April 2009)
- 139- **Real outcomes might be plagued by interactions that doom the planet to warming of 2 °C (or more)**, whether or not emissions are cut. Even with a big dose of luck, the effort needed to get to 2 °C would be heroic, as Allen and colleagues indicate, and probably far beyond what real governments can achieve. Global warming: why the 2 °C goal is a political delusion [David G. Victor](#) *Nature* **volume459**, page909 (18 June 2009)
- 140- Today, a central element is the interplay between the easterly trade winds in the subtropics and the westerly winds that, in turn, **interact with the ocean to move water (and heat)** around its surface. Climate change: Beyond the CO₂connection [Rainer Zahn](#) *Nature* **volume460**, pages335–336 (16 July 2009)
- 141- **Synergistic interactions with other conservation threats** could also be a bigger problem in tropical forests, which have many more species and more complex mutualisms than temperate forests. Changing climate threatens tropical rainforests too [Kwek Yan Chong](#), [Chow Khoon Yeo](#) & [Alex Thiam Koon Yee](#) *Nature* **volume465**, page420 (27 May 2010)

- 142- Physical scientists, health scientists and engineers are starting to answer specific questions about **how cities and the urban environment will interact in the face of climate change**. (...) There are important questions about how **air pollution will interact with future temperatures to affect population health**. Cities lead the way in climate-change action [Cynthia Rosenzweig](#), [William Solecki](#), [Stephen A. Hammer](#) & [Shagun Mehrotra](#) *Nature* **volume467**, pages909–911 (21 October 2010)
- 143- And the book includes an infographic on **the interactions between different causes of climate change**. Q&A: Climate-change DJ [Jascha Hoffman](#) *Nature* **volume477**, page279 (15 September 2011)
- 144- Arguably, even less seems to be known about **large-scale climate–biodiversity interactions and feedbacks**, preventing interpretation of climate-model diagnostics in the context of biodiversity stability. Earth science: The timing of climate change [Chris Huntingford](#), [Lina Mercado](#) & [Eric Post](#) *Nature* **volume502**, pages174–175 (10 October 2013)
- 145- This is due in part to the amount of information that is required to understand the complex networks of **ecological interactions** between organisms and their changing habitats. (...) Warming waters mean that, in the Northern Hemisphere, some southerly fish species are moving northward and forging **new interactions along the way**. Will these changes push some species towards faster extinction and others towards domination? Although we do not yet have an answer, knowing **the nature of the animals' interactions** and how they are likely to change can provide clues to help guide the mitigation of biodiversity loss before it is too late. (...) Food-web interactions form the core of ecosystem models that are commonly used **to assess the impacts of human activity on ecosystems** or non-target species. Climate change: A rewired food web [Julia L. Blanchard](#) *Nature* **volume527**, pages173–174 (12 November 2015)
- 146- **Climate change also interacts with other major forces** that have precipitated the current extinction crisis — most of which are also driven by human actions. Bring climate change back from the future The ‘shock’ over an Australian extinction shows that we still don’t accept that global warming is a problem for now, says [James Watson](#). *Nature* **534**, 437 21 June 2016
- 147- The range of risks summarized in the IPCC's 2014 *Synthesis Report* was limited by the research available. For example, the assessment highlighted increasing risks of climate extremes but said little about **how climatic hazards interact with societal vulnerability**. (...) **The impacts of climate changes and climate policies will interact** if, for instance, a slower reduction in poverty owing to higher energy costs increases vulnerability. (...) Research and assessment can create a powerful foundation for **these interactions**, and empower decisions in the years ahead. Make climate-change assessments more relevant Stéphane Hallegatte, Katharine J. Mach and colleagues urge researchers to gear their studies, and the way they present their results, to the needs of policymakers. *Nature* **534**, 613–615 27 June 2016

- 148- The authors discuss how Republican senator Jim Inhofe (Oklahoma) is **waging a “war” on climate science** by using hearings of the Senate environment committee that he chairs to try and debunk climate change. (...) For a wider readership, it makes clear just how high the stakes are. **If tackling climate change is indeed a war**, then Mann and Toles have certainly earned their stripes. I salute them. Climate science: Denialism deciphered [Dave Reay](#) *Nature* **volume538**, pages34–35 (06 October 2016)
- 149- Another powerful method of scaling future climate projections is to use **an optimal fingerprint** method. (...) The temperature ranges derived by **this fingerprint** method for a similar scenario (IS92a) are consistent with our results, from which we conclude that including natural variability would not strongly widen the PDF for long-term temperature changes. Constraints on radiative forcing and future climate change from observations and climate model ensembles [Reto Knutti](#), [Thomas F. Stocker](#), [Fortunat Joos](#) & [Gian-Kasper Plattner](#) *Nature* **volume416**, pages719–723 (18 April 2002)
- 150- These analyses reveal **a consistent temperature-related shift, or ‘fingerprint’**, in species ranging from molluscs to mammals and from grasses to trees. (...) **The predicted result, or fingerprint**, of an underlying consistent shift in a large-scale pattern shown by many species around the globe, coupled with an understanding of the possible causal mechanisms, provides confidence in attributing observed species changes to climatic change. (...) Meta-analyses provide a way to combine results, whether significant or not, from various studies, and to find **an underlying consistent shift, or fingerprint**, among species from different taxa examined at disparate locations. **Fingerprints of global warming** on wild animals and plants [Terry L. Root](#), Jeff T. Price, [Kimberly R. Hall](#), [Stephen H. Schneider](#), [Cynthia Rosenzweig](#) & [J. Alan Pounds](#) *Nature* **volume421**, pages57–60 (02 January 2003)
- 151- We define **a diagnostic fingerprint of temporal and spatial ‘sign-switching’ responses** uniquely predicted by twentieth century climate trends. Among appropriate long-term/large-scale/multi-species data sets, **this diagnostic fingerprint** was found for 279 species. (...) How should a **‘climate fingerprint’ be defined?** A straightforward view typical of an economist would be to conclude that climate change was important if it were principally responsible for a high proportion of current biotic changes. By this criterion a **climate fingerprint** appears weak. (...) The test for a **globally coherent climate fingerprint** does not require that any single species show a climate change impact with 100% certitude. Rather, it seeks some defined level of confidence in a climate change signal on a global scale. Adopting the IPCC ‘levels of confidence’ and applying the **economists’ view of a fingerprint**, we would have **“very high confidence” in a fingerprint** if we estimated that more than 95% of observed changes were principally caused by climate change, “high confidence” between 95% and 67%, “medium confidence” between 33% and 67%, and “low confidence” below 33%. (...) **We search for a climate fingerprint in the overall patterns**, rather than critiquing each study individually. (...) We formulated a probabilistic model to ask whether a **climate change fingerprint** exists in a disparate set of nobserved biological changes. (...) Claiming a **climate fingerprint** with high confidence would require high minimum values for π (> 0.67) regardless of n/n . (...) The meta-analyses of 334 species and the global analyses of 1,570 species (or functional/biogeographic groups) show highly significant, nonrandom patterns of change in accord with observed climate warming in the twentieth century, indicating a very high confidence ($>95\%$) in a **global climate change fingerprint** ([Table 2](#)). (...) We show that moderate values of π (0.35–0.70) are consistent with medium confidence in a **global climate change fingerprint**. The different approaches raise two distinct questions of the data and result in different levels of confidence in a **climate change fingerprint**. (...) With 279 species (84%) showing predicted sign switches, this diagnostic indicator increases confidence in a **climate change fingerprint** from either viewpoint. (...) **The climate fingerprint** found here implicates climate change as an important driving force on natural systems. A **globally coherent fingerprint of climate change** impacts across natural systems [Camille Parmesan](#) & [Gary Yohe](#) *Nature* **volume421**, pages37–42 (02 January 2003)

- 152- This **spatial fingerprint** of change echoes an independent reconstruction of the southeast Pacific, based on similar faunal methods, which found considerable ice-age cooling off Peru and along the Equator. Climate change: Chilled out in the ice-age Atlantic [Alan C. Mix](#) *Nature* **volume425**, pages32–33 (04 September 2003)
- 153- Ongoing climate change leaves a **clear global fingerprint** on ecosystems. Many organisms bring forward the timing of their seasonal activities, whether it be flowering in plants, budding of trees, emergence of insects or breeding in birds. Climate change and population declines in a long-distance migratory bird [Christiaan Both](#), [Sandra Bouwhuis](#), [C. M. Lessells](#) & [Marcel E. Visser](#) *Nature* **volume441**, pages81–83 (04 May 2006)
- 154- The attributable SST warming is derived from estimates that used well-established **'optimal fingerprinting' analysis**. (...) These spatial patterns each have an uncertainty distribution on their amplitude, estimated through **optimal fingerprinting analysis**. Anthropogenic greenhouse gas contribution to flood risk in England and Wales in autumn 2000 [Pardeep Pall](#), [Tolu Aina](#), [Dáithí A. Stone](#), [Peter A. Stott](#), [Toru Nozawa](#), [Arno G. J. Hilberts](#), [Dag Lohmann](#) & [Myles R. Allen](#) *Nature* **volume470**, pages382–385 (17 February 2011)
- 155- In our approach, the algorithm captures larger-scale ocean dynamics by clustering data into **'biogeochemical fingerprints'** in a self-organizing map (SOM). Future ocean hypercapnia driven by anthropogenic amplification of the natural CO₂ cycle [Ben I. McNeil](#) & [Tristan P. Sasse](#) *Nature* **volume529**, pages383–386 (21 January 2016)
- 156- Kouji Murayama, a researcher at the Japan Meteorological Business Support Center in Tokyo, believes that **the culprit is global warming**. He points to studies that show a clear link between summer temperatures and the amount of pollen produced the following spring. Such data already provide the basis for pollen forecasts. Climate change blamed for rise in hay fever [Rachael Williams](#) *Nature* **volume434**, page1059 (28 April 2005)
- 157- **Declining atmospheric CO₂ has long been envisaged as a culprit for the past 55 million years of cooling climates**, and the consequent transition from an ice-free world to one with large ice sheets on Greenland and a frozen Arctic, as well as with a deep-frozen Antarctica. Climate Change: The Arctic tells its story [Heather M. Stoll](#) *Nature* **volume441**, pages579–581 (01 June 2006)
- 158- **The most widely suspected culprit** is the 'conveyor' circulation in the Atlantic Ocean, known to be capable of abruptly switching on and causing rapid warming of the European climate. Climate change: Southern see-saw seen [Jeffrey P. Severinghaus](#) *Nature* **volume457**, pages1093–1094 (26 February 2009)

- 159- But CO₂ concentrations have not been as high as modern values for at least the past 3 million years, so we need to go further back in time to find potential analogues of current and future climate change. (...) **Possible culprits include compounds known as methane hydrates**, found in deep-sea sediments; volcanism that coincided with the initial opening of the Norwegian–Greenland Sea; and thawing of permafrost. Palaeoclimate: Volcanism caused ancient global warming [Katrin J. Meissner](#) & [Timothy J. Bralower](#) *Nature* **volume548**, pages531–533 (31 August 2017)
- 160- This so-called backward SAR method is a method for estimating endemic species, not ‘**extinction debt**’. The backward SAR method has nothing to do with, and does not measure, **extinction debt**. We do not question the existence of **extinction debt**, but to measure **extinction debt** it is necessary to use other methods. (...) We do not disagree with Thomas and Williamson that extinction is caused by many factors, not just habitat loss, including climate change, and we also agree that extinction is real and happening at elevated rates. He and Hubbell reply [Fangliang He](#) & [Stephen P. Hubbell](#) *Nature* **volume482**, pagesE5–E6 (23 February 2012)
- 161- These climatic oscillations over short geological timescales strongly affected sea levels and caused massive changes in island area, isolation and connectivity, orders of magnitude faster than the geological processes of island formation, subsidence and erosion considered in island theory. Consequences of these oscillations for present biodiversity remain unassessed. (...) Considering this and that island floras might have been unsaturated during the LGM²⁴, a potential post-LGM **extinction debt** seems to have a minor role. Late Quaternary climate change shapes island biodiversity [Patrick Weigelt](#), [Manuel Jonas Steinbauer](#), [Juliano Sarmiento Cabral](#) & [Holger Kreft](#) *Nature* **volume532**, pages99–102 (07 April 2016)

ENV Extracts

ENV - Eulogy of nature scenarios

ENV - GREEN scenario:

- 1- **The awards** will go to corporations who have shown **an outstanding commitment to acting green**. The Academy is dedicated to showing how hard corporations are really working for sustainable development. Nominations are open for the Green Oscars 04 June, 2002

- 2- For the Earth Summit to be rescued, governments in the North must urgently change their trade policy. The EU in particular expected developing countries **to support a global move towards green goals** such as expanding renewable energy, but were not able to address all their concerns about the unfair and inequitable trading system. Earth Cup Semi-Final in Bali: United States 1 – Earth 0 FoE denounces foul result at Earth Summit talks 07 June, 2002

- 3- "**Clean** technologies and renewables must be deployed as soon as possible. If the world is locked into a carbon-intensive development path, the impacts will fall most heavily on communities in fossil fuel producing regions and those most vulnerable to climate change. Resources and money, particularly public funds, **must be channeled away from dirty, inefficient fossil-fuels and towards the clean, green energy of tomorrow**". Catherine Pearce FOE. Advance Notice: MAJOR INTERNATIONAL RENEWABLES CONFERENCE – Bonn 1-4 June 01 June, 2004

- 4- "Clean technologies and renewables must be deployed as soon as possible. If the world is locked into a carbon-intensive development path, the impacts will fall most heavily on communities in fossil fuel producing regions and those most vulnerable to climate change. Resources and money, particularly public funds, **must be channelled away from dirty, inefficient fossil-fuels and towards the clean, green energy of tomorrow**". China's future energy needs 07 November, 2005

- 5- Greenpeace is an independent campaigning organization with a presence in 40 countries that uses non-violent, creative confrontation to expose global environmental problems and force solutions that are essential to **a green and peaceful future**. International environmental groups unite against Australian corporate assault on free speech 23 May, 2005

- 6- Greenpeace is an independent campaigning organization with a presence in 40 countries that uses non-violent, creative confrontation to expose global environmental problems and force solutions that are essential to **a green and peaceful future**. International environmental groups unite against Australian corporate assault on free speech 23 February, 2005

- 7- Tony Juniper (FOE) continued: "If the world is to avert global economic, social and environmental catastrophe, then a broad package of measures is needed at a national and international level. The technology exists to take us forward to **a clean green low carbon future** but emissions across the European Union as a whole are still rising. Governments need to recognise the urgent need to embrace such change and adopt climate friendly policies at every level." Climate change study shows urgent measures needed 30 October, 2006 (my addition in parenthesis)
- 8- People want a commitment to **a green, safe, sustainable, just energy future** based on energy savings and socially controlled energy. Nothing less than a systemic transformation of our energy systems will suffice to solve the climate crisis. Paris Climate Summit: People determined to mobilize for Climate Justice 27 November, 2015
- 9- Kate Hampton of Friends of the Earth International said: "The United States is the world's biggest polluter. It is outrageous that President Bush is still refusing to cut emissions in order to avoid upsetting the powerful US fossil fuel lobby. "This is an insult to other countries who gave their backing to the Kyoto Protocol in Marrakech last year. World leaders must not play along with **this green con trick** and continue to press him to ratify Kyoto." President Bush's climate policy, released today, was condemned by Friends of the Earth International as his latest climate con 14 February, 2002
- 10- But our experience shows many corporations are really engaged in "**greenwash**" (ie PR exercises designed **to boost their green image, without any change to their core activities**). The political failure to force these corporations to improve their operations, effectively rewards bad corporate behaviour and penalises good corporate behaviour. Don't let big business rule the world: Friends of the Earth International launches global campaign for Earth Summit 01 June, 2002
- 11- With Awards in 11 categories, including **Best Greenwash Actor**, Best Bluewash Actor (for masquerading as a corporate humanitarian), Best Supporting Government, Best Director, Best Picture, Best Makeup, and a Lifetime Achievement Award, **the Greenwash Awards** are the world's premier prize for **companies acting - but not behaving - green**. The multi-media award ceremony will include a display of some of the best examples of **greenwash** in the world today. Oil majors, biotech giants lead Greenwash Academy Award Nominees South – African companies: "Don't count us out" 22 August, 2002
- 12- "**This is not a green solution but public relations greenwash**", said spokesperson for SAFeAGE, Glenn Ashton. "There are other alternatives to GE to fulfil the needs of Africa and the south with far greater and proven potential than GE crops" Ashton said. **Greenwashing** genetic engineering at the WSSD: GE crops are not a tool for sustainable agriculture 21 August, 2002

- 13- Johannesburg, South Africa, August 30, 2002 - The International Chamber of Commerce (ICC) is pulling off the most outrageous **green-wash** stunt in history, according to Friends of the Earth International (FoEI) by presenting here the 'World Summit Business Awards for Sustainable Development Partnerships' on Aug 31. "The great irony is that the ICC is presenting itself as a paragon of sustainable development through giving out these awards. This is the worst kind of **greenwash**, because Governments and **the public will be tempted to assume the ICC is really working for sustainability, when its record is far from green,**" said Ricardo Narvarro, Friends of the Earth International Chair. Corporate lobbyists exposed for history's greatest **greenwash** 30 August, 2002
- 14- "BP markets itself as a **clean and green** oil company," said Nicholas Hildyard from The Corner House¹. "This complaint reveals how BP and its partners are routinely seeking exemptions from public health and environmental laws, and circumventing genuine public consultation. This isn't beyond petroleum, it's beyond the pale." Groups file claim against BP and pipeline partners in 5 countries "Green" company violating international norms in controversial Caspian oil pipeline 29 April, 2003
- 15- Eight years ago, Shell committed itself to sustainable development and the company **promoted its green image to the world**. But as people living next door to Shell will tell directors at the company's AGM, **the reality is a far cry from the green promises in glossy brochures and advertising campaigns** - Shell is failing the sustainability challenge. (...) LONDON (UK) / THE HAGUE (NETHERLANDS) - Oil giant Shell is still putting short-term profit before people and the environment, **despite its public commitment to a "green" future**, according to a shocking new report launched today to coincide with the company's Annual General Meeting (AGM). Shell failing the challenge Shell challenged by community activist shareholders at its AGM 23 April, 2003
- 16- May 8, 2007 - Complaints are being filed today, May 8, in three European countries against a **shameless advert that makes exaggerated and misleading green claims** about oil giant Shell's operations. Shell's misleading ad 08 May, 2007
- 17- PENANG (MALAYSIA) / BRUSSELS (BELGIUM), October 7, 2008 – Malaysian palm oil exported for use in food, biofuels and cosmetics **is far from 'green' – contrary to claims by Malaysian palm oil producers** – shows the new report "Malaysian Palm Oil: **Green Gold or Green Wash?**" released today by Friends of the Earth groups. Malaysian palm oil **greenwash** report 07 October, 2008
- 18- "Whilst we feed cars and factory farms with cheap crops from the South, food prices rocket, forests are destroyed and people suffer. **Certifying these crops as green, even if well intentioned, is a smokescreen that will fool the public and let the problems continue**. The really **green answer** is to reduce the demand for these crops in the first place," said Adrian Bebb of Friends of the Earth Europe. **Green** schemes for biofuel crops set to fail 22 April, 2008

¹ <http://www.thecornerhouse.org.uk/>

- 19- Understood within this context, the RSPO is a voluntary certification process for a market premium and membership that may be able to add a much sought after and **totally misleading 'green tag' to the industry**. Moreover, it provides certification without having to actually address some of the most very basic, structural issues that gave rise to the adverse impacts of oil palm cultivation. 'Certified' palm oil not a solution 03 November, 2009
- 20- As Shell's new Chief Executive, Peter Voser, takes charge this week, Friends of the Earth, Oil Change International and PLATFORM have released new research showing that despite attempts by outgoing CEO, Jeroen van der Veer, **to portray a green image**, the company has opted for a way forward **that is in stark contradiction** with the need to reduce CO2 emissions. Shell climate crimes exposed in new report 29 June, 2009
- 21- June 2009, Friends of the Earth England, Wales and Northern Ireland's: A complaint to the Advertising Standards Association (ASA) on the Malaysian Palm Oil Council's **misleading green claims**. In September 2009 the ASA called for the advertisement in question to be withdrawn. Complaint to the ASA about Malaysian Palm Oil Council 09 June, 2009
- 22- A new initiative to **re-brand the intensive and damaging** farming of soy as 'responsible' is nothing short of **green-wash** and will con the public, said Friends of the Earth International today. (...) Adrian Bebb from Friends of the Earth Europe said: "This scheme is nothing short of **green-wash** and should be abandoned. The standards they are developing will legitimise a devastating system of soy cultivation that is wiping out forests and destroying small farmer livelihoods for the benefit of a handful of very big landowners and multinational corporations. The only responsible soy is less soy." (...) Friends of the Earth International claims that the RTRS is **a green con**. **Public warned over 'Green Soy' scam** 27 May, 2009
- 23- Kirtana Chandrasekaran (food sovereignty program coordinator at Friends of the Earth International) added: "Rather than giving a 'responsible' label to an irresponsible product, we must overhaul factory farming in Europe. This would be good news for farmers, consumers and the environment and will reduce Europe's global footprint. **We need action to do this, not a green scam.**" Launch of 'responsible soy' label faces global opposition 08 June, 2010 (my addition in parenthesis)
- 24- Gates foundation-led **green revolution promotes false solutions** to hunger in Africa 25 September, 2012
- 25- "Fortunately **the so called 'Green Economy'** does not have such a prominent role that corporations would have wished to see in the declaration, and this is a victory for all those opposed to **the destructive Green Economy**

agenda promoted by industrialised countries and multinational corporations,” added Lucia Ortiz. FOE. Rio+20 declaration: a gift to corporate polluters 20 June, 2012

- 26- The UN has been working very closely with big business in developing and promoting the **concept of ‘Green Economy’ which is selling out nature and people, and greenwashing a broken and unfair economic system at the expense of sustainable development.** New Report Exposes ‘Corporate Capture’ of the UN 19 June, 2012

- 27- The UN has been working very closely with big business in developing and promoting the concept of **‘Green Economy’ which is selling out nature and people, and greenwashing a broken and unfair economic system at the expense of sustainable development.** Rio+20: Friends of the Earth international to meet with UN secretary general Ban Ki-moon: “stop the business lobby at the UN” 19 June, 2012

- 28- “The Rio+20 Summit **should not promote the ‘Green Economy’ agenda, which is selling out nature and people, and greenwashing an unjust and unsustainable economic system,**” added Ortiz. FOE. (...) The Peoples Summit is a process bringing together social movements and organizations from all over the world, to call for the defense of life and commons, social and environmental justice, **against commodification of nature and the ‘Green Economy’.** Rio+20 summit must listen to people’s summit 16 June, 2012

- 29- Remark by NGO Major Group on **the green economy** at Rio+20 talks in New York, May 1, 2012: “Civil society remains **deeply uncomfortable with the green economy concept** that is being used for **greenwashing the old discredited model of unsustainable development** as exemplified by the yawning gap between the conditions of the 99% and the 1%. This is particularly evident in the over emphasis by some countries which insist on **promoting the leading role of the private sector in the green economy.** **At the same time there is opposition to proposals for stricter regulatory mechanisms** for large corporations, in particular Transnational Corporations. The stress on **market-based mechanisms for the green economy which by definition supports trading of carbon, forests and biodiversity and water, for example are major concerns for us and which for which we remain firmly oppose.**” UN global compact turns a blind eye to corporate malpractices 10 May, 2012

- 30- Anglo American continues **to expand its climate-wrecking dirty business model while using green funds, offset mechanisms and dodgy techno-fixes to present a green image,** according to the report 'Anglo American's **dirty energy** lobby and **its false climate solutions'** which was released at the 'Peoples Summit against Climate Change' in Lima. Anglo American’s negative influence on climate policies exposed 08 December, 2014

ENV - FAMILY/ HOME scenarios:

- 31- "It's totally inappropriate for the countries who have **mortgaged our planet's future** to lend money to developing countries to tackle climate change - and then leave them saddled with financial and environmental catastrophe. Friends of the Earth's Climate Campaigner Asad Rehman High-level advisory group on climate change must avoid pitfalls 04 November, 2010
- 32- "We are bitterly angry that the OPEC countries, Japan and the United States have combined in this way to help wreck the world's environment and **endanger the security of our common home.(...)**" Hampton added. Kate Hampton, Climate Campaigner for Friends of the Earth International Earth Summit dumps on climate 02 September, 2002
- 33- "The real solutions **to feeding the world and nurturing our planet** are in the hands of small scale food producers. Food sovereignty and agroecology provide us with peoples' knowledge and science and this is where we need to provide support," added Kirtana Chandrasekaran. FOE Pope says climate crisis is a matter of justice – reaction 18 June, 2015
- 34- Prakash Sharma, Director of Pro Public (Friends of the Earth Nepal) said:
"Mount Everest is a powerful symbol of the natural world, not just in Nepal . If this mountain is threatened by climate change, then we know the situation is deadly serious. If we fail to act, we are failing future generations and denying them the chance **to enjoy the beauty of mother earth**. I urge the committee to place Sagarmatha National Park on the danger list." Everest must be put on a danger list 11 July, 2005
- 35- Vanessa María Gálvez Hernández, from Ceiba/ Friends of the Earth Guatemala said: "The people of Central America are fighting to defend our territories in the struggle against climate change. Transnational corporations and elites are responsible for the crisis and are promoting false solutions such as extractive activities, monoculture plantations, agribusiness, carbon markets, and free trade agreements. Instead we are promoting "Good Living" which is based on **the principles of solidarity, equity, harmony and respect for mother Earth.**" Friends of Earth International calls on President Obama to earn his Nobel 02 November, 2009
- 36- Lionel Lepine, representing the Athabasca Chipewyan First Nation in Canada said: "Shell's tar sand operations are disrupting our traditional way of life. They are destroying our air, water, land and medicinal plants and the birds, fish and animals we depend on to sustain our people" Mr. Lepine also stated that "Shell's footprint in our lands will have a multi-generational effect on our children not yet born, they are violating our Indigenous rights, **the rights of our sacred Mother Earth** and we are here at their AGM to put them on notice that we will stop them." Shell 'apologises' for worldwide damage in "erratum" to annual report 17 May, 2011

- 37- Friends of the Earth International campaigners are joining thousands of environmental defenders including relatives of murdered Peruvian trade union activists at today's 'world march **in defense of mother earth**' in Lima. The campaigners are observing the UN climate negotiations in Lima and participating in the alternative Peoples Summit. Climate injustice exposed on human rights day 10 December, 2014
- 38- "The Himalayas **nurture** bountiful, mighty, revered rivers such as the Ganga, Indus, Mekong, Yangtze, Irrawaddy, and many others. These rivers **feed** the lives and livelihoods of over 1.5 billion people including in India, Nepal, Tibet, China, Pakistan, Bangladesh, Myanmar, Thailand, and Afghanistan" said Dipti Bhatnagar, Friends of the Earth International climate justice and energy co-coordinator. Everest 'climbing for climate justice' expedition aims to break world records 08 May, 2013

ENV - RELIGION scenarios:

- 39- "People all over the world are protesting against corporate globalization - but governments continue to **sacrifice** the Earth Summit **on the altar of Exxon, Monsanto and co,**" said Daniel Mittler Earth Summit Coordinator for Friends of the Earth. Earth Summit is sinking: NGOs warn Kofi Annan 31 May, 2002
- 40- Nnimmo Bassey, chair of Friends of the Earth International, said: "Our hearts go out to the people of Japan in the tragic aftermath of the earthquake and tsunami. While these are natural disasters, the additional nuclear disaster is human made and clearly shows the urgent need for Japan and other countries to halt plans for new nuclear plants, to decommission existing ones and to invest in safe, renewable energy forms. **We cannot sacrifice more lives on the altar of the nuclear power industry lobby.**" Friends of the Earth International launches appeal as situation in Japan deteriorates 16 March, 2011
- 41- "Water is the source of life. To deprive poorest people of this right so that a few people can get rich, is one of **the gravest sins** that Newmont is committing in the Northern Andes of Peru," says Father Marco Arana of the Peruvian organization Grufides. (...) Affected people need to get better rights to protect their environment and their health. If needed, they must be able to take a company like Newmont to court in the US for crimes committed in other parts of the world," says Paul de Clerck from Friends of the Earth International Newmont: Don't poison our drinking water 25 April, 2006
- 42- Reverend Nnimmo Bassey, Executive Director of Environmental Rights Action/Friends of the Earth Nigeria, commented: "This victory marks a new dawn in the struggle of the communities of the Niger Delta to have **these flares of hell switched off**. For the first time there is a hope that children here can hope to have a dark, quiet night, enjoy the chirps of birds and rest their ear drums from the awful noise of these gas flares." Court orders oil companies to stop gas flaring in Nigeria 14 November, 2005

ENV - Deterioration scenarios

ENV – DAMAGED BODY scenarios:

- 1- Moreover, the inter-national community has an obligation to protect Indonesian forests, **described as “lungs of the world”**. Protests against mining giants and Indonesian government 03 July, 2003

- 2- “The rest of the world seems to be **suffering from a severe case of amnesia**, forgetting that we have once already **allowed the United States to severely weaken international climate agreements,**” said Antje von Broock, climate campaigner at Friends of the Earth Germany Friends of Earth International calls on President Obama to earn his Nobel 02 November, 2009

- 3- Nnimmo Bassey said: "The UN remains key to humanity’s collective response to this crisis and we see that the multilateral process is moving forward. However, the UN is only as strong as the countries that compose it. We could not achieve the progress that is needed in Cancun because the rich countries that are primarily responsible for climate pollution have prevented it. Rich countries tried to **assassinate the Kyoto Protocol and it is now on life support**, we have to redouble our efforts in the coming year **to revive it.**” Cancun package merely prevents collapse and leaves Kyoto protocol on life support 11 December, 2010

ENV - DAMAGED CONTAINER scenarios:

- 4- "The StarLink case clearly shows that biotech companies do not control their genetically modified inventions. Once they are **released** into the environment they are nearly impossible **to call back,**" said Larry Bohlen of Friends of the Earth U.S. “Stop contaminated US corn exports” more than 100 groups worldwide say to President Bush Concern over more contamination and unresolved reports of illnesses is increasing 04 April, 2001

- 5- ExxonMobil Chairman Lee Raymond is on record advocating that developing countries should lower environmental standards in order to promote economic growth. A recent report on the Baytown refinery in Houston has revealed **persistent accidental releases** and failure to report problems and emissions. Twelve years after the infamous Exxon Valdez disaster, **contamination** continues. ExxonMobil has been fined millions for Clean Air Act violations and the company openly funds anti-environment think tanks. Exxonmobil (Esso) international day of action: 11th of July 18 June, 2001

- 6- The European Commission and the Member States must stand firm in the face of US pressure and give EU citizens **the strict regulations on environmental and consumer protection** that they demand, (...) said Gill Lacroix, Biotechnology Coordinator at Friends of the Earth Europe. (...) The EU’s de facto moratorium was initiated by five Member States in 1999 - Denmark, France, Greece, Italy and Luxembourg - which demanded **traceability and labelling** regulations before any more GMOs are approved for **release** in the EU. Since then, three more Member States – Austria, Belgium and Germany – have adopted positions which support the moratorium. This initiative, first put forward by

the Commission in July 2000, proposes that GMO approvals could start again if the biotech companies commit, under voluntary agreements, to adhere to the conditions of both the revised **deliberate release directive** (before it is officially in place) AND the future EU Regulations on Traceability/Labeling of GMOs and GM Food/Feed. The U.S. steps up the pressure on EU GMO legislation 16 January, 2002

- 7- Many southern countries are concerned about **the potential threats GMO releases** present. In Brazil, no commercial cultivation of GMOs is legal today. An exploratory study conducted by independent researchers on nine different farms in southern Brazil illegally cultivated with GMO soya demonstrates some of the problems related to the commercial introduction of these crops. The study concluded that problems in plant development, significant rates of herbicide use, and emergence of weeds resistant to glyphosate (Roundup) are issues that need further investigation. Immediate action to **protect biodiversity** from GMO contamination demanded during COP6 meeting 17 April, 2002

- 8- Messages so far include a hard-hitting interview with the internationally-renowned anti-dam campaigner and Booker prize-winning author Arundhati Roy, a message of support from Radiohead lead singer Thom Yorke, and Ricardo Navarro of Friends of the Earth International talking about the impact of corporations in El Salvador. Noises people have recorded and sent in include the sound of the Sumatran gibbon, under threat from logging activities in Indonesia, and the hissing sound of **polluting gas, released by petrochemical plants** in South Africa. Make a noise to save the planet! Radio Earth Summit goes on-line 15 July, 2002

- 9- Scientific advisors to the U.S. Environmental Protection Agency have said that the bacterial toxin in most types of engineered corn may be a human allergen, and dozens of reports of severe unexplained adverse reactions to corn products in the U.S. have not been adequately investigated. (...) Once **released**, even in small quantities, widespread contamination by engineered corn can occur, as documented both in the U.S. and in Mexico. StarLink was planted on only 0.5% of all acreage but contaminated at least 10% of the entire corn crop in 2000. Friends of the Earth groups in developing countries set Bush Administration straight on genetically engineered food aid Nigerian environmental advocate calls Bush Administration actions "devious politics" 03 September, 2002

- 10- Delegates are discussing a new protocol under the 1998 Aarhus "public participation" Convention, which will require participating countries to collect and publish information on **quantities of pollutants released** from certain industrial sources and eventually from diffuse sources such as traffic. The meeting follows a two-year process involving countries from Europe, Central Asia, the US and Canada, as well as representatives from environmental NGOs, including Friends of the Earth, and representatives from the chemical industry (CEFIC). United States pull out of negotiations on pollution treaty; Canada decides to stay 25 November, 2002

- 11- Delegates are discussing the new protocol under the 1998 Aarhus "public participation" Convention, which will require participating countries to collect and publish information on **quantities of pollutants released** from certain industrial sources and probably from diffuse sources such as traffic. The meeting follows a two-year process involving countries from Europe, Central Asia, the US and Canada, as well as representatives from environmental NGOs, including Friends of the Earth, and

representatives from the chemical industry (CEFIC). Public right-to-know undermined in new pollution treaty 21 November, 2002

- 12- During the 1991 war devastating damage was done to the oil industry in Kuwait. Iraqi forces destroyed more than seven hundred oil wells in Kuwait, spilling sixty million barrels of oil. Over ten million cubic metres of soil was still contaminated as late as 1998. A major groundwater aquifer, two fifths of Kuwait's entire freshwater reserve, remains contaminated to this day. Ten million barrels of oil were **released** into the Gulf, **affecting coastline** along 1500km and costing more than \$700 million to clean up. (...) Depleted uranium is very dense and is used in projectiles designed to pierce armour, reinforced bunkers and other similar targets. Depleted uranium projectiles create fragments and dust which **release** uranium oxide into the air. The war in Iraq: general environmental implications A Friends of the Earth England, Wales and Northern Ireland briefing paper 19 March, 2003
- 13- Hilton Kelly, a community leader from Port Arthur, Texas, will also be at the AGM, facilitated by the Refinery Reform Campaign. He lives near Shell's Port Arthur Refinery, which is surrounded by homes, schools and churches in an area known as "gasoline alley" to locals. Shell reported 56 major accidents, process upsets and fires or explosions at the refinery in 2002 and just last week, an incident resulted in five tons of sulphur dioxide being **released** with gas flaring and black smoke covering the town for eight hours. Local people suffer exceptionally high rates of heart disease and respiratory problems. Shell failing the challenge Shell challenged by community activist shareholders at its AGM 23 April, 2003
- 14- Ricardo Navarro, chair of Friends of the Earth International said: "The US-led attempt to force-feed the world genetically modified foods appears to be losing support. The right of countries to take a precautionary approach on any new technology is fundamental **to protecting people and our environment**. (...) In 2001, the New Zealand Parliament passed an amendment to the HSNO Act to temporarily prevent applications to **release** GM organisms and to make specific controls on field testing mandatory for a two-year period. It was imposed to give New Zealand the time to investigate potential benefits from GM technology and explore ways to more effectively minimise any risks. Transatlantic trade war: US-led coalition starts to crumble as Europe stands firm 18 June, 2003
- 15- Meanwhile, securing access to Russian gas will be important to the EU in achieving its Kyoto targets because **gas releases** less carbon dioxide per unit of output than coal and oil. However, there is a fear that, without higher domestic energy pricing in Russia, the EU may increasingly rely on imports of energy-intensive goods from Russia, undermining emissions reductions at home. This brings to the fore more than ever the need for consistent climate and energy policy across the globe, starting with entry into force of Kyoto. Russians face storm of protest over climate treaty ratification 05 September, 2003
- 16- The Biosafety Protocol is the first treaty that officially seeks to protect biological diversity from the potential risks posed by GM organisms (GMOs). It will require all exporters of GMOs which are to be **released** into the environment to take measures to prevent contamination of GM seed products by implementing an 'identity preservation' system. It also allows countries to take a precautionary approach if faced with scientific uncertainty over the impacts on the environment. US-Europe GM trade war: WTO and US challenged to listen to the public 11 September, 2003

- 17- The Biosafety Protocol is the first treaty that officially seeks to protect biological diversity from the potential risks posed by GM. It will require all exporters of GM which are to be **released** into the environment to take measures to prevent the contamination of GM seed products by implementing an 'identity preservation' system. It also allows countries to take a precautionary approach if faced with scientific uncertainty over the impacts on the environment. Public bite back in GMO trade war 11 September, 2003
- 18- Global warming is caused by harmful greenhouse gases. Most of them are **released** by the richest nations of the planet, causing rising temperatures and more extreme weather events such as droughts and floods. Poorest lose out at climate change talks 18 December, 2004
- 19- Friends of the Earth opposes **the release of GM crops into the environment** but does not oppose biotechnology in general. Genetically modified foods in Europe: Politicians say yes – public says no! 19 May, 2004
- 20- **The large-scale release of GM crops around the globe** (the biotech industry's objective) would further exacerbate **the ecological vulnerability** already associated with monoculture agriculture. GM crops report shows a decade of failure and urgent need for liability rules 19 February, 2004
- 21- Flaring **releases a cocktail of toxic substances**, including benzene and particulates, exposing Niger Delta communities to severe health risks and property damage, as well as violating their human rights. Eight communities in the Niger Delta took legal action last week against Shell to stop gas flaring. Shell faces community rebellion at its annual meeting – oil giant's neighbours demand justice 27 June, 2005
- 22- Most of the heat-trapping gases are **released** by the richest nations of the planet, and cause rising temperatures and more extreme weather events such as droughts and floods. Climate change: Kyoto moves forward despite slow pace 20 November, 2006
- 23- Many large reservoirs cause significant greenhouse gas emissions. The World Bank's Nam Theun 2 Project has the potential to **release** roughly the same amount of greenhouse gases as a combined cycle natural gas project generating the same amount of electricity. (...) The World Bank's Nam Theun 2 Project has the potential to **release** roughly the same amount of greenhouse gases as a combined cycle natural gas project generating the same amount of electricity. World Bank misses double dividend on poverty and climate change 23 April, 2006
- 24- "G8 countries currently **release** 45 per cent of today's global emissions, and are the main decision makers in the World Bank. As such they are in a position to make a significant contribution to the fight against climate change" said Elizabeth Bast of Friends of the Earth US. World Bank's Climate Plan fails to show the right path 19 April, 2006

- 25- Friends of the Earth Indonesia / WALHI Deputy Director Farah Sofa said:
 “Indonesia, the host of these climate talks, has been used as a testing ground for a major, false solution to climate change – agrofuels. The destruction of tropical forests in Indonesia, including the draining and burning of peatland to clear land for plantation crops such as palm oil **releases** so many tons of carbon that Indonesia ranks in third place behind the US and China as the top emitters of greenhouse gases.” (...)Agrofuels are being perversely promoted as a solution to climate change while the draining of peat lands and cutting down of tropical forests for their cultivation is **releasing** huge amounts of carbon dioxide into the atmosphere. Climate change: launch of ambitious roadmap needed in Bali 26 November, 2007
- 26- Shell also claimed in the advert that it uses its ‘waste sulphur to make concrete’. The Dutch Advertising Authority also qualified this claim as misleading because this could be interpreted as applying to all of the waste sulphur generated by Shell. In reality, a major part of Shell's sulphur waste is used for fuel for sea ships and is finally **released** in the air. Sea ships are one of the biggest sources of sulphur dioxide pollution. Shell’s advert misleading 05 July, 2007
- 27- The gas which is flared at Shell oil and gas facilities in Nigeria has been estimated to cause as much climate change as half of all the pollution from private cars in the Netherlands. The flaring **releases many toxic gases which cause acid rain and damage to health**. Stopping the flaring would cost 1.5 billion dollars. Shell shareholders get billion dollar bills 15 May, 2007
- 28- Due to failures in managing its gold ore roasting and mine waste detoxification, Newmont **discharged** around 33 tons of mercury over a four-year period, 16 of which were dumped into the ocean and 17 of which were **released** directly into the atmosphere. Indonesian mine pollution ruling 24 April, 2007
- 29- In Sarawak plantation companies regularly practice open burning to clear land for planting, even on peat soils, contributing to regional air pollution (haze) and to the faster **release** of greenhouse gases into the atmosphere. Malaysian palm oil greenwash report 07 October, 2008
- 30- Delegates from 140 countries meeting in Bonn for United Nations (UN) talks this week are expected to make key decisions on global rules to deal with damage caused by the **release** of biotech or genetically modified (GM) crops. (...) The **polluter** must pay and should not be allowed to dictate the terms of the compensation”, said Juan Lopez Villar, international coordinator of the Friends of the Earth GM campaign. Corporations threaten biotech talks 12 May, 2008
- 31- The draining and deforesting of peatlands in South-East Asia, predominantly to make way for palm plantations, **releases** huge amounts of soil carbon into the atmosphere, accounting for a massive 8% of global annual CO2 emissions. Palm oil advert misleading 09 January, 2008
- 32- Huge levels of greenhouse gas emissions are **released** from deforestation and draining of peatlands. ‘Certified’ palm oil not a solution 03 November, 2009

- 33- Its well-documented expansion in recent years has led to widespread deforestation, social conflicts, high pesticide use and huge **releases** of greenhouse gases. Public warned over 'Green Soy' scam 27 May, 2009
- 34- Gas flares are open-air fires that burn the natural gas that is **released** when oil is extracted from the ground. Industry sources and World Bank research estimates vary, but most indicate that gas flaring in the Niger Delta sends 53 to 60 million tons of carbon dioxide (a global warming pollutant) into the atmosphere each year. ShellGuilty campaign launched 27 April, 2009
- 35- Nigeria is one of the world's biggest gas flarers. Nigerian gas flares emit as many greenhouse gases as 18 millions cars, and **release toxic substances** in densely populated areas, damaging both the environment and the people in the Niger Delta. Flaring can lead to leukaemia, asthma and premature death. **It causes acid rain** which acidifies lakes and streams and damages the environment. Nigeria to stop companies flaring gas 12 January, 2009
- 36- Adrian Bebb from Friends of the Earth Europe said: "The scale of the damage that European countries will cause with their biofuels plans is now clear – forests and nature will be destroyed on a shocking scale to fuel our cars. The resulting **release** of climate-damaging greenhouse gases will make biofuels a worse polluter than fossil fuels. The EU needs to urgently review the sustainability of using biofuels and ensure their use does not lead to more climate change or environmental destruction." Europe's biofuels plans driving social and environmental destruction 06 November, 2010
- 37- "We believe the legal system in Australia may help prevent the opening of this mega coal mine. But from this week we also call on Xstrata shareholders worldwide to push the company to stop this mine which would **release** every year as much climate-disrupting emissions as 72 nations combined," said Cam Walker of Friends of the Earth Australia. (...) According to Friends of the Earth estimates, the expected massive 41.6 mega tonnes of carbon dioxide **released** every year by the mine would be roughly equivalent to the emissions from 72 countries combined. Environmentalists call on shareholders to stop Australian mega coal mine 26 August, 2011
- 38- Despite promises made by Shell since the 1990s to stop flaring the 'associated' gas **released** in oil production in Nigeria, the oil concern flared more gas in 2010 than it did in 2009 in the West African country. This has come to light from the sustainability report brought out by Shell last week. (...) Gas flaring has serious negative impacts on the health of local residents and on the environment – while the flared gas could simply be **captured** and used as natural gas, to the benefit of local people who often do not even have electricity in their houses. In 2007 Shell promised that it would stop flaring gas in Nigeria in 2009. Shell breaks promises again and increases gas flaring in Nigeria 19 April, 2011
- 39- A new generation of GM crops designed to promote the use of pesticides Dicamba and 2,4 D, are set for **release** in the United States. GM companies are promoting these as a solution to the failure of existing GM crops to control weeds and reduce pesticide use. (...) Seven EU countries have banned Monsanto's GM maize because of growing evidence of **its negative environmental impacts**. Cracks widen in biotech industry myths 22 February, 2011

- 40- Eric Hoffman, food and technology policy campaigner for Friends of the Earth U.S. “The creation of novel organisms through synthetic biology **poses numerous risks to biodiversity**, including but not limited to genetic contamination, novel invasive species, and loss of livelihoods. It is tragic that so far the UN missed the opportunity to implement a moratorium on **the environmental release** and commercial use of synthetic organisms. Synthetic biology has not even been added to the Convention on Biological Biodiversity’s agenda. Even so, a relatively weak but small step forward was taken as the Parties agreed to apply the Precautionary Principle when dealing with synthetic biology and its potential risks,” he added. UN biodiversity talks favor false solutions to biodiversity crisis 19 October, 2012
- 41- The carbon budget is the limited quantity of carbon pollution that can still be **released** while avoiding 'dangerous climate change'. Developed nations watering down UN climate negotiations 09 December, 2014
- 42- Any climate agreement with emissions reduction targets must be comprehensive, binding, and reflect a fair share approach to the 'carbon budget' (the limited quantity of carbon pollution that can still be **released** while avoiding dangerous climate change). UN climate talks heading in the wrong direction 26 November, 2014
- 43- Indirect greenhouse emissions **released** by expanding biofuels production will be reported on every year by the European Commission and by fuel suppliers. This will increase the transparency of the impacts of this policy. Biofuels bubble turns to bust 28 April, 2015
- 44- Only four African countries -South Africa, Egypt, Burkina Faso and Sudan- have **released** GM crops commercially but the issue of genetically modified maize is deeply controversial, given that maize is the staple food of millions of Africans. (...) From February 24-27, 2015, Friends of the Earth delegates will attend the International Forum for Agroecology at the Nyéléni Center in Sélingué, Mali. The organisations attending the forum, which represent millions of small scale food producers, believe that genetically modified crops are **part of the problem, not the solution, to the hunger, climate, and biodiversity crises** we are facing globally. US force feeds GM crops to African nations, says new report 23 February, 2015
- 45- Cam Walker, Friends of the Earth Australia Energy Campaigner, commented: “Underground Coal Gasification technology has left a trail of destruction in its wake wherever it’s been tried. All three UCG experiments in Australia have been environmental disasters. This experimental technology is linked to **contamination from dangerous gases escaping** into nearby soils and groundwater, surface subsidence, and produces toxic waste.” Fuelling the fire: New coal technologies spell disaster for climate 28 July, 2016
- 46- Friends of the Earth warned that existing emission targets under the treaty are insufficient to **avoid dangerous runaway climate change**, with far deeper cuts required. But despite dramatic scientific warnings and substantial evidence that climate change is happening faster than previously predicted, global emissions are still on the rise. Climate change treaty one year old, but emissions still on the rise 15 February, 2006

- 47- Forests are a key component of the earth's carbon and hydrological cycles and are now recognised as being fundamental to our efforts **to stop runaway climate change**. Land grab threat at UN climate talks 19 August, 2008
- 48- "While people around the world are paying with their lives and livelihoods, and **the risk of runaway climate change draws closer**, we simply could not sit by this egregious inaction. Corporate profits should not come before peoples' lives," said Jagoda Munic. FOE Civil society walks out of Warsaw climate talks, says hope lies with building peoples' power 21 November, 2013
- 49- The report, 'Good Energy, Bad Energy: Transforming the Energy System for People and the Planet' makes the case for the urgent transformation of our energy system and comes in the wake of stark warnings by the world's leading scientists about the scale of the planetary emergency and **the threat of runaway climate change** unless we take immediate action. Energy road map offers hope for climate-safe planet 07 November, 2013
- 50- "The cuts pledged by President Obama are nowhere near what the US needs to cut if it was serious about **preventing runaway climate change**. These US voluntary pledges are not legally binding and are not based on science or equity," said Sara Shaw, Friends of the Earth International Climate Justice and Energy coordinator. US-China climate pledges just a drop in the ocean 12 November, 2014
- 51- Friends of the Earth International demands a total phase out of carbon emissions by the middle of this century in order to reverse current warming trends and minimize the chance of **irreversible damage and possible runaway climate change**. Climate summit: world leaders fiddle while the planet burns 16 September, 2014
- 52- The draft Paris deal states that 2 C is the maximum acceptable global temperature increase, and that countries should pursue efforts to limit the temperature increase to 1.5 °C. This is meaningless without requiring rich countries to cut their emissions drastically and provide finance in line with their fair share, and places the extra burden on developing countries. To **avoid runaway climate** we need to urgently and drastically cut emissions, not just put it off. Paris climate deal is a sham 12 December, 2015
- 53- To **prevent runaway climate change** we need urgent action based on historic responsibility and capacity to act, based on a fair shares approach, according to Friends of the Earth International. Draft Climate Deal fails to deliver, sparking protests 09 December, 2015
- 54- "Yes, industrialized countries need to support Southern countries to prevent deforestation and **adapt to runaway climate change** – but international carbon markets are an unjust and unreliable source of financing to meet this need," said Jeff Conant, senior international forest campaigner with Friends of the Earth U.S. Brazil frustrates California's hopes for international forest carbon offsets 02 December, 2015

- 55- Climate change is already happening – wreaking devastation on communities and ecosystems around the world. Without urgent and drastic action to reduce global greenhouse gas emissions, **we face far worse runaway climate change**, with impacts that would dramatically overshadow anything we see today, and affect predominantly the poorer people and nations, which are the least responsible for climate change. Richest 782 people could power half the world with 100% renewable energy 23 November, 2015
- 56- “Emission cut pledges made by rich countries so far are less than half of what we need to **avoid runaway climate change**. The draft Paris agreement on the negotiating table this week shows that many seem ready to accept irreversible and devastating consequences for people and the planet,” said Susann Scherbarth, climate justice and energy campaigner at Friends of the Earth Europe. Rich countries put planet on course for irreversible climate change 19 October, 2015
- 57- Friends of the Earth advocates that any biotech corporation or entity **releasing** GMOs into the environment should be strictly liable in case **any damage happens to the environment**, human health, or the livelihoods of citizens and farmers. Don’t let the U.S. Coalition water down the Biosafety Protocol! 23 February, 2004
- 58- Paradoxically, while agrofuels are being promoted as a solution to climate change, the draining of peat lands and cutting down of tropical forests for their cultivation is **releasing** huge amounts of carbon dioxide into the atmosphere, far more than would be saved by resorting to agrofuels. Governments must say no to ‘biofuels’ 29 November, 2007
- 59- Agrofuels are being perversely promoted as a solution to climate change while the draining of peat lands and cutting down of tropical forests for their cultivation is **releasing** huge amounts of carbon dioxide into the atmosphere. Climate change: urgent action and robust policies must match dire warnings 09 November, 2007
- 60- The first of these case studies outlines the practices and positions of South African energy giant Sasol, which was exposed today as **releasing** 61.2 million metric tons of carbon dioxide annually and is the world leader in coal-to-liquid technology. Climate agenda of South African energy giant Sasol exposed 07 December, 2011
- 61- These are commonly projects that **capture** or destroy gases with high global warming potentials like methane, nitrous oxide (N₂O) and hydrofluorocarbons (such as HFC23) at existing facilities. Ministers meet for crucial climate talks 01 December, 2004
- 62- The WAGP (West Africa Gas Pipeline project) has been touted by the World Bank, Chevron Texaco and Shell, as a project that will help end gas flaring but project sponsors have not made any commitments on how much reduction citizens in the Niger Delta will see once the WAGP is in

operation. In fact, Shell will be extracting natural gas for transport in the WAGP, **not capturing associated gas** that will be flared. World Bank inconsistency over African gas pipeline criticized 22 November, 2004 (my addition in parenthesis)

- 63- This technology will allow for the **capture** of CO2 emissions from coal-fired power plants and its subsequent storage underground, for example in exploited oil or gas fields or in sealed geological strata, thereby avoiding CO2 emissions into the atmosphere. China's future energy needs 07 November, 2005

- 64- According to Asume Osuoka of Friends of the Earth Nigeria/Environmental Rights Action in Nigeria, "In the current plans, there is no evidence of the intention to **capture** associated gas from existing oil fields, which leads us to believe that gas would be sourced from new gas fields and increase existing problems in the Niger Delta." New African gas pipeline worries civil society 09 September, 2005

- 65- Friends of the Earth expressed concern that this deal might focus new attention to unsustainable technologies such as nuclear and **carbon capture and storage** over sustainable and renewable energies. New climate deal will not tackle climate change 27 July, 2005

- 66- **Carbon Capture and Storage (CCS):** "agreeing to fund a collaborative research programme to determine the viability of geological carbon dioxide storage in developing countries". Friends of the Earth is concerned that money may be channeled **to CCS** when it would be better spent on renewables. Leaked G8 document exposes lack of commitment to tackling Climate Change 27 May, 2005

- 67- "Some technologies being promoted to mitigate climate change, such as nuclear energy and genetically modified trees, are false solutions as they pose risks to the environment, as well as to health and safety, and there are many serious concerns over **carbon capture and storage** as well as biofuels." Meena Raman, Chair of Friends of the Earth International in New York. Climate Justice Needed 24 September, 2007

- 68- Parties failed to explicitly reject **false solutions such as carbon capture and storage**, large dams, nuclear energy and agrofuels. Rich nations to blame for climate inaction and rejection of rights 12 December, 2008

- 69- Will Parties focus on **clean** renewable energy and energy efficiency, and reject **false solutions such as carbon capture and storage**, large dams, nuclear energy and agrofuels? UN Climate Talks: Clash on climate goal 03 December, 2008

- 70- Will Parties focus on clean renewable energy and energy efficiency, and reject **false solutions such as carbon capture and storage**, large dams, nuclear energy and agrofuels? Climate change: Ambition missing at upcoming U.N. talks 01 December, 2008

- 71- A new study published by Friends of the Earth Europe and Stockholm Environment Institute on December 1 proves for the first time that Europe could achieve at least 40% domestic emissions reductions by 2020 without resorting to **false solutions like agrofuels, nuclear or carbon capture and storage**. Europe must commit to at least 40% reductions by 2020 without offsetting 10 December, 2009
- 72- The scenario rules out nuclear power, agrofuels and **carbon capture and storage**. 40% domestic emissions cuts in Europe by 2020: feasible and affordable 08 December, 2009
- 73- Anglo American profits from **false solutions to the climate crisis such as carbon trading and carbon capture and storage**, which benefit big business but not people or the planet, according to the report released by Friends of the Earth International, Corporate Europe Observatory and the Transnational Institute. Anglo American's negative influence on climate policies exposed 08 December, 2014
- 74- The concept of 'net zero' (which means **a reliance upon Carbon Capture and Storage** and offsetting) has been removed from the text about mitigation (emissions reductions), however climate neutrality, in effect the same thing, remains in the text. 'Decarbonisation' has been maintained. However, the timescales for decarbonisation have been weakened, with the emphasis on the end of the century. Paris Climate Summit: Not enough progress by half 05 December, 2015
- 75- Again, here, much has already been agreed. Countries can get credit for new schemes and for re-planting areas that were previously forested. Debate at Milan has focused on the detail. NGOs, and many counties, want rules to prevent the planting of genetically-modified trees or invasive alien species. They want to ensure the increases in carbon **sequestered** are genuine and that communities affected by schemes are properly consulted. Kyoto agreement on climate change gets nearer 09 December, 2003

ENV - Materialisation scenarios

ENV - TRANSFORMED HOUSE scenarios:

- 1- The Convention sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognises that the climate is a shared global resource. Its stability can be **affected** by industrial and other emissions of carbon dioxide and other **greenhouse gases**. Climate talks – Nairobi 31 October, 2006
- 2- The report also covers **the range of anthropogenic greenhouse gases** and other factors **that drive climate change**. BACKGROUND the Intergovernmental Panel on Climate Change (IPCC): Recognising the problem of potential global climate change, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the IPCC in 1988. It is open to all members of the UN and WMO. Stark findings on climate change 02 February, 2007
- 3- "This report highlights the terrifying impacts of global climate change. It is essential that we all take action **to reduce the level of greenhouse gases we emit**. If we don't, not only will the natural world be **threatened**, but also the lives and livelihoods of people across the planet. Governments and businesses

are still not taking the issue seriously. Householders too have an important role to play," said Friends of the Earth International Vice-Chair Tony Juniper. Climate change threatens species extinction Friends of the Earth calls for urgent action 08 January, 2004

- 4- Even though it states that rich nations "will remain **the largest per capita emitters of greenhouse gases**," the new World Bank report does not encourage these nations to play a leading role in **fighting climate change by aggressively reducing emissions of greenhouse gases**. World Bank's Climate Plan fails to show the right path 19 April, 2006
- 5- The Intergovernmental Panel on Climate Change (IPCC)'s fifth assessment report on the physical science basis of climate change, released in Sweden next week, will confirm beyond all reasonable doubt that climate change is real; that **it is caused by human-induced greenhouse gas emissions**; and that it poses **a severe and immediate threat** to human well-being, including food production and human security. Urgent action needed as scientists warn on scale of climate crisis 20 September, 2013
- 6- The Avoiding Dangerous Climate Change book consolidates the scientific findings of the conference and gives an account of the most recent developments on critical thresholds and key vulnerabilities of the climate system, impacts on human and natural systems, emission pathways and technological options of meeting **different stabilisation levels of greenhouse gases in the atmosphere**. Climate change treaty one year old, but emissions still on the rise 15 February, 2006
- 7- Pressure Point, a Seattle USA NGO, and Friends of the Earth (Australia) are coordinating a Call to Action against Bush's biggest supporter and **the worst of the "Greenhouse Gangsters"** ExxonMobil. Exxonmobil (Esso) international day of action: 11th of July 18 June, 2001
- 8- The Protocol is the only international treaty **aimed at reducing emissions of the greenhouse gases that lead to climate change**. UN Conference on Climate Change – Oct. 29th – Nov. 9th 2001 (COP 7) 30 October, 2001
- 9- Tony Juniper, Vice Chair of Friends of the Earth International, said: "We are relieved that EU governments have finally fulfilled their modest promise and ratified the Kyoto climate treaty. But they must keep up the pressure on Japan, Russia and Eastern Europe to make sure it becomes international law. "The EU must also move ahead with **the major shifts in policy needed to reduce greenhouse gas pollution**. And it must step up its criticism of the US and Australia. By refusing to ratify the Protocol, these countries are putting the world at serious risk. The Protocol is only the beginning. All countries must now agree to a second round of emissions reductions if dangerous climate change is to be avoided." EU ratifies Kyoto; others must follow 04 March, 2002
- 10- Fossil fuel combustion is the primary source of emissions of **climate-threatening greenhouse gases** (...) It would concentrate control over resources amongst the richer over-consuming nations, and worse, it would increase the rate of consumption of fossil fuels, and thus emissions of **climate-changing greenhouse gases**, with the most severe impacts being felt in poorer developing nations. The war in Iraq: general environmental implications A Friends of the Earth England, Wales and Northern Ireland briefing paper 19 March, 2003
- 11- The Kyoto Protocol commits developed nations to an average cut of 5% in emissions of the **greenhouse gases that are causing climate change**. So far 113 countries have ratified it. (...) The Kyoto formula for entry into force is that 55 countries and countries representing 55% of industrialised country carbon dioxide emissions must ratify the treaty (carbon dioxide is the principal **greenhouse gas causing climate change**). Russians face storm of protest over climate treaty ratification 05 September, 2003
- 12- Global warming is caused by **harmful greenhouse gases**. Most of them are released by the richest nations of the planet, causing rising temperatures and more extreme weather events such as droughts and floods. Poorest lose out at climate change talks 18 December, 2004

- 13- The most conservative estimates of the Intergovernmental Panel on Climate Change (IPCC) suggest that international flights account for 3.5 percent of global emissions of **greenhouse gases such as carbon dioxide and methane that are believed to cause global warming.** (...) Without **clean** technology transfer, developing countries will continue to be locked into a path of fossil fuel based development; without a transition to **clean** energy in developing countries, **dangerous levels of global warming will be unavoidable.** Ministers meet for crucial climate talks 01 December, 2004
- 14- Gas flaring is a by-product of oil extraction - in Nigeria the process produces more **greenhouse gas emissions** than all of sub-Saharan Africa combined and is a major source of pollutants that are **hazardous** to human health. World Bank inconsistency over African gas pipeline criticized 22 November, 2004
- 15- These projects give rise to **greenhouse gas emissions that cause climate change** which affect everybody. German government sued over climate change 15 June, 2004
- 16- Crop yields are damaged by **air pollution.** The flaring pumps clouds of black toxic smoke into the sky, **causing more greenhouse gas emissions** than any other single source in sub-Saharan Africa, according to the World Bank. Shell ignores court order to stop gas flaring in Nigeria – Company faces contempt action 16 December, 2005
- 17- Renewable energy like wind power, small hydropower, and solar power, combined with aggressive energy efficiency strategies, can dramatically cut emissions of **greenhouse gases that lead to climate change.** Renewable energy also helps to alleviate poverty, and can provide electricity to those without access. World Bank missing its renewable energy targets Climate change meeting to start in London on November 1 01 November, 2005
- 18- The scientific evidence clearly shows that **climate change is happening and that greenhouse gas emissions must be curbed.** Unless urgent action is taken by the richest, industrialised nations to reduce emissions, the poverty reduction envisaged by the Millennium Development Goals will not be achieved. UN world summit: empty words on climate change 16 September, 2005
- 19- Mark Wakeham from Greenpeace said: "This report shows that energy efficiency measures and renewable energy sources can deliver **the large reductions in greenhouse pollution** required without the dangers associated with nuclear power. It's time to shift from dangerous and dirty fuel sources – coal and nuclear – to a **clean** energy future." Nuclear energy no solution to climate change 08 September, 2005
- 20- The United States is the world's biggest **polluter** (four per cent of the world's population; a quarter of **the world's greenhouse gas emissions**), but the Bush administration has so far refused to take any meaningful action **to tackle climate change.** (...) Friends of the Earth International vice chair Tony Juniper, said: "Ending poverty is a crucial campaign. Pressure must also be intensified on G8 leaders to take urgent action on climate change too. Unless **the world reduces its emissions of greenhouse gases the impacts on the environment and people across the planet will be severe,** with the biggest effects felt by the poorest countries. Unless the rich nations of the world wake up to the threat of climate change, the planet faces a grim future." Make Climate Change history 02 July, 2005
- 21- Crucially, the United States must wake up to the reality of climate change and start taking action to cut its emissions - rather than scuppering international efforts to tackle the problem. The US is the world's largest **polluter**, responsible for a quarter of **the world's greenhouse gas emissions**, despite having only around four per cent of the world's population. (...) Dangerous climate change is already being felt in some parts of the world, and **as greenhouse gas emissions increase, this is likely to get worse.** (...) To minimize the risks of warming above two degrees centigrade **global greenhouse gas emissions need to peak and decline** within the next 10-15 years. G8 Summit: It's time for urgent action on Climate Change 22 June, 2005
- 22- Peter Roderick, co-Director of the Climate Justice Programme said: "As the G8 prepares to discuss climate change and Africa, Nigerian gas flaring provides them with an outrageous example of the

problems. It is a shameful and indefensible stain on the reputation of western oil companies. **The appalling waste of greenhouse gases** in one of the world poorest countries is a violation of the human rights of those subjected to the flaring. It is astonishing that it continues on such a scale when Nigerian regulations have prohibited the practice in general since 1984." Communities sue oil companies to stop Nigerian gas flaring 20 June, 2005

- 23- Past emissions of **greenhouse gases, largely from industrialised countries**, mean that the world cannot avoid **an increase of average global temperature** to 1.3°C above pre-industrial levels. Climate change: governments talk but don't act 13 May, 2005
- 24- He (G. W. Bush) spoke of emerging technologies and said that "all nations, including the developing countries can advance economically, while **slowing the growth in global greenhouse and avoid pollutants** that undermine public health". Friends of the Earth International said that the US – the world's biggest **polluter** - must accept that we need to do **far more than "slowing the growth" of greenhouse gases**, and called on the US to commit itself to join the rest of the world in tackling global warming by pledging itself to a significant reduction in carbon dioxide levels. United States urged to reduce carbon dioxide emissions, as president Bush accepts need for action on climate change 21 February, 2005 (my addition in parenthesis)
- 25- Past emissions of **greenhouse gases, largely from industrialised countries, mean that the world cannot avoid an increase of average global temperature** to 1.3°C above pre-industrial levels. If the average temperature rises beyond 2°C, the impacts of climate change, which we are already suffering will become catastrophic. Climate change treaty goes live but battle on emissions has only just begun 14 February, 2005
- 26- Confronted with the latest dramatic evidence of **the impacts of rising greenhouse gas emissions**, ministers are seeking international agreement on future action. Key to the talks is action after 2012, when the first phase of the Kyoto climate change treaty ends. "Some countries have been slow to recognise the problem and seem to want to delay global action – but if they take their heads out of the sand, they may realise that the only way **to tackle climate change is by actually reducing the levels of greenhouse gases they emit**," said Catherine Pearce of Friends of the Earth International. Climate is changing but ... talks are slowing 15 November, 2006
- 27- "Australia and other countries would like poor developing countries to show a commitment to **reductions of climate change-causing greenhouse gas emissions**, but the industrialised countries that created the problem must show the way and commit themselves rapidly to binding targets first," he (Erasmus Aborley from Friends of the Earth Ghana) added. Australia isolates itself at climate change negotiations 14 November, 2006 (my addition in parenthesis)
- 28- 'None of the solutions proposed at this conference will offer **a real cure for climate change**. On the contrary, they give no incentives for Northern countries to reduce their oil consumption and **lower the level of greenhouse gases that cause climate change**', said Soile Koskinen of A SEED Europe². (...) '**Greenhouse gases** are generated in the production cycle of nuclear energy as well. Moreover, we still **face great environmental and safety risks** in nuclear power plants operations' said Peer de Rijk of the Amsterdam-based World Information Service on Energy (WISE)³. Activists defy climate change conference in Amsterdam "Save our climate, not their oil profits" 13 October, 2006
- 29- Nigeria has been the world's biggest gas flarer, and the practice has contributed more **greenhouse gas emissions** than all other sources in sub-Saharan Africa combined, as well as **poisoning localities with their toxic cocktail**. Nigeria: award for community affected by gas flaring 29 September, 2006
- 30- Roda Verheyen, co-Director of the Climate Justice Programme said: "This was a case waiting to happen. It is the most significant piece of climate change litigation that has ever been brought. It shows

²<https://aseed.net/>

³<https://www.wisecampaign.org.uk/>

that those who suffer damage from climate change can seek compensation in the courts. More of these cases will happen until governments and companies make the **deep cuts in greenhouse gas emissions that the planet needs**. Car makers should realise that they cannot continue business-as-usual and realise high profits while **destroying the climate** by selling high-consumption engines." Landmark legal case: California sues automobile companies for climate change damage 20 September, 2006

- 31- Global average temperatures must not be allowed to rise two degree centigrade higher than pre-industrial levels. **To minimise the risks of warming** above two degrees centigrade **global greenhouse gas emissions need to peak and decline** within the next 10-15 years. G8 to feed oil addiction, fueling climate change 14 July, 2006
- 32- They call the Committee to recognize that countries that have signed up to the World Heritage Convention must significantly **cut their greenhouse gas emissions as part of their duty to protect and transmit** World Heritage Sites to future generations (...) Friends of the Earth International's climate campaigner, Catherine Pearce said: "The survey by the World Heritage Committee suggests that climate change is already impacting on scores of the world's most spectacular natural heritage sites. Unless the international community takes urgent action to cut **their emissions of greenhouse gases the situation will get much worse**. " Anger as world heritage committee fails to protect Everest and other sites from climate change 11 July, 2006
- 33- The campaigners are calling on the World Heritage Committee to: recognize that countries that have signed up to the World Heritage Convention must significantly cut their **greenhouse gas emissions as part of their duty to protect** and transmit World Heritage Sites to future generations (...) The Paris meeting recognized the unique scale and urgency of the risks, and in considering these at its meeting in Lithuania we want the 21-member Committee to: recognize that the duty on State Parties to the World Heritage Convention **to protect and transmit** World Heritage Sites to future generations requires **significant reductions in greenhouse gas emissions** (...) Developed countries that choose not to reduce their **greenhouse gases emissions** do so in the knowledge of **the results of that choice** for World Heritage glaciers and coral reefs, in their own and other countries, and for people's lives and livelihoods. (...) If governments are to support the WH Convention as an effective legal instrument for **protecting the most outstanding parts of our planet**, it is necessary to make significant **cuts in greenhouse gas emissions** (mitigation) and to ensure best management practices (adaptation). Both must be urgently addressed, as adaptation without mitigation would be futile. World Heritage Committee must take action to protect Everest and other top sites from climate change 10 July, 2006
- 34- Friends of the Earth International Climate Campaign Coordinator Stephanie Long said: "Current commitments from the industrialised world to fund mitigation and adaptation programs in the global South are grossly inadequate and based on voluntary 'charity' rather than real assessments of needs and attribution of responsibility. Clearly, the industrialised world has profited significantly from over a century of **producing greenhouse gas emissions that perversely will provide protection from climate change impacts**. Globally, billions of dollars are spent annually on military defense and repayment of odious debts with undeniable environmental and social costs. Such quantities of funds must be redirected to adaptation programs that provide relief for the vulnerable communities and build resilience to climate change impacts." Climate change: launch of ambitious roadmap needed in Bali 26 November, 2007
- 35- "Industrialised nations which have **contributed disproportionately to climate change** must take lead in radically **reducing their emissions of greenhouse gases** (...) "said Meena Raman, Chair of Friends of the Earth International in New York. Climate Justice Needed 24 September, 2007
- 36- Experts are expected to say that massive investment in renewable energy technology and energy efficiency is needed to **stop greenhouse gas emissions from rising with disastrous consequences**. Climate change mitigation 27 April, 2007

- 37- The World Bank invests 2 to 3 billion USD a year in **greenhouse gas-producing energy projects that fuel climate change** and fail to help the world's poor people. World Bank still fuelling climate change 13 April, 2007
- 38- The report is expected to portray a bleak future for the world's poorest countries, which have done least to **pollute** the atmosphere. Despite the negligible historical emissions of **greenhouse gases** by the least developed countries, their people will **suffer most from climate change**, as they are the most vulnerable to the impacts and least able to adapt. The second volume of the Fourth Assessment Report of the UN Intergovernmental Panel on Climate Change (IPCC), Working Group II provides the starkest warning yet on the threat of global climate change and predicts the **severe consequences the planet will face** unless world leaders take urgent action to cut emissions of **greenhouse gases**. Climate change set to overwhelm the world's poor 29 March, 2007
- 39- Friends of the Earth International today called on world leaders to take **urgent action to cut emissions of greenhouse gases** after the planet's leading scientific experts, endorsed by the world's governments, delivered **the starkest warning yet on the threat of global climate change**. Scientists issue global warning 02 February, 2007
- 40- The 194 nations which signed on to the UN climate convention have the legal obligation to protect human rights through mitigation of climate change, but **greenhouse gas emissions keep on rising** across industrialized nations despite their obligations to cut their emissions. Industrialized countries have grown rich **emitting greenhouse gases and causing climate change** and have a historical responsibility for the increased carbon dioxide levels in the atmosphere through burning fossil fuels. Climate change talks standstill: a human rights threat 10 December, 2008
- 41- Friends of the Earth International Climate and Energy coordinator Stephanie Long **“To conquer climate change**, rich industrialised countries must **reduce their greenhouse gas emissions** by at least 40 per cent by 2020 – and provide finance and technology to enable poorer countries to develop low carbon sustainable economies. (...) **The level of greenhouse gases in the atmosphere is causing global climate change** and the lag time of emissions in the atmosphere means that we will be experiencing the consequence of today's emissions for the next 50 years. (...)The most vulnerable nations – including small island states - are calling for ambitious targets of returning **greenhouse gas emissions concentrations** to 350 parts per million by mid-century and **to keep global temperature increase to less than 1.5 degrees** above pre-industrial levels. **Current greenhouse gas emissions have billowed to over 380 parts per million of greenhouse gas emissions**. UN Climate Talks: Clash on climate goal 03 December, 2008
- 42- In Sarawak plantation companies regularly practice open burning to clear land for planting, even on peat soils, contributing to regional **air pollution** (haze) and to the faster release of **greenhouse gases into the atmosphere**. Malaysian palm oil greenwash report 07 October, 2008
- 43- Rather than show global leadership, the Obama Administration failed to live up to its **responsibility as the world's largest historical greenhouse gas polluter**. This strategy damages the prospects for a just, equitable, and effective outcome at the key UN conference planned in Copenhagen, Denmark, in December this year. (...) **Domestic greenhouse gas emission reductions** by industrialised countries of at least 40% by 2020 on 1990 levels – with no offsetting – are needed for **a reasonable chance of avoiding catastrophic global climate change**. (...) The Alliance of Small Island States called on developed countries to commit to **higher greenhouse gas reduction targets so that global temperature rise stays below 1.5°C**. (...) Industrialised nations owe developing countries a 'climate debt' for both **excessive greenhouse gas pollution** over the past 200 years and to compensate for the **damage that pollution has and will cause**. US holds UN climate negotiations hostage 12 June, 2009
- 44- Nigerian gas flares emit as **many greenhouse gases** as 18 millions cars, and release toxic substances in densely populated areas, **damaging both the environment and the people** in the Niger Delta. Flaring

can lead to leukaemia, asthma and premature death. It causes acid rain which acidifies lakes and streams and damages the environment. Nigeria to stop companies flaring gas 12 January, 2009

- 45- Adrian Bebb from Friends of the Earth Europe said: "The scale of the damage that European countries will cause with their biofuels plans is now clear – forests and nature will be **destroyed** on a shocking scale to fuel our cars. The resulting release of **climate-damaging greenhouse gases** will make biofuels a worse polluter than fossil fuels. The EU needs to urgently review the sustainability of using biofuels and ensure their use does not lead to more **climate change or environmental destruction.**" Europe's biofuels plans driving social and environmental destruction 06 November, 2010
- 46- Large scale corporate agriculture is one of **the leading causes of environmental damage**, responsible for about **half of all global greenhouse gas emissions**, habitat destruction from land clearance and huge use of fossil fuels and natural resources. World Bank accused of promoting land grabbing 27 April, 2010
- 47- Martin Drago, Food Sovereignty coordinator at Friends of the Earth International. "Small-scale farming not only improves food security and food sovereignty but also **helps to combat climate change by tackling two principal sources of greenhouse gas emissions**: food transportation over large distances and industrial agriculture," he added Climate talks: sustainable, small-scale, and peasant agriculture needed to cool down the earth 05 December, 2011
- 48- Friends of the Earth International today strongly denounced the Japanese government which stated at the UN climate talks that it is breaking its promises **to reduce climate change-causing greenhouse gases**. Japan's climate inaction strongly denounced 15 November, 2013
- 49- "**Averting the worst consequences of climate change requires an urgent and drastic reduction of the greenhouse gases emitted by our energy system.** This will not happen unless we stop **dirty** energy corporations and the **destructive** energy sources and false solutions they are peddling," said Dipti Bhatnagar, Friends of the Earth International coordinator of the Climate Justice and Energy Programme. Energy road map offers hope for climate-safe planet 07 November, 2013
- 50- Jagoda Munic, chairperson of Friends of the Earth International, said: "The world's richest, developed countries are **most responsible for climate change**. They emitted **the biggest share of the greenhouse gases present in the atmosphere today, way more than their fair share**. They must urgently make the deepest emission cuts and provide most money if countries are to fairly share the responsibility of preventing catastrophic climate change." UN climate talks heading in the wrong direction 26 November, 2014
- 51- The world's richest, developed countries are **most responsible for climate change**. They emitted **the biggest share of the greenhouse gases present in the atmosphere today, way more than their fair share**. US-China climate pledges just a drop in the ocean 12 November, 2014
- 52- The world's richest, developed countries are **most responsible for climate change**. They emitted **the biggest share of the greenhouse gases present in the atmosphere today, way more than their fair share**. They must urgently make the deepest emission cuts and provide the bulk of the money if countries are to share fairly the responsibility of preventing catastrophic climate change. Climate scientists: our energy system needs urgent reform 03 November, 2014
- 53- There are real solutions to **the climate crisis**. First among them is **the reduction of greenhouse gas emissions**. Reductions must be agreed through a legally-binding agreement at the UNFCCC that is in line with what science and equity demand. Climate summit: world leaders fiddle while the planet burns 16 September, 2014
- 54- **Climate change is already happening** – wreaking devastation on communities and ecosystems around the world. Without urgent and drastic action to **reduce global greenhouse gas emissions**, we face far worse runaway climate change, with impacts that would dramatically overshadow anything we see

today, and affect predominantly the poorer people and nations, which are the least responsible for climate change. Richest 782 people could power half the world with 100% renewable energy 23 November, 2015

- 55- “The energy sector is the largest, fastest-growing **contributor to climate change**. More than **a third of all human greenhouse gas emissions** come from burning fossil fuels such as coal, oil and gas for energy,” said Lucy Cadena, climate justice and energy coordinator at Friends of the Earth International. Time for people to Reclaim Power 08 October, 2015
- 56- 197 countries have agreed **to reduce greenhouse gas emissions in an effort to hold the global temperature increase** to “well below 2 °C above pre-industrial levels” and to “pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels.” However, even if countries stick to commitments made so far, we can expect at least 3.5°C of warming. Paris agreement comes into force But sets us on course for a 3.5 degree world. We need to act now! 03 November, 2016
- 57- **Climate change is caused by a build-up of man-made pollution that traps** some of the light reflecting off the Earth's surface - heating up the atmosphere and changing weather patterns. The main gases involved include carbon dioxide, methane and nitrous oxide. Exxon Mobil's historic contribution to climate change assessed for the first time 29 January, 2004
- 58- Most of the **heat-trapping gases** are released by the richest nations of the planet, and cause rising temperatures and more extreme weather events such as droughts and floods. (...) Ways to reduce **greenhouse gas-causing deforestation** in developing countries (which accounts for approximately 20% of global emissions) were also discussed, but progress was very slow, despite the fact that urgent action is needed to reduce deforestation. During the 11 days of the conference an estimated 330,000 ha of forest have been lost. Climate change: Kyoto moves forward despite slow pace 20 November, 2006
- 59- Antje von Broock, climate campaigner at Friends of the Earth Germany, referring to the policy positions taken by the United States during the negotiations to establish the Kyoto Protocol in 1997. **“The European Union must not fall into the same trap again.”** Friends of Earth International calls on President Obama to earn his Nobel 02 November, 2009
- 60- (Meena Raman of Friends of the Earth Malaysia and Third World Network) “There is an urgent need to ramp up pre-2020 emissions reductions especially by developed countries, whose low Paris pledges will lead us to a 3.5°C world which is **a death trap for Africa and island nations among others**. We also demand that the High Level Ministerial address the huge climate finance gap because finance needs to be the key to energy transformation in developing countries.” What Marrakech Must Deliver For People And The Planet As we go into the second week of COP22, Friends of the Earth International asserts that Marrakech must deliver concrete actions for the sake of people and the planet. 14 November, 2016 9my addition in parenthesis)
- 61- The climate debt is owed for the historical overproduction of **greenhouse gas emissions by developed countries that saturated the atmosphere** – considered to be a global common – thereby reducing the environmental space available for developing countries. (...) The submission is based on modelling of the historic and continued developed country overuse of **the Earth's capacity to absorb greenhouse gases and the impacts of climate change as a result of this over pollution**. Rich countries try to dodge climate obligations 05 October, 2009
- 62- Domingo Lechon, Friends of the Earth Mexico said: “Our concerns on a non-transparent process are becoming reality and it seems that the Mexican government will become responsible for **killing the Kyoto Protocol**. This is not what the Mexicans want, and it is not what the world wants. We need real solutions. Mexico must not follow Denmark's bad example and avoid by all means an exclusive, un-transparent and undemocratic process that leads **to lock-in of dangerous climate change**, of which we will all suffer.” Rich countries must reject any secret text that puts in place process that could kill Kyoto 03 December, 2010
- 63- "We are bitterly angry that the OPEC countries, Japan and the United States have combined in this way to help wreck the world's environment and endanger the security of our common home. **The deal is as**

stupid and self-destructive as the man who climbed into an oven and switched up the heat. The resulting text is so bad that those countries who care about the environment should simply refuse to have anything to do with it," Hampton added. Kate Hampton, Climate Campaigner for Friends of the Earth International Earth Summit dumps on climate 02 September, 2002

ENV - FOOTPRINT scenario:

- 64- Kirtana Chandrasekaran (FOE) added: "Rather than giving a 'responsible' label to an irresponsible product, we must overhaul factory farming in Europe. This would be good news for farmers, consumers and the environment and will **reduce Europe's global footprint**. We need action to do this, not a green scam." Launch of 'responsible soy' label faces global opposition 08 June, 2010
- 65- In Colombia, the fumigations which are used in an attempt to exterminate the coca and poppy crops, the ingredients of the psychoactive substances that present an escape for desperate young people all over the world, are achieved through blood and fire without any legal, medical, or social justification. When the Amazon is fumigated, large expanses of agricultural lands are also fumigated, **leaving behind a big toxic footprint** and rendering the soil infertile. Declaration of international conference of environmental and human rights, Cartagena 18 September, 2003
- 66- Lionel Lepine, representing the Athabasca Chipewyan First Nation in Canada said: "Shell's tar sand operations are disrupting our traditional way of life. They are destroying our air, water, land and medicinal plants and the birds, fish and animals we depend on to sustain our people" Mr. Lepine also stated that "**Shell's footprint in our lands** will have a multi-generational effect on our children not yet born, they are violating our Indigenous rights, the rights of our sacred Mother Earth and we are here at their AGM to put them on notice that we will stop them." (...) **Reduces the carbon footprint** of its operations Shell 'apologises' for worldwide damage in "erratum" to annual report 17 May, 2011
- 67- The groups are calling on EU governments and the European Commission to review urgently the real impacts of biofuels on climate change and food security, and to prioritise energy efficiency in transport. New legislation must take account of **the full carbon footprint** of biofuels by introducing indirect land use change 'factors'. Europe's biofuels plans driving social and environmental destruction 06 November, 2010
- 68- "These 'hidden' emissions add up to **a vast footprint**, and the EU's current climate pledge falls dimly short of its fair share. The Coal Atlas shines a light on the huge deficit in ambition we see as we head into the Paris climate summit, and on the need for a radical shift away from coal." Lucy Cadena, Climate Justice and Energy coordinator for Friends of the Earth International Coal Atlas 2015 released in Brussels today 18 November, 2015
- 69- As well as having a poor record in financing renewables, the EIB remains a significant supporter of road and air transport as well as fossil fuels. Pouring more money into fossil fuel projects leaves a

legacy of further harmful emissions, increasing the global threat of climate change - and leaves the EIB with a **substantial carbon footprint of its own**. Is the EIB cooling climate change or fueling it? 02 June, 2005

- 70- Lifestyle changes envisaged by the study include a shift to public transport with only 43% of trips being made by car in 2050 compared to 75% in 2005. Such changes could make the **carbon footprint of the average European 8 times smaller in 2050 than today**. 40% domestic emissions cuts in Europe by 2020: feasible and affordable 08 December, 2009
- 71- “Since palm oil has **major carbon footprint**, any talk of 'certified' palm oil must take this issue seriously, but the RSPO is not doing that. Instead of adopting voluntary schemes like the RSPO, national governments should pass and enforce laws to control the damaging expansion of palm oil. They should also critically assess if palm oil can still play a role in current or future poverty alleviation programmes. We believe it is part of the problem, not the solution," said Teguh Surya, Head of Campaign Department of WALHI/Friends of the Earth Indonesia. ‘Certified’ palm oil not a solution 03 November, 2009
- 72- The report shows that an insatiable appetite for meat, dairy, wood and other products that require large areas of land from Europe and the United States, **makes their ‘land footprint’ among the highest in the world**. (...) Ariadna Rodrigo, Friends of the Earth Europe Resource Use campaigner said: “In order to reduce our land consumption and stop the harm we’re doing to other parts of the world, we need the EU **to start measuring its land footprint** now, and to start working out how to reduce our land use. Cutting Europe’s land use means focusing on quality of life rather than continuing to over-consume products.” (...) The EU starts **measuring its land footprint** by making Member States report **their land footprint** annually and start taking appropriate and fair measures **to reduce its land footprint** (...) Friends of the Earth Europe and the Sustainable Research Institute have measured flows of ‘virtual land’ around the world, in order **to calculate land footprints** for a large number of countries and regions. **The land footprint** is made up of the land consumed domestically within a country plus land imported within products such as food and clothing, minus the land which is used for exports. Meat and forest products consumption fuel inequalities in global land use 10 October, 2011
- 73- Bobby Peek, ground Work South Africa⁴, said: “Turning coal into liquid fuels, Synthetic Natural Gas and other chemical products **leaves a huge footprint** from the massive coal extraction, water consumption, energy use and the creation of toxic waste. We call on Coal Chemicals to be phased out and for no new plants to be built anywhere in the world.” Fuelling the fire: New coal technologies spell disaster for climate 28 July, 2016

⁴<https://www.groundwork.org.uk/>

ENV - Doom Prediction scenarios

ENV - CONFLICT scenarios:

- 1- (Kate Hampton, climate change campaign coordinator for Friends of the Earth International)
“Countries must do far more to reduce their emissions of climate changing gases, and the United States, the world’s biggest polluter, must join the rest of the world in **the war against climate change**. Unless we act now the planet faces catastrophe,” she added. Urgent action needed to address climate change, says rally 28 October, 2002

- 2- Friends of the Earth International Vice-Chair Tony Juniper said: "**The climate change alarm bells are ringing loud and clear**. It's about time George Bush woke up to the terrible threat of global warming and took serious action to reduce US emissions of carbon dioxide. Unless the United States joins **the rest of the world in the war on climate change**, our environment and the lives and livelihoods of millions of people across the world will be at risk." Tony Blair’s top scientist expected to call for US action on climate change 13 February, 2004

- 3- A study of the European heat wave in the summer of 2003, published in December 2004 (Ref: Stott, et. al., "Human contribution to the European heatwave of 2003", NATURE (VOL 432) 2 DECEMBER 2004 pp. 610-614), concluded that there was **a clear global warming fingerprint on the killer heat wave**, and that by mid-century, such a summer would be cooler than average. Climate change: governments talk but don't act 13 May, 2005

- 4- A study of the European heat wave in the summer of 2003, published in December 2004 (Ref: Stott, et. al., "Human contribution to the European heatwave of 2003", NATURE (VOL 432) 2 DECEMBER 2004 pp. 610-614), concluded that there was **a clear global warming fingerprint on the killer heat wave**, and that by mid-century, such a summer would be cooler than average. Climate change treaty goes live but **battle** on emissions has only just begun 14 February, 2005

- 5- There are many activities that are directly responsible for the loss of biological and cultural diversity. The logging (which caused the disappearance of a great part of the world's forests) and mining industries are **two major culprits**. Biopiracy threats at biodiversity meeting 09 February, 2004

- 6- "The Angry Mermaid Award exposes some of the **worst corporate culprits**. Millions of people are calling for strong and just action against climate change. Now they can vote to expose the worst of the worst at www.angrymermaid.org” Nina Holland from Corporate Europe Observatory, one of the Angry Mermaid Award organisers. Angry mermaid award to expose business lobby undermining climate action 02 November, 2009

- 7- However, they are failing to expose industrial agriculture as the **culprit** and small-scale agroecological food production as the only solution to the problem, said Friends of the Earth International today.
Climate talks: sustainable, small-scale, and peasant agriculture needed to cool down the earth 05 December, 2011
- 8- Targeting ExxonMobil, the biggest US corporation and its highest profile oil company, will spearhead the boycott campaign and send a message to Bush and all oil companies that the US has to take **climate justice** seriously NOW. Exxonmobil (Esso) international day of action: 11th of July 18 June, 2001
- 9- Pietermaritzburg, South Africa, August 16, 2002 - In time for this month's World Summit on Sustainable Development (WSSD), **environmental justice** and human rights NGO groundWork today launches a series of five booklets entitled South African People and Environments in the Global Market. This series of booklets report from several 'fronts' of the struggle we call development. (...) Presentations by community leaders from South Africa and other countries on their experiences of **environmental injustices** at the hands of multi-national corporations Press Announcement from 16 August, 2002
- 10- The event is of significance, with two Government Ministers, North and South, declaring that **environmental justice issues** have to be addressed in their countries and we will hear of policy initiatives which they are taking. Environmental justice activists will provide their testimonies of the **injustices** faced by communities who are having to bear a disproportionate burden of pollution, exposure to risk and ill- health consequences. A new approach to community **environmental rights** will be advocated. "The speakers will all be speaking on the need for world leaders attending the Earth Summit to adopt a new approach to addressing community **environmental justice rights**. They will also be calling for the inclusion of **environmental justice** in the text of the final declaration coming out of the Summit", said Kevin Dunion. FOE. Friends of the Earth international event with Valli Moosa, S.A. environment minister September 30, 2002
- 11- But climate negotiations show no progress and communities are calling for urgent action to address climate change and to protect their livelihoods in a manner that is consistent with human rights, worker's rights, and **environmental justice**. Urgent action needed to address climate change, says rally 28 October, 2002
- 12- Military action to secure oil supplies – on the other hand – threatens to increase **environmental injustice**. The war in Iraq: general environmental implications A Friends of the Earth England, Wales and Northern Ireland briefing paper 19 March, 2003

- 13- **Environmental injustices** are the daily bread of factory workers, of street vendors, of women, girls and boys who carry water across great distances. Urban pollution is concentrated in areas where the most impoverished live, where there are effluents in the drinking water and where people fight with birds of prey for the scraps in rubbish bins. (...) We seek **environmental justice** because there are **environmental injustices** taking place. (...) In the United States organizations have emerged **to fight for environmental justice and against ecological discrimination**, and so far as we know, they have yet **to be called terrorists**. (...) Our organizations are recognized, awarded and supported locally and internationally for the depth of our arguments, our persistence, our commitment and our work our fairness and for our dedication to **environmental justice**. (...) This is why we have come together to set out our actions and proposals for creating **a world of environmental and social justice**. Declaration of international conference of environmental and human rights, Cartagena 18 September, 2003
- 14- Commenting Friends of the Earth Scotland Chief Executive, Duncan McLaren, said: "We are absolutely delighted that our ground-breaking work on **environmental justice** has been recognised by this prestigious award. It is Friends of the Earth work with socially and economically disadvantaged communities across urban and rural Scotland that truly sets us out from the rest of the environment movement. We know that by empowering communities with the knowledge and skills to tackle environmental problems for themselves will, in the long run, benefit us all". (...) Friends of the Earth Scotland set up the UK's first accredited **environmental justice** course for community activists, training 16 socially and economically disadvantaged communities across urban and rural Scotland. Scottish charity wins the Guardian Charity Awards 2003 03 October, 2003
- 15- The area involved has suffered years of **environmental injustices** and a vision of a cleaner and healthier future must be developed and implemented. UK Environment Agency backs down over ghost fleet 31 October, 2003
- 16- High profile Friends of the Earth campaigners from around the world will be speaking on **climate justice** and corporate globalisation and privatisation at the 'G8 Alternatives Summit' on Sunday July 3rd. (...) Meena Raman, Chair of Friends of the Earth International will address two plenary sessions at different venues, one on corporate globalisation and privatisation and one on **climate justice**. Tatiana Roa Avendaño, General Director of Friends of the Earth Colombia will be speaking on the urgent need for **climate justice**. And Nnimmo Bassey, Director of Friends of the Earth Nigeria, will discuss corporate power, revealing Shell's abuse of human rights, and the environment, and making the case for tough measures to dismantle corporate power. Meena Raman, Chair of Friends of the Earth International said: "Just eight countries - the G8 - account for 45% of the emissions causing climate change, yet have only 13% of the world's people: **that's climate injustice**." (...) (Tatiana Roa Avendaño, General Director of Friends of the Earth Colombia) "Instead of supporting more fossil fuel exploitation, the G8 must finance sustainable energy in impoverished countries, and find real solutions to deliver **climate justice** by reducing emissions at home where most the emissions are actually produced". G8: Environmentalists speak on Climate and Corporate power 03 July, 2005 (my addition in parenthesis)

- 17- Just eight countries - the G8 - account for 45 per cent of the emissions causing climate change, yet have only 13% of the world's people: that's **climate injustice**. "Delivering **climate justice** is essential to ending poverty. (...) Friends of the Earth Scotland's Chief Executive Duncan McLaren, said: "We hope the G8 visit to Scotland will result in something meaningful on ending global poverty and **delivering climate justice**." Make Climate Change history 02 July, 2005
- 18- During the G8 Summit in Gleneagles (Scotland) the global environmental group is looking for individuals and groups in Scotland, and throughout the world, **to sound warning bells to wake** the G8 leaders up to the fact that time is running out to tackle **climate injustice**. (...) Meena Raman, Chair of Friends of the Earth International said: "Rising sea levels, extreme weather and shortages of food and water will affect billions of poor people before this century ends. But most of the emissions come from rich countries. The G8 nations represent 13% of the world's people but are responsible for 45% of the world's carbon dioxide emissions. That's **climate injustice**. "The G8 leaders are unlikely to venture far from Gleneagles when they meet there in July. But we can make sure they hear our demands. People all over Scotland and throughout the world will be sounding an alarm for **climate justice** at 13:45 on Thursday 7th July. Join in. Let everyone know you care, and help make world leaders take responsibility for the problems they have caused." G8: Climate alarm planned: International public call to action on 7 July 24 June, 2005
- 19- Friends of the Earth is a member of Make Poverty History and is encouraging supporters to take part. Friends of the Earth will take part to promote the call for **climate justice**. (...) Friends of the Earth is co-organising a free counter-event G8: (...) FoE Nigeria (Shell in Nigeria) is at the Assembly Hall Tatiana Roa, FoEI/FoE Colombia (venue tbc) will speak on **climate justice**. G8 Summit: It's time for urgent action on Climate Change 22 June, 2005
- 20- In May, Friends of the Earth International launched its first-ever photo competition, which will gather photos on the theme of **climate justice** from around the globe. The best shots will feature in a 2007 wall calendar and in a travelling photo exhibit. (...) We are looking for imaginative, striking photos that illustrate the impacts that the changing climate is having on people and the environment; that show who is responsible for dangerous climate change; and that show the way forward towards **climate justice**. Photographers Yann Arthus Bertrand et Pal Hermansen Join Climate Justice Photo Competition July 27 June, 2006
- 21- SDCEA is a local **environmental justice** organisation based in south Durban that provides a collective voice for the various community organisations and residents in south Durban, who live adjacent to the petro-chemical industrial developments in the south Durban area. Community victory: Shell to replace fuel pipelines 24 February, 2006
- 22- "Around the world millions of people are already suffering the effects of climate change. People outside the talks have sent a strong message demanding **climate justice**. This message must no longer

fall on deaf ears. We only have two years to build on this weak outcome and develop a just deal which ensures tough action from industrialised countries and assistance for people in the developing world.” Stephanie Long FOE. (...) WALHI/ Friends of the Earth Indonesia Deputy Director Farah Sofa said: “The major success of these UN climate talks in Bali has been to make the first major step toward building a global movement for **climate justice**. WALHI remains committed to raising the voices of the people and ultimately it is the people that will judge the quality of our leaders. These voices must be heard.” Kyoto Afloat After Attempted Sabotage 15 December, 2007

23- Peoples from social organizations and movements from across the globe brought the **fight for social, ecological and gender justice** into the negotiating rooms and onto the streets during the UN climate summit in Bali. What's missing from the climate talks? **Justice! Climate justice now!** What's missing from the climate talks? Justice! (...) Compared to the outcomes of the official negotiations, the major success of Bali is the momentum that has been built towards creating a diverse, global movement for **climate justice**. (...) huge financial transfers from North to South based on historical responsibility and **ecological debt** for adaptation and mitigation costs paid for by redirecting military budgets, innovative taxes and debt cancellation. What's missing from the climate talks? Justice! 14 December, 2007

24- EXPOSING FALSE SOLUTIONS, BUILDING REAL ANSWERS, **CLIMATE JUSTICE FOR ALL** (...) In Bali, we took another step towards building a global movement for **climate justice**. **Climate justice for all** 11 December, 2007

25- People in Bali will call for tough action to tackle climate change at a march and rally on 8th December (Saturday) as people around the world join the Global Day of Action on Climate Change. Activists from across Indonesia will call for **climate justice** and deep cuts in greenhouse gas emissions across the developed world. The Bali march will be the focus for thousands of people who have gathered for a civil society forum running alongside the UN Climate Change talks. Friend of the Earth International Chair Meena Raman will address the rally. (...) Friends of the Earth International Climate Coordinator Joseph Zacune said: “Negotiators inside the UN talks in Bali must listen to the voices of people in the streets and tackle these talks with more urgency. People all around the world are demanding **climate justice**. The pressure is on government delegates here in Bali to deliver the outlines of a future agreement which recognises the rights and needs of people in the developing world.” Bali Joins Global Day for Tough Action on Climate Change 07 December, 2007

26- Director of CENSAT Agua Viva/ Friends of the Earth Colombia Tatiana Roa Avendaño said: This drives home the need for a global, diverse movement to tackle climate change and demand **climate justice**. This can only be achieved by halting unsustainable consumption and production while promoting genuine solutions including clean renewable energy, energy-efficiency, the funding of adaptation, mitigation and forest conservation that protects land rights.” New report: voices from communities affected by climate change 26 November, 2007

- 27- The Chair of Friends of the Earth International, Meena Raman, warns the world's Heads of State today that '**climate justice**' needs to be urgently addressed in the **fight** against global warming. (...) Meena Raman, Chair of Friends of the Earth International in New York. "The eight most powerful industrialised countries - the G8 - account for 43% of the emissions causing climate change, yet have only 13% of the world's population. **That's climate injustice**, because climate change impacts most severely upon the world's poorest people. " **Climate Justice Needed** 24 September, 2007 24 September 2007
- 28- **INDONESIAN MINE POLLUTION RULING: SETBACK FOR ENVIRONMENTAL JUSTICE**
Indonesian mine pollution ruling 24 April, 2007
- 29- "This is a landmark case in the Philippines as far as **environmental justice** is concerned. The Pandacan oil depot services 80% of the petrol requirements of the Philippines. In the decision, the Supreme Court has upheld the general welfare of the people over the private and pecuniary interest of the oil companies. The Court has placed paramount importance on the health and safety of the people. This is a welcome precedent to Philippine **environmental justice**" said Vladimir Cabigao, lawyer for the Fenceline Community for Human Safety and Environmental Protection and one of the proponents of the case filed to the Supreme Court. Court orders shut down shell oil depot 07 March, 2007
- 30- 142 organizations **fighting for climate justice** are issuing today (Tuesday 9 December) at the UN climate talks a joint statement rejecting any role for the World Bank in controlling climate change finance. World Bank unfit to manage climate funds 09 December, 2008
- 31- Friends of the Earth International Climate and Energy Campaigner Juana Camacho said: "United Nations climate change negotiations are deciding the fate of millions of people and of our planet. World leaders must listen to the demands to address climate change now and deliver **climate justice**." (...) Industrialised countries owe a '**climate debt**' to developing countries. Industrialised countries governments must take the lead in radically reducing their emissions and meet their obligations for financial transfers to developing countries. Climate change talks pressured by 'global day of action' 06 December, 2008
- 32- A delegation of Friends of the Earth International - the world's largest grassroots - based environmental federation with more than 70 national member groups – will be at the talks in Poznan lobbying, holding governments to account, and strengthening a diverse civil society movement to achieve **climate justice**. (...) Friends of the Earth International Climate Coordinator Joseph Zacune added: "Friends of the Earth International is working with social movements, local communities, and other organisations to strengthen a diverse, effective and **global climate justice** movement. At these talks, there is particular concern about new, dangerous forest carbon trading proposals that could create the climate regime's greatest loophole, sanction the replacement of natural forests with plantations and trigger a

land grab that would imperil Indigenous Peoples and forest-dependent communities." Climate change: Ambition missing at upcoming U.N. talks 01 December, 2008

- 33- Friends of the Earth Japan will be holding events parallel to the G8 Summit demanding **climate justice**, opposing the World Bank's climate funds, and highlighting the dangers of the rush for agrofuels. G8 Leaders urged to dump the World Bank's climate investment funds 04 July, 2008

- 34- Achieving true **climate justice** also requires huge financial transfers from the industrialised countries who owe the global South **an ecological debt** that should be paid for by redirecting military budgets, innovative taxes and debt cancellation. Davos elites must listen 24 January, 2008

- 35- "Our organizations represent millions of people around the world and provide a critical voice promoting **climate justice** inside the UN. On the inside and the outside, all the rules have gone out the window - organizations such as Friends of the Earth that support peaceful action are being barred while developing countries concerns are being trampled in the plenary. Nnimmo Bassey, Chair of Friends of the Earth International. Danish PM tries to derail UN climate talks; Friends of the Earth suspended from the conference 16 December, 2009

- 36- Friends of the Earth International Chair Nnimmo Bassey had the following statement: "We are surprised and shocked that Friends of the Earth member groups from around the world and other non-governmental organizations have been denied access to the negotiations this morning. Our organizations represent millions of people around the world and provide a critical voice on behalf of **climate justice** inside the UN. We are currently attempting to discuss the situation with the UNFCCC to understand and resolve the situation." Friends of the Earth suspended from UN climate talks 15 December, 2009

- 37- The "climate capsule" project of Friends of the Earth International has collected hundreds of messages, in all languages and all forms, from communities and people around the world who are affected by climate change. These demands for **climate justice** are being presented at the Klimaforum, Copenhagen, between 10th and 18th December 2009. This artistic approach to **climate justice** acknowledges the historical trends of climate change, and the environmental and social impacts caused to the most impoverished communities around the world. (...) Meet the voices from the victims of climate change around the world and join the flood demanding **climate justice** now! (...) We call for **Climate Justice** – to recognise and deal with the historical responsibility for human induced climate change– through massive emissions reductions in the Global North, reparation of **the climate debt**, and equitable sharing of the earth's resources in recognitions of all peoples' right to a dignified life within ecological limits. Climate capsule: people from around the world demand **climate justice** now 11 December, 2009

- 38- Friends of the Earth International is running an international petition demanding industrialised countries to turn **climate justice** into reality, asking new targets of at least 40 per cent emissions reductions, without offsetting compared to 1990 levels as well as sufficient public finance for adaptation and climate protection in the global south. The world's people are demanding real action. Rich countries scheme to ditch Kyoto targets 06 November, 2009
- 39- Friends of the Earth International is running an international petition demanding industrialised countries turn **climate justice** into reality, asking new targets of at least 40% emissions reductions compared to 1990 levels as well as sufficient public finance for adaptation and climate protection in the global south. The world's people are demanding real action. Friends of Earth International calls on President Obama to earn his Nobel 02 November, 2009
- 40- "Rich countries have to drastically reduce their own greenhouse gas emissions now. This is the first step towards **climate justice**. Besides, **the climate and ecological debt** has to be recognized and paid. False solutions like agrofuels are not acceptable", said Irene Velez of CENSAT AGUA VIVA (Friends of the Earth Colombia), co-coordinator of the climate justice program of Friends of the Earth International. Some of the objectives of the Tribunal are: Strengthen the social struggles for **climate justice** and raise the level of awareness on the need to respond urgently to the effects of climate change. (...) The administration of Evo Morales has shown a strong stance in **defense of the environment and climate justice**, and its positions in the UN climate talks have been very constructive, according to Friends of the Earth International. First International **Climate Justice Tribunal** Started 14 October, 2009
- 41- At the close of the Bangkok UN climate change negotiations tensions between the world's rich nations and developing countries were at an all-time high, according to Friends of the Earth International campaigners observing the talks to demand **climate justice**. (...) (Stephanie Long – FOE) "On the streets of Bangkok there were thousands of demonstrators calling for immediate action from developed countries. But climate negotiators remain deaf to these calls for **climate justice**," she added. Climate talks regress 09 October, 2009 (my addition in parenthesis)
- 42- "Industrialised countries need to assume their historical responsibility and pay back their **climate debt**. Developing countries must stay strong in calling for **climate justice**. By ignoring calls to repay their climate debt and hindering progress in these talks, rich countries are jeopardising the lives and livelihoods of millions of people." said Meena Raman, Honorary Secretary of Friends of the Earth Malaysia. US holds UN climate negotiations hostage 12 June, 2009
- 43- Claire Prizeman, a Young Friends of the Earth Europe activist said: "Rich countries must do their homework and promise to radically cut their emissions and give up on false solutions like offsetting, so-called clean coal and nuclear if we are to have any hope of avoiding catastrophic climate change.

Rich countries have to live up their historical responsibilities and act now for **climate justice**.” Climate crisis: politicians must find just solutions 05 June, 2009

44- Friends of the Earth International is urging people to call for an end to the carbon offsetting con and put pressure on world leaders for real action. Individuals can sign up to a **climate justice** petition at . Carbon offsetting exposed as con 02 June, 2009

45- Tomorrow, Friends of the Earth International joins the thousands of people around the world and in Cancun who are mobilizing under the banner of **climate justice**. They will demand steep, binding emission reduction targets from developed countries and an open process, and will hold the Mexican Presidency accountable to its public pledges to provide such a process. Cancun week 2: Friends of the Earth International analysis 06 December, 2010

46- Friends of the Earth International supports the inclusion in the climate negotiating texts of proposals introduced by Bolivia, as a result of the Cochabamba Accord. The demands for a rejection of carbon trading and in support of community rights (**climate justice tribunals and referenda**) must be supported by all parties as a legitimate and progressive development in the UN negotiations. The people’s voices: mobilizations in Cancun 04 December, 2010

47- Friends of the Earth International chair Nnimmo Bassey will join the event. Bassey said: “Standing on the shoulders of history we see clearly the beginnings of the trials that are bound to expose those who have waged **ecological wars** against the peoples of the Niger Delta and elsewhere in the world. The labors of our heroes past must not be in vain. We demand **environmental justice** and an end to fossil fuel addiction: be it crude oil, tar sands or coal.” Global day of remembrance: 15th anniversary of Ken Saro-Wiwa’s murder 10 November, 2010

48- Asad Rehman, of Friends of the Earth-England, Wales and Northern Ireland, who will observe the Tianjin UN talks, said: “There is the potential for real progress to be made in Tianjin if developed countries do their part. Citizens of developed countries should urge their leaders to take bold action that advances the cause of **climate justice**.” Climate talks: developed countries must stop stalling 01 October, 2010

49- Nnimmo Bassey, who is currently in Africa, said: "This award is a vindication of the just and resolute struggles for **environmental justice** by impacted communities globally. We want to see an end to the corporate crimes committed by oil giants like Shell in Nigeria and around the world.” ‘Alternative Nobel prize’ awarded to FoEI chair Nnimmo Bassey 30 September, 2010

- 50- Karin Nansen, Vice-Chair of Friends of the Earth International and Coordinator of Friends of the Earth Uruguay said: "All countries should follow the good example set by Bolivia on climate issues. Disgracefully, some rich industrialised countries accused the Bolivian government of being obstructionist in the UN climate talks. The US has even denied climate aid to Bolivia. Friends of the Earth International is collaborating with social movements and the Bolivian government to promote genuine **climate justice** demands including the promotion of food sovereignty and rejection of carbon trading." Social movements gathered in Bolivia are demanding that other governments start promoting **climate justice** demands like those of the Bolivian government, ahead of UN climate talks due to start in Cancun, Mexico in November. Bolivian government increases its moral authority on climate change 21 April, 2010
- 51- Nnimmo Bassey, Chair of Friends of the Earth International said: "The people have spoken loud and clear: we need **climate justice** now and this means urgent action. Yet the politicians inside the talks are once again failing to deliver. If urgent, ambitious action is not taken the lives of millions will be in peril." Reaction to today's protest at the UN climate talks 09 December, 2011
- 52- Nnimmo Bassey, Chair of Friends of the Earth International. "On Saturday thousands of people will march on the streets of Durban to demand **climate justice**. African leaders must hear their call and stand strong in the interests of our peoples and the people of the world," he continued. Will Africa lead the world where rich countries have failed? 02 December, 2011
- 53- Nnimmo Bassey, the chair of Friends of the Earth International, from Nigeria, said: "Ken Saro-Wiwa was a hero who died because of the world's addiction to fossil fuels. His words still ring true in our ears today. This is why we set November 10 as a day of remembrance of the victims of mining, oil and gas. We demand that those who have orchestrated the murder of people for the sake of profits should be held to account. We also demand **environmental justice** and an end to fossil fuels: be it crude, tar sands or coal." New report: memory, truth and justice for heroes in the resistance against mining oil and gas 10 November, 2011
- 54- Nnimmo Bassey, chair of Friends of the Earth International, said: "As we work together around the world, we show belligerent institutions and governments that the path to the future is one of solidarity and not of competition and destruction. We are proud to say that in forty years we have grown in numbers and power and will continue to stand firmly with people struggling for **environmental justice** across the world." Friends of the Earth International celebrates 40 years of mobilization, resistance and transformation 15 June, 2011
- 55- Dipti Bhatnagar, Friends of the Earth International climate justice coordinator said: "(...)Only people- and-planet-centred solutions will solve the climate crisis and create a better future for us all. We must

make our governments listen and demand **climate justice** now”. Doha climate talks: industrialised countries block climate action 08 December, 2012

- 56- Multinational corporations made massive lobbying efforts in the past twenty years to ensure that the UN serves their own interests rather than promoting solutions that benefit the people, such as economic justice, **climate justice** and food sovereignty. Rio+20 declaration: a gift to corporate polluters 20 June, 2012

- 57- On June 5, 2012, Friends of the Earth International started a campaign urging the UN to limit the excessive influence of multinational corporations on UN decision-making processes, and address this major cause of **environmental injustice**. Rio+20 summit under corporations' undue influence 18 June, 2012

- 58- While world leaders and the business sector gather for the Rio+20 Earth Summit due to take place here on June 20-22, Friends of the Earth International campaigners are gathering with social movements from around the world at an alternative Summit focused on human rights and **environmental justice** on 15-23 June. (...) “The People and our governments must reclaim the UN's decision making processes from corporate interests. They must prioritise real solutions that transform our economies and deliver food sovereignty, **climate justice** and economic justice for all,” said Nnimmo Bassey, chair of Friends of the Earth International. (...) The Peoples Summit is a process bringing together social movements and organizations from all over the world, to call for the defense of life and commons, social and **environmental justice**, against commodification of nature and the 'Green Economy'. Rio+20 summit must listen to people's summit 16 June, 2012

- 59- This month marks the 20th anniversary of the UN Conference on Sustainable Development, also known as the Rio Earth Summit. For 20 years governments have tried to agree on ways to save our planet - and ultimately our lives. As we are facing multiple global crises today, people around the world can no longer remain silent about the false solutions offered and the **environmental injustices** that remain unresolved. Reclaim the United Nations campaign starts today 04 June, 2012

- 60- Commenting on the last day of the UN climate talks in Warsaw, where civil society organisations representing millions of people around the world walked out of the conference in an unprecedented protest, Jagoda Munic, chairperson of Friends of the Earth International said: “The only success of the dirtiest climate conference on record is the fact that civil society walked out and started a domino effect already reaching our home countries, where ordinary citizens are joining the struggle for **climate justice**.” Warsaw climate talks: dirtiest climate conference on record 22 November, 2013

- 61- The report, “ and violations of the Israeli occupation of Palestine” documents some of the **environmental injustice** that a Friends of the Earth International delegation observed in 2012. Dr. Ayman Rabi from Friends of the Earth Palestine / PENGON said: “The continuation of the Israeli

occupation of Palestinian territory is the prime cause of **environmental injustice** and degradation in Palestine. The illegal acts that the occupation authorities are currently practicing against the Palestinian People are clear violations of international law and humanitarian law. These include land confiscations to expand illegal Israeli colonies, over-exploitation of natural resources, and pollution of the environment as well as denying Palestinians the right to access and use their natural resources". Jagoda Munic, the chairperson of Friends of the Earth International, said: "Apart from illegal Israeli settlements and the separation wall, we have witnessed less visible forms of occupation including toxic waste-dumping, the expropriation and diversion of fresh water sources from Palestinian communities to the benefit of Israeli settlers, the development of polluting industries close to Palestinian towns and landgrabs. Friends of the Earth International has exposed **environmental injustices** and resource grabbing around the world, but the Israeli government's systematic policies of segregation, land grabbing, and water resources expropriation are truly shocking." She added: "Palestine stands as an example of the link between **environmental injustice** and social and political injustice. The environmental and subsequent humanitarian impact of the Israeli occupation worsens every year." Visit to Palestine exposes **environmental injustices** and human rights abuses under the Israeli occupation 18 October, 2013

- 62- Alberto Villarreal from Friends of the Earth Uruguay / REDES said: "International Investment Agreements grant unprecedented rights to foreign corporations and investors, including the right to sue sovereign States and challenge their public interest policies in international arbitration tribunals that only look after the interests of the investors. They are **deadly weapons** against democratic rule and the protection of peoples' rights and **environmental justice**. Any steps taken by governments to put peoples' rights before the rights of investors and transnational corporations need to be supported" Free trade and investment agreements under fire by civil society 27 May, 2013
- 63- The expedition aims to raise awareness of the impacts of climate change and the need for **climate justice**. (...) (Sarah-Jayne Clifton, Friends of the Earth International climate justice and energy co-ordinator) "The leaders of the developed countries that caused the crisis are not even trying to deliver **climate justice**. To avoid climate catastrophe we must transform the unjust and unsustainable economic system at the heart of the problem," she added. (...) He (Suman Shrestha, 22, is the youngest member of the Climbing for Climate Justice Team) believes we need to save World Heritage sites like Mount Everest for future generations and that youth around the world should join the struggle for **climate justice**. He is General Manager of Khangri Media. Everest 'climbing for climate justice' expedition aims to break world records 08 May, 2013 (my addition in parenthesis)
- 64- Today, on Human Rights Day, Friends of the Earth International warned that the countries and peoples that have contributed the least to greenhouse gas emissions will be the worst affected by the climate crisis, a '**climate injustice**' that highlights the link between climate change and human rights. (...) "The inaction of wealthy nations at the UN climate negotiations is outrageous. It flies in the face of the most vulnerable countries and communities suffering from the climate crisis. This is **climate injustice**," said Friends of the Earth International chairperson Jagoda Munic. (...) "The climate crisis should be solved with a true human rights approach. **Climate justice** should be at the core of **the fight against climate change**. Unfortunately, wealthy countries and corporate polluters have so far succeeded in preventing this approach," she added. (...) The UN climate agreement recognises that

wealthy countries have done the most to cause climate change and should take the lead in solving it, as well as provide finance to poorer countries as repayment of their **climate debt**. Developed countries are historically responsible for the majority of all emissions while hosting only 15% of the world's population. **Climate injustice** exposed on human rights day 10 December, 2014

- 65- A proposal presented by African nations earlier in the year calls for an energy transformation and was welcomed by **climate justice** activists including Friends of the Earth International. "Africa as a continent contributed the least to the climate crisis. Now Africans are pointing to the real solutions to stop global warming and for **environmental justice**," said Godwin Ojo, executive director of Friends of the Earth Nigeria. Build clean community energy, activists tell UN climate talks 05 December, 2014
- 66- Friends of the Earth U.S. President Erich Pica. "So we are taking the first steps to expand our focus beyond **environmental injustices**, to challenge corporate and financial exploitation, halt systematic oppression and otherwise challenge those that threaten to prioritize greed over public health and safety." Solidarity with the people of Ferguson, Missouri 13 November, 2014
- 67- On September 21, hundreds of thousands of people including Friends of the Earth International members and supporters will march in New York, London, Amsterdam and many other cities around the world to demand **climate justice**, standing with climate and dirty energy-affected communities worldwide. Climate summit: world leaders fiddle while the planet burns 16 September, 2014
- 68- Jagoda Muncic, chairperson of Friends of the Earth International: Today (Saturday 12th December) over 2,000 activists from the Friends of the Earth International federation, joined by thousands more from Paris sent a global message for **climate justice and peace**, writ large across the city in a peaceful protest. (...) The demands in the Test cover the key pillars of what would have constituted a just deal: a commitment to keeping us well below 1.5 C warming while dividing the carbon budget using the fairshares principle; finance and support in line with rich nations' **climate debt**; a just, systemic transformation; and justice for impacted communities, including compensation for irreparable climate damage. Paris climate deal is a sham 12 December, 2015
- 69- As politicians cop-out on genuine climate action at the international climate talks in Paris, over 2,000 activists from the Friends of the Earth International federation, joined by thousands more from Paris sent a global message for **climate justice and peace**, writ large across the city. (...) Malika Peyraut, campaigner for Friends of the Earth France said: "There is a state of planetary emergency and politicians are failing to act. Despite a clamp-down on civil liberties, people are writing history on the streets of Paris - demanding **climate justice and peace**. The French government must shift financing from dirty energy like coal and nuclear, towards the socially-controlled and owned renewable energy the world needs." Paris: Thousands Call for **Climate Justice** as Politicians Cop-out on Climate 12 December, 2015

- 70- Equitable distribution of a global carbon budget based on historical responsibilities and **climate justice** also remains in the text Paris Climate Summit: Not enough progress by half 05 December, 2015
- 71- Florent Compain, President of Friends of the Earth France, said: "President Hollande stated that he wants an ambitious and equitable climate agreement. But how can France lead if it cannot reign in its polluters? Companies like Engie and EDF, in which the French state is a shareholder, still refuse to close their 46 dirty coal plants. This must change urgently, we need **climate justice** now." Paris Summit: Reaction to Heads of States 30 November, 2015
- 72- Activists and experts are available to brief journalists on developments at the talks and to tell their personal stories and struggles, often from areas affected by **climate injustice**. Paris Climate Summit: People determined to mobilize for Climate Justice 27 November, 2015
- 73- Since the tragic attacks in Paris, the French government has unfortunately clamped down on civil liberties, announcing a state of emergency and cancelling planned mobilizations for **climate justice**. But peoples' voices will not be shut down. We are determined to ensure that the much-needed peoples' call for **climate justice** will be heard loud and clear. (...) We are telling those who were planning to travel to Paris on Dec. 11-12 not to change their plans. We are exploring creative ways to modify our **climate justice** mobilizations in order to comply with the new security measures because the final word must be from the people, not politicians or polluters. (...) Our plans for mobilizations in Paris will be modified, but the movement for **climate justice** will continue to grow with demonstrations, marches, and gatherings planned for 2016 and beyond. Paris climate mobilizations ban – reaction Statement by Friends of the Earth International in reaction to the French government ban of the Paris climate justice mobilizations due to the heightened security situation 20 November, 2015
- 74- "Ken Saro Wiwa's legacy is not only a major source of inspiration to the people of Nigeria, it also serves as a beacon of hope to people across the world struggling for **environmental justice**," said Friends of the Earth International chairperson Jagoda Munic. Executed Nigerian activist 20th anniversary celebrated around the world 09 November, 2015
- 75- On Oct 9-10, 2015 even more individuals and groups are poised to join Reclaim Power and call for **climate justice**. Time for people to Reclaim Power 08 October, 2015
- 76- We the undersigned organisations, networks, and movements gathered in Marrakech at COP22 issue the following collective statement in support of communities and movements around the world in response to Donald Trump becoming President-Elect of the United States of America and its potentially devastating implications for the cause of **climate justice**. (...) We all have a responsibility to show President-elect Trump and right-wing populists everywhere that we as **climate justice** groups and movements stand in solidarity with all people threatened and impacted by his Presidency.

Islamophobia, homophobia, racism, sexism, elitism, and climate denialism are an insult and threat to us all. (...) We stand in solidarity with Indigenous land and water protectors in Standing Rock, and **climate justice and environmental justice** movements that have been rooted in communities across the U.S. as they resist President-Elect Trump's attempt to back more fossil fuel expansion which will **poison** our environment, our air and our water. Global Climate Justice Movements Refuse to Be Overshadowed by Election of Climate Change Denier to U.S. Presidency 19 November, 2016

- 77- "Whilst the election of a climate denier into the White House sends the wrong signal globally. The grassroots movements for **climate justice** - native american communities, people of color, working people - those that are at this moment defending water rights in Dakota, ending fossil fuel pollution, divesting from the fossil fuel industry, standing with communities who are losing their homes and livelihoods from extreme weather devastation to creating a renewable energy transformation - are the real beating heart of the movement for change. We will redouble our efforts, grow stronger and remain committed to stand with those on the frontline of **climate injustice** at home and abroad. In the absence of leadership from our government, the international community must come together redouble their effort to prevent climate disaster," --Jesse Bragg, from Boston-based Corporate Accountability International ⁵. (...) "As a young woman and first-time voter I will not tolerate Trump's denialism of the action needed for **climate justice**. Our country must undergo a systemic change and just transition away from fossil fuels towards renewable energy within my lifetime. The next four years are critical for getting on the right pathway, and the disastrous election of Trump serves as a solemn reminder of the path ahead of us. As young people and as **climate justice** movements we will be demanding real action on climate for the sake of our brothers and sisters around the world and for all future generations," --Becky Chung from the youth network SustainUS ⁶. Paris agreement comes into force But sets us on course for a 3.5 degree world. We need to act now! 03 November, 2016
- 78- As part of **the global fight against climate change**, more than 30 grassroots environmental groups from Friends of the Earth International will mobilize in a for **climate justice** on 13-14 October 2017. (...) Actions will include: giant murals of resistance against dirty energy in Spain; anti-coal mobilizations in Japan and Indonesia; a bicycle rally for **climate justice** in Palestine; work with gas-affected communities in rural Mozambique and an anti-fracking rally with inflatable dinosaurs in England, UK. Environmental groups unite across 30 countries for Global Days of Action for climate justice 13 October, 2017
- 79- The poorest American communities, which are disproportionately of colour, are already suffering **environmental injustices** and Trump is increasing their suffering. Friends of the Earth International stands in solidarity with the majority of Americans who are resisting Trump's extreme agenda that is prioritizing fossil fuel profits over people. We express with vulnerable people across the world who are fighting injustice and climate catastrophe." (Sara Shaw FOE). Trump pulls out of the Paris climate agreement, making US a Rogue State on Climate 01 June, 2017 (my addition in parenthesis)
- 80- In addition, the activist has been a member of Friends of the Earth Latin America and the Caribbean (ATALC)'s Executive Committee, as well as the Executive Committee of Friends of the Earth International. As such, she has been involved in numerous socioenvironmental struggles in countries across five continents and she has devoted her life to working for **environmental justice**. Karin Nansen, new chair of Friends of the Earth International 12 January, 2017

5 <https://www.corporateaccountability.org/>

6 <https://sustainus.org/>

- 81- In the coming days, Friends of the Earth will present its trade & environment, **ecological debt** and international financial institutions programmes in series of workshops. Friends of the Earth joins march for life in Porto Alegre 26 January, 2001
- 82- FoEI believes governments should use the Johannesburg meeting to establish rules of corporate accountability, **environmental rights**, a just trade system, effective environmental governance and agree action by over-consuming countries on their **ecological debt** to the South. Earth Summit – still stuck at Rio? 25 September, 2001
- 83- FoEI is calling on Governments to agree an ambitious agenda for the World Summit. Governments should use the Johannesburg meeting to establish rules of corporate accountability, **environmental rights**, a just trade system, effective environmental governance and agree action by over-consuming countries on their **ecological debt** to the South. Governments trade away Earth Summit? 24 September, 2001
- 84- A lasting solution to the debt crisis must also include the recognition of the **ecological debt** owed by the northern countries to the South, a factor that should be included in all future multilateral negotiations. Protecting the environment is a prerequisite for peace 08 November, 2001
- 85- **Ecological Debt:** There has been no formal recognition of **the ecological debt** owed by the rich countries to the poorer ones, nor of those who suffer as a result, let alone a schedule for discussions on how the issue should be handled. In Rio, the North agreed that they had caused most environmental harm and had therefore to lead the clean up effort. Governments failed to move this forward. Statement on the revised draft WTO 4th Ministerial Conference Declaration 30 October, 2001
- 86- Acknowledge and act on the industrialized countries' **ecological debt** to the South. Gloomy outlook for the World Summit unless change of direction, says Friends of the Earth International 28 January, 2002
- 87- Acknowledgement of the **ecological debt** owed to the South from the North - At the 1992 Earth Summit developed countries acknowledged the pressures they place on the global environment. Action is needed to redress this and to **“pay back” this debt** to developing countries through programmes and plans of action. Earth Summit 2002 – Heading for failure? Deputy Prime Minister John Prescott is giving oral evidence to the Environmental Audit Committee on Monday 4th 28 February, 2002
- 88- Recognise **“carbon debt”** - industrialised countries have a historical responsibility to reduce emissions and provide adequate funds to reduce the vulnerability of affected communities What prospects for the Earth Summit? 14 May, 2002

- 89- Measures to control big business were crippled in the talks by the US and EU and key issues such as the **ecological debt** owed by the North to the South were not even acknowledged. Earth Cup Semi-Final in Bali: United States 1 – Earth 0 FoE denounces foul result at Earth Summit talks 07 June, 2002
- 90- Industrialised nations are also unlikely to acknowledge their **massive ecological debt** to the developing world. One month to Johannesburg – still hope for the Earth Summit? FoEI campaign “Don’t let big business rule the world” reaching climax in Johannesburg 26 July, 2002
- 91- Industrialised nations are also unlikely to acknowledge their **massive ecological debt** to the developing world. (...)FoEI corporate accountability and **ecological debt** campaign details Richest nations try to trade away Earth Summit 26 August, 2002
- 92- **Ecological debt:** The issue of **ecological debt**, that is **the debt** accrued by industrialized northern countries to Southern countries from the exploitation of their environment, resources and people, has been completely ignored in the negotiations. FoEI believes it is time for the North to recognize and **pay the debt** to the South. Earth Summit: Progress of negotiations 28 August, 2002
- 93- FoEI is disappointed with what was achieved here in Johannesburg. But we will continue its campaign for trade justice, rights for communities and rules for big business. We will also continue to call on developed countries to acknowledge **their ecological debt** to the developing world. FoEI will now be taking its campaign “Don’t let big business rule the world” to the Cancun WTO Conference. Betrayal....But see you all in Mexico! 03 September, 2002
- 94- **Ecological Debt:** There has been no formal recognition of **the ecological debt** owed by the rich countries to the poorer ones, nor of those who suffer as a result, let alone a schedule for discussions on how the issue should be handled. In Rio, the North agreed that they had caused most environmental harm and had therefore to lead the clean up effort. Governments failed to move this forward. WSSD end of term report not satisfactory: must do better 02 September, 2002
- 95- Industrialised nations failed to acknowledge **their massive ecological debt** to the developing world. Friends of the Earth International challenges UN governments “don’t let big business rule the world” summit wasted – the time for action is now 13 November, 2002
- 96- **Ecological debt** from northern countries to the south. International Conference on Environmental Rights and Human Rights 27 August, 2003
- 97- The report ‘**Our Environment, Our Rights**’ launched by Friends of the Earth International expands the definition of human rights to include **environmental rights** (such as rights for environmental refugees, right to claim **ecological debt** and the right to **environmental justice**) and shows how and

where these rights are abused. (...) The 70-page testimony shows that the most blatant **environmental rights** violations tend to be inflicted on people whose civil, political, social and economic rights are not respected. "Marginalized people around the world, including women, people of color and impoverished people in industrialized countries, suffer from **environmental injustice** by bearing the brunt of pollution," said Sonja Ribi of Pro Natura / Friends of the Earth Switzerland. Environmental rights abuses exposed in new report 10 December, 2004

- 98- International recognition of the G77's existing position that the North owes an **ecological debt** to the South (...) **The ecological debt** which has been incurred by the countries of the North - through the importation of under-priced natural resources from the South - is therefore highly relevant. The G77 could push to include its already agreed position on **ecological debt** (as set out in the Declaration of the South Summit, Havana, Cuba, 10-14 April 2000). Cancún to saõ paulo: Will developing countries gain ground in trade and development talks? 14 June, 2004
- 99- Meena Raman of Friends of the Earth Malaysia and chair of Friends of the Earth International stated that "**the ecological debt** of the countries in the North to the countries in the South increases day by day. Climate change generated by unsustainable lifestyles and overconsumption in the North hits the poorest communities in the South the hardest, communities that have least responsibility in causing the problem." (...) "The panorama of desolation, death, destruction of crops makes life even more difficult in a region that has suffered chronic poverty and social and **environmental injustice** since the colonialist invasion," said Jose Utrera, Coordinator of the Secretariat of Friends of the Earth International, who is himself from Guatemala. Friends of the Earth International expresses solidarity with the peoples of Central America and Mexico 09 October, 2005
- 100- Juniper (FOE) continued: "Suggestions that developing countries need to make legally binding commitments are outrageous. The rich countries that are most responsible for this problem have the means to take action. **They must repay their climate debt:** by cutting emissions themselves, helping others to adapt and by helping to build low carbon economies". Happy 10th Birthday Kyoto 11 December, 2007 (my addition in parenthesis)
- 101- Meena Raman (FOE) added: "Technology transfer is not about reducing trade barriers. If the EU and US were serious about helping developing countries tackle climate change, they should be radically reducing their own emissions and living up to their obligations by **paying their climate debts**. This includes the costs of adaptation and mitigation, including technology transfer and forest conservation. Instead, we see them pushing intellectual property rights onto the poor that block the transfer of desperately needed environmental technology." Keep unfair trade out of climate talks 07 December, 2007 (my addition in parenthesis)
- 102- Friends of the Earth International Climate Coordinator Stephanie Long said: "Rich nations must **pay their climate debt** to the developing world by radically reducing their emissions and help vulnerable communities adapt to the impacts of climate change. This means embracing renewable technologies, improved energy efficiency and reduced consumption." Bali climate change talks must succeed 04 December, 2007

- 103- Friends of the Earth International Climate Campaign Coordinator Joseph Zacune said: "Industrialised nations must commit to stringent targets and timetables that ensure steep emissions' reductions after peaking by 2015. Those countries with the greatest responsibility for historical and continuing greenhouse gas emissions have sufficient wealth to act and must do so. The inequitable consumption of resources by the North and exploitation of resources from the South has led to **ecological debt that must be repaid.**" Climate change: launch of ambitious roadmap needed in Bali 26 November, 2007
- 104- A range of mitigation and adaptation efforts are required, including changes in lifestyle and unsustainable consumption patterns mainly in the rich, developed countries that have accumulated **an ecological debt** to poor communities in the global South (...) Friends of the Earth International climate campaigner Joseph Zacune said: "It's time for **climate justice**. Wealthy nations which have benefited economically by polluting the most must finance developing countries' adaptation and mitigation costs." Climate change: urgent action and robust policies must match dire warnings 09 November, 2007
- 105- G8 nations so far failed to take their historical responsibilities seriously and **pay the ecological debt** they owe to the people in poorer countries who are suffering from the consequences of the current unsustainable development model. Weak G-8 climate deal lacks substance 07 June, 2007
- 106- G8 nations must also take their historical responsibilities seriously and **pay the ecological debt** they owe to the people in poorer countries who are suffering from the consequences of the current unsustainable development model. G8: campaigners demand alternative approach 31 May, 2007
- 107- Having created a disproportionate amount of greenhouse gases for many decades, which has allowed us to develop our economy, it would be extremely mean spirited for Australia not to commit to deep cuts in emissions as a way of acknowledging our historic and contemporary **carbon debt**. Climate change set to overwhelm the world's poor 29 March, 2007
- 108- Antje von Broock, climate campaigner for Friends of the Earth Germany (BUND) said: "The European Union is causing a standstill – it's trying to play down the importance of these talks and by doing so it is playing with people's lives. Europe can only be a genuine leader if it commits to at least 40 per cent missions cuts in Europe by 2020 and **to repay its climate debts** by helping developing countries." Young people meet eu ministers to demand they 'wrap up' climate change 11 December, 2008
- 109- **The 'carbon debt'** of palm oil is huge when the plantation is developed on peat soils and/or at the expense of forests. Malaysian palm oil greenwash report 07 October, 2008
- 110- Campaigners are demanding that Northern governments take the lead in radically reducing their emissions and meet their obligations for financial transfers to the South, based on **climate debt**, for mitigation and adaptation that are independent from and additional to emission reduction obligations. Land grab threat at UN climate talks 19 August, 2008

- 111- This is the minimum scale and speed of reductions science says is necessary from rich countries to avert the worst impacts of climate change, and is the kind of deep cuts needed if industrialised countries are **to repay their climate debt** and make a just and effective global climate agreement possible. Europe must commit to at least 40% reductions by 2020 without offsetting 10 December, 2009
- 112- Friends of the Earth International's climate campaigner Catherine Pearce said:
 “At long last it looks like the Kyoto climate treaty is finally going to come into effect, and the world can begin the crucial **battle** against global warming, the biggest environmental threat the planet faces. But international pressure must be put on the United States and Australia to join the fight too. If they want to be responsible members of the world community they must wake up to the threat of climate change, sign up to Kyoto, and take urgent action to cut their emissions.” Russian parliament approves climate treaty 22 October, 2004
- 113- This is the minimum scale and speed of reductions science says is necessary from rich countries to avert the worst impacts of climate change, and is the kind of deep cuts needed if industrialised countries are **to repay their climate debt** and make a just an effective global climate agreement possible. (...) The chances of reaching an agreement in Copenhagen which delivers **climate justice** are currently extremely slim since Europe and other developed countries have not committed to steep emission cuts and to provide the finances needed to enable developing countries to tackle climate change, says Friends of the Earth International, the world’s largest grassroots environmental network. 40% domestic emissions cuts in Europe by 2020: feasible and affordable 08 December, 2009
- 114- **What is Climate Debt? The climate debt** is owed for the historical overproduction of greenhouse gas emissions by developed countries that saturated the atmosphere – considered to be a global common – thereby reducing the environmental space available for developing countries. More than a financial debt, **the climate debt** is also owed for the impacts of climate change that is suffered in past and present in developing countries, and future generations. Therefore, **the climate debt** based on the historical responsibility of the developed countries must be paid through a range of actions. (...) The Plurinational State of Bolivia submitted a proposal to recognise and **repay the Climate Debt** to the UN Climate Change Convention, which has been officially endorsed by Venezuela, Paraguay, Cuba, Malaysia and Sri Lanka. (...) Friends of the Earth International urged developed countries to cut their greenhouse gas emissions and provide public finance for developing countries in line with science and **climate justice** at United Nations climate talks in Bangkok, Thailand. (...) Stephanie Long of Friends of the Earth International said: “Developed countries have been accumulating **a climate debt** for the past 200 years, based on their fossil fuel intensive development. **This climate debt** must be repaid if we are to have any chance of avoiding dangerous climate change. This means that those that are historically responsible for climate change must reduce their emissions to give more resources to developing countries so they can develop sustainable economies.” Rich countries try to dodge climate obligations 05 October, 2009
- 115- The leaders will be forced to write out that they must commit to reduce their carbon emission by at least 40% by 2020, **to repay their climate debt** and to promise not to invest in offsets, coal and nuclear. Climate crisis: politicians must find just solutions 05 June, 2009

- 116- Meena Raman from Friends of the Earth Malaysia said: “It is disgraceful that despite the urgency we are facing to tackle climate change, rich industrialised countries are trying to buy their way out of emission reductions through perilous offset schemes. Instead of cheating and continually failing to address climate change, they should live up their historical responsibilities and **repay their climate debt.**” Carbon offsetting further increases the '**climate debt**' that industrialised nations owe to developing countries, which have emitted just a fraction of the carbon emissions responsible for global warming. Carbon offsetting exposed as con 02 June, 2009
- 117- Nnimmo Bassey, Friends of the Earth Nigeria and chair Friends of the Earth International: "(...) We need real solutions to protect our forests, and we need developed countries to solve the climate problem they created by making drastic emissions cuts at home instead of offsetting them elsewhere. Rich countries should also commit to provide public money to stop deforestation, **as a repayment of their climate debt.**" Governments urged not to rush into REDD deal and focus on effective forest conservation 09 December, 2010
- 118- Developed countries also have a moral and legal obligation to honour **their climate debt** and provide adequate public finance to developing countries to develop sustainably and protect the vulnerable from climate impacts. Climate: disastrous “Durban package” accelerates onset of climate catastrophe 13 December, 2011
- 119- Nnimmo Bassey, Chair of Friends of the Earth International. “Developed countries must take the lead by committing to urgent and dramatic legally-binding emissions cuts, stop the drive for destructive false solutions like carbon trading, and **repay their climate debt** to developing countries. Developing countries must resist the drive from the US, Japan and others towards climate catastrophe, and the EU must prove its climate leadership or take its share of responsibility for what could be a disastrous outcome in Durban. The world cannot wait any longer” he continued. UN climate talks : strong concerns over agenda of developed countries 22 November, 2011
- 120- The Rio+20 declaration ignores the need of the industrialised world to **repay its ecological debt** through provision of new and additional public finance and through technology transfer. (...) “Once again corporate polluters have held UN decision-making hostage to furthering their economic interests, at the expense of people’s wellbeing and the planet. But real solutions to the crises exist and were presented by the alternative Peoples Summit. They include economic justice, **climate justice**, and food sovereignty, “said Nnimmo Bassey, chair of Friends of the Earth International. Rio+20 summit condemned as sell out of people and the planet 22 June, 2012
- 121- The agreement recognises that rich countries have done the most to cause the problem of climate change and should take the lead in solving it, as well as provide funds to poorer countries as **repayment of their climate debt.** Civil society walks out of Warsaw climate talks, says hope lies with building peoples’ power 21 November, 2013
- 122- The UN agreement recognises that rich countries have done the most to cause climate change and should take the lead in solving it, as well as provide funds to poorer countries as **repayment of their climate debt.** UN climate talks heading in the wrong direction 26 November, 2014

- 123- The UN agreement recognises that rich countries have done the most to cause the problem of climate change and should take the lead in solving it, as well as provide funds to poorer countries as **repayment of their climate debt**. US-China climate pledges just a drop in the ocean 12 November, 2014
- 124- "In order to address climate change, we require the transfer of resources and technology from developed to developing countries in the order of hundreds of billions of dollars a year. This **repayment of the so-called 'climate debt'** of the rich to the impoverished will allow us to build the community-controlled sustainable energy systems we need to **fight poverty** and climate change at the same time," added Dipti Bhatnagar (FOE). Climate scientists: our energy system needs urgent reform 03 November, 2014 (my addition in parenthesis)
- 125- The demands in the People's Test on Climate cover the key pillars of what would constitute a just deal: a commitment to keeping us well below 1.5 and dividing the carbon budget using the fairshares principle; finance and support in line with rich nations' **climate debt**; a just, systemic transformation; and justice for impacted communities, including compensation for irreparable climate damage. Draft Climate Deal fails to deliver, sparking protests 09 December, 2015
- 126- "Those who owe the **biggest ecological debt**, industrialised countries, must now act with urgency and ambition. Dirty corporations that have long **abused our planet** have driven us to the brink of environmental and social catastrophe. Pope Francis' words today meet the surge in popular demand for urgent, ambitious and equitable action to address the climate crisis." (Lucy Cadena, FOE). (...) "We commend the work of communities and movements globally who have long worked to restore the balance of life on earth, implementing renewable community energy solutions, resisting dirty energy and uniting to build the movement for **climate justice**." (Lucy Cadena). Pope says climate crisis is a **matter of justice** – reaction 18 June, 2015 (my addition in parenthesis)

POL Extracts:

POL - Eulogy of nature scenarios

POL - GREEN scenario:

- 1- It is only by governing that we will have the opportunity to build a society that is **free, fair and green**. (...) And when that moment comes, to ensure that we are ready to build a Britain that is **free, fair and green**. 21/09/2006 Leader's speech, Brighton Menzies Campbell (Liberal Democrat)

- 2- And **our economic future must be green**. We are already global leaders in wind power, **green cars, clean coal** and carbon capture 29/09/2009 Leader's speech, Brighton Gordon Brown (Labour)

- 3- But we recognised we could work together. Not just lots of shared values, like wanting a country that is **more free, more fair, more green, more decentralised**, but a shared way of trying to do business. 06/10/2010 Leader's speech, Birmingham David Cameron (Conservative)

- 4- And yes, **a clean, green economy too**, powered by the new low-carbon technologies. Britain leading the world. But I have to tell you, we will not succeed in this last task unless we can see off that most short-sighted of arguments: that **we have to choose between going green and going for growth**. (...) **Going green means going for growth**. But more than that, it means going for more energy that we produce ourselves and which never runs out; it means going for **clear air and clean water and a planet we can proudly hand over to our children**. **Going green means going forward**. 26/09/2012 Leader's speech, Brighton Nick Clegg (Liberal Democrat)

- 5- To create a country that is **free, fair and green**. (...) Only we can achieve that **free, fair and green** society. Leader's speech, Brighton Menzies Campbell (Liberal Democrat)

- 6- This party never wants to punish or hold back the aspirations of people who want to get on in life and have a good life. And what we must be is the party of **sensible, green leadership**, and that is exactly what we are going to stay. Leader's speech, Blackpool 2007 David Cameron (Conservative)

- 7- Fiscal discipline is not an end in itself. We offer discipline for a purpose. Not just austerity, but progressive austerity. Reducing the deficit, yes, but also building a **fair society and a green economy**. Still driven by generosity of spirit, but fit for the circumstances of the day. It's the only way to deliver real change in Britain. Leader's speech, Bournemouth 2009 Nick Clegg (Liberal Democrat)

- 8- In 2001, we highlighted in every policy section **the positive green impact** of the proposals being made. Next time we're going to have to be even more upfront. **We've always been ahead on green issues. I'm determined we'll stay ahead**. And we'll do that by sticking to one firm principle: making

the economy work for the environment. **Green growth.** 25/09/2003 Leader's speech, Brighton Charles Kennedy (Liberal Democrat)

- 9- He's ("my opponent"/ D. Cameron) been found out because he hugged a huskie before the election, and then said "**let's cut the Green crap**" after the election. He's been found out because he stood outside a hospital with a sign saying "no hospital closures" before the election, and then closed that very A&E department after the election. He's been found out because he changed his logo to a tree before the election, and tried to sell off the forests after the election. 23/09/2014 Leader's speech, Manchester Ed Miliband (Labour)

- 10- Both parties in this Government promised we would stick **to our green commitments**, but it has taken constant pressure from the Liberal Democrats – not least Ed Davey – to hold the Tories to their word. And I can tell you now that a sustainable environment will remain at the heart of our vision for Britain's future – **it's not green crap to us.** A plan that is credible. A party which has learnt from our mistakes. 08/10/2014 Leader's speech, Glasgow Nick Clegg (Liberal Democrat)

- 11- The Conservatives describe **protecting the environment as 'green crap'**. By contrast, Liberal Democrats will always **fight for the green agenda.** More than anything else, investing in people is the key to a successful modern economy. 19/09/2017 Leader's speech, Bournemouth Vince Cable (Liberal Democrat)

- 12- You didn't champion **green politics as greenwash** but because climate change is devastating our environment, because the energy gap is a real and growing threat to our security... 01/10/2008 Leader's speech, Birmingham David Cameron (Conservative)

- 13- It can undermine the competitiveness of our companies, so it's harder for them to invest in the **new, green technologies of the future. (...) That is the Britain we want to build. A Britain that is more green. More family-friendly.** 01/10/2006 Leader's speech, Bournemouth David Cameron (Conservative)

- 14- We've made the biggest investment in our railways since the Victorian times. We've created a bank devoted to **clean, green industry** – a world first. 18/09/2013 Leader's speech, Glasgow Nick Clegg (Liberal Democrat)

- 15- New legislation announced by Jim Wallace just this month to provide free eye and dental checks for all. And a new Environment Bill announced by Ross Finnie so that **a green thread runs through the heart of Scottish government**, one where every policy will be audited for its environmental impact. (...) **The green thread that should run through all aspects of government, should run through all aspects of our lives also.** 23/09/2004 Leader's speech, Bournemouth Charles Kennedy (Liberal Democrat)

- 16- And I want **the new green technologies of the future** to be the source of British jobs in British businesses. 24/09/2007 Leader's speech, Bournemouth Gordon Brown (Labour)

POL - Deterioration scenarios

POL - DAMAGED CONTAINER scenarios:

- 1- We are already global leaders in wind power, green cars, clean coal and **carbon capture**. And now we will lead again, with new designated **low carbon zones** around the regions of this country. And I say to you today – we will create over a quarter of a million new green British jobs. 29/09/2009 Leader's speech, Brighton Gordon Brown (Labour)
- 2- In the next five years the first works should start on a high speed rail network. The cables of super-fast broadband will be laid. **The first Carbon Capture and Storage projects** will be under way. These are the long-term commitments we've made. (...) Let's make Humberside **lead the world in carbon capture and storage**. Let's make Bristol a centre for marine energy parks. "Transforming the British economy: Coalition strategy for economic growth", 28/05/2010 Shipley David Cameron (Conservative)
- 3- Big infrastructure projects like high speed rail, super-fast broadband, **carbon capture and storage**. 06/10/2010 Leader's speech, Birmingham David Cameron (Conservative)
- 4- Councils generating renewable energy. A Green Deal to make bills lower and homes warmer. **Carbon capture and storage**. Green buses, trains and trams. The world's first ever green investment bank. Green achievements. From a green party of government. 21/09/2011 Leader's speech, Birmingham Nick Clegg (Liberal Democrat)
- 5- To see the Green Deal ditched, the Swansea lagoon delayed, **carbon capture and storage** abandoned... To see the Conservatives doing a massive u-turn on Heathrow expansion. 19/09/2017 Leader's speech, Bournemouth Vince Cable (Liberal Democrat)
- 6- And by investing in energy efficiency, renewables, **carbon capture**, clean fuels and new environmental technologies, I want Britain to lead in carbon-free vehicles, carbon-free homes and carbon-free industry. 24/09/2007 Leader's speech, Bournemouth Gordon Brown (Labour)

POL - Materialisation scenarios

POL - TRANSFORMED HOUSE scenarios:

- 1- We will increase the amount of energy from renewable sources fivefold; ensure every major business in the country has a **responsibility for greenhouse gas reduction**; treble investment in **clean** technology, including **clean** coal; and make sure every new home is at least 40% more energy efficient. 26/09/2006 Leader's speech, Manchester 2006 Tony Blair (Labour)

POL - Doom Prediction scenarios

POL - CONFLICT scenarios:

- 1- Let me conclude – the **battle** the leaders of the G20 are **fighting** this week is not **the old one against old enemies**– but a **new one**, against global recession, **against climate chaos**, and against unemployment, insecurity poverty and hopelessness. "Global Rules, Global Values", 31/03/2009 London Gordon Brown (Labour)