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A framework for classifying climate change questions used in public opinion surveys

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ABSTRACT
Climate change is a significant site of political contestation, with public opinion frequently invoked to support claims for more (or less) action. Yet, 'climate change public opinion' is an umbrella term encompassing many different components. Empirical research has recently burgeoned, but an up-to-date and globally comprehensive guide to navigating the interconnected concepts currently measured is still lacking. In this review, we develop an original classification framework based on questions fielded in over 315 surveys across different parts of the world. We reflect on what aspects the questions elicit, relate them to patterns in the existing empirical literature, and identify and reflect on important implications for future research. Given the diversity of climate-relevant concepts that can be measured via survey questions, we recommend that researchers are clear about which component(s) of climate change public opinion they are eliciting, how they analyze these, and situate their research claims and policy recommendations accordingly.

1. Introduction

In democracies, climate policies are more likely to be adopted, implemented and maintained when politicians are able to demonstrate that they enjoy public support[1] (Drews and van den Bergh 2016, Drews 2021). Activists, lobbyists and politicians often draw upon public opinion surveys to support their claims that the public is or is not in favor of particular forms of climate action. However, 'climate change public opinion' is an umbrella term covering a variety of components that are not always complementary. In fact, what may appear as contradictory findings may result from different types of

climate change questions being used interchangeably and/or inconsistently across or within country and time contexts similar to what Dunlap and Jones (2002) concluded in relation to inconsistent findings within the environmental concern literature.[2] In line with Sartori's (1970, p. 1053) seminal writings, such a lack of clarity is problematic as it heightens the risk of conceptual stretching whereby researchers 'are left to swim in a sea of empirical and theoretical messiness'. This in turn may impede cumulative, comparative knowledge development. There are also potentially grave policy implications: uncertainties in how publics stand on climate change can make it difficult for political representatives to fulfill their responsiveness function (Chen *et al.* 2021, p. 35).

Articles by Nisbet and Myers (2007) and Roser-Renouf and Nisbet (2008) stand out in relation to this challenge by drawing attention to the need for careful measurement and the knock-on implications for construct validity, with both sketching out initial categorizations. These categorizations are, however, neither sufficiently up-to-date nor as comprehensive as they once were. Alongside the rapid growth in climate policy outputs (Schaub *et al.* 2022) and the changing political, social and technological landscapes that have created different types of policy challenges and opportunities (Lees and Eyre 2021), since these studies were carried out the field of public opinion research on climate change has burgeoned as has the number, type and variety of climate change questions asked. There is a pressing need to develop a holistic guide of existing questions to make it easier for researchers to navigate the range of conceptual measures that now exist.[3] After all 'if we are weak in our measurement, we may in fact only amplify uncertainty about the public dimensions of the debate [on climate change], slowing progress toward solutions' (Roser-Renouf and Nisbet 2008, p. 38).

This review addresses this gap by providing greater clarity on the various components of climate change public opinion elicited in survey research and discussing what each tells us about publics' views. We begin by outlining the process through which we identified relevant surveys and survey questions for classification purposes. We then identify the different aspects they address and elicit while assessing them against the existing literature. Finally, we conclude by reflecting on the implications for future research.

2. Classification framework

We carried out an inductive, bottom-up review of the types of questions asked in public surveys in a cross-national context. To gather our corpus of relevant questionnaires, we initially searched datasets in the UK data archive and the GESIS repository using the keywords 'global warming' and 'climate change'. While these databases do contain a large number of studies from the UK and Germany, they are not limited to data from these countries. They

also include for instance the EU-wide *Eurobarometer* and the global *International Social Survey Programme* (ISSP) studies. This adds far greater geographic scope than previous reviews that concentrated on climate change questions in the United States (Nisbet and Myers 2007, Roser-Renouf and Nisbet 2008). We also ensured however to review key longitudinal surveys from the United States, namely from the American National Election Study, the Cooperative Congressional Election Study, the National Surveys on Energy & Environment, and the Climate Change in the American Mind surveys. To offer an even greater global perspective, we searched the regional public opinion resources of the Afrobarometer, Americas Barometer, Arab Barometer, Balkan Barometer, Asian Barometer and Eurasia Barometer.[4] Several other primarily academic- or government-led surveys were added based on our knowledge and web searches, with a cut-off publication date of June 2021 for all sources.[5] This resulted in a corpus of over 315 survey questionnaires.[6] Figure 1 displays the geographic spread.[7] The countries that appear the most are the United Kingdom/Great Britain, Germany, Spain, France and the United States. These are followed by surveys in all other European Union member states not yet mentioned, reflecting the efforts of the European Union-wide Eurobarometer surveys to ask climate change questions. Within Africa, Nigeria and South Africa have the most coverage. Central Asia received the least coverage, with Tajikistan, Turkmenistan and Uzbekistan just appearing in a single survey.

We analyzed this corpus to generate our classification framework.[8] Questions were considered if they referred to climate change, global warming or emissions reductions.[9] Rather than starting with a pre-set list of categories, we inductively brought together similar questions to form the framework (see Table 1).[10] Thus, the approach follows qualitative evaluations of the wording of survey questions, rather than the
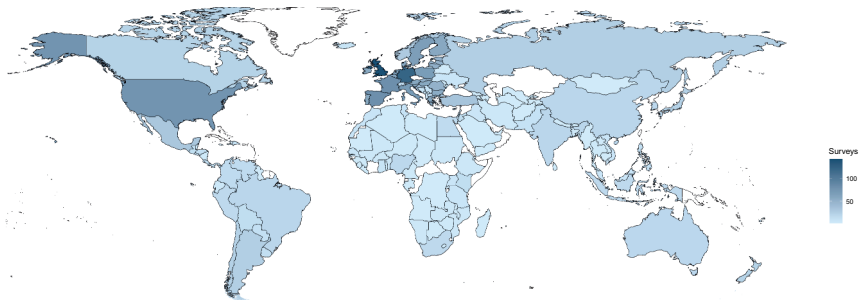
Figure 1. Summary of geographic areas covered by the questionnaire corpus. Note: The United Kingdom numbers include some surveys of England, Scotland and Wales.

Table 1. Summary of the classification framework.

(1) Information: Engagement, knowledge and sources
(2) Beliefs
(3) Threat; Worry and Concern
(4) Responsibility and Action
(5) Climate Change and the Economy
(6) Public Support for Climate Policies
(7) Evaluation of Action; Representation; and Activism

framework emerging from quantitative analysis of the underlying data. It is important to note that we are first and foremost interested in the types of questions that are asked, and that the framework should not be interpreted as having categories containing questions of equal prevalence in the datasets examined – some types of questions appear occasionally while others are much more frequent both over time and across contexts. This is a point we elaborate on in the conclusion. Throughout this review, we relate the concepts elicited through these questions to key empirical findings in the existing literature.

2.1. Information: engagement, knowledge and sources

Respondents' engagement with climate change information is an initial consideration that surveys may measure. Theoretically this is relevant as information can be a pre-cursor to attitude formation (Zaller 1992).

Sometimes, questions gauge individuals' interest in climate change and/or consumption of information on it. There is no standard wording. Questions may include agreement with statements such as 'I keep up-to-date' and 'I don't give information about climate change my full thought and attention'. Respondents may also be asked whether they have reflected much on it or would be interested in learning more about it. A related collection asks whether they discuss it, share stories about it on social media or hear people they know talk about it. Frequently asked is how often and from where respondents receive their climate change information, with common categories being family, friends, local/national government, social media, websites, TV news and newspapers.

Individuals may be asked to self-assess their climate change information including whether they are well-informed or feel they understand it. While some are uninformed, others are misinformed and are highly confident in climate beliefs that are not aligned with the scientific consensus (Flynn et al. 2017). This may follow from decades of organized disinformation by those with a vested interest in fossil fuels (Stokes 2020, Treen et al. 2020), such as ExxonMobil's prominent campaigns that casted doubt on the existence and dangers of climate change in contrast to the company's internal awareness of the science (Supran and Oreskes 2020, Supran et al. 2023). Surveys may thus

measure respondents' objective knowledge via true/false or agree/disagree questions on scientific statements ranging from very basic to highly sophisticated information. This enables the exploration of self-assessed knowledge in relation to actual scientific understanding.

Scientific trust is relevant here. We know that when news outlets produce content that gives those representing the scientific consensus equal weighting to climate sceptics, it produces 'balance as bias' effects (Boykoff and Boykoff 2004) whereby users are more likely to think there is greater scientific division than exists, though news outlets have generally become more responsible in this regard (O'Neill *et al.* 2023). Moreover, (not) trusting the scientific consensus on climate change can be partly linked to (not) trusting the science on other issues such as COVID-19 (Rutjens *et al.* 2021), though it can also operate distinctly (Rainie *et al.* 2015, Tesler 2018). Some surveys elicit such views by asking whether respondents believe the media exaggerates climate change or are too alarmist. On the science itself, fielded questions include agreement with statements such as 'the evidence for climate change is unreliable' and 'most scientists agree that humans are causing climate change'. Surveys may ask directly about the proportion of scientists that think anthropogenic climate change is occurring, with respondents who think there is more disagreement tending to think the evidence is less solid (Ding *et al.* 2011). Trust in actors themselves is also key, and surveys may ask whether individuals place their trust in (climate) scientists and/or other actors to provide accurate climate information. Meta-analyses suggests that trust in scientists – who are regarded by publics globally as amongst the most trusted professions (Ipsos 2022, p. 19) – and environmental groups has the largest effect on climate action support (Cologna and Siegrist 2020).

2.2. Beliefs

Belief questions are among the most widespread of fielded questions (Fairbrother 2022). These are related to the knowledge questions described in the prior section, but distinct. As Fischer and van den Broek remark (2021, p. 117), 'Where climate change knowledge reflects the accuracy of people's understanding of climate change information, climate change beliefs are not necessarily evaluated for their correctness, but reflect a judgment in relation to climate change'.

The first type of belief question asks whether respondents believe climate change is happening regardless of humans' influence. This may allow a dichotomous response, or the expression of more uncertainty on a Likert scale. In others, respondents do not necessarily deny that it is occurring, but can express a belief that humans' influence has been exaggerated.

However, many climate sceptics have shifted from proclaiming climate change 'is not real' to 'it may be happening, but humans are not causing it' (Viala-

Gaudefroy 2020). This is where a second type of question adds further detail on respondents' understanding of whether humans bear responsibility. These can use a range of categorical options, or scales (for instance, ranging from 'entirely natural' to 'entirely human') or alternatively respondents are given a statement on either end of the scale and asked the extent to which they agree with it. Experimental research suggests that recorded anthropogenic belief appears higher when responses are recorded on an agree/disagree scale compared to using categorical responses options (Motta *et al.* 2019). Moreover, the number of response categories is important, in particular whether there is an option to assign equal responsibility to humans and natural causes (Greenhill *et al.* 2014).

Of course, beliefs as recorded in surveys can be transient (Converse 2006). While longitudinal panel studies are best placed to ascertain it, some (repeated) cross-sectional studies seek to measure this by asking respondents how confident they are in their views, how strong their opinions are, and whether their opinion has changed recently. Changing one's mind may not only be due to randomness, but to whether respondents have personally perceived the effects of climate change. Such perceptions may be related to changes in seasonal patterns or experiences of severe weather events (Brügger *et al.* 2015), with surveys also asking whether particular severe weather events are considered to be related to climate change. The literature on the role of (perceived) personal experiences of climate change however lacks clear conclusions with a key reason being conceptual and measurement shortcomings leading to a lack of clarity (Reser and Bradley 2020). While less common than insights on beliefs, those on the transiency of views are valuable as they indicate whether respondents would be receptive to primes – for instance from politicians or other actors – that could shift their views in a more/less climate-sceptic direction (Fischer and Van den Broek 2021).

2.3. Threat; worry and concern

2.3.1. Threat

Even if one accepts that climate change is occurring – whether caused by humans or not – one may not necessarily consider it a threat or problem. Despite the scientific consensus that its overall consequences will be negative, individuals may not believe this. Indeed, sometimes the media portrays climate change as a good thing in opinion pieces (for instance Ridley 2013) or through visual imagery (O'Neill *et al.* 2023). Some discourses note beneficial effects for one's local area even if the global effects are negative, and such frames can impact upon publics' perceptions (Wiest *et al.* 2015). Psychological mechanisms, such as system justification and cognitive dissonance avoidance, may also decrease certain individuals' perceptions of its dangers or lead to individuals doubting the evidence itself (Feygina *et al.* 2010).

Respondents may be asked whether they consider the consequences to be good/bad, the benefits outweigh the risks or if climate change is a threat. These may be asked in general, or focus on a specific arena such as perceived effects on one's own/family's life, one's local area, one's country (or other regions/countries) or globally. Respondents may also be prompted to consider the relative effects on different spatial areas concurrently in the same question, such as whether they think their local area is more likely to be affected compared to other parts of their country or will primarily (or only) affect far away countries as opposed to where they live. Calculations of localized costs/benefits can bear on policymakers, with research suggesting that regions are less likely to mitigate emissions when they may experience a net local benefit from a changing climate (Gazmararian and Milner 2024).

When the effects might be expected and which generations will be (most) affected by climate change are other elicited factors. On the one hand, the greater the perceived immediacy of the impact, the greater the likelihood that individuals will take note of the problem (Moser and Dilling 2004) given that individuals may prioritize more immediate and tangible societal goals (Spence *et al.* 2012, Kenny 2018). However, highlighting its proximal causes does not by itself trigger concern or behavior change and may even have the opposite effect given the complex psychological processes involved (Brügger *et al.* 2015)

Other questions pick up on views of the multi-faceted impacts of climate change. Individuals may be presented with a list of problems – such as biodiversity loss or migration – and asked to rank which ones they perceive will intensify the most due to climate change – often within a specified timeframe – or choose which ones they find the most worrying. They may also be asked for each one whether they think climate change will lead to more or less of these problems or be presented with a particular issue and asked the extent to which it is caused or will be affected by climate change.

2.3.2. *Worry and concern*

Capturing climate worry/concern has standard wordings, mainly asking 'How concerned/worried are you about climate change?'. The main difference is the number of ordinal responses categories, or whether there is a prompt to focus on a particular aspect. This can also be tapped through asking to what extent respondents feel certain emotions when thinking about climate change such as anxiety, fear, worry or depression[11] (see Wang *et al.* 2018 for further discussion). While belief is a pre-requisite and worry is correlated with whether one considers climate change consequences to be negative, these are not sufficient conditions for worry by themselves and can themselves be structured differently. Within Europe for instance, worry about climate change is more politicized among individuals than belief in its anthropogenic cause (Fisher *et al.* 2022). This raises the point that while there may be occasions where one may wish to merge different types of

climate questions into a generalized climate index, one may lose not only nuances but forgo important empirical differences that lead to substantively different conclusions.

A related approach captures the salience of climate change in the public mind vis-à-vis other issues. This is mainly done through asking what individuals perceive to be the biggest/most important issue/problem/security issue/challenge facing the country/world/family/them personally, with regards to the present or a future period. During elections, another variation is to ask which issues parties should campaign/concentrate on. When this is open-ended and coded post-hoc, climate change salience can be captured even when the research team has not prespecified it (though it is often merged with other environmental issues when reported). Alternatively, respondents may be presented with a specified list which may include climate change or environmental protection, either listed separately or together in a joint category. Respondents may just choose one or be given a set number of responses to choose, or occasionally be asked to rank-order them. As salience measures may be 'costless' (Norris 1997, p. 326/327, Kenny 2024b), they do not necessarily give insight into whether respondents would prioritize climate action if such action would conflict with other societal goals.

Climate change salience among other – potentially related – environmental problems is an alternative elicitation approach whereby individuals are presented with different environmental problems and are asked which they consider to be the most important/serious or worry/concern them the most. Eurobarometer surveys highlight substantial regional differences: climate change has been the most salient environmental issue within Western Europe over the past two decades, whilst in Central and Eastern Europe other environmental issues – such as air pollution and waste – are more prominent (Lorenzoni and Pidgeon 2006, Kenny 2021).

2.4. Responsibility and action

Questions on responsibility and action in relation to climate change are frequently found in surveys. Opinions can be elicited on whether individuals believe that their own behavior contributes to climate change and, if so, do they broadly feel they have a responsibility/duty and are prepared to act. Collective action can be an issue. Thus, respondents may be asked how they perceive others are acting, whether those around them share their views, and whether they would do more if they thought others were taking action. These are related to questions on whether individuals believe that the actions of a single person or their own actions can make a difference (response efficacy), and/or whether society can make a difference if everyone acts (collective efficacy) (Nisbet and Myers 2007, p. 51).

While individuals may be inclined to take action, other questions elicit individual agency or self-efficacy through agreement with statements such as 'it is hard to take action against climate change, even if you want to'. Even those who think they know what to do may have misperceptions, with one report (IPSOS 2021, p. 25) finding 'We underestimate high-impact actions such as becoming vegetarian and taking flights, and overestimate lower-impact actions such as avoiding excess packaging'.

People can thus be asked which actions they have done or are willing to undertake to reduce their carbon footprint. With these, it is worth keeping in mind the mismatch from reported to actual behavior – with respondents sometimes misreporting actions due to social desirability bias (Gifford *et al.* 2011, p. 806). There is a tendency to ask more about behaviors associated with low carbon reductions – such as turning off lights – than high-impact actions, thus focusing on doing something positive rather than the actual impact (Hadler *et al.* 2022, p. Chapter 2). The societal prominence of such low-impact behaviors may relate to individuals' overestimation of their effects. Reported action is usually in the form of a 'yes or no' question. Variants include giving respondents the option to indicate the frequency of their actions, or ask if they have adopted a behavior without a climate frame and then specifically if limiting climate change was a reason. A 2020 survey by Statistics Netherlands (2021) found that among the 78% of Dutch drivers who reported occasionally leaving their car at home, just 16% did it to contribute towards a better environment/climate, while 48% did it for exercise. This highlights that in some cases and for some people, emphasizing the co-benefits of climate-friendly behavior may have a greater resonance (Whitmee *et al.* 2024). Or respondents can be asked what are the reasons why they do (not) think taking climate action is important. Questions can also be fielded on what actions respondents think people need to or should be doing, which is sometimes followed up by asking about their own habits to see whether there are gaps between what they know they should do and what they actually do.

Willingness to adopt actions tend to focus on the extent to which people would accept lifestyle changes such as reducing their standard of living, driving or flying less, or eating less (red) meat. These can be particularly revealing when questions are designed to encourage the respondent to consider the required trade-off. As some actions can be considered less of a sacrifice than others, it is also worth capturing whether respondents believe that particular lifestyle choices would be easy or difficult for them to undertake. Even perceived 'easy' actions may not be implemented without appropriate incentives (Moberg *et al.* 2021, p. 13).

There are of course differences as to how climate change can, or should, be addressed. The Intergovernmental Panel on Climate Change

(IPCC) Working Group III report for instance argued that individual lifestyle changes are important but also suggests that novel technologies such as carbon capture and storage have a role (Creutzig *et al.* 2022). The promise of such technological change may however raise expectations of more effective policy options becoming available, thus 'diminishing the perceived urgency of deploying costly and unpopular, but better understood and tested, options for policy in the short term' (McLaren and Markusson 2020, p. 395). An illustrative survey question that captures this asks respondents to agree whether '[n]ew technologies can solve global warming without individuals having to make big changes in their lives'.

Individuals are but one actor. Even if people see bottom-up action as important, they may also consider other actors to hold a (potentially greater) responsibility. A key debate captured in questions is whether industrialized countries should shoulder most of the blame, and therefore burden, for mitigation (see Sardo 2023 for further discussion on this point). The form these questions take are important for the deductions one makes. If one asks from a pre-specified list which actors hold a responsibility, individuals may assign a responsibility to many different actors – including themselves – but this does not give an insight into *how* responsible they perceive them to be and so one could overestimate assignment of public responsibility. This can be overcome by asking individuals to attribute some degree of responsibility to each actor, whether each actor should be doing more or less, or by asking them which actor holds the greatest responsibility, whether outright or through rank ordering a list. This reveals that individuals attribute much more responsibility to top-down than bottom-up action as shown in annual surveys carried out in New Zealand since 2017 where approximately two-thirds of respondents say that individuals have a responsibility, but less than 20% consider individuals to be the most responsible (IAG 2021, p. 9). While individuals generally consider that national governments should lead, climate action can get 'trapped' when governments do not take on this responsibility (Newell *et al.* 2015).

Surveys also ask if people believe that nothing can be done (fatalism) through agreement with statements such as 'it's too late to do anything'. These should be fielded with a question on anthropogenic climate change belief; otherwise it is difficult to distinguish those who believe that human-caused climate change is occurring, yet think that humans cannot do anything or should not be expected to change their behaviors, from those that believe that (anthropogenic) climate change is not real.

2.5. Climate change and the economy

There has been much literature on the relationship between climate change and objective measures or subjective perceptions of the economy, testing whether individuals are less likely to be concerned or support climate policies when times are hard (Scruggs and Benegal 2012, Mildenberger and Leiserowitz 2017, Kenny 2018, Duijndam and van Beukering 2021, Meyer 2022, Böhmelt and Zhang 2024). The framing of questions that seek to capture the association between the economy and climate change reveal in themselves divergent perspectives on how this relationship is seen. And such framings can result in different interpretations on whether the public support climate policies.

One perspective assumes that individuals perceive a trade-off between the economy and climate action. This is sometimes tested by polling on agreement with sociotropic statements such as 'If our country takes steps to reduce global warming, it will cost jobs and harm our economy' or egotropic statements, e.g. 'it will put my own job at risk'. It is known that the fossil fuel industry commissioned economic consultants who would use frames such as these from the late 1980s onwards to publicly emphasize the economic costs while neglecting the benefits of emissions reductions given its effectiveness at delaying mitigation action (Franta 2022). While whether there is a trade-off is much-debated (see Gugushvili 2021), questions can continue with this assumed implication in their wording to still elicit whether respondents would choose the climate-friendly option if it had an adverse economic impact. This can be by putting 'fighting climate taking precedence even if it impairs economic growth' at one end of a Likert scale and vice-versa at the other. Experimental research using a related question focusing on a trade-off with environmental issues suggests that specifying the extent of the trade-off expected is furthermore an important factor to predict climate policy support, as even some individuals who say they would prioritize the environmental option would not do so if the costs are too high (Nadeau *et al.* 2022). Individuals may also be asked whether reaching net zero targets will have negative economic consequences for their country.

Another perspective is captured succinctly by Greta Thunberg (2021) who stated 'The climate crisis is today, at best, being treated only as a business opportunity to create new green jobs, new green businesses and technologies'. The framing of many climate questions uses this lens of action as a tool for/threat to economic growth. Respondents are asked the extent of their agreements with statements such as taking action will make 'companies more competitive', 'create economic growth and jobs' or make the country 'economically stronger compared to other countries'. Surveys may frame such questions around a *Green New Deal* and whether this may have positive or negative economic effects, such as increasing/decreasing the number of jobs

or paying for itself through the revenue it would generate. While such questions may appear cynical, many individuals – or governments – will not support climate action solely because of the risk of environmental catastrophe. Therefore, these can be useful in eliciting whether respondents might support action if framed differently (Bain *et al.* 2015).

A third approach frames the relationship as a valence one (Clarke *et al.* 2004), whereby respondents are presented with economic policies to address the climate problem, but no economic trade-off is highlighted or only positive economic benefits are presented to respondents. These often refer to 'green jobs' or a 'Green New Deal'. Such questions are more likely to capture affirmative responses than ones where the potential trade-offs are made salient.

The COVID-19 pandemic had an impact on climate questions with an economic dimension. Being the most significant worldwide disruption on daily life since the Second World War, it offered people opportunities to break long established habits through behavior change that could aid the transition to a more low-carbon lifestyle (Whitmarsh 2021). Whether publics were willing to put climate change before economic recovery therefore became central. A survey commissioned by IAG (2021) in New Zealand found that 53% of respondents thought climate change should play a part but not be at the forefront of economic recovery. An IPSOS Global Survey (IPSOS 2021, pg 15) found variation within and across countries on whether governments should prioritize climate change in the economic recovery from COVID-19. And one study utilizing conjoint survey experiments in Canada and the United States found that, in these countries, COVID-19 economic recovery packages that included climate action policies were preferred to those that did not (Bergquist *et al.* 2023). So while these COVID-19 questions pick on themes seen in the other economic-related questions, the COVID-19 angle presented a particularly immediate take.

2.6. Public support for climate policies

Broadly, there are questions that can be termed 'non-trade off' questions. These may ask respondents whether they support a particular policy or action; whether they think it is important that climate action is undertaken; or whether climate change research should be pursued. However, they do not highlight possible trade-offs. These then can approximate *valence* questions, for instance asking whether your country should keep the oceans and waterways healthy to address the climate crisis or should reduce greenhouse emissions. Such questions do still receive different responses among different groups and in different countries (see Flynn *et al.* 2021).

There are also questions with explicit trade-offs whereby it is made apparent that supporting a particular policy may come with drawbacks,

thus more accurately reflecting actual conditions. People may support policies if they can have them alongside other societal goods, but support declines when trade-offs – particularly the financial costs to individuals – become apparent (Whitmarsh *et al.* 2021, Beiser-McGrath and Bernauer 2024). Examples include pointing out that a carbon tax would make driving significantly more expensive and then asking about policy support or supporting climate action if it resulted in a lower standard of living. Framing experiments – with different groups given more information on trade-offs than others – allow one to measure how much policy support may reduce when a trade-off is made explicit. The temporal dimension can come into play, such as by asking whether we should urgently do everything we can – sometimes regardless of other costs – or should take time to decide. One can also gather views on whether climate change should be a high priority for countries. As individuals may have different perspectives on what taking action entails, they are sometimes presented with potential policy options and asked the ones they deem most appropriate or support the most, or to provide a rank order.

There is however a middle-ground which focuses on the introduction of various instrument types such as taxes or state subsidies (see Bumann 2021). While these inevitably involve a trade-off as subsidies for climate measures may mean money is not spent elsewhere and more taxes may impact respondents' pockets, these are often implicit and so respondents may not make the connection with the ensuing trade-offs. A subset focuses on the conditions under which one would support carbon taxes, and where money raised from such taxes should be spent (Carattini *et al.* 2019).

While such questions are typically domestically focused, others are more internationally focused. One can be asked how supportive one is – prospectively or retrospectively – of one's country signing up to (or breaking away from) international climate agreements[12]; of one's country taking an active role in pressuring other countries to commit to action; and of the emissions reductions targets that countries have set. More recently, these may ask about support for 'net zero' targets. As well as asking directly, other questions capture whether support for one's own country depends on actions of other countries. More punitively, respondents can be asked whether economic or diplomatic penalties should apply to countries that do not sign up to international agreements or fail to reach their targets.

A final point to be made is that most policy support questions in the corpus focus on mitigation rather than adaptation policies. This is in line with mitigation receiving far more attention and investment within many governments' climate strategies (Hodgkin and Rutter 2024), as well as politicians 'still neglecting big questions about how to help the vulnerable adapt' (Ostrander 2022). While some surveys have asked about specific adaptation policies, such as whether governments should be spending

more money preparing different sectors for the impacts of climate change, others ask about respondents' views on whether mitigation or adaptation should be prioritised. As countries place more focus on adaptation policies, it is likely that adaptation questions may become more widespread.

2.7. Evaluation of political action; representation; and activism

2.7.1. Evaluation of political action

Here, we present the category of respondents' evaluations of present measures. Wording includes asking whether the relevant actor is doing too much/not enough, whether actions go too far/not far enough or whether one has confidence in their climate actions. These can be asked of the world as a whole, or of different geographic regions, various supranational organizations, one's own country (national or subnational level) or other countries/national governments. When considering evaluations of one's own government, government's own supporters may be more likely to consider they are doing a good job on most subjects, while supporters of the opposition may be more likely to think the opposite (Kenny 2018).

While these above evaluations are general, respondents can be asked to judge specific policies that have already been carried out, including in relation to various subsidies, grants and regulations. And prospectively, opinions can be gauged as to whether certain policies would be effective or even necessary to mitigate against climate change, especially in relation to carbon taxes, carbon capture and storage or other technological or financial solutions. For instance, one survey asked whether reducing greenhouse gas emissions would be a benefit of installing energy efficient measures in homes. Though a high proportion agreed, making bills cheaper was still considered the primary benefit (Bright Blue 2020). This again reinforces that putting more emphasis on the co-benefits of actions may increase their support, but that there is a challenge when such measures come into conflict with other goals.

2.7.2. Representation

Questions surrounding climate change and representation are not historically so common, though this has been changing in tandem with the steep growth in articles focusing on climate change and politicians (Moore *et al.* 2024). Given limited space in surveys, that such questions have had less attention than others may partly arise from path dependency within electoral studies to ask about more general environmental protection questions as well as the tendency to assume that climate change – along with other environmental issues – is but one component of a broader liberal dimension (Fisher *et al.* 2022, Kenny and Langsæther 2023). They are vital to measure though

given that electoral support is typically required to make policy progress on climate change in democratic regimes (Baccini and Leemann 2021, p. 468), though of course these are not as transferable to dictatorships or one-party states where competitive, inter-party competition does not occur.

The questions on representation have varied formats. Respondents may be asked which political party has the best climate policy or is most likely to represent the policy that the respondent wants. While these indicate which party respondents think is closest to their own views, one cannot determine how close the match is or indeed how individuals see other parties. More detail can be obtained where respondents rank all parties – such as on how they perceived them on an 'economy versus climate change' scale – and are then fielded the same question for their own views. Such an approach enables researchers to determine how voters perceive the party-political space, whether it matches up with their own views and how this relates to their vote intentions or their propensity to vote for a party. Parties' voters' issue preferences are important considerations in the formation of government coalitions as parties – and indeed individual representatives – do not want to be punished at the next election for compromising too much on core issues in government (Plescia, Ecker and Meyer 2022). So such questions can give an insight into the viability of different potential coalition partners being compatible in their climate policies in the eyes of their supporters, which may be especially important in government negotiations when Green Parties are involved.

Respondents can also be asked how important the issue was or would be for them when voting. As political parties tend to be more responsive to voters than the public at large (Dassonneville *et al.* 2021), if climate change were to increase as a key reason for voters making their voting decisions one would expect to see candidates and parties – ceteris paribus – devote more attention towards it. It can be listed along with other issues where respondents choose it as the most important, one of several important or not important at all; to rank it individually on a Likert scale or where respondents have to list it as simply important or not. Respondents can also be asked whether candidates' climate views are an important component they consider when voting or would make the respondent more/less likely to vote for someone. While such questions can give an indication into voter priorities, without forcing the respondent to rank the importance of climate change against another issue or carrying out some sort of survey experiment, one cannot determine how decisive climate is vis-à-vis other issues.

2.7.3. Activism

We place climate activism as the final component that follows from evaluations and representation. After all, activism is a tool to utilize when one does

not consider the political system to be performing adequately, and to pressure representatives – or indeed other actors – to take what one believes to be the correct action.

Climate activism has played a large role in putting climate change on the issue agenda, with the climate protests of 2018/2019 being particularly prominent (de Moor *et al.* 2021, Fisher and Nasrin 2021, Kirby 2023, Nisbett *et al.* 2024). At the same time, given their disruptive nature, protests can be divisive and while raising the issue up the agenda their methods may be perceived as counterproductive (Conner 2021). Thus, the first type of activism questions gathers respondents' views on climate activists, such as through positive (e.g. intelligent, caring) or negative (dogmatic, arrogant) word associations. More directly, people are asked if they support the activities of climate activists in general, or asked about the activities of specific groups. Another key aspect is the type of activism people support, from authorized peaceful marches through to civil disobedience to violent destruction. Occasionally, surveys field batteries on the perceived impact of lobbying on climate policy, such as whether it has an effect and, if so, if it is positive or negative.

People can also be asked about their own involvement. This can start with relatively informal action on how, whether and why the respondent tries to influence one's personal connections. It can also incorporate more formal action including whether they have taken or would consider taking part in different activist activities, such as demonstrations, signing petitions, writing to representatives, volunteering or being climate conscious when consuming products. Of note is a European Investment Bank survey which finds the number of people who have taken part in climate activist activities is low, but that there are much higher numbers who would consider doing so. Trying to understand this gap is important, and some surveys directly ask what are the barriers that prevent people from becoming involved, whether it is due to a lack of information, interest or perceived efficacy for instance. On the latter, surveys can also measure the extent to which individuals believe that collective action could change governments' climate action and/or mitigate against climate change. Another useful question – especially where the issue is polarized – is whether respondents' actions were focused on trying to achieve more or less climate action.

3. Conclusions and future directions

Climate change is a significant site of political contestation, with public opinion frequently invoked to support claims for more (or less) policy action.

Despite burgeoning comparative research work undertaken since 2000, an up-to-date and globally comprehensive guide to available survey questions has been lacking. This review thus provides an original framework to navigate the complex set of interconnected concepts that are currently measured in climate change public opinion research.

Through this work, we emphasize that there are many different components of climate change opinion. Existing work indicates some of these may be necessary pre-requites for others, such as needing to believe in climate change to worry about it. For others, the relationships are complex and multidimensional. For example, those that worry about climate change may not support policy actions, or their support may differ depending on the *type* of policy being presented. And one may consider climate change to be an important issue without being willing to undertake personal action to address it. These are not contradictions, but reflect the diverse political, social, economic and psychological influences that shape the different components of publics' views.

Our review identifies a number of important priorities for future research. Firstly, echoing Daniels *et al.* (2012) findings on measuring broader environmental protection attitudes, we recommend that – given the diversity of theoretical perspectives captured in survey measures on climate change – researchers should be clear as to which (sub)component(s) they are analyzing, and base their claims accordingly rather than overgeneralize. That is not to say that it is necessary or even desirable – let alone feasible – to address all components in a single study. Rather, researchers should focus on those that are theoretically relevant to their particular hypotheses and research questions. Other features of question wording that can affect responses – such as the types of response options provided or the choice of whether or not to accompany the question with particular contextual frames – should of course also be taken into account (see Motta *et al.* 2019, Chen *et al.* 2021). Moreover, while there are some advantages to having a parsimonious solution and aggregating measures, we caution against merging different climate change survey items – both within and between categories – without a strong theoretical rationale as the various question types may tap into very different constructs and may not be interchangeable. For as Feldman and Johnston (2014), p. 253) note, parsimony 'must be balanced against the need for an accurate description of social phenomena'.

Secondly, that questions of belief in and worry/concern about climate change are the most common and relatively standardized questions provides solid data for cross-country and/or temporal comparisons. However, a primary reliance on these questions reflects an information deficit approach which has become increasingly discredited given the ample evidence that more information does not necessarily ensure that publics' climate attitudes and preferences align with the scientific consensus (see

Suldobsky 2017). For even having a concerned citizenry does not provide a pathway to action that is socially and/or politically acceptable. However, while mere recognition of the phenomena is no longer a cleavage in most Western countries (Nisbet and Myers 2007), it is still a divide across much of Africa and Asia (Lee *et al.* 2015). Thus, if recognition does increase in these continents – which are generally under-researched and lacking the equivalent breadth and depth of data seen elsewhere – we need to be able to ascertain how increased knowledge translates to individuals' beliefs.

Thirdly, the predominant mode of analysis has been to analyze such components separately – and often treat them as interchangeable – rather than in relation to each other (Crawley *et al.* 2020). To advance knowledge, more attention should be devoted to analyzing the interactions between the various components across different country contexts. For instance, building on the previous recommendation, research should explore whether support for different types of policy instruments is related to different beliefs in climate change's anthropogenic cause, respondents' climate knowledge or their perceived efficacy of different measures, and whether and how such relationships differ according to contextual factors across different world regions.

Fourthly, research would benefit from fielding questions on support for climate change measures that are less abstract for respondents. The nuances of how policy support may differ according to what is being asked has long been neglected (Bernauer 2013, p. 439) with the current prevalent approach being to aggregate support for different policies into a single index (Kyselá *et al.* 2019). Similarly, the precise type of policy that publics support or desire also remains under-researched (Fairbrother 2022) even though insights into how this differs in different (sub)national contexts could guide policymakers in devising tailor-made mitigation and/or adaptation policies. Many measures still capture the sentiment of support for climate action or present policies in a vacuum without taking into account the real-life trade-offs that would likely ensue, rather than – with some innovative exceptions[13] - the types of policy-instruments and sacrifices that would be acceptable to/supported by respondents.

These are important to capture given that publics may show different levels of support for different climate policy instruments (Bretter and Schulz 2024). It is especially pertinent to do so given the changes of tactics from those wishing to slow down decarbonization from outright denying climate change's threat to using discourses of delay such as redirecting responsibility away from systemic change, pushing for incremental solutions, advocating for unproven technological solutions or arguing only for voluntary measures rather than ones that would restrict carbon-intensive activities (Lamb *et al.* 2020). By measuring support for different types of climate policies and climate policy instruments,

researchers can ascertain whether and among which publics these less effective actions proposed by delayists are resonating, and enable a better understanding of how support for the most effective types of instruments could be strengthened. While there are good examples within the corpus of surveys from within the US and Europe who have especially in recent years devoted more attention to this, there is a very clear gap in data on these questions in other world regions.

Moreover, regarding questions on individuals' climate behaviors, if behavior change is to result in substantial emissions reductions it is far more instructive to ask about the drivers of and barriers to high-efficacy than the dominantly-asked low-efficacy behavioral changes given that there is little evidence that low-efficacy behaviors spill-over into higher ones (Puntiroli *et al.* 2022). While beyond the remit of this review, there is scope for such survey work to be complemented by detailed qualitative work to further understand underlying mechanisms.

Even if sufficient policy action is undertaken, it will likely provoke at least some level of politicization and – in democracies – much will depend on the outcome of electoral contests. The evidence of increasing polarization in climate-relevant attitudes in Anglophone and Western European countries based on publics' party affiliations (Caldwell *et al.* 2024) and the electoral backlash that may occur if voters feel financially worse off as a result of climate policies (Colantone *et al.* 2024) point to the significant challenges that lie ahead in the electoral arena. Yet, in the corpus, climate questions related to representation and elections have been neglected. Those that exist tend to be US focused. Given the observed disconnect between recorded public support for climate action[14] and the adoption of ambitious policies (Prakash and Bernauer 2020), the development and fielding of such questions that investigate non-US political systems – such as those with norms of multi-party competition and coalition governments – could help shed light on, for instance, under what conditions publics do (and do not) hold their politicians/parties to account for climate (in)action in elections.

Finally, our framework and recommendations may be of benefit to policymakers who 'tend not to reflect on the possible differences in concepts and measures and their implications for decision-making' (Kyselá *et al.* 2019, p. 879). If researchers are explicit about the component(s) of climate change public opinion they are eliciting, they can then be more specific in their discussions of what their results mean from theoretical, empirical and/or policy perspectives, and reduce the risks of the implications of their results being misinterpreted. This may in turn provide policymakers with greater clarity as to where the public stands and equip them with more strongly grounded insights to better inform effective policy formulation.

Notes

1. Though public support alone may not be sufficient to achieve policy adoption, let alone policy success (Prakash and Bernauer 2020).
2. They noted that 'We believe that many inconsistent findings within the literature stem from comparing results from studies employing noncomparable measures of environmental concern, measures tapping into very different facets of the environment and/or concern components of the construct'(Dunlap and Jones 2002, p. 515)
3. Moreover, though overlaps exist with broader environmental issues, the greater complexity of the climate change challenge makes it distinct and necessitates researching it in its own right (see Farstad 2018).
4. The latter two did not have any climate questions at the time of searching.
5. We do not claim to have a representative survey population, though this is not necessary for our purposes.
6. See Appendix A for the detailed list.
7. See Appendix B for the detailed list.
8. Such an approach is similar to Nisbet and Myers (2007) who searched over 70 US surveys to examine trends across key dimensions of climate change public opinion.
9. We recognise that using 'global warming' or 'climate change' may affect responses (Schuldt *et al.* 2017). Nevertheless, from a theoretical perspective – even if responses may shift with either use – the classification of question 'types' is the same. Thus, we denote 'climate change' for either case.
10. The list of survey questions grouped by their categorisations – using the corresponding numerical scheme – is provided in Appendix C.
11. More positive emotions can also be tapped such as hope and resilience.
12. In the aftermath of President Trump's announced intention of withdrawing the US from the Paris Climate Change Agreement, individuals in international surveys were also asked their specific approval of the US case (Kenny 2024a)
13. As can be seen in some of the questions listed in the appendix.
14. While, as per the previous paragraph, noting that existing measures of such tend not to be particularly nuanced.

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