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Heterotopia and the urban politics of climate change experimentation

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Abstract

Seeking to govern the city in relation to climate change is a political project that at once imagines the present in terms of the future and the future in terms of the present. The urban politics of climate change has brought multiple visions of the possibilities (and limits) of urban futures. In this context, we find urban responses taking experimental form – creating sites through which to explore and experience different urban futures. They provide spaces in which utopian visions can be imagined, enacted and contested. Conceptualizing urban climate change experiments as heterotopic sites seems fruitful in at least two regards. Firstly, it captures their provisional and ambivalent relationship with the broader urban milieu. Secondly, and even more critically, it opens up the dialogues between the future and present which are at the heart of the climate governance project, and highlights the spatial form of these politics. We examine both with reference to two examples of climate experimentation in Berlin and Philadelphia.

Keywords

Heterotopia, climate politics, Philadelphia, Berlin, climate change experimentation, Foucault, governing the future

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1. Two vignettes

#1 Philadelphia, USA

On the 19th June 2010, the mayor of Philadelphia, Michael Nutter, joined residents of the 1200 Wolf Street block in the heart of South Philadelphia, 2.3 miles south of the Philadelphia City Hall, for a block party to celebrate their success in winning the 'Retrofit Philly "Coolest Block" Contest'. A collaboration between the Energy Coordinating Agency (ECA), Dow Chemical Company (Dow) and Mayor's Office of Sustainability (MOS), the contest required blocks (defined as every home on both sides of a street between two cross-streets) to submit a petition signed by the homeowners pledging participation and submit a short essay of under 500 words explaining why their block was the 'coolest' in Philadelphia (Interviewee, ECA; Interviewee, Dow). Seventy-six blocks had entered, and 1200 Wolf St had prevailed (Dow Chemical Company and ECA, 2011). A band played and children splashed in a wading pool as a cherry-picker lifted residents and dignitaries to the terraced skyline to view the white elastomeric 'cool roof' coating which had been applied to one of the roofs in the block and would be applied to the rest over the next eight months, along with a package of retrofits to improve the air sealing and insulation in the homes. The Mayor spoke to the assembled crowd: "It's because of Philadelphians like you, who have taken action to save energy" he said, "that we'll be able to hand over a healthier, safer community to our children. This will serve as a great example to the rest of the city that we can save energy and become the greenest city in America"[1]. A cool roof expert explained that cool roof coatings like the one being applied to their block save money on air-conditioning, reduce the urban heat island effect and could even slow climate change. Liz Robinson, the Executive Director of the ECA, said "We feel this effort can be a blueprint for bringing communities together in the interest of saving energy and improving quality of life"[2]. This one city block stood as a sentinel of the future city: lower carbon, better maintained, more liveable, and more community-oriented (Edwards and Bulkeley, 2017).

#2 Berlin, Germany

Around the same time, just over 4000 miles away in the German capital, Berlin, a small group of people from Berlin Senate, Berlin Partner (the city's PR arm) and virtualcitySYSTEMS (a company specialising in 3D city models) launched an initiative which also aimed to transform the rooftops of the city. The 'Berlin Solar Atlas'[3], funded through European Fund for Regional Development, added a new layer visualising the potential for Solar Photovoltaic (PV) and Solar Thermal (hot water) systems on city rooftops to the city's existing 2D and 3D virtual model of the city. The proponents explained that "Berlin's Solar Atlas shows precisely whether a roof is suitable for using solar energy and whether the investment will pay off. Possible electricity generation, CO_2 savings and investment costs are displayed in a single overview" (Berlin Senate, 2011: 43). Browsing the Solar Atlas, one is presented with a city full of potential. The roofs of buildings appear in shades of red, orange and

[1] http://ecasavesenergy.org/content/1200-wolf-st-celebrates-becoming-coolest-block
[2] http://building.dow.com/media/news/2010/20100513a.htm
[3] http://www.businesslocationcenter.de/wab/maps/solaratlas/

yellow depending on their suitability for solar PV (electricity) installations, and a separate layer visualises those deemed suitable for solar thermal (hot water). Only a select few buildings are not subjected to the solar calculus; the Brandenburg Gate is one, but the *Berliner Dom* (Cathedral) is included. Clicking on a building's roof brings up a bewildering array of statistics: the possible CO_2 savings from a solar PV installation, the potential energy yield in MWh/year, the area of the roof suitable for installation, the likely cost of such an installation and the achievable power. A further click opens a separate page with a ready reckoner for the building, which can be saved as a PDF. The Atlas was seen as a way to stimulate building owners to install solar systems, and thus facilitate the transformation of the city's rooftops into an inter-connected web of micro-scale solar power stations. One imagines flying into Berlin at some point in the future, to be greeted as the plane banks on its final approach to the airport with a city that is literally glittering as the sun catches millions of solar panels mounted on its rooftops. Indeed, the vision of Berlin as a sparkling capital at the centre of a new low-carbon economy informs the aspirations of the Solar Atlas. In the words of one of its leaders, "Climate protection is a global challenge that we must rise to locally. Urban conurbations must play an exceptional role in overcoming the climate problem. As Germany's capital city and a European metropolis, Berlin sees [climate protection as] its particular responsibility" (Berlin Senate, 2010: 7).

2. Climate change, experimentation, and the future

As the governing of climate change increasingly finds expression beyond the confines of international institutions, commentators have noted its experimental quality (Hoffmann, 2011; Bulkeley et al., 2015). As a disposition, experimentation entails an ambivalence to both the possibilities of the present and the potential of the future. Rather than operating with the strategic certainty of many of the techniques and instruments of liberal government, from integrated planning to economy-wide systems of taxation, experimentation implies a more indeterminate relation to what might constitute interventions that improve, in this case, climate conditions. This is perhaps unsurprising given the ongoing presence of both apocalyptic visions and utopian promises within the climate discourse. On the one hand, responding to climate change is about averting a looming ecological catastrophe, an apocalypse caused by the untrammelled unfolding of present conditions into the future. On the other, responding to climate change is about transforming and improving society, resolving a whole raft of pre-existing economic and social ills through transitioning to a 'low carbon' way of life. Yet, what such interventions might entail, and the (political, infrastructural, cultural) inertia they may encounter, produces radical uncertainty about what it means to act in the present in relation to a better climate future (Oels, 2013). Rather than being thought of as uncertainty in the sense of an unknown that can in some sense be calculated, this form of radical uncertainty is better understood as a condition of indeterminacy, where not only are the outcomes unknown, the parameters against which they should be judged are open to contestation (Wynne, 1992). Indeterminacy operates on multiple levels, from questions about who has responsibility to act and what constitutes sufficient action, to more fundamental questions about what a 'better' future should entail, whether the 'good' being pursued is understood in terms of development, increased wealth, sustainability, or well-being, to name just some of the possible framings. Scholars have pointed to the growing use of calculation as a technique

liberal government uses to govern climate futures, and the way it serves to secure particular kinds of future imaginaries, projects and subjectivities (Anderson, 2010; Wainwright and Mann, 2013; Braun, 2014). Such forms of calculative rationality tend to regard the future as knowable in relation to given parameters and seek to render this knowability visible in one way or another, in order to secure particular interests or pursue particular forms of political economy. Modes of practice which regard the future as not only uncertain but also indeterminate must not only calculate possible futures, but *demonstrate* their potential by enacting them in the present in order that alternative means of determining what constitutes practicable or ethical or economic practice can be recognised. These modes of practice are not merely neutral devices through which optimum social or technical solutions are derived, but actively political in constituting particular kinds of future above others and in configuring the nature and dynamics of power, capacity and responsibility through the assemblages they create (Braun, 2014; Dalby, 2013; Delgado and Callén, 2017). As Gibson-Graham and Roelvink (2009: 342) put it, "Small actions and networks can be seen to have sweeping global effects, and rapid large-scale change can emerge from diffuse local transformations."

In this paper, we seek to better understand how climate change experimentation engages with futures through forms of calculation and demonstration, contributing to debates about both climate politics and the governance of the future. Our focus is on one domain in which climate experimentation is increasingly being documented: cities. Within urban studies, the rise of the 'experimental city' is seen as closely entangled with the shifting terrains of urban governance and politics, often manifest in relation to issues of climate change and sustainability (Evans et al., 2016). For example, Karvonen and van Heur (2014) warn of the importance of accounting for the ways in which the emergence of 'urban laboratories' not only enable more progressive visions for urban futures but also contribute to the politics and practices of neoliberalization. Seeking to understand the equivocal position of urban experimentation, accounts of the urban politics of climate experimentation locate it precisely as a means of government through which the 'will to improve' the city in relation to climate change is realised through enabling flows and circulations (Bulkeley et al., 2015). From Foucault's essay on the town, climate experimentation is seen as a form of governmentality which "works on the future … that is not exactly controllable, not precisely measured or measureable" (Foucault, 2009: 20). Experimentation provides a disposition through which liberal government can navigate uncertainty and indeterminacy to implement 'knowable' actions—such as reducing Greenhouse Gas emissions—to improve the condition of the population while also demonstrating that this is possible without undermining other forms of improvement such as economic growth, quality of life, or social justice (Bulkeley et al., 2015).

To develop and extend this conceptualisation of the politics of urban climate experimentation, we engage with Foucault's (1986:24) concept of heterotopia, understood as "a kind of effectively enacted utopia in which the real sites … that can be found within the culture, are simultaneously represented, contested, and inverted." We start our investigation by exploring the utopian and dystopian images which have framed much of the debate about the effects of climate change (Section 3), before examining the links between the literatures on urban climate change experimentation and the

governance of the future. We argue that urban climate governance is fundamentally shaped by dialogues between the future and the present, in ways that go beyond existing notions of anticipatory action (Section 4). This leads us to the concept of heterotopia, which we consider in more detail in Section 5.

In Section 6 we return to the two vignettes of climate change experiments with which we opened the paper. These were drawn from a broader study which examined the emergence and implications of climate change experiments in cities around the world (Bulkeley et al., 2015). Research visits were undertaken to Philadelphia in October 2011 and to Berlin in December 2011 and January 2012. Semi-structured interviews with key stakeholders and participants were the core methodological tool (28 in Philadelphia; 18 in Berlin), supplemented by site visits and documentary analysis. We use these vignettes to illustrate our argument that it is appropriate to understand urban climate change experiments as heterotopic sites and that such an understanding offers conceptual insights to scholars interested in both climate change experimentation and the governing of the future. We offer some brief reflections by way of conclusion.

3. Utopia and dystopia in the climate changed city

Methman and Rothe argue that climate change "marks the crossroads between apocalyptic doom and universal salvation" (2012: 329), and as cities have moved from the fringes of the climate change debate to occupy a central position within it, the city has been placed firmly on these crossroads. In popular culture, dystopian imaginaries are particularly abundant. For instance, on the 1st September 2015, a sculpture was unveiled on the foreshore of the Thames as part of the Totally Thames festival, which each year celebrates the role of the river in London's life. Entitled 'The Rising Tide', the installation by Jason deCaires Taylor consists of four horses with besuited riders. The head of each horse has been stylized to match the horsehead on an oil well pumpjack, and each day they are submerged twice by the rising tide, re-emerging with the ebb tide[4]. This apocalyptic imagery is typical of popular culture representations of urban futures in the context of climate change. In the 2004 film 'The Day After Tomorrow', the impacts of rapid climate change are understood in terms of the havoc a phalanx of climate-related disasters wreak on Los Angeles, New Delhi, Tokyo, and particularly New York, which is overcome by a catastrophic flood. The future being imagined here is bleak, characterized by widespread water shortages, extreme weather events, sea level rise and catastrophic flooding, viscerally apparent in the city in the breakdown of infrastructure systems including water, electricity and transport (Methman and Rothe, 2012; see also Dalby, 2013).

But utopian visions of the future are equally apparent. For instance, the 'Postcards from the Future' exhibition held at the Museum of London from October 2010 to March 2011[5] consisted of a series of images representing possible futures for London. In it, alongside dystopian images such as Hyde Park transformed into a giant shanty town, were much more utopian images showing it as the location of

[4] http://totallythames.org/events/info/jason-decaires-taylor-rising-tide
http://www.theguardian.com/artanddesign/2015/sep/02/underwater-sculptures-thames-london
[5] http://www.postcardsfromthefuture.co.uk/

new energy futures based around tidal, wind or nuclear power, where even sea level rise had the curious effect of transforming it into a peaceful—almost comforting—larger-scale version of Venice. These artistic urban imaginaries articulate neatly with the option-framing undertaken by organisations such as the International Energy Agency, which in a 2009 report contrasted the possible future with and without a transition to a decentralised and decarbonised energy system (IEA, 2009). The IEA report opened with two visions of the future city, framed in Dickensian terms: the reader was invited to visualise the 'best of times' and the 'worst of times'. Failure to achieve the technocratic transition envisaged would usher in a future characterised by energy shortages, urban congestion, and limited supplies of potable water. In short, it was seen as a road to urban dysfunction and dystopia, at least in the formerly 'developed' world. Success, by contrast, would usher in a future characterised by clean, vibrant and connected communities (IEA, 2009); a technological urban utopia strongly reminiscent of the managerial utopias imagined and planned in earlier eras – from ideas of the Garden City to Le Corbusier's visions of modernist urban planning (Pinder, 2010; Bradley and Hedrén, 2014).

Often, these utopian visions are technocentric, seeing 'salvation' in the more widespread adoption of current technologies or the introduction of emergent ones, both of which are seen to overcome current dependencies on unsustainable energy systems or the predicted effects of climate changes. For instance, a range of urban actors—including private sector companies such as Arup and IBM, but also NGOs such as Greenpeace—have proposed variants of 'smart urbanism' as the solution to climate change. For them, technological innovation and particularly the increasing use of digital connectivity provides the tools needed to overcome the conjoined environmental and social challenges climate change poses to cities (Luque-Ayala and Marvin, 2015). However, not all utopian visions envisage such a top-down modality of governance. Less established in mainstream discourses, but nonetheless prevalent, is a vision that might be termed 'decentralised engagement' (Foresight, 2008: 117). Here, a future is imagined in which multiple actors develop measures that provide low-carbon energy and transport, or address urban vulnerability and foster resilience 'from the bottom up'. Initiatives such as the Transition Town Network are pursuing a mission of

> actively and cooperatively creating happier, fairer and stronger communities, places that work for the people living in them and are far better suited to dealing with the shocks that'll accompany our economic and energy challenges and a climate in chaos. (Transition Network, 2013)

For Transition Towns, this is accomplished through new forms of food and energy provision located in cities, and managed through collective action. More mainstream initiatives use different language, but likewise emphasise how self-governing communities can be enabled to provide and sustain their own resilience, energy security and so forth. Despite significant divergence on the roles and importance of technology, economy, government and community, but there is a remarkable convergence between these utopian visions, which centres on their conversation with the future.

4. Governing the future: anticipatory action and urban experimentation

Ben Anderson has observed that "In the enactment of better worlds, the future is constantly being folded into the here and now; a desired future may act as a spur to action in the present, for example, or action in the present may bring back memories of long-forgotten hoped-for futures" (Anderson, 2010: 778). This dialogue with possible futures is deeply embedded in urban climate action in the present, whether technocratic or community-focussed, mainstream or radical, utopian and dystopian (Bulkeley, 2013). For Swyngedouw (2011), the fear of an impending climate apocalypse is used by elites to justify the need for ongoing consensus-based governance efforts, foreclosing the possibility of 'proper politics' (i.e. conflict and dissensus) which could lead to real alternatives to be developed, and a growing number of scholars have drawn parallels between the risk-based framings of climate change and debates about anticipatory action in the context of national security (Oels, 2013; Dalby, 2013). In addition to the *discursive* folding of the future into the present noted as a component of a broader post-political condition, we observe in climate change experiments a *material* folding of the future into the present, an enactment and contestation of alternatives which is both temporally as well as spatially contingent (Williams and Booth, 2013). Anderson (2010: 779) suggests "calculation, imagination and performance" as three modes of practice through which futures are made present to various extents. Calculation involves giving shape to possible futures by combining knowns about the present with modelled projections. Imagination involves a process of scenario building through more creative channels to envision plausible futures. Performance involves the actualisation of the future in the present, for instance through the use of exercises, simulations and games. Each is connected to both 'styles' and 'logics'. The former are statements which allow the future as a category to be referenced; the latter are programmatic actions undertaken in response to particular futures (Anderson, 2010).

Reflecting on the utopian visions discussed in Section 3 in terms of these modes of practice, it becomes clear that while their 'solutions' to climate change are radically divergent, each engages in a process of calculation through which they account for and rationalise the uncertainty of the future, in the process at least implicitly asserting a certain 'knowability' about it. They also all share an imagination; a sense of the possibilities of the city and of the ways in which responding to climate change is not only a matter of addressing a global environmental challenge but of also reconfiguring urban systems and daily experiences. But they also share a common indeterminacy; namely the potential effects and side-effects of their enactment. It is this indeterminacy, along with the inertia of existing socio-technical systems and governmental dispositions, that creates both the space and the possibility for experimentation.

Climate change experiments are interventions in the name of climate change which seek to transform the socio-technical nature of the city (Bulkeley et al., 2015). Led by a variety of actors—ranging from municipal governments to NGOs and small and large businesses—they have widely varying agendas and can be found in a range of sectors, including energy, the built environment, water and waste. Despite a rapidly growing literature on urban experimentation (Evans et al., 2016), little attention has been devoted to the way it navigates the interface between the present and the future (De Búrca et al.,

2014). One of the reasons for the rapid growth in interest in experimentation is because it is seen as an important mechanism through which to resolve some of the indeterminacy implicit to responding to climate change. By acting as a space to 'try out' new ideas—be they about energy efficiency, energy provision, consumption patterns or social practices—experimentation provides insight into the effects and side-effects of reconfiguring urban systems in the context of climate change. In Anderson's terms, these insights are generated because experimentation brings the future into the present through *performance*. But whereas Anderson (2010: 787) situates performance in terms of hypotheticals ("playing, pretending, acting"), which can take place across the surface of existing urban conditions, experimentation involves forms of demonstration that are embedded in and necessarily connected to existing urban milieu.

Anderson argues that the performance of futures generally "involve staging a specific possible future (whether in live or artificial time), and participants then playing or performing a set of roles." (Anderson, 2010: 786). He gives the example of an exercise held in the USA in mid-2001 in which a bioterrorist attack was simulated to generate experiential knowledge of a hypothetical future. His example here comes from the work of Stephen Collier, who cites it as one example of what her terms a "'style of reasoning' about risk" (Collier, 2008); an equally valid alternative mechanism to know and assess risk to that of the dominant 'archival-statistical' style typical of the insurance industry. Anderson and Collier's work is situated within a broader literature on governing futures which is concerned with the anticipatory logics of liberal governance in an age of risk, and focusses primarily on (national) security, read through a biopolitical lens (Dillon and Reid, 2001; Cooper, 2006; Aradau and Van Munster, 2007; Massumi, 2007; Massumi, 2009; Collier, 2008; Collier and Lakoff, 2008; Aradau, 2010; Anderson, 2010; Anderson, 2012; Lundborg and Vaughan-Williams, 2011; Adey and Anderson, 2012). Collier's point is that there are many forms of reasoning which seek to know uncertain futures, and that the process of enactment has a particular affective quality to it: the planners involved in the exercise come to *feel* the scenario they are embedded within. Similarly, Collier and Lakoff (2008) argue that vulnerability mapping, developed to help planners in the USA be ready for events such as a catastrophic terrorist attack, has the effect of shifting how they actually view the city: "the very systems that had been developed to support modern urban life were now sources of vulnerability and, as such, likely targets of enemy attack" (Collier and Lakoff, 2008: 19). Even more importantly, they argue, the 'distributed preparedness' paradigm vulnerability mapping facilitated has expanded in remit from disaster preparedness to homeland security with the paradoxical effect of reinforcing the securitized state it was originally intended to help avoid.

The point here is that performances or enactments of possible futures, though they deal in hypotheticals, have both affective and material implications for how the *actual* future plays out by shaping planning, infrastructure, bureaucracy and indeed *governance* in the present. We might say that the present is shaped according to logics of the (still uncertain) future, or as Anderson (2010: 786) puts it, that "The space of the exercise becomes an occasion for experiencing how a future event might feel". Anderson's (2010) performative mode of practice and Collier and Lakoff's (2008) notion of enactment share a common feature, which is that the future is only ever imported into present in a

transient fashion—as hypotheticals, parameters into a game, model or scenario and the like. In this, they are building on the work of Brian Massumi (2007) about the 'affective presence of the future', to convincingly argue that the logic of distributed preparedness, originally developed to counter the potential for a Cold War nuclear attack, became pervasive as the way to think about and manage for across a wide range of possible threats (Collier and Lakoff, 2008). Massumi actually goes one step further, arguing that the metabolism of the future by the present has become pervasive in the logic of *pre-emption*, which mobilizes potential threats "in such a way as to make present a future cause that sets a self perpetuating movement into operation". In other words, pre-emption creates effects in the present which are justified by uncertain and indeed *unknowable* potential futures, and these effects justify further pre-emption even if the initial threat is illusory, since pre-emption itself can always be held out as the reason for the failure of the threat to materialize (Massumi, 2007; see also Cooper, 2006).

Experimentation works in a subtly different fashion, because it seeks to demonstrate the presumed or hoped-for future—for instance a solar-powered neighbourhood or low-carbon, low-energy dependent housing form (see Section 1)—by literally constructing it in the present. The infrastructures created by experimentation must serve both the logics of the present and the future, and as a result experimentation creates much more durable but also more contradictory expressions of the future than the exercises, scenarios and enactments Anderson, Collier or others refer to, which in some sense remain outside the material realities of the everyday present (see also Adey and Anderson, 2012). Experimentation follows a pre-emptive logic in the sense that the anticipated future shapes the present, but rather than being largely unknown, it is the proximate and unfolding—if still uncertain—threat of climate change around which responses are configured. Moreover, as the vignettes in Section 1 show, experimentation simultaneously sees climate change as a risk and opportunity, and like similar neoliberal rationalities in which the need to respond to threat is framed as creating space for new, more positive futures, is animated by this utopic of the future.

Experiments are in this sense passage points at the intersection of the 'now' and the 'not yet'; they are liminal and ambivalent, yet charged with political potential, creating specific dynamics of power, capacity and responsibility at the intersection between the present and the future. Experimentation most closely conforms to Anderson's (2010) performative mode of practice, but the styles and logics it assembles also reflect an intention to demonstrate futures in relation to the present in ways that are arguably underplayed in the literatures on anticipatory action and governing futures. Foucault's concept of 'heterotopia' provides a very useful analytical lens through which to understand and unpack the material, spatial, and political dimensions of how experimentation simultaneously metabolises the future and present.

5. Heterotopia and the performance of urban climate governance

Foucault developed the idea of heterotopia for two French radio broadcasts about utopia in December 1966, and condensed his notes into a lecture entitled "Des espaces autres" that he gave to a group of architects and planners in March 1967. Despite reportedly not being fond of the ideas himself, just

before his death in 1984 he allowed this lecture version to be published by the journal *Architecture – Mouvement – Continuité*, from which it was posthumously translated into English, appearing as 'Of Other Spaces' in *Diacritics* in 1986 (Saldanha, 2008; Johnson, 2013). Foucault's concern was to explain those spaces "that have the curious property of being in relation with all the other sites, but in such a way as to suspect, neutralize, or invert the set of relations that they happen to designate, mirror, or reflect" (Foucault, 1986: 24). Utopias are undoubtedly such places, but they lack material form; as Foucault put it, "Utopias are sites with no real place" (Foucault, 1986: 24). So to describe the *real* places with these utopian characteristics, Foucault thus appropriated the term 'heterotopia' from anatomy where, as Hetherington (1997: 42) explains, it refers to "parts of the body that are either out of place, missing, extra, or, like tumours, alien". For Foucault (1986: 24), heterotopias "are something like counter-sites, a kind of effectively enacted utopia in which the real sites, all the other real sites that can be found within the culture, are simultaneously represented, contested, and inverted." One way to understand heterotopias is as 'spaces out of place'—spaces defined by their otherness to the society in which they are located. This is what Foucault is denoting by calling them "counter-sites". But heterotopias are much more than just 'spaces out of place', since they exist only in relation to utopia. Heterotopias, then, are real spaces which challenge modes of thinking, which embody in themselves the changes required to reorder society (Hetherington, 1997). They are the by-products created when utopian thinking is converted into practices, or as Maassen puts it "The outcomes of attempts to orchestrate necessarily deviate, or 'drift' into imperfect and partial versions of the original utopian intention" (Maassen, 2012: 64). Heterotopias are defined by being real, material spaces with the characteristic of 'belonging' both in the (utopian) future and the present. Whereas utopias exist only in the future, heterotopias exist also in the present, and as a result are constantly in tension with the present that they occupy. We might see them as spaces in which futures are melted with the present. They are not wholly driven by logics of precaution, pre-emption or preparedness in relation to risk (Anderson, 2010)—though all of these might be present to varying degrees—but also contain the intention to enact transformation towards a better future.

The concept of heterotopia diffused through geography and cognate disciplines largely as a result of Ed Soja's use of the term in his influential 1989 book *Postmodern Geographies*, in which he fused Foucault's method of heterotopology with Lefebvre's work on the 'right to the city' to construct a new way of thinking about space he termed 'thirdspace' (Saldanha, 2008; Johnson, 2013). Since then, its primary use has been to open up to analysts the idea that social differences necessarily coexist because of their spatial outworkings (Saldanha, 2008), and Johnson (2013: 796) draws up a long list of sites which have been cited as examples of heterotopia. This list highlights a prominent criticism of the term, namely that it is ill-defined and could feasibly describe any number of spaces. But Saldanha (2008) develops a more focussed critique, arguing that heterotopia retains a commitment to structuralism in that it situates some spaces as counter to *all other spaces*, with the effect that "heterotopology inherently contains a danger—though perhaps not an imperative—to simplify spatial difference" (Saldanha, 2008: 2093). Saldanha's concern is that this simplification "hinders a geography of mobility, unevenness, and differentials of power" (Saldanha, 2008: 2081). This is undoubtedly true at one level. Heterotopia are not the *only* places which can be conceptualized as

'other' to society more broadly, but contrasting particular places with 'society as a whole' does not necessarily require assigning a totality to society in the structuralist sense.

We—like Johnson (2013)—believe the concept still has substantial analytical purchase. A singular strength of Foucault's ideas are their flexibility and adaptability (Walters, 2012). Foucault provides us with a rich pastiche of analytical tools and concepts which have "proved highly capable of registering all manner of subtle (and not so subtle) shifts in the rationalities, technologies, strategies and identities of governance" (Walters, 2012: 3; see also Li, 2007). In this open and critical spirit, we find Kevin Hetherington's reading of heterotopia particularly helpful. Hetherington applies the notion of heterotopia to the Palais Royal in late 18th century Paris, arguing that

> Heterotopia are sites associated with alternate modes of social ordering that are expressions of a utopic spatial play. They are the spaces, defined as Other, relationally, within a spatializating process, which, I believe, have this distinct utopic associated with them. Almost like laboratories, they can be taken as the sites in which new ways of experimenting with ordering society are tried out. (Hetherington, 1997: 12)

For Hetherington the significance of heterotopia is not that they provide space for expressions of resistance or disdain for society, but that "they act as obligatory points of passage through which an alternate mode of social ordering is performed" (Hetherington, 1997: 37). So it is *through* and *in* heterotopia that new social orders emerge. In Hetherington's example, the Palais Royal was a "site of pleasure, consumption and civility" but also "associated with the issues of politics and resistance" (p. 4) where there existed "a strange combination of the socially central with the socially marginal" (p. 6). It was this heterotopic quality which allowed it to stage a dialogue and transition between the *Ancien Regime* (the present) and modernity (the future), to create real political effects.

Hetherington's reading of heterotopia draws out four key characteristics of heterotopia which we think are productive in examining how climate change experimentation modulates the relationship between the present and the future: (1) they are expressions of a utopic spatial play; (2) they are ambivalent; (3) they are discordant; and (4) they stage an interplay between the present and future with political effects. Let us turn to these now.

6. A heterotopology of climate change experimentation

In this section we consider each characteristic in turn, drawing on the two vignettes of climate change experimentation we open the paper with to illustrate our analysis. This analysis does two things. Firstly, it establishes that heterotopia is an appropriate way to conceptualize climate change experiments. Secondly, it argues that the lens of heterotopia is particularly useful for helping us to understand the effects of and importance of performative modes of practice in governing futures. In particular, it provides a way of seeing and understanding the politics of precarity and ambivalence that experimentation creates. In a context where cities and societies are governed through futures, heterotopia is therefore a useful vocabulary and method for analysing the critical relation between present and future.

Utopic spatial play

The first characteristic of a heterotopia that Hetherington identifies is that it expresses "a utopic spatial play" (Hetherington, 1997: 12). It gives spatial form to a particular utopian vision. The Palais Royal embodied the shift from feudalism to modernity – a radically different social order structured around the idea of freedom. Climate change experiments give spatial form to a slightly different utopic: that of climate change (Section 2). Experiments are undoubtedly energised and brought into being by logics of anticipation. But whereas the literature on anticipatory action (Massumi, 2007; Aradau and Van Munster, 2007; Collier, 2008; Collier and Lakoff, 2008; Anderson, 2010; Aradau, 2010; Adey and Anderson, 2012) focusses on the logic of 'risk' (Beck, 1992) which has also been seen as key logic in climate change (Oels, 2013; Dalby, 2013), climate change experiments supplement this logic with that of 'opportunity'. That is, they see climate change as both a risk to the city as it currently is and an opportunity to forge a better, more liveable, and more just city, and seek to give spatial and material form to this logic. We might add a fourth anticipatory logic of 'transformation' to Anderson's (2010) trilogy of precaution, preparedness and pre-emption. Climate change provides the possibility of re-imagining and (literally) re-constructing blighted, tired industrial cities into dynamic, cultural, 'eco' cities, by mobilizing utopian discourses of creating a lower-carbon and more liveable city that are capable of unlocking both public and private purses in ways that facilitate significant interventions in the infrastructure of the city (Edwards and Bulkeley, 2017).

In both Philadelphia and Berlin, the need for material renovation and social revitalization was driven by structural factors which pre-existed any sensibility to climate change or imperative to decarbonise. Both emerged as 19th century industrial powerhouses, but in recent years have struggled with poverty compounded by the effects of deindustrialisation. In Philadelphia, the inner city has long been and remains overwhelmingly poor and black (Schade et al., 2008; Bauman, 1987; City of Philadelphia, 2011), and Adams observes that incomes in the central city declined still further from 73% of suburban incomes in 1980 to only 61% in 2000 (Adams et al., 2008: 30). The Cold War partition of Berlin created an absolute divide between the capitalist west and communist east, with large parts of East Berlin left to decay even as infrastructure including water, gas and electricity networks were duplicated for security reasons (Campbell, 1999; Moss, 2009). But both cities have found their finances perpetually strained at both public and personal levels. After the initial euphoria following the fall of the Berlin Wall, reductions in federal subsidies created a such a severe budgetary crisis for the city that the privatization agenda pursued by the Senate seems almost unavoidable (Monstadt, 2007). In Philadelphia, the post-Global Financial Crisis recession drained public finances to the extent that even the rather boosterish *Citywide Vision: Philadelphia2035* (City of Philadelphia, 2011) cannot gloss over the city's financial woes.

This context of budgetary austerity makes it more notable that both the Coolest Block Contest and Solar Atlas proved able to mobilize considerable capital from both public and private sources. In both cases, the utopic of climate change—specifically the idea of a wholesale transformation to a more sustainable and more just city—was central to this ability. Consider again how the interventions were justified in Section 1: Philadelphia as a healthier, safer, greener community; Berlin has having a

particular responsibility for climate protection. In Philadelphia, climate change unlocked for what at heart was little more than a home improvement scheme both the very-substantial funding stream provided by the *American Recovery and Reinvestment Act (2009) (ARRA)* under which significant tranches of funding were available for energy efficiency works, and some $500,000 for the Contest alone from the Dow Foundation (Interviewee, MOS). In Berlin, climate change was the justification for funding injections from the European Fund for Regional Development, the entrepreneurial *Dachkampagne* ('roof campaign') which was engaged to promote the project (Interviewees, Berlin Senate, Berlin Partner, Solar Entrepreneur), and ultimately, building owners.

The idea of the wholesale transformation of the city is a powerful utopic in that it facilitates action on pressing challenges of urban poverty and revitalization which sometimes may have very little to do with climate change. In this context, experiments both challenge the adequacy of the city as it currently is (for instance poor, deprived, unmaintained, divided), and reinforce and reflect the processes which produce division, decay and deprivation. But by simultaneously performing according to the logics of an imagined utopian future and the existing social order, they open up possibilities for the city to be otherwise and demonstrate the way that this future can be made real, somewhat like the e-waste hacks described by Delgado and Callén (2017). Their politics is not universal. Wholesale transformation of the city is out of reach. To paraphrase Foucault, they simultaneously represent, contest, and invert the high-carbon divided, post-industrial, capitalist city, but through this performance they stage an encounter with and a new city arranged according to various utopian logics, and the experiments themselves are partial and fragmented manifestations of these logics (Foucault, 1986; Hetherington, 1997). It is important to note that while low-carbon is a constant in the utopic of climate change, other utopian ideals are less pervasive and may even be incompatible. For instance, for some climate change holds out the possibility of a city (re)made socially just, characterised by ideas such as inclusiveness or community, whereas for others climate change holds out of the possibility of a new climate economy which allows the pursuit of new forms of accumulation.

Ambivalence

The second characteristic of heterotopia is their *ambivalence*. The Palais Royal was the promenade and domain of the pre-Revolutionary feudal elites even as it gave space for the development and expression of a whole variety of Revolutionary ideas. Indeed, its valorization by these elites arguably underpinned its ability to prefigure the onset of modernity by acting as the space in which the core tenets of modernity could be expressed, where the Revolution could be performed and indeed planned. Climate change experiments, likewise give expression to and stand as examples of lower carbon urbanism; spaces which validate the kind of boasts about city status and liveability seen in Section 1. Yet just as the Palais Royal served first and foremost the needs and desires of present elites, our vignettes are points of intervention of government and capital, infrastructures created out of the needs and desires of high carbon lifestyles. Because of this, they are deeply ambivalent spaces, neither entirely driven by the high-carbon logics of the present city nor entirely able to transcend it, since the infrastructures they create are both situated within the present city and must connect to it.

Experimentation moves beyond imagination or even calculation of possible futures by drawing the future into the present through performance (Anderson, 2010), and this performance has the paradoxical effect of coupling experiments ever more tightly to the existing urban milieu. As a result, they simultaneously mobilize utopian and pragmatic discourses. The Coolest Block Contest appealed both to a sensibility about climate change as a threat to society and also the rising cost of energy or the discomfort of life in poorly insulated homes (Interviewees, MOS, ECA, Dow). Similarly, respondents in Berlin Berlin stressed the dual motivations for installing solar panels. A representative from the Berlin Energy Agency, a powerful quasi-public consultancy focussed on energy efficiency, explained that "you have to do something for climate protection but in the end it's always they ask 'OK what does this cost' and then you have to have the answer, you have to have the right financial models and you have to have good examples in hand which show it's reasonable and it's doable". A solar entrepreneur was even more direct: "I've never heard of someone who does it only for the climate, it's all about the money".

The ambivalence of climate change experiments frustrates the utopic—the ideals and aspirations—of their proponents. In Philadelphia, the aspiration of the Coolest Block Contest is to improve the decaying rooftops of the city, yet the elastomeric, 'climate friendly' roof coating cannot be installed without a certain level of structural integrity which inherently excludes many. So climate change facilitates more renovation than was previously possible, but it is still not universally accessible. Likewise, despite the ECA's history in facilitating weatherization of low income homes, neither the Coolest Block contest nor the *EnergyWorks* program which most directly drew on the publicity it created target this sector of society. Instead, the Coolest Block targeted those with abundant community spirit and adequately maintained roofs, and *EnergyWorks* targets those with credit ratings sufficient to enable them to access the low-interest finance at the heart of the scheme, and even amongst tested households the rejection rate is 40%. The emergence and continued existence of experiments within the city *requires* a certain ambivalence to the contradictions between their utopian aspiration to test out the possibilities of the future city and the political, economic and social challenges of the present which they also respond to. In exercises, scenarios or enactments (Collier, 2008; Adey and Anderson, 2012), the challenge is their transience, and suspension of disbelief is essential to overcome this transience and generate the affective registers by which the future is made present (Massumi, 2007). In experiments, the challenge is rather their permanence or obduracy, and the challenge is to find a way to hold together the incompatibility of the futures they perform and the present they inhabit. Ambivalence facilitates this, but at the cost of limiting the realisation of their utopian aspiration of low-carbon liveability; in this case making it accessible for some but not others (Maassen, 2012). Like Delgado and Callén's hacks, the ambivalence of experiments facilitates a "politics of demonstration that relies not on the production and display of evidence, but on the production and display of a precarious relationality" (Delgado and Callén, 2017: 189; see also Corsín Jiménez, 2014a)

Discordance

The third characteristic of heterotopia is that they are *discordant* spaces. The discordance of the Palais Royal is driven by the multiple currents it was situated within; it was a space in which promenading elites mixed with eager *nouveau riche* bourgeoisie, Enlightenment philosophers and all manner of 'common' people attracted by the spectacle or the circus entertainments (Hetherington, 1997). It was a counter-site located within Paris which provided the opportunity to experiment with new social orderings based around the idea of freedom. Climate change experiments are similarly discordant. They are counter-sites which by their very experimental nature are circumscribed and limited yet sanctioned and valorized; laboratories for experimenting with new social orderings based around the idea of low carbon. Residents in Philadelphia can drive their large petrol car up to their low-carbon, cool-roofed home, then turn up their coal-powered air-conditioners safe in the knowledge that their electricity bills are lower due to the recently-retrofitted insulation upgrades. The solar energy from newly-installed panels in Berlin is fed into an electricity grid dominated by lignite-fired generators. Experiments can exist in the present, in other words, only because they are contained to specific areas or domains of the city, and their extent and influence is governed by the logics of the present, both economic, political and social.

Yet the future they prefigure is radically uncertain, because experiments are in fact performances of multiple, perhaps incompatible, futures. The futures they perform are utopic—they are all regarded as improvements on current conditions—but in fact not all of those futures are actually possible in the same space. However the discordance of the experiment allows them to occupy one space, to be momentarily compatible, held together, and therefore resolvable. So in Philadelphia the ECA sees the Coolest Block Contest as a step towards a future defined by manageable utility bills and better maintained, more liveable homes. The future envisioned by Dow includes greater use of its Building and Construction Division's products; and the MOS hopes to stimulate the take-up of cool roofs in aid of its vision to make Philadelphia the "greenest city in North America." In Berlin, likewise, the actors involved seek to give shape to divergent expressions of the future through the Solar Atlas. For the Berlin Senate, the reduction in fossil fuel dependence and energy independence were key components of the future, whereas for Berlin Partner it was the city's attractiveness potential investors, which suggests a much less radical departure from the present. These divergent futures became particularly visible in how the experiments were mediated and presented to different constituencies. So in addition to the 'Block Party' described in Section 1, where a cherry-picker was on hand to show off the cool roof coating, the Coolest Block Contest featured in a YouTube video expounding the benefits of the various Dow products, but was also promoted by the MOS through a 'road trip' of congressional staffers bussed in to see the retrofits for themselves. In Berlin, the Solar Atlas was promoted to industry professionals at trade fairs, to potential investors at the Business Location Centre, and (belatedly) to homeowners through the *Dachkampagne*. The point here is not that heterotopia exposes the uncontrollability and uncertainty of the future. Work on governing futures has shown how futures remain uncontrollable in the context of exercises, scenarios and the like due to the vitality of the material conditions they create (Aradau, 2010; Lundborg and Vaughan-Williams, 2011; Adey and Anderson, 2012), and related work on governing uncertainty (Dillon and

Reid, 2001; Cooper, 2006; Aradau and Van Munster, 2007; see Dalby, 2013 for an intervention directly on climate change) has established that biopolitical governance is not so much concerned with eliminating uncertainty as governing *through* it. The point is that heterotopia helps explain how the ambivalence and discordance of experiments shapes the form of the future that ultimately gains traction. Bulkeley and Castán Broto (2013: 367-368) argued that "experiments could provide grist in the urban mill, creating conflict, sparking controversy, offering the basis for contested new regimes of practice", and a heterotopic reading of experiments explains how this process operates: their ambivalence and discordance is a disposition through which they are able to hold together divergent utopic of the future in particular spatial arrangements and also keep them in dialogue with the existing urban milieu.

Interplay

The fourth characteristic of heterotopia is that their ambivalence and discordance is ultimately driven by the *interplay* between the present and future. Hetherington argues that the Palais Royal is constituted by

> an interplay between freedom and order that is both informed by and has helped to shape a utopics of modernity. The issues, then, are the relationship between utopics and the production of heterotopic sites, and the effects that that relationship has had in the process of modern social ordering. (Hetherington, 1997: 13)

What he is saying is that the interaction of future social norms (freedom) and present ones (order) in the space of the Palais Royal had the effect of shaping how modernity was imagined and pursued; that it was how the utopian view of modernity was performed in the Palais Royal (a heterotopic space) which shaped the actual changes to social order which accompanied the Revolution. A similar interplay underlies the ambivalence and discordance of climate change experiments discussed in this section so far: to paraphrase Hetherington, experiments are constituted by an interplay between high and low-carbon which is both informed by and shapes the utopics of climate change. They produce the future by enacting the utopics of the future in the present. As a result, it is not the act of performance which disrupts the high-carbon logics of the present. The power generated by solar panels in Berlin, for instance, flows into the same grid primarily used as a conduit for fossil-fuel electricity, and the energy savings made by the 1200 Wolf St Block are imperceptible in the context of Philadelphia's overall energy use. It is the logics they create and re-create which prove highly disruptive. Both the Solar Atlas and the Coolest Block Contest re-write the logics of individual and community benefit through a low-carbon logic, the former by enacting a rationality in which renewable energy saves money; the latter by enacting a rationality in which energy efficiency saves money, improves comfort, and strengthens community. But though they enact a future in which low-carbon has become normal—most of the residents of the 1200 Wolf St Block had within a year stopped consciously considering the climate or even financial benefits of their newly-renovated homes—these logics only operate as motivators inasmuch as the experiments remain exceptional within the city. This exposes the precarity of their existence and their politics. The Palais Royal ceased to be heterotopic when the Revolution swept modernity fully into the present; likewise, experiments

are suspended in the interstice between the future and the present, and the interplay this precarity necessitates creates them as a particular kind of political spaces. Like e-waste hacks (Delgado and Callén, 2017), prototypes (Corsín Jiménez, 2014a; Corsín Jiménez, 2014b) and public demonstrations (Rosental, 2013): experiments can be understood as the exceptional striving for the mundane. They are constantly grasping towards of utopian futures while always dependent on them remaining just out of grasp. They simultaneously structure the future according to the logics of the present *and*—like precaution or pre-emption (Anderson, 2010; Cooper, 2006; Massumi, 2007; Aradau and Van Munster, 2007)—structure the present according the logics of the future.

A heterotopic reading exposes the intricate relationship between the present and the future which experimentation entails. Consider this observation from a young activist in Berlin, who wanted solar panels installed on the roof of her building:

> I just wrote to my housing organisation and it's a public organisation it is owned by Berlin and they told me 'we don't want to build solar panels on our roof because we don't have the financial capacity but we also don't want to rent a roof to someone else' … because they want to have the possibility to build it themselves. So they are just wasting the roofs [laughs].

Both the activist and the housing association see solar panels as the *future*. The activist wants them installed and the Solar Atlas has allowed her to understand the *present* benefits. But lacking the *present* capital to invest in solar panels, the housing association prefers to retain the *option* of installing them in the *future*, an outcome it considers preferable to entering an arrangement with a third party to install them *presently* due perhaps to the fact that this would be less financially rewarding in the *future*. The experiment opens a dialogue between the present and the future, but the interplay between them and the utopic of climate change shapes the actions of both activist and housing association, in this case with apparently unfortunate consequences for the climate.

7. Heterotopia, experimentation, and the politics of precarity

This paper has set out to better understand how urban climate change experimentation engages with futures. The utopian and dystopian imaginaries which structure much of the debate about climate change point to the centrality of conversations with the future in shaping responses to climate change, but the literature on urban experimentation, climate urban governance and socio-technical transitions has not devoted much attention to the way experimentation navigates the interface between the present and the future. There is a broader literature on governing futures which is concerned with the anticipatory logics of liberal governance in an age of risk, and focusses primarily on (national) security, read through a biopolitical lens. This literature opens up a number of very productive lines of enquiry for scholars interested in the urban politics of climate change and experimentalism as a disposition of urban governance. We have sought to extend this thinking in order to capture particular modalities of how experimentation engages with futures. We find that while experimentation is primarily a performative mode of practice (Anderson, 2010), it is much more durable expression of the future than the exercises, scenarios and enactments the literature discusses. This durability, and

the embedded materiality of experiments, makes them more obdurate but also more precarious, since they must secure and justify themselves according to logics which reference both the future/s they anticipate and the present milieu in which they are embedded. Moreover, experiments address both uncertainty and its more radical cousin indeterminacy. As a consequence, they do not operate only according to a 'risk' logic, but also according to a 'transformation' logic that is intertwined with their dependence on the utopic of climate change. Like other forms of liberal governance, experimentation understands the future as an *opportunity* as well as a *threat*. As a result, the styles and logics of anticipation that experimentation assembles reflect not only an intention to manage risk, but are a manifestation of the ways in which new forms of improvement of the present are intricately intertwined with futures.

We therefore propose that Foucault's concept of 'heterotopia' is a valuable analytical lens to supplement and extend the existing work on governing futures with respect to experimentation. We have argued that four key intertwined and interlinked characteristics of heterotopia are productive in examining how climate change experiments modulate the relationship between the present and the future: (1) they give spatial form to a distinct utopic; (2) they are ambivalent; (3) they are discordant; and (4) they are constituted by an interplay between present and future which animates them. According to this reading of heterotopia, our argument is that climate change experiments are heterotopias.

This analysis highlights several things. Firstly, the relationship between the utopic and its spatial outworkings is critical in shaping both the *potential* of experimentation and the *politics* of experimentation-based urban governance. When multiple (often incompatible) utopian visions are inscribed on the city through the transformation of real spaces and places, these spaces become temporary sites of political struggle; crucibles in which the *actual* future is forged. Climate change experiments are self-consciously framed as spaces which enact visions of the future city: more climate friendly, lower carbon, more liveable, and frequently more just. But in material terms they must contend with and interact with the embedded infrastructure of high carbon, with spatial inequality, and with the prevailing neoliberal political and economic consensus. But this dialogue between future and present, between aspiration and reality, means experiments are always constituted through political contestations – both external (over their legitimacy and place in the present city) and internal (over what futures they seek to actualize and what methods they adopt to do so). One way that they seek to deal with this tension is through a focussed *ambivalence* to both the present and the future. Heterotopia explains why and to what effect experiments are *necessarily* ambivalent spaces. It shows that to understand the potential outcomes of experimentation requires examining not only the patterns of advantage and disadvantage visible in the present, but also the ways in which visions of the future are actualized in the present through anticipatory action.

Secondly, experimentation entails a particularly intricate and nuanced dialogue between the future and the present. Heterotopia calls attention to the way experiments both reflect and challenge the city as it currently is (poor, deprived, unmaintained, divided, unjust), while also providing the means through which an alternative low-carbon city is developed. This act of performing the alternative,

desired-for, future (Hetherington, 1997) but according to the constraints of the present which is so fundamental to climate change experimentation reveals experimental spaces as spaces of utopian hope, of contestation, resistance and struggle over the form of the future city. In other words, climate politics is just as much located in the performance of experimentation as in the corridors of UNFCCC meetings, and heterotopia provides the lens to facilitate this view. These politics are then reflected in climate governance more broadly as the experiments themselves—or particular aspects of them—find traction, creating topological shifts in the metabolic circulations of both the cities in which they are located and in other cities(Bulkeley et al., 2015). As heterotopic spaces, they exist in a provisional and ambivalent relationship with the broader urban milieu, but open up the interstitial spaces within which critical dialogues between the future and present are constantly being created, and through which the fabric of the city is being made and remade.

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