Transnational governance and the urban politics of nature-based solutions for climate change

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Abstract

Multiple visions for how urbanism can respond to the climate crisis and foster sustainability have emerged on the international agenda, including the eco-city, low carbon city, smart city, and resilient city. These competing visions have been joined by one deploying 'nature-based solutions'. We examine how nature-based solutions are emerging as a lynchpin holding together the nature and climate agendas and what this means for where and by whom nature-based solutions are forming part of transnational urban governance. We argue this field is animated by four frames connecting urban nature and climate: nature for resilience, nature for mitigation, the integrated benefits of nature, and nature first. Diverse actors from conservation organisations to design firms to transnational municipal networks draw on these frames and adopt new governance arrangements such that what it means to govern climate in the city is shifting. How this emerging nature-climate governance complex is structured will generate new momentum for governing urban nature over the coming decade.

Introduction

Over the past decade, cities have become firmly established on the international agenda as both a critical sustainability challenge and a key part of any solution (Bulkeley 2021). Whilst engagement with questions of urban sustainability stretches back for a quarter of a century to the inception of the Rio Agenda, the gathering momentum behind the strategic importance of the city as a vital site for addressing climate change has propelled urban sustainability to the front and centre of global environmental governance (Gordon and Johnson 2018). An expansive body of research has sought to examine what the increasingly urban dimensions of global environmental governance entail – from establishing the multilevel and networked structures of urban global environmental governance, to the dynamics of the specific transnational municipal networks through which it takes place, and analyses of what it means to govern global environmental concerns in practice at the urban scale (Gordon 2020; Hughes 2019; Johnson 2018; Heijden, Bulkeley, and Certomà 2019).

Our understanding of the nature, potential and limitations of urban global environmental governance has been driven primarily through the lens of climate change. Global environmental politics and earth system governance have given particular attention to the ways in which the orchestration or coordination of subnational governance is giving rise to new forms of multilevel and polycentric governance that have significant implications for climate governance and the realisation of global environmental goals (Chan et al. 2021; Hale 2020). For the most part, such accounts tend to treat (urban) climate governance as a singular and relatively static phenomenon, undertaken primarily by municipal governments and focused directly on climate mitigation and/or adaptation. Yet, the nature, dynamics and objects of urban climate governance (i.e. the issues, entities, behaviours etc. that are targeted for change) are much more varied and fluid, and exhibit a distinct evolution over time (Bulkeley 2021; Bulkeley and Betsill 2013; Castán Broto, Robin, and While 2020). If urban climate governance in the 1990s and early 2000s could be conceived as a matter of the largely voluntary response of municipal governments to the global challenges of reducing greenhouse gas (GHG) emissions and urban vulnerability, over the past two decades a more "strategic urbanism" (Bulkeley and Betsill 2013) has arisen in which climate action is regarded as part of the strategic political and economic interests of a wide range of urban actors. In addition, throughout the last decade climate action has come to be connected to a wider range of issues, entities and behaviours, from energy poverty to food policy, health to inequality. This has both been driven by a rise in and, in turn, given rise to a plethora of urban experimentation, a growing role for a more diverse range of actors from architects to insurers across all levels and spheres of governance, and a growing multiplicity in terms of what, in fact, governing urban climate change means in practice (Bulkeley 2021).

As a result, we witness the growth of multiple, and sometimes competing, visions of what climate urbanism entails, including the eco-city, low carbon city, smart city and resilient city, each of which is itself characterized by different frames and intentions, objects and techniques of governing that draw diverse actors and agendas into the realms of urban environmental governance (Castán Broto, Robin, and While 2020). In this paper, we seek to explore the ways in which new frames and objects of urban climate governance are reshaping the transnational landscape through a specific focus on the emergence of nature-based solutions (NBS) - or natural climate solutions as they are sometimes referred to in the climate debate (e.g. a wetland restoration project or urban tree planting for cooling). Scholars have examined framing for NBS in rural contexts, but have not considered how those frames (i.e. discursive definitions of a topic) are interacting with existing frames for climate governance (Woroniecki et al. 2020). We build on this work to further our understanding of why frames for nature matter for transnational urban climate governance. The potential of natural climate solutions in achieving 'net zero' targets for companies and countries has risen on the agenda in recent years and is set to play a prominent role in the next stage of the implementation of the Paris Agreement as one of five key action agendas identified for COP26. NBS are an emergent response to climate change, alongside existing response areas like energy and transport. In the urban realm, NBS, defined as "solutions to societal challenges that are

inspired and supported by nature" (European Commission 2015) are increasingly being positioned as a means through which cities can address both local and global sustainability challenges. This discourse of bringing nature back into the city has attracted a range of new actors to the urban as an arena through which environmental goals can be pursued, from conservation organisations to architects and from utilities to the investment and insurance industries, weaving together new visions of the future city with the possibilities offered by nature for responding to the climate emergency. Given the increasingly urban dimensions of global environmental governance, understanding how transnational networks and actors are mobilising NBS in urban settings is critical for unpacking their implications for governing both nature and climate change.

In what follows, we examine the rise of NBS for climate change in the transnational governance arena and trace the history of transnational initiatives seeking to carve out space for urban nature. We find that transnational governance is being shaped by four different frames about the promise that urban nature holds as a solution to climate and nature challenges. Building on work exploring the "climatization of global politics" (Aykut and Maertens 2021), we examine how existing frames related to cities and nature interact with those related to climate governance to shift the boundaries of climate governance and expand what it means to govern the climate in practice. We argue that the transnational governance complexes for urban nature and climate are increasingly linked.

The Rise and Rise of Nature-Based Solutions

Over the past five years, the term nature-based solutions (NBS) has gained increasing currency as an umbrella term encompassing multiple different means through which natural systems, or interventions that seek to generate natural functions and services, are being put to work in the name of sustainability. These NBS range from green infrastructure to ecosystem-based adaptation, green space to landscape restoration, rewilding to urban agriculture (Dorst et al. 2019). Some of these interventions are pre-existing and some are new, but the framing of them is evolving as interest in NBS increases. Frames are a critical part of transnational governance not only because they serve to construct how and by whom challenges should be addressed, but also because they come to delimit what are considered to be the legitimate modes of governing, the actors who should engage, the objects that need to be governed and the kinds of consequences that we should value. Framing is also important because "particular ways of framing nature express and reinforce the power relations that structure people's interactions", which influences justice outcomes through NBS (Woroniecki et al. 2020). For example, a critique of nature-based solutions in the urban context is that they can promote gentrification (Anguelovski et al. 2019; Tozer et al. 2020), which necessitates consideration of accessibility and for whom nature is protected and restored.

The increasing interest in NBS seems to be driven from at least three sources. First, while there has been a long-standing effort to identify and value the ecosystem services that nature provides, the 2019 IPBES Global Assessment has given new momentum to recognizing the crisis of nature together with the significance of (what they term) nature's contribution to people. Second, in the wake of the 2015 Paris Agreement attention has once again turned to the possibilities of large-scale greenhouse gas removal and carbon sequestration and storage through the conservation and restoration of nature (Waller et al. 2020). Third, the European Commission has played a critical role in defining and mobilising the term NBS as a means through which *multiple* sustainability challenges can be addressed in harmony, stressing that such interventions can "result in multiple co-benefits for health, the economy, society and the environment, and thus they can represent more efficient and cost-effective solutions than more traditional approaches" for sustainability (European Commission 2015: 4). Particularly through the Horizon 2020 Sustainable Cities and Communities programme and the LIFE programme, the European Commission has generated new research and extensive demonstration of the potential of NBS in urban and regional areas across Europe.

Whilst the term NBS is all-encompassing, it has been natural *climate* solutions that have tended to attract the most attention – and controversy. NBS for climate change include those that contribute to climate mitigation, through both carbon capture and storage and by reducing the demand for fossil-fueled energy and mobility, as well as those for adaptation and resilience. With the IPCC indicating that keeping the world within 1.5 degrees will require not only large-scale reductions in GHG emissions but also negative emissions alongside increasing commitments from state and non-state actors to adopt 'net zero' targets, there has been a particular focus on natural climate solutions that can sequester and store carbon. For example, UK Prime Minister Johnson pledging 3bn of the UK's 11.6bn climate finance budget to natural climate solutions and President Macron pledging 30% of France's climate finance to NBS (Farand 2021). Companies have also pledged to implement natural climate solutions to reach net zero emissions, including American Airlines, Shell, BP, Amazon, Microsoft and more (Aminetzah et al. 2021; Amazon, 2021). Despite this new momentum, there is of course a longer history of nature being framed as a solution to the climate crisis both in relation to carbon 'sinks' and the potential offered by 'ecosystem-based adaptation'. Reviewing each of these policy fields in turn, we find that the urban arena has been positioned very differently in turn shaping the emerging landscape of transnational urban governance.

From Nature as Carbon Sink to Cooling the City?

There is a long history of attempts to develop and enhance carbon sinks as a means of governing carbon, from the inclusion of land use and land cover change as a valid mitigation strategy within the Kyoto Protocol to the development of the REDD+ mechanism (Lövbrand and Stripple 2011; Carton et al. 2020). Current critiques of natural climate solutions echo concerns levelled at these schemes. One is that the abstraction and standardisation inherent in the making of carbon sinks reduces the complexity of "biodiverse and socioculturally rich landscapes" to matters of carbon alone, enabling market-based logics for neoliberal governance while ignoring ignore local communities and Indigenous peoples' land use practices and rights (Carton et al. 2020; Gifford 2020). Concerns are also raised as to whether carbon sinks can live up to their promises of efficacy and viability over the long-term and whether such schemes are being used as a means of supporting business as usual. This view is not without foundation since analysis shows that over the period 2007 – 2014 it has been countries with significant ongoing interests in fossil fuel production who have been proponents of both technical and natural carbon removal technologies (Røttereng 2018). In the post-Paris period as interests in natural climate solutions rise, it is critical to attend to how, by and to what ends carbon sinks are being advanced as the solution to the climate problem.

Yet alongside these long-standing concerns, the natural climate solutions narrative also reframes this agenda. Importantly, the framing of carbon sinks within the natural climate solutions narrative is no longer necessarily bound up with the North/South politics of climate change and is more diverse in terms of the entities that are enrolled, the actors involved, and the sites in which it takes place. In North America, for example, "increasingly, land trusts and other conservation organizations are turning to carbon offsets as seed projects to raise capital for expanded conservation efforts" such that the politics of natural climate solutions here must be understood in relation to "evolving trends in conservation finance, forest ownership, and timberland transformation broadly" (Gifford 2020: 292). Vandergast and Peluso (2015) suggest that we are witnessing a fourth 'green neoliberal' moment in forest politics, characterised by a greater role for a diversity of non-state actors than previous state-based projects as the purpose of governing forests comes to be "defined by the rise in conservation, biodiversity protection, watershed management, eco-tourism and carbon sequestration practices" (Devine and Baca 2020). The narrative of natural climate solutions as a means of carbon capture and storage is not confined to forests, with new sites and entities from peatland moors to sea grasses, agroforestry to mangroves all now positioned as having the potential to support climate mitigation.

Despite its new framing, the *urban* dimension of natural climate solutions for mitigation is rarely visible. Perhaps reflecting the long history of carbon sink governance, natural climate solutions are envisaged as primarily rural and often large-scale interventions, designed and valued primarily for their storage capacities. Most cities offer little in the way of expansive land or forest, although evidence does suggest that urban nature has some carbon storage potential that is both more complex and fragmented than other carbon sink resources (European Commission 2020). This framing of natural climate solution's mitigation potential in carbon sink terms neglects a potentially significant urban component – the capacity of NBS to provide passive cooling (and insulation) and hence reduce the demand for energy. With air-conditioning forecast by the IEA to rise exponentially over the next two decades, working out how to cool cities through natural climate solutions has significant potential yet remains hidden from view within a narrative which, shaped by decades of carbon sink politics, positions natural climate solutions for mitigation as largely a matter of large-scale land and forest governance. Nonetheless, urban actors are beginning to experiment with various forms of nature-based solution that contain ambitions for both carbon storage and urban cooling alongside other sustainability goals. Positioned as NBS intended to have traction on multiple sustainability goals, climate mitigation comes to be one of the 'co-benefits' of working with nature in the city. As we detail below, this new conjunction has brought new actors into the arena of urban climate governance.

Harnessing the benefits of Natural Defences: Ecosystem Based Adaptation and the City

When it comes to the positioning of natural climate solutions for adaptation and resilience, the picture is somewhat different. The term 'ecosystem-based adaptation' (EbA), defined as harnessing biodiversity and ecosystem services to reduce vulnerability and build resilience to climate change (CBD 2009), has gained significant traction in the past decade. First introduced at the UNFCCC in 2008 (UNFCCC 2008), EbA spans many activities including the conservation, restoration, and sustainable management of ecosystem to deliver services that can reduce climate impacts and help people to adapt to the adverse effects of climate change. EbA has deep roots in long-standing approaches applied by local communities around the world (Ojea 2015). Adaptation efforts that incorporate EbA approaches can result in positive outcomes for both people and nature, as well as for climate mitigation (Mori, Furukawa, and Sasaki 2013). For its proponents, the multifunctionality of nature renders EbA a comprehensive and cost-effective approach comparing to traditional technical solutions and grey infrastructure (Brink et al. 2016; Chausson et al. 2020). EbA has been adopted by international organizations (e.g., UNFCCC and CBD) and institutions (e.g. the World Bank), although adaptation is still dominated by traditional measures (Ojea 2015; Wamsler 2015). At the same time, EbA has been critiqued for an overly utilitarian approach to nature (Chong 2014), and for its capacity to generate unintended and unexpected social and environmental outcomes, such as reproducing and even exacerbating social inequality and disrupting natural ecological process and ecosystems (Wakefield 2019).

Unlike nature-based mitigation, EbA and the broader concept of NBS for adaptation (Pauleit et al. 2017) have come to be closely associated with urban areas (Geneletti and Zardo 2016; Roberts et al. 2012), including the design and improvement of green and blue infrastructures (McVittie et al. 2018), as well as other interventions that harness ecosystem functions to help build resilience and adapt to climate risks (Geneletti and Zardo 2016). Existing studies have found multiple benefits of EbA and nature-based climate adaptation in cities, including reducing disaster risk, ameliorating adverse climate impacts, promoting social interaction and wellbeing, and generating broader environmental benefits such as climate change mitigation and pollution control and abatement (Chausson et al. 2020; Demuzere et al. 2014; Depietri and McPhearson 2017). The promise of urban EbA to both address climate risk while generating social and economic benefits means that it has been adopted by policy-makers and practitioners in both the global North (Wamsler and Pauleit 2016) and global South (Roberts et al. 2012). As we detail below, transnational city networks have been strong proponents of EbA over

the past decade and this in turn has been a key means through which urban nature has come to be mobilized across the urban transnational governance arena.

While NBS are positioned as a new response to the twin challenges of climate and biodiversity, our brief review of the ways in which nature has been configured (and contested) as a solution to climate change suggests that there is a longer history in which climate mitigation and climate adaptation have, in parallel, come to be bound up with different forms of intervention intended to harness nature towards climate outcomes. While nature's capacities to support mitigation have been most visible in terms of the REDD+ programme, here the urban has been of little significance and the value of such interventions in terms of contributing to biodiversity goals has also been questioned. On the other hand, while EbA has placed cities and nature as crucial to building resilience and adapting to climate change and has been recognized as a significant means through which biodiversity can contribute within the CBD, it has received relatively less attention within the global politics of climate change. It is within this complex arena that NBS are beginning to generate new modes of transnational urban governance, animated by frames that originate in the politics of climate, of nature and of cities, to which we now turn.

Making Space for Urban Nature in Global Environmental Governance

As NBS have gained traction and popularity over the past five years, so too has there been a growth in transnational initiatives seeking to carve out space for urban nature as a legitimate means through which the triple challenges of climate, nature and urban sustainability can be addressed. Here we examine the development of four frames about the promise that urban nature holds as a solution to climate and nature challenges that have been mobilized through these networks. Following Woroniecki et al. (2020) and Williams and Sovocool (2019), we understand frames as involving the discursive definition of a topic. Frames give a partial view of a complex reality, where that reality is not external but is "expressed, performed and brought into being through the act of framing" (Woroniecki et al. 2020). Frames are mutable, deployed by actors and, in this process, they are created, reproduced and can be changed. They are also fluid and overlap, with actors often deploying multiple frames across and within different projects or programmes (Williams and Sovacool 2019). Nature can be framed in different ways for NBS with potentially inequitable consequences (Woroniecki et al. 2020).

This research was conducted as part of the EU Horizon 2020 NATURVATION project,[1] which was a transdisciplinary research project involving academics and stakeholders. We examined written documents and websites (including reports, transnational network websites, and media articles) for actors visibly participating in the transnational urban nature/climate governance arena, beginning with a review of transnational networks focused on urban governance and widening the scope to additional actors identified during data collection. We also conducted participant observation at 10 transnational events (e.g. CBD conference meetings, Science Based Targets Initiative meetings, UNFCCC meetings, webinars etc.) where we were engaged as active participants connecting our research findings about urban NBS to transnational policy making processes. Public events are listed here and we also participated in a set of private meetings with other participant's knowledge of our presence and role. Using a transdisciplinary research approach, the multi-stakeholder research team was engaged in a process of "mutual learning" to create robust and solutions-oriented knowledge (Lang et al. 2012). Data were collected iteratively by all authors between 2018 and 2021. One researcher used a discourse analysis approach to inductively identify key frames and then we discussed them as a group (Hajer and Versteeg 2005; Waitt 2005). We conducted a thematic analysis using an analysis matrix focused on key frames for nature in

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[1] See acknowledgement.

transnational urban climate governance, how these frames delimit problems and solutions, which key actors are involved in each frame, and which objects and techniques of governing are used. Alongside ongoing discussion, analysis was repeated, as necessary, in a retroductive approach similar to methods described by Sovocool and Williams (2019). A summary of our findings is given in Table 1.

We find that the field of transnational urban nature governance is being shaped by four frames that depict the problem of climate change/nature in cities in particular ways. This is then generating foci on different kinds of interventions seeking to govern diverse objects and is bringing multiple new actors and forms of finance into governing climate in the city. Below, we discuss each of these frames further, before turning to consider their implications for how urban global environmental governance is being reshaped.

Table 1. Overview of frames for urban nature as a climate solution in the transnational arena

Frame	Problem/Solutions	Role for Nature	Key actors	Example
Nature for Resilience	Problem to address: Increase resilience to climate change impacts Solutions: Urban NBS contribute to climate change adaptation and disaster risk reduction	Nature as natural assets or green infrastructure (e.g. restoring mangrove forests to protect against storm surges and planting tree to reduce temperatures in cities)	• Transnational urban networks including 100 Resilient Cities (now the Global Resilient Cities Network), ACCCRN, C40 Cities' Connecting Delta Cities Network and Urban Flooding Network • Financial institutions including World Bank, Global Facility for Disaster Reduction and Recovery, and the AFD • International organizations such as WRI	"Diverse and well-functioning ecosystems provide a range of regulating services that can reduce vulnerability to climate impacts, including flood control, wave and wind attenuation, stabilization of hill slopes, and temperature reduction to moderate urban heat island effects. This natural infrastructure is often more flexible and cost-effective than built infrastructure, and may be especially relevant to poor or marginalized communities." (ACCCRN 2021)
Nature for Mitigation	Problem to address: Limit global average rise in temperature to below 1.5 degrees Celsius Solutions: Urban NBS store carbon or reduce GHGs	Nature as a strategy to capture and store carbon and to reduce energy use (e.g. trees, green roofs and walls)	• Transnational urban networks including C40 Cities, Cool Coalition, Energy Cities, Global Cool Cities Alliance, and Carbon Neutral Cities Alliance • International organizations such as Climate-KIC	A central goal of the global multi-stakeholder network Cool Coalition is to "reduce where possible the need for mechanical cooling through better urban planning and building design, and the use of nature-based solutions such as green public spaces and green roofs and walls" (Cool Coalition 2019)
Integrated Benefits of Nature	Problem to address: Sustainability challenges (including biodiversity loss, climate change, energy sustainability, health and wellbeing, etc.) are deeply intertwined and cannot be tackled separately Solutions: Urban NBS address multiple sustainability challenges simultaneously	Nature in cities or urban novel ecosystems are increasingly highlighted for the various benefits or ecosystem services that they can provide for nature and people	• Transnational urban networks including ICLEI-Local Governments for Sustainability, Global Covenant of Mayors, Food System Networks within C40 Cities • Conservation organizations such as IUCN, the Nature Conservancy, and Wetlands International • New partnerships including CitiesWithNature (ICLEI, IUCN and the Nature Conservancy), Cities4Forests (led by WRI), and IUCN's Urban Alliance	ICLEI features urban nature prominently as one of five pathways to create change across urban systems in order to achieve sustainable urban development: "The five ICLEI pathways towards low emission, nature-based, equitable, resilient and circular development are designed to create systemic change" (ICLEI 2021)
Nature First	Problem to address: Reverse biodiversity loss and achieve climate co-benefits Solution: Halting biodiversity loss	As urban land-cover change and socioeconomic activities threaten biodiversity and affect ecosystem productivity while contributing to climate change, international biodiversity and nature organizations urge cities to act to halt biodiversity loss. Although biodiversity within cities is not highlighted, urban nature is understood to offer numerous co-benefits.	• Nature conservation organizations such as IUCN and the Nature Conservancy • Convention on Biological Diversity • Transnational networks such as Science-Based Targets Network, Biophilic Cities, and Tree Cities of the World Programme	Climate action is a co-benefit of biodiversity protection: "It is now widely recognized that climate change and biodiversity are interconnected. Biodiversity is affected by climate change, with negative consequences for human well-being, but biodiversity, through the ecosystem services it supports, also makes an important contribution to both climate-change mitigation and adaptation. Consequently, conserving and sustainably managing biodiversity is critical to addressing climate change." (CBD 2021)

Nature for Resilience

In the *nature for resilience* frame, the problem is defined as increasing resilience in the face of climate change impacts. In relation to this problem, solutions are defined with their potential to contribute to climate change adaptation and disaster risk reduction. NBS are mobilized as natural assets or green infrastructure. There is a particular interest in using the properties of ecosystems to provide regulating services for communities, such as planting trees to reduce temperatures in cities. Often actors mobilizing this frame reference the cost effectiveness of green infrastructure compared to grey infrastructure and juxtapose them to highlight the resiliency of the former. This frame is primarily deployed by transnational urban networks that are focused on adaptation and resilience, as well as international organizations interested in disaster risk reduction.

Through this frame, some local governments gain access to resources flowing through transnational networks and many of these resources relate to creating plans, implementing projects, and building formal municipal capacity. Some urban transnational climate networks (e.g., 100 Resilient Cities and ACCCRN) were set up with a resilience or adaptation theme. These networks have been embracing a *nature for resilience* frame longer than other urban climate networks and have been focusing on intervening in urban planning to enhance resilience by changing spatial planning practices and integrating nature as a solution into existing policies. Transnational municipal networks with broader climate mandates also mobilize the frame related to their adaptation work. For example, C40 Cities' Connecting Delta Cities Network and Urban Flooding Network both aim to assist cities to address the impacts of floods by providing a platform for showcasing solutions, exchanging knowledge, and connecting cities with experts and other cities.

While transnational municipal networks have focused on *urban* resilience, other actors have reached the same *nature for resilience* frame through a different route. Organizations such as the World Bank and WRI, for example, have an interest in disaster risk reduction, which has led to interest in how to increase urban resilience. The World Bank highlights how NBS supporting conventional infrastructure, including in cities, "can reduce disaster risk and produce more resilient and lower-cost services in developing countries" (Jongman and Ozment 2019). The link to disaster risk reduction unlocks access to finance through the promise of reducing the negative impacts of urbanization and climate change: "The greater concentration of people and assets can amplify the impact of disasters and a changing climate…Investing in urban resilience is thus key to sustainable development and poverty reduction" (The World Bank 2020). The World Bank has invested \$2 billion in disaster risk management that incorporates some nature-based solution components and over 1 in 10 of their disaster risk management projects include nature-based solution elements (Jongman and Ozment 2019). Similarly, the Agence française de développement (AFD, a public financial institution that implements the policy defined by the French Government) is also interested in how NBS can make cities more resilient to climate catastrophes; AFD is supporting a 'sponge city' project in China to increase natural land cover to try to reduce runoff and prevent flooding (AFD 2018). Through the narrative of nature for urban resilience and the link that development banks are drawing between disaster risk reduction and natural climate solutions for adaptation, financial resources are being directed towards urban NBS.

Nature for Mitigation

In the *nature for mitigation* frame, the problem is framed as keeping global average rise in temperature to below 1.5 degrees Celsius. Traditionally, urban climate action has emphasized climate change mitigation for sectors such as energy and transportation. But more recently, transnational urban climate networks and other urban climate actors have begun to express interest in harnessing the potential of nature for mitigation. For example, in 2019, EIT Climate-KIC (an EU supported funder, network coordinator, and capacity builder

supporting climate innovation) launched the Climathon Global Awards and Healthy, Clean Cities initiatives to accelerate decarbonisation of 100 cities by 2030. In the call, Inger Andersen, Executive Director of the UN Environment Programme, highlighted that "Nature can be a powerful tool to address pollution, climate change and fast-track the decarbonisation of cities" (Climate-KIC 2019). Such recent forays into natural climate solutions are expanding the scope of what experimental urban climate action can look like.

Urban nature is recognized as a strategy to both capture and store carbon and to reduce GHGs by reducing energy use in this frame. The Carbon Neutral Cities Alliance, for example, released a call for proposals in 2021 that offered funding for any city or Indigenous Peoples government interested in implementing policies that "use nature-based solutions to draw down carbon from the atmosphere" (CNCA 2021). The C40 Cool Cities network was launched in 2012 to focus on measures that can be introduced to reduce the urban heat island effect and resulting energy use, including green roofs and parks (C40 Cities Cool City Network 2016). Similarly, the Cool Coalition is a global network connecting actors from government, cities, international organizations, businesses, finance, academia and civil society groups to exchange knowledge and launch initiatives that spur the transition to efficient and climate-friendly cooling. It highlights the potential to reduce mechanical cooling through planning and building design, including by incorporating NBS (Cool Coalition 2019). Energy Cities is a network of European municipalities that has also recognized the contributions of nature in cities to lower carbon footprint (Energy Cities 2019a) and to capture CO_2 (Energy Cities 2019b). While the focus on carbon capture and storage echoes broader transnational discussions about nature-based climate solutions, urban transnational networks are one of the few actors highlighting the potential for nature to contribute to GHGs emission reduction by reducing energy use through cooling and insulation.

Integrated Benefits of Nature

The *integrated benefits* frame views sustainability challenges (including biodiversity loss, climate change, energy sustainability, health and wellbeing, etc.) as deeply intertwined such that they cannot be tackled separately. Transnational urban networks are one group of actors that have begun developing the *integrated benefits* frame related to NBS. These networks, such as ICLEI – Local Governments for Sustainability, Climate Alliance, C40 Cities and the Covenant of Mayors, have traditionally focused on cities and climate action, but increasingly seek to address a wider range of issues and use NBS as a means through which to do so. Actors mobilizing this frame focus on the practices of capacity building, technical assistance, creating political support, and peer-to-peer learning.

New partnerships are developing where nature organizations and urban organizations are creating initiatives to work together. One example is the establishment of the International Union for Conservation of Nature's (IUCN) Urban Alliance with membership from both nature conservation and urban organizations and a focus on a shared platform to connect organizations and the development of new knowledge tools (e.g. Urban Nature Index to measure change and drive action). Another example is CitiesWithNature (a partnership between ICLEI, the Nature Conservancy and IUCN) focused on recognizing and enhancing the value of nature in and near cities and uses a shared platform technique to connect cities to one another. Some transnational conservation organizations and urban networks are starting to argue that urban nature deserves transnational recognition because of its integrated benefits (e.g., Global Platform for Sustainable Cities). In addition, new actors who have traditionally been engaged with neither the urban nor the climate sectors are also entering this space through this frame. For example, Wetlands International, a not-for-profit organization dedicated to the conservation and restoration of wetlands, is working with ONE Architecture & Urbanism, a design and planning firm, to integrate wetlands in the urban landscape to build more resilient and livable cities. Another example is Cities4Forests (led

by WRI and consultant organizations), which aims to achieve multiple sustainability outcomes since it involves "leading cities partnering with forests to combat climate change, protect watersheds and biodiversity, and improve human well-being" (Cities4Forests 2018).

The *integrated benefits* frame is also connected to a growing interest in examining the impacts of urban consumption. Increasingly, urban actors seeking to address climate change are examining scope 3 emissions, which are all of the GHG emissions that are emitted outside of the boundaries of the city, but result from activities that take place within the city (e.g. consumption of goods and food). The Food System Networks under the Food, Waste & Water Initiative of the C40 Cities network promotes regenerative urban agriculture to decrease production emissions, close yields gaps, increase food security, support local producers, decrease food miles, mitigate urban heat island effect and reduce building energy demand (through roof and wall gardens). As urban actors examine consumption, it becomes apparent that decisions about upstream activities are interconnected; decisions made about how and where to reduce scope 3 GHG emissions have biodiversity implications. By fundamentally drawing together multiple sustainability challenges, the *integrated benefits* frame opens up what it means to take action on climate change in cities and what kinds of actors have responsibilities or vested interests in intervening in urban climate action.

Nature First

In the *nature first* frame, the problem that needs to be addressed is framed as reversing biodiversity loss which yields climate co-benefits. Approaching urban areas as drivers of biodiversity loss, international biodiversity and nature organizations mobilize this frame to encourage cities to halt land use change as well as protect and restore natural areas. Increasingly, nature organizations are concerned that natural climate solutions, particularly those related to carbon sequestration, will be implemented without regard for biodiversity implications and seek to circumvent this outcome by linking the issue areas as fundamentally interconnected through nature. For example, "nature is our life source and the origin of every raw material required to produce the products and services we depend upon. When businesses and cities incorporate science-based targets to tackle both nature loss and climate change into their strategies, they create immense opportunities" (SBTN 2020b). Linking climate co-benefits to biodiversity conservation is seen as a route to gaining a sense of urgency for nature and to gaining access to resources (e.g. climate finance). It is also a way to surface synergies and trade-offs that are not consciously considered when biodiversity actors are not part of the conversation.

In this frame, cities are seen as drivers of negative environmental impacts, although nature in city is thought to have other co-benefits. The Science-Based Target Network describes how businesses' and cities' activities contribute to biodiversity loss through actions like changing the way land and ocean are used, exploiting raw materials and contributing to climate change, pollution and invasive species prevalence. Urban nature is understood to offer numerous co-benefits since it can reduce pollution, manage water, sequester carbon, provide recreation opportunities, provide physical and mental health benefits, and develop people's support for nature conservation elsewhere. Key techniques deployed through this frame include integrating nature into urban policies and plans, setting targets, and international recognition. One example of integrating nature into urban policies and plans is Biophilic Cities – a global network of leading cities pushing for rich, nature-filled experiences in daily urban life. When it comes to integrating biodiversity into targets, the Science Based Target Network argues that, "through setting science-based targets for nature, companies and cities can play their part in halting biodiversity loss while improving business performance and creating more liveable cities" (SBTN 2020a). Finally, awarding international designation is another technique used in the mobilization of this frame.

For example, the Tree Cities of the World Programme is an international recognition programme encouraging and celebrating cities and towns committed to the creation of an enabling environment for their urban forests and trees.

Conclusions: An emerging nature-climate governance complex

NBS are beginning to reshape transnational urban governance, animated by four frames that originate in the interwoven politics of climate, nature, and cities. We find that diverse actors draw on these frames in various combinations, adopting new governance arrangements and focusing on novel governance objects such that what it means to govern climate in the city is being reconfigured, while cities increasingly occupy a prominent position on the agendas of those seeking to govern nature. Scholarship on framing in environmental politics has often focused on contestation between frames and emphasized the agency of actors deploying frames and counter-frames (Williams and Sovacool 2019). We have shown another analytical application focused on the emergent nature of frames based on the institutional histories, the actors involved, and the ways that their goals interact. We also build on work that has looked at framing for NBS in rural contexts by focusing on urban NBS and by examining how those frames are interacting with existing frames for climate governance (Woroniecki et al. 2020). Our results indicate that urban transnational governance is an important part of an emerging nature-climate governance complex and that how this comes to be further structured and embedded through decisions taken at Convention on Biological Diversity (CBD) COP meetings and United Nations Framework Convention on Climate Change (UNFCCC) COP meetings will generate new momentum for governing urban nature over the coming decade.

Reconfiguration of what it means to govern climate in the city

Our analysis shows that a range of actors are drawing on frames about the promise that urban nature holds as a solution to climate and nature challenges. Bringing nature back into the city to address climate change is engaging a range of new actors, in turn changing how the urban climate challenge and its solutions are made visible and legible, the tools and approaches used, and the resources flowing into the city. Our comparative analysis of the four frames demonstrates that the way problems and solutions are delimited shifts which actors are considered legitimate in urban climate governance. Nature organizations have traditionally been focused on nature outside of the city and have approached cities as drivers of biodiversity loss. However, they are now engaging in new governance arrangements with urban organizations connected through the *integrated benefits* frame in particular, where actors are united by a shared interest in the potential of nature to address integrated sustainability challenges.

We also find that actors are focusing on novel governance objects. Urban adaptation has a longer history of engaging with nature as a solution to a climate problem. Nonetheless, here are we seeing an increasing and wider range of actors engaging and a shift away from a disaster risk reduction towards more long-term resilience, in turn raising questions about how, why, and for whom nature is seen to be resilient. When it comes to mitigation, urban nature as mitigation starts to challenge the overall focus on carbon sinks by drawing attention to the capacity of NBS to provide passive cooling and reduce the demand for energy, even if the sink discourse remains dominant. The limited attention given to the role of NBS in reducing energy demand is in part due to a lack of visibility about the importance of this cooling for mitigation since urban heat has been treated mainly as a resilience issue. Making this potential visible requires new tools and forms of calculation that are not 'off the shelf'. Urban climate governance uses standardized climate accountancy tools which are now having to be changed to accommodate new kinds of actions. Furthermore, the calculation of sink potential used in NBS standards tools makes the potential of cities contribution seem insignificant. While the frames are emerging, the

techniques through which they come to govern the city are still in formation and different forms of and values for nature will become more/less valuable and visible. Finally, as nature becomes more prominent as an object of climate governance, nature organizations are increasingly drawn into climate governance discussions. The *nature first* frame describes efforts by these actors to draw some of the political attention and resources aimed at climate towards conservation, as well as trying to make sure that climate action does not happen at the expense of biodiversity, by emphasizing the interconnection of these topics. In turn, this has meant engaging with urban nature and urban actors.

Urban transnational governance is an important part of an emerging nature-climate governance complex

Our analysis shows how the evolving transnational governance complex is introducing new ways of bringing nature into the city. The gathering momentum behind nature-as-an-urban-climate-solution frames is attracting the interest of new actors, new forms of finance, and new forms of authority, which brings both new opportunities and constraints. The hybrid institutional complexes (HICs) – "comprising heterogeneous interstate, infra-state, public–private and private transnational institutions, formal and informal" (Abbott and Faude 2021) – governing nature and climate transnationally are increasingly linked. Institutions within a HIC are thought to "address a common set of governance problems" (Abbott and Faude 2021), but the findings of this paper show what happens when boundaries defining such governance problems shift and merge. Rather than simply being added together, what the climate and nature challenges are and how they should be governed are changing through this process. The actors that are coming to be involved in the governing of urban climate change are now working in multiple and overlapping configurations linked through shared frames about nature-as-an-urban-climate solution. Scholars have pointed to the "climatization of global politics" where "climate change is increasingly becoming the frame of reference for the mediation and hierarchization of other global issues"(Aykut and Maertens 2021). Our paper shows that the interaction between frames related to cities and nature and those related to climate governance is leading to an expansion in the boundaries of what climate governance is, in turn shifting what it means to govern the climate in practice.

The nature-climate governance complex is still emerging and could evolve in numerous directions. The CBD and UNFCCC remain far apart in the role given to cities, with UNFCCC having a more expansive agenda which positions cities as part of the growing wealth of 'non-state' actors independently contributing to action at the global level while cities in the CBD still remain 'implementing' actors for other levels of governance. One potential implication is that the frames that come to dominate urban action are likely to emphasise climate, resulting in climate focused resources and capacities being extended to address urban nature. In this context, the *nature first* frame, which positions climate action as a co-benefit of biodiversity protection, may struggle to find traction. Furthermore, multiple different tools and approaches to operationalize this complex – especially in terms of reporting and monitoring – are still emerging and will evolve over time. Finally, given the rise in private finance initiatives on climate/nature, how these initiatives take on the urban question will be critical to this space. If development banks, private finance, and governments continue pursuing mainly large scale, non-urban natural climate solutions, much of the potential for urban nature as a climate solution found here could fall between the cracks and the possibility of enacting a transformative governance of climate and nature that also addresses the social challenges of cities could be lost.

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Biographies

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Harriet Bulkeley holds joint appointments as Professor in the Department of Geography, Durham University, and at the Copernicus Institute of Sustainable Development, Utrecht University. Her research focuses on environmental governance and the politics of climate change, energy, nature and sustainable cities. She has published 8 books, several edited collections and over 60 papers, including *An Urban Politics of Climate Change* (Routledge 2015) and *Accomplishing Climate Governance* (CUP 2016). From 2016 – 2021 she convened the EU H2020 NATURVATION project exploring the potential and politics of urban nature-based solutions (www.naturvation.eu). In 2019, she was elected as a Fellow of the Academy of the Social Sciences and as a Fellow of the British Academy.

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References

Abbott, Kenneth W., and Benjamin Faude. 2021. "Hybrid Institutional Complexes in Global Governance." *The Review of International Organizations*, May. https://doi.org/10.1007/s11558-021-09431-3.

ACCCRN. 2021. "Explore ACCCRN Network." ACCCRN. 2021. http://explore.acccrn.net/.

AFD. 2018. "'Sponge City': Rethinking Water Resource Management in the Hedong District of Mianyang." Agence Francaise de Development. 2018. https://www.afd.fr/en/carte-des-projets/sponge-city-rethinking-water-resource-management-hedong-district-mianyang.

Amazon. 2021. "20 More Companies from around the Globe Join The Climate Pledge." Amazon News. February 17, 2021. https://www.aboutamazon.com/news/sustainability/20-more-companies-from-around-the-globe-join-the-climate-pledge.

Aminetzah, D., E. Birch, J. Claes, S. Marlier, A. Stevens, J. Katz, P. Mannion, and D. Pinner. 2021. "Why Investing in Nature Is Key to Climate Mitigation." McKinsey. McKinsey & Company. January 22, 2021. https://www.mckinsey.com/business-functions/sustainability/our-insights/why-investing-in-nature-is-key-to-climate-mitigation.

Aykut, Stefan C., and Lucile Maertens. 2021. "The Climatization of Global Politics: Introduction to the Special Issue." *International Politics* 58 (4): 501–18.

Brink, Ebba, Theodor Aalders, Dóra Ádám, Robert Feller, Yuki Henselek, Alexander Hoffmann, Karin Ibe, et al. 2016. "Cascades of Green: A Review of Ecosystem-Based Adaptation in Urban Areas." *Global Environmental Change: Human and Policy Dimensions* 36 (January): 111–23.

Bulkeley, Harriet. 2021. "Climate Changed Urban Futures: Environmental Politics in the Anthropocene City." *Environmental Politics*, February, 1–19.

Bulkeley, Harriet, and Michele M. Betsill. 2013. "Revisiting the Urban Politics of Climate Change." *Environmental Politics* 22 (1): 136–54.

C40 Cities Cool City Network. 2016. "Good Practice Guide Cool Cities." C40 Cities. https://c40-production-images.s3.amazonaws.com/good_practice_briefings/images/4_C40_GPG_CCN.original.pdf?1456788797.

Carton, Wim, Adeniyi Asiyanbi, Silke Beck, Holly J. Buck, and Jens F. Lund. 2020. "Negative Emissions and the Long History of Carbon Removal." *Wiley Interdisciplinary Reviews. Climate Change* 11 (6). https://doi.org/10.1002/wcc.671.

Castán Broto, Vanesa, Enora Robin, and Aidan While, eds. 2020. *Climate Urbanism: Towards a Critical Research Agenda*. Palgrave Macmillan, Cham.

CBD. 2009. "Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change." Montreal, Technical Series No. 41, 126 pages. Secretariat of the Convention on Biological Diversity . https://www.cbd.int/doc/publications/cbd-ts-41-en.pdf.

———. 2021. "Climate Change and Biodiversity." Convention on Biological Diversity. Secretariat of the Convention on Biological Diversity. April 27, 2021. https://www.cbd.int/climate/.

Chan, Sander, Idil Boran, Harro van Asselt, Paula Ellinger, Miriam Garcia, Thomas Hale, Lukas Hermwille, et al. 2021. "Climate Ambition and Sustainable Development for a New Decade: A Catalytic Framework." *Global Policy* 12 (3): 245–59.

Chausson, Alexandre, Beth Turner, Dan Seddon, Nicole Chabaneix, Cécile A. J. Girardin, Valerie Kapos, Isabel Key, et al. 2020. "Mapping the Effectiveness of Nature-Based Solutions for Climate Change Adaptation." *Global Change Biology* 26 (11): 6134–55.

Chong, Joanne. 2014. "Ecosystem-Based Approaches to Climate Change Adaptation: Progress and Challenges." *International Environmental Agreements: Politics, Law and Economics* 14 (4): 391–405.

Cities4Forests. 2018. "Cities4Forests." A City-Led Movement to Protect Forests. September 12, 2018. https://www.wri.org/our-work/project/cities4forests.

Climate-KIC. 2019. "Global Call for Transformative Solutions to Tackle the Climate Emergency." Climate-KIC. October 14, 2019. https://www.climate-kic.org/press-releases/global-call-transformative-solutions/.

CNCA. 2021. "Game Changer Fund Launch." Carbon Neutral Cities Alliance. 2021. https://carbonneutralcities.org/game-changer-fund-launch/.

Cool Coalition. 2019. "What We Do." Cool Coalition. September 6, 2019. https://coolcoalition.org/about/what-we-do/.

Demuzere, M., K. Orru, O. Heidrich, E. Olazabal, D. Geneletti, H. Orru, A. G. Bhave, N. Mittal, E. Feliu, and M. Faehnle. 2014. "Mitigating and Adapting to Climate Change: Multi-Functional and Multi-Scale Assessment of Green Urban Infrastructure." *Journal of Environmental Management* 146 (December): 107–15.

Depietri, Yaella, and Timon McPhearson. 2017. "Integrating the Grey, Green, and Blue in Cities: Nature-Based Solutions for Climate Change Adaptation and Risk Reduction." In *Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice*, edited by Nadja Kabisch, Horst Korn, Jutta Stadler, and Aletta Bonn, 91–109. Cham: Springer International Publishing.

Devine, Jennifer A., and Jenny A. Baca. 2020. "The Political Forest in the Era of Green Neoliberalism." *Antipode* 52 (4): 911–27.

Dorst, Hade, Alexander van der Jagt, Rob Raven, and Hens Runhaar. 2019. "Urban Greening through Nature-Based Solutions – Key Characteristics of an Emerging Concept." *Sustainable Cities and Society* 49 (August): 101620.

Energy Cities. 2019a. "Urban Gardens City Project." Energy Cities. January 20, 2019. https://energy-cities.eu/best-practice/urban-gardens-city-project/.

———. 2019b. "The Paris Greening Programme." Energy Cities. February 20, 2019. https://energy-cities.eu/best-practice/the-paris-greening-programme/.

European Commission. 2015. "Towards an EU Research and Innovation Policy Agenda for Nature-Based Solutions & Re-Naturing Cities: Final Report of the Horizon 2020 Expert Group on 'Nature-Based Solutions and Re-Naturing Cities." Directorate-General for Research and Innovation. https://doi.org/10.2777/763305.

———. 2020. "Nature-Based Solutions for Climate Mitigation Analysis of EU-Funded Projects." Directorate-General for Research and Innovation.

Farand, Chloé. 2021. "France and UK Lead Push for Climate Finance to Restore Nature." Climate Home News. January 11, 2021. https://www.climatechangenews.com/2021/01/11/france-uk-lead-push-climate-finance-restore-nature/.

Geneletti, Davide, and Linda Zardo. 2016. "Ecosystem-Based Adaptation in Cities: An Analysis of European Urban Climate Adaptation Plans." *Land Use Policy* 50 (January): 38–47.

Gifford, Lauren. 2020. "'You Can't Value What You Can't Measure': A Critical Look at Forest Carbon Accounting." *Climatic Change* 161 (2): 291–306.

Gordon, David J. 2020. *Cities on the World Stage: The Politics of Global Urban Climate Governance*. Cambridge University Press.

Gordon, David J., and Craig A. Johnson. 2018. "City-Networks, Global Climate Governance, and the Road to 1.5°C." *Current Opinion in Environmental Sustainability* 30 (February): 35–41.

Hajer, Maarten, and Wytske Versteeg. 2005. "A Decade of Discourse Analysis of Environmental Politics: Achievements, Challenges, Perspectives." *Journal of Environmental Policy & Planning* 7 (3): 175–84.

Hale, Thomas. 2020. "Catalytic Cooperation." *Global Environmental Politics* 20 (4): 73–98.

Heijden, Jeroen van der, Harriet Bulkeley, and Chiara Certomà. 2019. *Urban Climate Politics : Agency and Empowerment*. Cambridge: Cambridge University Press.

Hughes, Sara. 2019. *Governing Climate Change Mitigation in New York City, Los Angeles, and Toronto*. Cornell University Press.

ICLEI. 2021. "Our Pathways Our Approach." ICLEI. 2021. https://iclei.org/en/our_approach.html.

Johnson, Craig A. 2018. *The Power of Cities in Global Climate Politics: Saviours, Supplicants or Agents of Change?* Palgrave Macmillan, London.

Jongman, B., and S. Ozment. 2019. "What If We Could Use Nature to Prevent Disasters?" World Bank Sustainable Cities Blog. 2019. https://blogs.worldbank.org/sustainablecities/what-if-we-could-use-nature-prevent-disasters.

Lang, Daniel J., Arnim Wiek, Matthias Bergmann, Michael Stauffacher, Pim Martens, Peter Moll, Mark Swilling, and Christopher J. Thomas. 2012. "Transdisciplinary Research in Sustainability Science: Practice, Principles, and Challenges." *Sustainability Science* 7 (1): 25–43.

Lövbrand, Eva, and Johannes Stripple. 2011. "Making Climate Change Governable: Accounting for Carbon as Sinks, Credits and Personal Budgets." *Critical Policy Studies* 5 (2): 187–200.

McVittie, Alistair, Lorna Cole, Anita Wreford, Alessandra Sgobbi, and Beatriz Yordi. 2018. "Ecosystem-Based Solutions for Disaster Risk Reduction: Lessons from European Applications of Ecosystem-Based Adaptation Measures." *International Journal of Disaster Risk Reduction* 32 (December): 42–54.

Mori, Akira S., Takuya Furukawa, and Takehiro Sasaki. 2013. "Response Diversity Determines the Resilience of Ecosystems to Environmental Change." *Biological Reviews of the Cambridge Philosophical Society* 88 (2): 349–64.

Ojea, Elena. 2015. "Challenges for Mainstreaming Ecosystem-Based Adaptation into the International Climate Agenda." *Current Opinion in Environmental Sustainability* 14 (June): 41–48.

Pauleit, Stephan, Teresa Zölch, Rieke Hansen, Thomas B. Randrup, and Cecil Konijnendijk van den Bosch. 2017. "Nature-Based Solutions and Climate Change – Four Shades of Green." In *Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice*, edited by Nadja Kabisch, Horst Korn, Jutta Stadler, and Aletta Bonn, 29–49. Cham: Springer International Publishing.

Roberts, Debra, Richard Boon, Nicci Diederichs, Errol Douwes, Natasha Govender, Alistair Mcinnes, Cameron Mclean, Sean O'Donoghue, and Meggan Spires. 2012. "Exploring Ecosystem-Based Adaptation in Durban, South Africa: 'Learning-by-Doing' at the Local Government Coal Face." *Environment and Urbanization* 24 (1): 167–95.

Røttereng, Jo-Kristian S. 2018. "The Comparative Politics of Climate Change Mitigation Measures: Who Promotes Carbon Sinks and Why?" *Global Environmental Politics* 18 (1): 52–75.

SBTN. 2020a. "Biodiversity: Why Set Science-Based Targets for Species and Ecosystems?" Science Based Targets Network. May 5, 2020. https://sciencebasedtargetsnetwork.org/earth-systems/biodiversity/.

———. 2020b. "Science Based Targets Network." Science Based Targets Network. May 5, 2020. https://sciencebasedtargetsnetwork.org/.

The World Bank. 2020. "City Resilience Program." The World Bank. 2020. https://www.worldbank.org/en/topic/disasterriskmanagement/brief/city-resilience-program.

UNFCCC. 2008. "Ideas and Proposals on the Elements Contained in Paragraph 1 of the Bali Action Plan." Submissions from intergovernmental organizations.

Waitt, G. 2005. "Doing Discourse Analysis." In *Qualitative Research Methods InHuman Geography*, edited by I. Hay. Oxford: Oxford University Press.

Wakefield, Stephanie. 2019. "Making Nature into Infrastructure: The Construction of Oysters as a Risk Management Solution in New York City:" *Environment and Planning E: Nature and Space*, November. https://doi.org/10.1177/2514848619887461.

Wamsler, Christine. 2015. "Mainstreaming Ecosystem-Based Adaptation: Transformation toward Sustainability in Urban Governance and Planning." *Ecology and Society* 20 (2). https://doi.org/10.5751/ES-07489-200230.

Wamsler, Christine, and Stephan Pauleit. 2016. "Making Headway in Climate Policy Mainstreaming and Ecosystem-Based Adaptation: Two Pioneering Countries, Different Pathways, One Goal." *Climatic Change* 137 (1): 71–87.

Williams, Laurence, and Benjamin K. Sovacool. 2019. "The Discursive Politics of 'Fracking': Frames, Storylines, and the Anticipatory Contestation of Shale Gas Development in the United Kingdom." *Global Environmental Change: Human and Policy Dimensions* 58 (September): 101935.

Woroniecki, Stephen, Hausner Wendo, Ebba Brink, Mine Islar, Torsten Krause, Ana-Maria Vargas, and Yahia Mahmoud. 2020. "Nature Unsettled: How Knowledge and Power Shape 'Nature-Based' Approaches to Societal Challenges." *Global Environmental Change: Human and Policy Dimensions* 65 (November): 102132.