Governance learning from collective actions for just climate adaptation in cities

Mahir Yazar[1]*, Håvard Haarstad[1], Lene Lundøy Drengenes[1] and Abigail York[2]

[1]Centre for Climate and Energy Transformation, Department of Geography, University of Bergen, Bergen, Norway, [2]School of Human Evolution and Social Change, Arizona State University, Tempe, AZ, United States

Environmental policy research fails to integrate procedural and recognitional justice perspectives and collective actions in governance learning for just climate adaptations. Drawing on the insights of two cities experiencing climate impacts differently, Bergen (Norway) and Istanbul (Turkey), this paper assesses how collective actions influence different levels of governments (local to national) to learn from these actions to implement just climate actions in their localities. Using environmental justice (specifically recognition and procedural) and policy learning literature, we contextualize a three-governance learning typology that emerges through collective actions that may trigger governance structures for policy integration: governance learning by resisting, co-opting, and expanding. We identify what kind of learning is introduced to the existing governance structures in Bergen and Istanbul, and how that learning shapes or is shaped by the governance structures, local government in Bergen and local to national governments in Istanbul, while developing climate adaptation policies and actions. Overall, this paper shows what types of knowledge and information are incorporated or ignored after collective actions and how power mediates interactions between actors across multiple urban settings for just climate adaptation.

KEYWORDS

governance learning, collective action, just climate adaptation, Bergen, Istanbul

Introduction

Halting the risks carried by the impact of climate change is especially urgent for vulnerable urban communities, households, and social groups that are socio-economically disadvantaged and disproportionately exposed to extreme summer heat or flash floods (Wilhelmi and Hayden, 2010; Wolf et al., 2010; Hsu et al., 2021; Eriksen, 2022). The effects of extreme weather events triggered by climate change, such as flash floods in Europe or extreme heat conditions in the Global South, illustrate how cities' infrastructures and administrative capacities (e.g., governance structures) and responses are not prepared to climate exposures and stresses (Kern and Alber, 2009; Yazar et al., 2021). Such downsides, in turn, increase equity and justice concerns amid extreme climates. Many institutions in multiple urban settings try to address complex

socio-ecological and technical systems (SETS) challenges exacerbated by climate change through their already existing administrative knowledge and traditional governance structures. On the other hand, studies show that the traditional governance structures are ineffective in addressing extreme climate conditions, and new ways of doing things and taking actions are needed (Pelling et al., 2015; O'Brien, 2016; Broto and Westman, 2017; Keith et al., 2021; Yazar and York, 2022). To be able to do that, formal governance structures need to be transformed through the co-production of knowledge *via* bottom-up learning beyond the formal organizational structures.

Governance learning is an emerging field in the policy literature (May, 1992; Toens and Landwehr, 2009; Dunlop and Radaelli, 2013; Howlett, 2014). Much of the current works focus on the modes of learning, including both endogenous and exogenous sources of learning within or outside of policy fields or jurisdictions that affect policy integration (Heikkila and Gerlak, 2013; Biesbroek, 2021; Pahl-Wostl and Patterson, 2021). Policy integration is "a continues process of adjustment through reflexivity and learning (Biesbroek, 2021, p. 75)." Studies show governance learning can be achieved through effective participatory design that includes formal governance actors (e.g., federal-state officials), researchers, and consultancy groups (Heikkila and Gerlak, 2013; Newig et al., 2016).

Although new empirical and theoretical insights are growing in governance learning, less focus is given to what extent these knowledges are informed by practice for climate adaptation (Rouillard et al., 2013; Fink, 2019; Gerlak et al., 2020). Some strong institutional settings have the authority to push forward top-down climate change integration through hard regulations (Schoenefeld and Jordan, 2020). For instance, nature-based solutions as a climate adaptation concept have developed alongside the research and innovation agenda within the European Commission and the European Environment Agency (European Commission., 2015). Instead, other institutions or governance settings may depend on soft governance capacities with limited substantive authority but high interests in integrating climate change concerns throughout other agencies or departments, resulting in ineffective policy accumulation (Yazar et al., 2020; Biesbroek, 2021; Knill et al., 2021). Yet, no attention has been given to how collective actions, or "practice from the bottom-up," inform governance structure to learn what kinds of effective policies and actions are needed to be implemented to address complex and place-dependent climate adaptations in urban settings. Thus, this paper suggests that collective actions through citizen and activist engagements are essential sources for formal governance structures to learn how to implement robust climate actions in urban contexts.

Learning is not static or linear but dynamic and consists of multiple dimensions; thus, governance learning processes that aim for policy integration or inform "practice" either lead to transformation in governance structures or exacerbate the existing power asymmetries (York and Yazar, 2022). Especially

when it comes to decisions about policy integration for climate adaptation, in terms of who is included and excluded from the governance learning structures, what types of knowledge and information are incorporated or ignored, and how power mediates interactions between actors across multiple scales become essential. The role of power structures or how urban elites' economic interests shape urban climate actions and increase environmental injustices are recognized and studied broadly (Bulkeley and Newell, 2015; Westman et al., 2022; Yazar and York, 2022). But more research is needed to explain how collective actions through civic actions trigger governments to alter their existing governance structures through learning from these collective actions to address climate adaptation and injustices in cities, especially those that are under threats of extreme weather events.

Drawing on the insights of two cities experiencing climate impacts differently, Bergen (Norway) and Istanbul (Turkey), we will assess how collective actions influence local governments to learn from these actions to implement just climate actions in their localities. Two case studies in this paper illustrate that learning from collective actions takes different forms and directions by the formal governance structures. Using environmental justice (specifically recognition and procedural) and policy learning literature, we identify a three-part governance learning typology that emerged through collective actions that may trigger governance structures for policy integration or change: (1) *Learning by resisting*, (2) *Learning by co-opting*, and (3) *Learning by expanding*. Following a brief exploration of policy learning and environmental justice literature, we will introduce a three-governance learning typology (Section Theoretical context: governance learning, collective actions, and just adaptation). Then we describe our methodology and data and its application to the two selected cases (Section Case studies and methods) and then outline the results of each case (Section Results from the case studies). We discuss the implications of collective actions on governance learning and climate adaptation and make suggestions for further studies (Section Discussion) and then offer some concluding remarks (Section Conclusion).

Theoretical context: Governance learning, collective actions, and just adaptation

Cities are framed as the foci for change, especially in global action for global environmental change (Ostrom, 2010; Bulkeley and Castán Broto, 2013). Effective local climate adaptation requires robust governance learning. Learning is defined as "the reflexive updating of beliefs on the basis of evidence, experience, and new information (Newig et al., 2016, p. 354)." Research on learning has been used dominantly in policy and social learning contexts, seeking questions around the types of institutional

designs that foster or hinder learning processes, how or when learning leads to policy integration or change, and to what extent learning processes can be devised (Benson and Jordan, 2011; Van der Heijden, 2014; Newig et al., 2016). Learning also becomes an increasingly used concept in environmental and climate change research, especially learning through collaboration with multiple actors within and beyond formal governance structures for environmental and adaptive governance, disaster recovery, and urban climate practices (Emerson and Gerlak, 2014; Hartmann and Spit, 2016; Bellinson and Chu, 2019). Governance learning refers to "the social learning process leading to a different governance structure and practice (Wolfram et al., 2019), p. 32".

However, the existing literature only identifies and focuses on formal actors (e.g., policymakers, private businesses, civil society, and academia) that are engaged in learning processes through *face-to-face dialog that is open and ongoing, cross-scale linkages*, and *formalized venues, rules, and shared routines that foster intentional learning* (Gerlak et al., 2020). In addition, learning has been conceptualized with policy-relevant lessons that come from related policy fields and how cross-policy fields affect policy learning (Dunlop and Radaelli, 2013; Howlett, 2014). Considering the available insights from the literature, we argue that collective actions and their actors (e.g., community members, activists) are generally sidelined from governance learning processes, mainly because these groups lack representatives under formal organizations that hinder their recognition by the formal institutions. However, learning from collective actions (e.g., bottom-up movements using their social capitals) and adapting the knowledge generated from these actions into formal governance channels could shape governance learning for *in-situ* and just adaptation actions.

Collective action is when individuals come together for a common purpose and improve group outcomes (Van Laerhoven, 2010) at multiple levels of influence on climate adaptation decision-making (York et al., 2021). This study acknowledges collective action, similarly, focusing on efforts of individuals in collective action to act in an equitable manner to strengthen just urban climate adaptation through activism and social capital. The vast literature on collective action in the environmental governance domain has unpacked many variables, including how and why individuals cooperate and what variables affect collective actions, including social capital, group size, and market access (Meinzen-Dick and Knox, 1999; Sullivan and York, 2021). On the other hand, we argue that much has been uncovered about how collective actions in the context of climate justice lead to governance learning. Historically, injustices are exacerbated in governance structures. Considering the extreme weather events triggered by changing climate, linking climate injustices in the context of policy learning literature is critical to identify to what extent governance learning might hinder or foster climate injustices in the decision-making processes.

Climate justice draws on the concept of environmental justice with its three overlapping dimensions of justice; distributive, procedural, and recognition (Schlosberg, 2009). Against this backdrop, climate justice focuses on the unequal distribution of climate change-related threats and the uneven ability to respond and mitigate their impacts among various social groups (distributive justice); the extent to which multiple actors, individuals, and groups are involved in climate decision-making (procedural justice); and whose knowledge, values, identities, and interests are respected and taken into account (recognition justice) (Schlosberg and Collins, 2014; Massarella et al., 2020). Recognition justice is getting more attention in climate governance literature as it underlies whose visions, knowledge, and values matter, while procedural justice examines the extent to which vulnerable populations' push back against asymmetric power relations favoring powerful political elites and decision-makers (Schlosberg, 2012; Hardy et al., 2017; Chu and Michael, 2019; Malloy and Ashcraft, 2020).

Governance learning may increase procedural justice in terms of involving diverse stakeholders in a formal governance structure. Still, we must look beyond simple inclusion on coalitions or appointments to understand whose knowledge, information, and perspectives are welcomed and respected, known as recognitional justice (York and Yazar, 2022). Each decision-maker might be equally recognized in a decision-making process, while the capability of each actor to participate in a decision might be ignored. Thus, recognition and procedure are not only inherently bound up with one another in terms of power in the creation, makeup, and dynamics, but they also emerge within the collective actions. Without collective actions, many historically excluded groups may be unable to affect change from within through social learning processes that are the hallmark of collaborative governance networks.

Critically, procedural justice may not be enough; instead, it must be coupled with recognition and capacity. The dominant actors within formal governance structures do not necessarily facilitate learning. In fact, studies find that formal actors, including policy entrepreneurs, resist learning and create obstacles for policy integration, especially in environmental and climate domains (Khan, 2013; Arnold, 2021). Hence, collective actions could influence decision-makers in formal governance structures to realize the immediate need to address local climate challenges and emergencies, either in disasters or long-term urban design. Yet, we hypothesis that learning from collective actions takes different forms and directions by the formal governance structures. Responding to this lacuna in the literature identified above, we identify a three-governance learning typology that emerged through collective actions that may trigger governance structures to alter their structure or adopt new policies inspired by collective actions (see Figure 1 for illustrations of a three-part governance learning typology for just urban climate adaptation). The following subsection introduces three types of governance learning

FIGURE 1
A three-part governance learning typology for just urban climate adaptation.
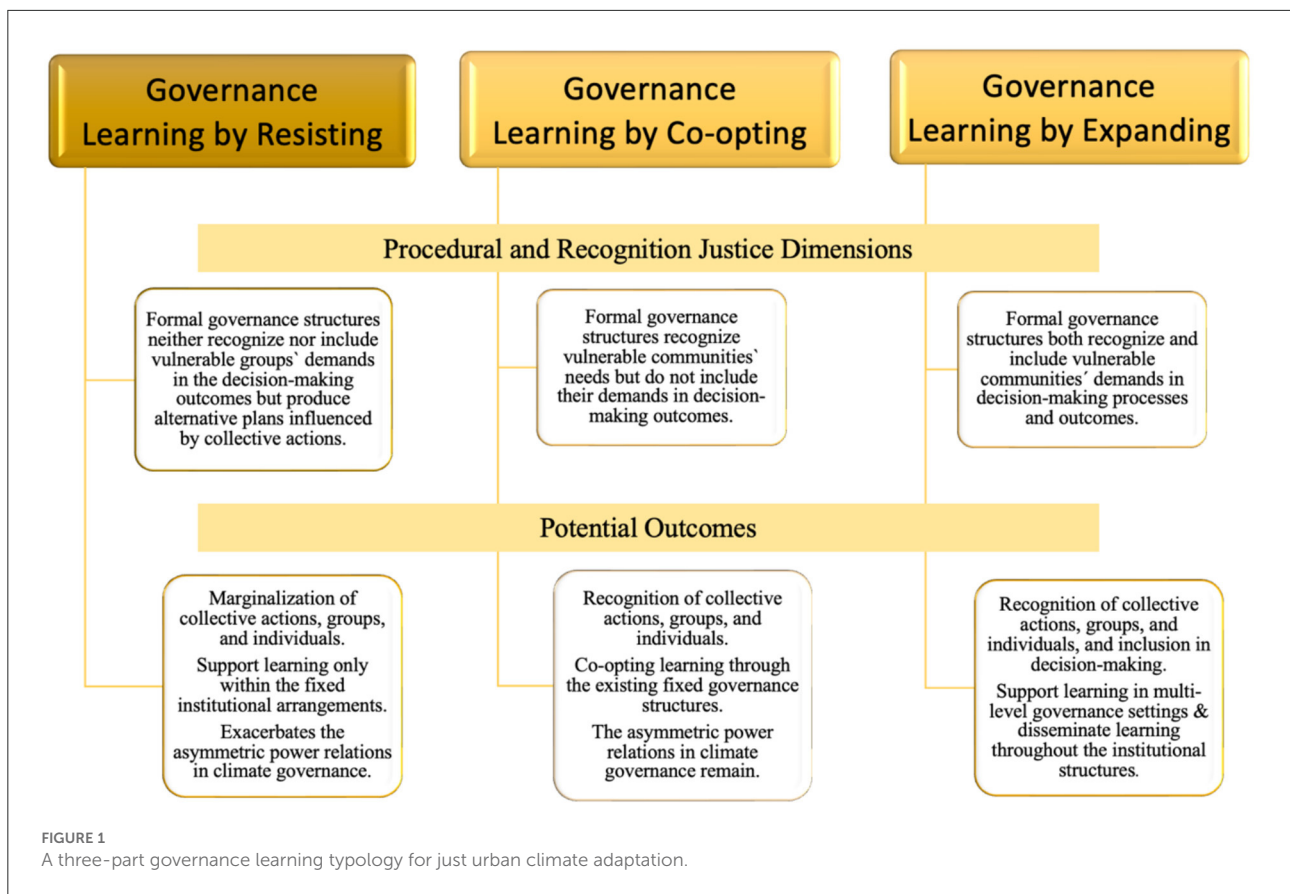
through collective actions: *learning by resisting*, *co-opting*, and *expanding*.

Governance learning by resisting

The critical argument we follow here is that there should be a meaningful linkage between collective actions and governance learning for which collective action creates a "leverage point for change" (Bryant and Thomson, 2021), either policy integration for adaptation or change in the formal governance learning mechanism. However, multiple factors can hinder governance learning for just adaptation in cities. One of the most pervasive obstacles to governance learning is the lack of open discussions and failure to include key stakeholders Mostert et al., 2007; Heikkila and Gerlak, 2019. Here, learning processes occur where formal governance actors adapt the knowledge generated through collective actions (e.g., collective actions through social capital or networks to demand change, for instance, better climate adaptation practices). Yet, the actors who generate knowledge through their collective actions are sidelined and, in some cases, marginalized due to the highly hierarchical socio-institutional dynamics (North, 1990) that

hinder the learning process (Heikkila and Gerlak, 2019). In this case, governance learning happens while decision-makers utilize the generated knowledge but resist to include collective action actors into the decision-making processes (procedural justice). Consequently, the formal governance structure does not recognize the historically underrepresented groups (justice as recognition) and gloss over their demand but is influenced by their ideas to develop alternative policies.

Governance learning by co-opting

A growing literature in environmental governance explores the transformational potential of governance with collective decision mechanisms (Bowen et al., 2017; De Voogt and Patterson, 2019; Pahl-Wostl and Patterson, 2021; York et al., 2021). Here, learning by co-opting is understood that formal governance structures are enticing or forcing less powerful actors to their bidding. For instance, decision-makers might recognize and incorporate with collective action actors, but the outcomes of decision-making generally exclude the demands of the community members. In turn, lack of inclusion in procedures reproduces power imbalances in rigid climate

governance structures and co-opts seemingly governance learning mechanisms. For instance, extreme weather events triggered by climate change represent a social dilemma in which individuals have little incentive to act in society as a whole. Yet, it is rational for individuals to act within social groups (e.g., using their social capital) on their collective interest (Olson, 2009; Ostrom, 2010). With the increasing intensity of climate change-related events (e.g., flash floods, extreme heat), political elites and decision-makers rely less on resisting to adjust a new climate governance approach with collective decision mechanisms, especially in climate disaster and emergency planning and actions (Delilah Roque et al., 2020). In the times of climate emergency and disaster planning, collective actions might emerge across communities to address climate adaptation issues and lead to governance learning with the inclusion of more diverse voices (procedural justice). However, certain social groups have historically been marginalized and excluded from the formal governance learning processes. Lack of political and social capital and access means that marginalized groups will inevitably seek channels to be recognized and supported by the public and gain attention (recognition justice) from the formal authorities, resulting in co-option or elite capture amongst more vulnerable communities.

Governance learning by expanding

Expansive learning theory is a process of learning; namely, "it proposes an ideal-typical sequence of learning actions that together make an expansive learning cycle (Engestrom, 2014), p. 12." In the context of this study, we conceptualize learning by expanding in governance learning for just adaptation in cities as to what extent learning through collective actions is institutionalized in governance and decision-making processes. Governance learning by resisting and co-opting suggest that learning processes can side-line and even manipulate actors within collective actions and exacerbate power asymmetries in governance structures. Yet, governance learning by expanding reveal that learning by resisting and co-opting are insufficient to transform formal governance structures. Ultimately, we argue that the diversity of knowledge through recognizing and including vulnerable communities' demands in decision-making processes and outcomes are essential components of learning by expanding. Hence, in the context of governance learning by expanding, collective actions serve as both the enablers of learning processes and, ultimately, learning outcomes. Governance learning by expanding also improves the credibility, legitimacy, and acceptance of diverse knowledge produced through collaborative processes. It also enables formal governance actors to assess their assumptions and biases and learn together with actors (Armitage et al., 2008; Susskind, 2013).

Case studies and methods

The analysis focuses on two cities, namely Bergen (Norway) and Istanbul (Turkey). This study's empirical data is gathered through interviews conducted in Bergen (2020–21) and Istanbul (2019). This study's approach, including the reasoning for the two-case study selection and data collection process, is presented in the sections below.

Bergen (Norway)

In Bergen, Norway, there has been a growing focus from governance actors on sustainable urban development, climate mitigation, and to some extent, adaptation to ongoing climate changes. The city is exposed to extreme weather, causing landslides and urban flooding. Stormwater management is a major policy issue for the municipality, and the municipality recognizes that the problem will increase as the urban area is built up and developed as the urban population grows. Changed land use in urban areas as a result of compact city policies can have substantial effect on water run-off and cause significant adaptation problems with a changing climate (Bergen, 2019). As a result, the municipality has developed a strategy and multiple pilot projects with blue-green infrastructure and other nature-based solutions.

The recognition of the need to adapt to climate change, and the shift from traditional stormwater management to nature-based solutions, has led the to a shift in governance practice Kvamsås (2021). In the fall of 2005, there were two landslide episodes in the city, which causes in total four lives. These were primarily attributed to climate change and significantly raised awareness in the municipality of the need to account for future climate risk in policymaking. The episodes have been interpreted as the trigger event for a greater emphasis on climate adaptation in the municipality. Following the events, the municipality implemented new guidelines for stormwater management, ushering in a new paradigm in line with ideas of blue-green structures and nature-based solutions (Groven, 2013). As Kvamsås (2021) shows, the shift to nature-based solutions has promoted cross-sectoral collaborative approaches in governance that created space for professional negotiation and mediation between professions, city departments and sectors.

Bergen has since the 2005 events been considered a frontrunner in climate adaptation policy and has adopted ambitious climate goals both for mitigation and adaptation. On the mitigation side, the city has significantly constrained sprawl in its new master plans, it is expanding new Light Rail lines, and it is incentivizing electrification of vehicles. Still, the climate-related policy has been controversial in much of the population. There has been long-running political tension around the Light Rail project and the road tolls aimed to finance public transportation and limit traffic. The public mobilization

against the road tolls had a significant effect on the local elections in 2019, when the single-issue party People's Action No To More Toll Roads because the third largest party despite having been formed just months prior. In this and other issues, there are significant social divisions around green, climate-friendly policies in the city, concerning their merit, who benefits, and questions of financing (Wågsæther et al., 2022).

The analysis for the current case study is based on the process of building a public park in the city center, as part of the city's efforts toward climate resilient urban development. The park is integrated with a major public transport infrastructure investment—the Light Rail. This development has been broadly supported by the public, but also controversial among some groups. We will here refer to it as the City Beach project, the label used by local authorities. The park is conceived as a climate resilient ecopark concept focused on enhanced biodiversity, including potential effects of light pollution on biodiversity and consequently, adapted lighting solutions. It is planned to involve concepts for and prototyping of energy-neutral park design and technological solutions to improve local carbon footprint. Since 2018, there have been several processes of public participation and public hearings, which have shaped and continue to shape the park's design. The public participation has created tensions, as it has been unclear what the scope of participation is, how to fit public input into the bureaucratic process and how to reconcile public participation input with expert knowledge. Nevertheless, public input into the governance process has primarily been through the official institutional channels created by the municipality, unlike the Gezi protests considered in the Istanbul case.

Istanbul (Turkey)

Istanbul is the megacity of Turkey and is highly vulnerable to heatwaves and urban heat islands due to dense urban planning, high-rise buildings spurred by the construction-based economy, and decreasing green spaces due to dense urban planning. Such climate-driven risks coupled with the existing infrastructure intensify exposures. The city already experienced heatwave episodes totaling 14 days between 2015 and 2017, which caused 419 deaths (Can et al., 2019). Future climate scenarios also project that flash flood will increase in Istanbul due to deforestation and the lack of green infrastructures (Cetonkaya et al., 2022). Although the 2011 National Climate Change Strategy and following national action plans and programs (e.g., the 2020 National Smart Cities Action Plan) recognize climate change-related challenges in cities, these plans remain insufficient to provide climate adaptation targets for cities in Turkey. Local governments have some individual authority which is best seen in developing their climate action plans (Kuokkanen and Yazar, 2018; Thornton et al., 2020). On the other hand, researchers find that when it comes to climate

change, local governments in Istanbul do not use their ability to allocate budget generated through their own-source revenue granted by the Municipal Law (Yazar and York, 2021). Instead, the local governments prioritize profitable urban development plans over *in-situ* climate solutions to mitigate the impacts of extreme weather events in the city.

The 2013 Gezi Park protests were a significant milestone in Turkish environmental activism, particularly affecting national and local governments' environmental agendas. Gezi Park, located in Taksim Square, is one of the few remained green areas in the urban core. The 2013 protests started to oppose the national government's urban development plans to transform the Park into a large strip mall. The protests evolved something more extensive than the Park itself and aimed to conserve urban green in cities, predominantly in Istanbul. The protests have reached an age where numbers of neighborhood associations and groups are emerged with urban green agendas, in turn contributing to urban climate adaptation. Unlike in the Bergen case, the Gezi Park movements triggered the national and local governments in Turkey to reassess their urban green agendas. Therefore, for the Istanbul case, we will focus on (1) how the collective actions in the Gezi Park triggered the national government to realize urban green agenda for the country (national-scale), and (2) how the protests affected a local government (Uskudar district municipality) in Istanbul to reassess its urban green plans in the Kuzguncuk neighborhood (local-scale). The Kuzguncuk allotment garden is selected for its long history of community-based allotment gardens and one of the most significant green infrastructures (e.g., tree canopy) that could host large communities in the district. The local municipality and the developers tried to develop many projects (e.g., building a new hospital, school, parking lots) on the land, as the garden has been in deadlock for some years due to complex ownership structures. The 2013 Gezi Park protests, however, were one of the turning points in which the local conservation groups won the hearts of the locals using various means (e.g., organizing community forums, festivals, and gatherings) and pushed the local government to conserve the allotment garden for multiple nature-based related activities. The local government realized the bottom-up demand and urged to address the local needs considering the political environment was rising in the city. Confronted with these masses, the local government decided to freeze the development projects planned for the allotment garden in 2014.

Methods and data collection in the case studies

The article authors draw on long-term engagement with the cases at hand, and experiences from multiple research projects on the broader theme of sustainability and governance.

In the specific cases discussed directly in the article, we here use original data. Both case studies rely in semi-structured, one-on-one interviews conducted, as well as a range of document material. The interviews in Istanbul ($n = 14$) were conducted in 2019, and the interviews in Bergen ($n = 16$) were conducted in 2020–21, all by members of the author team. Interviews in both locations were conducted with governance actors, civil society activists, representatives of civil society organizations, local outreach coordinators, and other stakeholders, including volunteers, as well as officers from the national government and the selected municipality (see Supplementary material). The participants were selected through snowball sampling, and interviews generally took 30–45 min, with some communications through email and phone calls.

The interviews were conducted to capture similarities and differences of a wide range of perspectives on a three-governance learning typology introduced in this study. The interviewees were asked questions related to the collective actions raised in the City Beach Project (Bergen) and the Kuzguncuk allotment garden (Istanbul), and the roles of residents, civil society, and the local government in Bergen and the national and local governments in Istanbul in developing urban green infrastructures. For analyses of the Bergen and Istanbul cases, we identified statements that align with a three-governance learning typology introduced in Section Theoretical context: Governance learning, collective actions, and just adaptation. The identified statements were coded in NVivo under three thematic codes: governance learning by resisting, co-opting, and expanding. Although the interview material has mostly been important to illustrate the temporal shifts in urban climate actions and activism, we here provide exemplar quotes from our interviews (supplemented with field note-based observations) to provide a complete view of shared values and understandings about collective actions for urban green and climate adaptation and practices in the two cities. Additionally, we analyzed key policy documents to complement the qualitative interview data. The primary documents reviewed for the City Beach project are the Norwegian Planning and Building Act and the Kommunedelplan for 2019–2029. Also, the 2020 National Smart Cities Action Plan and the Municipal Law were reviewed for the Istanbul case.

Results from the case studies

Results for Bergen case

Governance learning by resisting

Learning by Resisting has not played a major role in development of climate adaptation in the Bergen case. While resistance has been a major factor in populist opposition to climate mitigation-related policies, such as toll roads, climate

adaptation has not been politicized to the same degree. The first landslide attributed to climate change, in 2005, led to a significant shift internally in local governance institutions, whereby climate adaptation has been high on the agenda of the municipality (Groven, 2013; Bergen, 2019). Arguably, climate adaptation has been seen as a matter of concern for public institutions rather than for civil society activism and resistance. One exception is the special interest group Bergen River Forum, an organization based on citizens lobbying for the preservation of water streams and promotion of "blue-green infrastructure". They have primarily worked within institutional channels for this cause. However, the Norwegian governance context is one characterized by a high degree of institutionalization and public trust, and climate adaptation measures have to little extent been politicized.

Governance learning by co-opting

Public participation is inscribed in the Norwegian Planning and Building Act, so municipalities are obliged to include citizens in planning processes. In other words, there is a formal recognition of the needs for communities affected by developments to be included, and some minimum requirements for how this participation should be conducted. In many cases, local authorities exceed these minimum requirements, or use various participation experiments and activities to get particular types of input or to create legitimacy for interventions. In the City Beach Park project the municipality and invited architect offices OK Kontor and White Architects conducted a series of creative participation exercises to solicit input on the park's design. As described in a public report that produced by the municipality and the architects, the participation and co-creation activities included a drawing competition with children, a public exhibition, social media presence, an online survey and a "walk and talk" with architects for residents. There was also an online vote between five illustrated concepts for the park's design. The public vote went in favor of one concept, while the expert committee selected another—which created some controversy in the media. The University also contribute a design thinking workshop for key stakeholders in the project as part of the Horizon 2020-funded research project VARCITIES. As part of the VARCITIES project, a co-creation strategy was also designed that was intended to be implemented across the eight pilot cities of the project. However, Bergen municipality was forced to withdraw from the VARCITIES project for lack of capacity before the co-creation strategy had been implemented.

The lesson in terms of *governance learning by co-opting* is that, while the authorities are initiating creative participation activities that go beyond what they are legally required to do, substantive participation in the sense of citizens shaping proposals, is quite far off. In their own participation report on City Beach project, the municipality and its partners

conceded that practical reasons such as financing and technical limitations hindered them from taking some of the inputs into account. It is clear from our analysis that a large part of the co-creation is geared toward *informing* citizens about ongoing plan, while structural constraints make substantial participation out of reach. In an interview, a project officer from the municipality described the objective of the participation activities as "*creating an increased interest and knowledge in the population about the project we are working with, and to communicate what is going on.*" The challenge is that by the time participation processes are initiated, most of the solutions are tied up in established designs, bureaucratic processes and tight timelines. Therefore, there is very little room for the solutions that come about through participation and co-design to have any real impact on the overall design of the park.

Governance learning by expanding

The participation processes described above indicate little direct impact from participation on park design. However, if we take a broader view at the way the municipal authorities relate to voices of different communities in developing the climate adaptation agenda, there are signs of *governance learning by expanding*. Over longer time horizons and across multiple projects, authorities in Bergen are forced to take public perceptions into view. The landslides in 2005 created a strong impetus for bringing climate adaptation onto the municipality's agenda. When another landslide occurred in a neighboring municipality and one person died in 2017, and it was revealed in the media that the municipality in question did not have the required analysis and procedures in place for dealing with landslides, it caused media controversy and heightened awareness of these procedures. Local authorities did not change their procedures as a result of direct participation or citizen activism, but rather through the more diffuse mechanisms of media narratives, public debate, electoral politics and bureaucratic responsibility.

Arguably, *governance learning by expanding*, to the extent that it is observed, is in the Bergen case an evolutionary process whereby the bureaucracy, the electorate, and politicians co-produce governance agendas over time. This is not to say that power relations are equally distributed in the process. Power is held by the actors that manage to seize narratives that trigger shifts in political agendas, as for example the anti-road toll activists managed to do for the 2019 municipal elections. The Norwegian institutional context is characterized, in our assessment, both by a great deal of institutional capture as well as by high degrees of trust in governance actors. Over time, governance actors are forced to show *governance learning by expanding* to maintain this situation.

Results for Istanbul case

Governance learning by resisting

The conflict between citizens and the state through the 2013 Gezi Park resistance, triggered by state-led urban development projects vs. conserving urban green commons, was central to reconstruct the national government's narratives and actions for the urban environment in Turkey. The resistance was much more than environmental justice; it raised concerns over the oppressive regime, increasing authoritarian rule, and rapid transformation of green infrastructures for lucrative development projects. It transformed the national politics and increased state authoritarianism; criminalized environmental activism and detached the environment from political concerns while the national government mobilized itself toward urban green agendas in Turkey (Kurtiç, 2022). Accordingly, the 2018 general election slogan used "Let's Build a Greener Turkey Together" campaign conveniently preceded the announcement of snap elections of 2018, and banners along the highways of Istanbul claimed the Istanbul Metropolitan Municipality (IMM) 's success in greening Istanbul. Before the 2019 local elections, the President of Turkey opened a large urban green park in Istanbul and promised to construct new "National Gardens" in other cities. In this case, governance learning took place by which the national government was inspired by the Gezi Park Movement and integrated new policy agendas to implement urban green parks that aim to increase urban green infrastructures (e.g., tree canopy) across the country. Yet, the national government phased out the key stakeholders' participation in governance mechanisms, marginalized them, and spurred top-down urban green planning without considering local demands and climatic conditions. Thus, environmental injustices once again unfold through nationally driven urban green infrastructures in the cities of Turkey.

Governance learning by co-opting

The conflict over the Kuzguncuk allotment garden dates to the mid-1980s. The Kuzguncuk allotment garden is used as a market garden by residents of Kuzguncuk, in the Üsküdar district of Istanbul. The Directorate General of Foundations, a national institution, owns the Kuzguncuk allotment garden and the urban forestry and issued many permits to developers for public-private development projects including car-parking space, public school and a hospital from the mid-1980s till the late 1990s. The key objections against these plans were taken by a small formal local conversation group that consisted of lawyers and urban planners from the district to take legal actions against the Directorate, which successfully protected the garden and forestry for almost two decades. The 2013 Gezi Park was a milestone for the future of Kuzguncuk. The increasing authoritarian structure and lack of public input have

also fueled collective action and activism in multiple urban green commons throughout Istanbul including Kuzguncuk. Activists and volunteers organized events to gather supports from the locals to defend the green commons in the neighborhood. Activists established new associations to communicate with locals and bring support from strong NGOs in Turkey to employ several strategies to conserve the green common, while the existing formal conservation group keeps using legal channels against the national and local authorities. The increasing support from the community and the assemblage of networks involving academics, especially in architecture and urban planning departments, national and international NGOs, pushed the district municipality of Uskudar to collaborate on conserving the green common in the district. The political environment and civic actions highly influenced this decision, and the municipality accepted managing the allotment garden by regulating plots (e.g., the municipality decides to designate vacant plots to individuals for short terms). The municipality also built multiple small cottages, "knowledge hubs," for the educational and recreational purposes of the neighborhood schools. The municipality's control over the green common led to heated debates among the locals and activists about co-option. "*People from both sides were unhappy with the local governments' control and surveillance role*". "*Historically, the garden has been a place of collective action against the local and national governments' short-term economic interests.*" Another interviewee added: "*This was the least desired scenario, but now at least we are happy to keep the garden status' with the local government's involvement.*" The municipality showcases the Kuzguncuk allotment garden in their public relations documents and presents it as a socially responsible municipality approach with sustainability concerns. Interviewees mentioned that the activists' involvement in the decision-making had been gradually phased out, while only one neighborhood association remains as the negotiator between individuals and the municipality when disputes emerge over the designated plots in the garden.

Governance learning by expanding

In Istanbul, learning by expanding remains sidelined due to two major reasons. First, the outcomes of learning by resisting are replicated by the multiple local municipalities in Istanbul. For instance, the national government's urban environmental agenda by increasing tree-canopy in randomly selected urban vacant lands has been a favorable adaptation action for the local municipalities. Secondly, the municipalities are aware that the inclusion of communities in urban governance is not a policy coordination issue but is a political process. Against this background, the municipalities remain silent to negotiate with vulnerable urban populations' values and needs in policy creation, which exacerbates the current asymmetric power relations in urban climate governance.

Discussion

Governance learning is an emerging field and a critical aspect of environmental policy literature but is sometimes technocratic and linked to interests within formal institutional structures. Collective actions hold great potential for governance learning in terms of public participation in urban environmental planning and design. The knowledge generated by collective actions—in informal institutional settings—toward climate adaptation must be seen as a window of opportunity to transform the existing governance structures. We argue that the justice dimension of urban climate adaptation must be prioritized by decision-makers while learning from collective actions. In this paper, we broaden the concept of governance learning by integrating collective action and procedural and recognitional justice perspectives to understand better the extent to which the knowledge generated through collective actions informs governance structures to practice just climate adaptation in urban contexts. Two case studies, one from a small-sized city in Norway, Bergen, and one megacity from Turkey, Istanbul, guided us to understand better how decision-makers have learned from collective actions to design and adapt *in-situ* planning for just climate adaptation. Our findings indicate that governance learning by resisting is predominantly observed in Istanbul due to top-down environmental governance agenda setting imposed by the national government in Turkey on local governments. Governance learning by co-opting is found in both cases where the local governments in Istanbul and Bergen leave little space for learning from collective actions to implement climate actions. Governance learning by expanding has serious political barriers in Istanbul, whereas a few drivers might emerge in Bergen if the local government breaks the silos within the organizational structures for climate action.

Regarding governance learning by resisting the design of just urban climate adaptation, we find mixed evidence from the two cases. Collective actions for climate actions in Bergen are institutionalized, which usually means change is introduced from the local administrations for climate actions. Yet, the fixed institutional arrangements for governance learning do not necessarily lead to broader participation. There are some tensions observed between politicians with different political ideologies when it comes to implementing climate-related changes in the urban contexts in Bergen. However, collective actions for the city beach park project created a window of opportunity to bypass the political division to promote blue-green infrastructure in the city. In Istanbul, collective actions that emerged from the Gezi Park were perceived as threats to the national government. Thus, unlike in the Bergen case, the identity and capabilities of collective actions have been politically stigmatized at the national level. Such top-down pressures toward the collective action in Istanbul affected the opportunities for transforming the urban environment, excluded citizens from the urban planning, and intensified

national authoritarianism through urban environmental design. The national government marginalized collective actions, groups, and individuals, but imitated collective action activists' urban environmental agendas (e.g., creating more green spaces in cities) by exacerbating injustices and asymmetric power relations in climate and environmental governance in Turkey.

In the two cases, public participation and recognition at the local levels for governance learning by co-opting take almost similar directions. Governance learning is followed by co-opting the collective actions' ideas through the fixed governance structures. In Bergen, local governments opted for intensive participatory designs for creating a blue-green infrastructure. Nevertheless, the municipality and the private sector stakeholders hold the power of decision-making throughout the participatory processes and left little maneuvering space for activists who demanded a nature-based solution in the city. In Istanbul, however, the greater recognition and awareness toward protecting green urban areas due to the Gezi Park movement, the local government of Uskudar district opted for participatory governance, but with less involvement from the activists and more from the professional organizations in the neighborhood. Thus, instead of benefitting from collective action and evidence-based urban green implementations and consequently systemic learning for change, the municipality stands in managing the urban green common by giving little to no monitoring responsibility to the collective action's actors. The two cases clearly indicate that public participation led by public authorities for governance learning carries potential co-optation risks that the local governments exploit for further learning for just climate adaptation in cities.

Governance learning by expanding is observed in the Bergen case through evolutionary processes in which local institutions and governance structures are usually managed to address climate-related concerns raised by the locals. Norway's existing local governance networks generally recognize collective actions, groups, and individuals, and decisions makers are affected by these actions. Given that such fora already exist in Bergen, there are still silos, especially in climate planning among different organizations within the municipality (Oseland, 2019), which creates obstacles to governance learning in multi-level governance settings and to disseminating learning throughout the institutional structures. In the Istanbul case, top-level decision-makers, either in local or national governments, mainly rely on their intuition which hinders facilitating knowledge sharing with collective action actors and institutional settings within the multiple levels of local governments for climate actions. Due to the commitments toward the European directives for the local climate actions in Turkey, some local municipalities incorporate the technical language of European reports and guidelines to their local climate agendas. However, when it comes to diagnose the climate exposures in their localities, local governments in Istanbul function less effectively

to initiate learning generated from the collective actions. More research is needed to understand better how governance learning triggered by collective actions is disseminated and expanded throughout the multiple layers of organizations and departments within and beyond the local governments.

Conclusion

In the Anthropocene, rapid changes in the Earth's systems generate novel problems requiring *in-situ* adaptation actions, and more research is needed to explain how collective actions through social capital or civic actions trigger governments to alter their existing governance structures through learning from these collective actions, especially in cities that are under the treats of extreme weather events. This paper suggests that collective actions through citizen and activist engagements are important sources for formal governance structures to learn how to implement robust climate actions in urban contexts. Using environmental justice (specifically recognition and procedural) and policy learning literature, we identify three learning mechanisms emerged through collective actions that may trigger governance structures to change: (1) *Learning by resisting* (formal governance structures neither recognize nor include vulnerable groups' demands in the decision-making outcomes, but come up with alternative plans influenced by collective actions), (2) *Learning by co-opting* (formal governance structures recognize vulnerable communities' needs but do not include their demands in decision-making outcomes), (3) *Learning by expanding* (formal governance structures both recognize and include vulnerable communities' demands in decision-making processes and outcomes).

There is still progress for nature-based solutions to become mainstream in planning and governing practices. From exclusively being a concept of climate change adaptation and biodiversity conservation, nature-based solutions have evolved to become a resource for environmental management. Enhancing governance learning for just climate adaptation in cities (e.g., nature-based solutions) requires collectively generated knowledge. The two case studies in the paper show that governance learning takes different directions and forms depending on the institutional contexts, the willingness of decision-makers, and socio-political environments. The governance learning typologies coupled with climate justice concerns in this paper could be beneficial for other case studies, especially to determine how climate adaptation actions foster or hinder climate injustices while urban practitioners introduce methods to develop nature-based solutions in cities.

The emerging research in climate adaptation in cities emphasizes transformative practices to identify and address asymmetric power relations in urban climate adaptation decision-making. For this special issue, we argue that

transformative practices require governance learning perspectives generated by collective actions to diagnose injustices that are emerged during the implementation of climate adaptation actions in cities. Historical injustices are exacerbated in decision-making, especially amid extreme weather events triggered by climate change. Against this backdrop, identifying governance learning pathways and their connections to climate justice (particularly recognition of vulnerable groups and their inclusion in decision-making) is essential to hinder the potential negative outcomes of climate adaptation actions in cities. Thus, we must identify what kind of learning is introduced to the existing governance structures and how that learning shapes or is shaped by the same governance structures while developing just climate adaptation policies and actions. Therefore, identifying governance learning typologies amid climate decision-making allows researchers to identify more equitable (or unequal) adaptation plans and policy developments.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Arizona State University (IRB 28356531) and University of Bergen. The participants provided their written informed consent to participate in this study.

Author contributions

MY: conceptualization, methodology, formal analysis, writing, review, and editing. HH: methodology, writing, review, and editing. LD: methodology, review, and editing. AY: supervision, review, and editing. All authors contributed to the article and approved the submitted version.

Funding

Acknowledgments

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/frsc.2022.932070/full#supplementary-material

References

Armitage, D., Marschke, M., and Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Glob. Environ. Change.* 18, 86–98. doi: 10.1016/j.gloenvcha.2007.07.002

Arnold, G. (2021). Does entrepreneurship work? Understanding what policy entrepreneurs do and whether it matters. *Policy Stud. J.*49, 968–991. doi: 10.1111/psj.12388

Bellinson, R., and Chu, E. (2019). Learning pathways and the governance of innovations in urban climate change resilience and adaptation. *J. Environ. Policy Plan.* 21, 76–89. doi: 10.1080/1523908X.2018.1493916

Benson, D., and Jordan, A. (2011). What have we learned from policy transfer research? Dolowitz and Marsh revisited. *Political Stud. Rev.* 9, 366–378. doi: 10.1111/j.1478-9302.2011.00240.x

Bergen, K. (2019). *Kommunedelplan for overvann 2019-2029*. Available online at: https://www.bergen.kommune.no/api/rest/filer/V56541 (accessed April 2, 2022).

Biesbroek, R. (2021). Policy integration and climate change adaptation. *Curr. Opin. Environ. Sustain.* 52, 75–81. doi: 10.1016/j.cosust.2021.07.003

Bowen, K. J., Cradock-Henry, N. A., Koch, F., Patterson, J., Häyhä, T., Vogt, J., et al. (2017). Implementing the "Sustainable Development Goals": towards addressing three key governance challenges—collective action, trade-offs, and accountability. *Curr. Opin. Environ. Sustain.* 26, 90–96. doi: 10.1016/j.cosust.2017.05.002

Broto, V. C., and Westman, L. (2017). Just sustainabilities and local action: evidence from 400 flagship initiatives. *Local Environ.* 22, 635–650. doi: 10.1080/13549839.2016.1248379

Bryant, J., and Thomson, G. (2021). Learning as a key leverage point for sustainability transformations: a case study of a local government in Perth, Western Australia. *Sustainabil. Sci.* 16, 795–807. doi: 10.1007/s11625-020-00808-8

Bulkeley, H., and Castán Broto, V. (2013). Government by experiment? Global cities and the governing of climate change. *Trans. Instit. Br. Geograph.* 38, 361–375. doi: 10.1111/j.1475-5661.2012.00535.x

Bulkeley, H., and Newell, P. (2015). *Governing Climate Change*. London: Routledge. doi: 10.4324/9781315758237

Can, G., Sahin, Ü., Sayili, U., Dubé, M., Kara, B., Acar, H. C., et al. (2019). Excess mortality in Istanbul during extreme heat waves between 2013 and 2017. *Int. J. Environ. Res. Public Health* 16, 4348. doi: 10.3390/ijerph16224348

Cetonkaya, I. D., Yazar, M., Kilinc, S., and Guven, B. (2022). Urban climate resilience and water insecurity: future scenarios of water supply and demand in Istanbul. *Urban Water J.* 1–12. doi: 10.1080/1573062X.2022.2066548

Chu, E., and Michael, K. (2019). Recognition in urban climate justice: marginality and exclusion of migrants in Indian cities. *Environ. Urban.* 31, 139–156. doi: 10.1177/0956247818814449

De Voogt, D. L., and Patterson, J. J. (2019). Exogenous factors in collective policy learning: the case of municipal flood risk governance in the Netherlands. *J. Environ. Policy Plan.* 21, 302–319. doi: 10.1080/1523908X.2019.1623662

Delilah Roque, A., Pijawka, D., and Wutich, A. (2020). The role of social capital in resiliency: disaster recovery in Puerto Rico. *Risk, Hazards Crisis in Public Policy.* 11, 204–235. doi: 10.1002/rhc3.12187

Dunlop, C. A., and Radaelli, C. M. (2013). Systematising policy learning: from monolith to dimensions. *Polit. Stud.* 61, 599–619. doi: 10.1111/j.1467-9248.2012.00982.x

Emerson, K., and Gerlak, A. K. (2014). Adaptation in collaborative governance regimes. *Environ. Manage.* 54, 768–781. doi: 10.1007/s00267-014-0334-7

Engestrom, Y., (2014). *Learning by Expanding*. Cambridge: Cambridge University Press.

Eriksen, S. H. (2022). Is my vulnerability so different from yours? A call for compassionate climate change research. *Prog. Hum. Geogr.* 03091325221083221. doi: 10.1177/03091325221083221

European Commission. (2015). "Towards an EU research and innovation policy agenda for nature-based solutions and re-naturing cities," in *Final report of the Horizon 2020 expert group on 'nature-based solutions and re-naturing cities' directorate-general for research and innovation.* European Commission. Luxembourg: European Union.

Fink, J. H. (2019). Contrasting governance learning processes of climate-leading and-lagging cities: Portland, Oregon, and Phoenix, Arizona, USA. *J. Environ. Policy Plan.* 21, 16–29. doi: 10.1080/1523908X.2018.1487280

Gerlak, A. K., Heikkila, T., and Newig, J. (2020). Learning in environmental governance: opportunities for translating theory to practice. *J. Environ. Policy Plan.* 22, 653–666. doi: 10.1080/1523908X.2020.1776100

Groven, K. (2013). "Eit politisk skred: Korleis naturskadeførebygging og klimatilpassing kom på dagsorden i Bergen," in *Mot en farligere fremtid? Om klimaendringer, sårbarhet og tilpasning i Norge,* Bye, I. L. M., Lein, H., and Rød, J. (eds.). Trondheim: Akademika forlag.

Hardy, R. D., Milligan, R. A., and Heynen, N. (2017). Racial coastal formation: The environmental injustice of colorblind adaptation planning for sea-level rise. *Geoforum.* 87, 62–72. doi: 10.1016/j.geoforum.2017.10.005

Hartmann, T., and Spit, T. (2016). Legitimizing differentiated flood protection levels–Consequences of the European flood risk management plan. *Environ. Sci. Policy.* 55, 361–367. doi: 10.1016/j.envsci.2015.08.013

Heikkila, T., and Gerlak, A. K. (2013). Building a conceptual approach to collective learning: Lessons for public policy scholars. *Policy Stud. J.* 41, 484–512. doi: 10.1111/psj.12026

Heikkila, T., and Gerlak, A. K. (2019). Working on learning: how the institutional rules of environmental governance matter. *J. Environm. Plan. Managem.* 62, 106–123. doi: 10.1080/09640568.2018.1473244

Howlett, M. (2014). From the 'old'to the 'new'policy design: design thinking beyond markets and collaborative governance. *Policy Sci.* 47, 187–207. doi: 10.1007/s11077-014-9199-0

Hsu, A., Sheriff, G., Chakraborty, T., and Manya, D. (2021). Disproportionate exposure to urban heat island intensity across major US cities. *Nat. Commun.* 12, 1–11. doi: 10.1038/s41467-021-22799-5

Keith, L., Meerow, S., Hondula, D. M., Turner, V. K., and Arnott, J. C. (2021). Deploy heat officers, policies and metrics. *Nature.* 598, 29–31. doi: 10.1038/d41586-021-02677-2

Kern, K., and Alber, G. (2009). "Governing climate change in cities: modes of urban climate governance in multi-level systems," in *The international conference on Competitive Cities and Climate Change, Milan, Italy.* (p. 171–196).

Khan, J. (2013). What role for network governance in urban low carbon transitions? *J. Clean. Prod.* 50, 133–139. doi: 10.1016/j.jclepro.2012.11.045

Knill, C., Steinbacher, C., and Steinebach, Y. (2021). Balancing trade-offs between policy responsiveness and effectiveness: the impact of vertical policy-process integration on policy accumulation. *Public Adm. Rev.* 81, 157–160. doi: 10.1111/puar.13274

Kuokkanen, A., and Yazar, M. (2018). Cities in sustainability transition: comparing Helsinki and Istanbul. *Sustainability.* 5, 1421. doi: 10.3390/su10051421

Kurtiç, E. (2022). *Criminalizing Environmental Activism in Turkey*. Available online at: www.brandeis.com/crown/publications/middle-east-briefs/pdfs/101-200/meb147.pdf (accessed April 2, 2022).

Kvamsås, H. (2021). Addressing the adaptive challenges of alternative stormwater planning. *J. Environ. Policy Plan.* 23, 809–821. doi: 10.1080/1523908X.2021.1921568

Malloy, J. T., and Ashcraft, C. M. (2020). A framework for implementing socially just climate adaptation. *Clim. Change.* 160, 1–14. doi: 10.1007/s10584-020-02705-6

Massarella, K., Sallu, S. M., and Ensor, J. E. (2020). Reproducing injustice: why recognition matters in conservation project evaluation. *Glob. Environ. Change.* 65, 102181. doi: 10.1016/j.gloenvcha.2020.102181

May, P. J. (1992). Policy learning and failure. *J. Public Policy* 12, 331–354. doi: 10.1017/S0143814X00005602

Meinzen-Dick, R., and Knox, A. (1999). "Collective action, property rights, and devolution of natural resource management: A conceptual framework," in *Draft Paper for Workshop*, Vol. 15 (Bloomington, IN: University of Indiana).

Mostert, E., Pahl-Wostl, C., Rees, Y., Searle, B., Tàbara, D., and Tippett, J. (2007). Social learning in European river-basin management: barriers and fostering mechanisms from 10 river basins. *Ecol. Soc.* 12. doi: 10.5751/ES-01960-120119

Newig, J., Kochskämper, E., Challies, E., and Jager, N. W. (2016). Exploring governance learning: How policymakers draw on evidence, experience and intuition in designing participatory flood risk planning. *Environ. Sci. Policy* 55, 353–360. doi: 10.1016/j.envsci.2015.07.020

North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press. doi: 10.1017/CBO9780511808678

O'Brien, K. (2016). "Climate change adaptation and social transformation," in *International Encyclopedia of Geography: People, the Earth, Environment and Technology: People, the Earth, Environment and Technology.* p. 1–8. doi: 10.1002/9781118786352.wbieg0987

Olson, M. (2009). *The logic of collective action* (Vol. 124). Harvard University Press.

Oseland, S. E. (2019). Breaking silos: can cities break down institutional barriers in climate planning?. *J. Environ. Policy Plan.* 21, 345–357. doi: 10.1080/1523908X.2019.1623657

Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. *Glob. Environ. Change.* 20, 550–557. doi: 10.1016/j.gloenvcha.2010.07.004

Pahl-Wostl, C., and Patterson, J. (2021). Commentary: Transformative Change in Governance Systems: a conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Glob. Environ. Change.* 71, 102405. doi: 10.1016/j.gloenvcha.2021.102405

Pelling, M., O'Brien, K., and Matyas, D. (2015). Adaptation and transformation. *Clim. Change* 133, 113–127. doi: 10.1007/s10584-014-1303-0

Rouillard, J. J., Heal, K. V., Ball, T., and Reeves, A. D. (2013). Policy integration for adaptive water governance: learning from Scotland's experience. *Environ. Sci. Policy* 33, 378–387. doi: 10.1016/j.envsci.2013.07.003

Schlosberg, D. (2009). "Climate justice, the capabilities approach, and potential policy implications," in *Prepared for Presentation at the Final Seminar in the Series on The EU, Climate Change, and Global Environmental Governance* (Edinburgh: University of Edinburgh).

Schlosberg, D. (2012). "Justice, ecological integrity, and climate change," in *Ethical Adaptation to Climate Change: Human Virtues of the Future* (Cambridge, MA: MIT Press). p. 165–183. doi: 10.7551/mitpress/9780262017534.003.0009

Schlosberg, D., and Collins, L. B. (2014). From environmental to climate justice: climate change and the discourse of environmental justice. *Wiley Interdisciplinary Rev.: Clim. Change.* 5, 359–374. doi: 10.1002/wcc.275

Schoenefeld, J. J., and Jordan, A. J. (2020). Towards harder soft governance? Monitoring climate policy in the EU. *J. Environ. Policy Plan.* 22, 774–786. doi: 10.1080/1523908X.2020.1792861

Sullivan, A., and York, A. M. (2021). Collective action for changing forests: a spatial, social-ecological approach to assessing participation in invasive plant management. *Glob. Environ. Change.* 71, 102366. doi: 10.1016/j.gloenvcha.2021.102366

Susskind, L. (2013). Water and democracy: new roles for civil society in water governance. *Int. J. Water Resour. Dev.* 29, 666–677. doi: 10.1080/07900627.2013.781914

Thornton, T. F., Mangalagiu, D., Ma, Y., Lan, J., Yazar, M., Saysel, A. K., et al. (2020). Cultural models of and for urban sustainability: assessing beliefs about Green-Win. *Clim. Change.* 160, 521–537. doi: 10.1007/s10584-019-02518-2

Toens, K., and Landwehr, C. (2009). The uncertain potential of policy-learning: a comparative assessment of three varieties. *Policy Stud.* 30, 347–363. doi: 10.1080/01442870902863927

Van der Heijden, J. (2014). Experimentation in policy design: insights from the building sector. *Policy Sci.* 47, 249–266. doi: 10.1007/s11077-013-9184-z

Van Laerhoven, F. (2010). Governing community forests and the challenge of solving two-level collective action dilemmas—a large-N perspective. *Glob. Environ. Change.* 20, 539–546. doi: 10.1016/j.gloenvcha.2010.04.005

Wågsæther, K., Remme, D., Haarstad, H., and Sareen, S. (2022). The justice pitfalls of a sustainable transport transition. *Environ. Planning. F* 26349825221082169. doi: 10.1177/26349825221082169

Westman, L., Patterson, J., Macrorie, R., Orr, C. J., Ashcraft, C. M., Broto, V. C., et al. (2022). Compound urban crises. *Ambio.* 51, 1402–1415. doi: 10.1007/s13280-021-01697-6

Wilhelmi, O. V., and Hayden, M. H. (2010). Connecting people and place: a new framework for reducing urban vulnerability to extreme heat. *Environ. Res. Lett.* 5, 014021. doi: 10.1088/1748-9326/5/1/014021

Wolf, J., Adger, W. N., Lorenzoni, I., Abrahamson, V., and Raine, R. (2010). Social capital, individual responses to heat waves and climate change adaptation: an empirical study of two UK cities. *Glob. Environ. Change.* 20, 44–52. doi: 10.1016/j.gloenvcha.2009.09.004

Wolfram, M., Van der Heijden, J., Juhola, S., and Patterson, J. (2019). Learning in urban climate governance: concepts, key issues and challenges. *J. Environ. Policy Plan.* 21, 1–15. doi: 10.1080/1523908X.2018.1558848

Yazar, M., Hestad, D., Mangalagiu, D., et al. (2020). Enabling environments for regime destabilization towards sustainable urban transitions in megacities: comparing Shanghai and Istanbul. *Clim. Change* 160, 727–752 doi: 10.1007/s10584-020-02726-1

Yazar, M., and York, A. (2021). Urban climate governance under the national government shadow: Evidence from Istanbul. *J. Urban Aff.* 1–17. doi: 10.1080/07352166.2021.1915151

Yazar, M., and York, A. (2022). Disentangling justice as recognition through public support for local climate adaptation policies: Insights from the Southwest US. *Urban Climate.* 41, 101079. doi: 10.1016/j.uclim.2021.101079

Yazar, M., York, A., and Kyriakopoulos, G. (2021). Heat exposure and the climate change beliefs in a Desert City: the case of Phoenix metropolitan area. *Urban Climate.* 36, 100769. doi: 10.1016/j.uclim.2020.100769

York, A., and Yazar, M. (2022). Leveraging shadow networks for procedural justice. *Curr. Opin. Environ. Sustain.* 57, 101190. doi: 10.1016/j.cosust.2022.101190

York, A. M., Otten, C. D., BurnSilver, S., Neuberg, S. L., and Anderies, J. M. (2021). Integrating institutional approaches and decision science to address climate change: a multi-level collective action research agenda. *Curr. Opin. Environ. Sustain.* 52, 19–26 doi: 10.1016/j.cosust.2021.06.001