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Justice in urban climate policy: climate planning, finance, and action in U.S. cities

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Dissertation

JUSTICE IN URBAN CLIMATE POLICY:

CLIMATE PLANNING, FINANCE, AND ACTION IN U.S. CITIES

by

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DEDICATION

To Logan, who brightens my life every day. I will always be in awe that I found you.

To my parents, who selflessly gave away our time together for me to fulfill this dream.

To my brother, who drives me to be better for him.

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ABSTRACT

Climate change is one of the most important ethical issues of the twenty-first century, and cities play an essential role in the global response to this crisis. Urban scholars and practitioners now recognize the need to address justice and equity concerns associated with cities' responses to climate change, and calls for just urban transitions are proliferating across city halls. This increasing attention to climate justice is unfolding at the intersection of increasing climate impacts in cities, the aftermath of a global pandemic, and an impending economic recession. More than ever, the fate of local climate efforts is tied up in unknown dynamics around city revenue streams, state and federal funding priorities, and national economic circumstances. At the same time, critiques about the gaps between the rhetoric and reality of urban climate action persist among scholars, and many questions remain about whether and how city governments will be able plan for, pay for, and implement just climate efforts on the ground.

This dissertation contributes to our understanding of the politics of urban climate action and climate justice through an examination of the planning, financing, and implementation of justice centered climate efforts across cities in the U.S. I explore how justice is embedded, contested, and operationalized in cities' climate mitigation plans, the funding and financing of climate action, and the implementation of climate policies. I utilize a rich mixed-methods research design that combines systematic content analysis, multivariate logistic regression analysis, semi-structured interviews, participant observation, and in-depth case studies. I demonstrate that city governments across the U.S. are increasingly (i) explicitly integrating attention to justice into climate planning, (ii) reshaping fiscal policies, budgetary practices, and funding tools to incorporate climate and justice into municipal finance, and (iii) operationalizing justice on the ground through the implementation of climate action. These findings position cities as key leaders in the global struggle for climate justice. This dissertation raises provocative questions about the need to politicize scholarship on urban climate policy, bring attention to the mundane components of urban climate action, and reframe climate justice as a set of practices that continuously unfold throughout the policy process.

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LIST OF ABBREVIATIONS

BERDO………………………... Building Emissions Reduction and Disclosure Ordinance

CAG……………………………………………………….Community Advisory Group

CN……………………………………………………………….. Climate network staff

CO……………………………………………………………………………… Consultant

CP…………………………………………………………………………….. Climate plan

EP……………………………………………………………………………... Energy plan

FG…………………………………………………………….. Federal government official

FI………………………………………………………………… Financial institution staff

FY……………………………………………………………………………… Fiscal Year

GCM…………………………………………………………..Global Covenant of Mayors

MG………………………………………………………… Municipal government official

MHI………………………………………………………… Median household income

NP………………………………………………………………………… Non-profit staff

RE………………………………………………………….… Research institution staff

SP……………………………………………………………………… Sustainability plan

USCM…………………………………………………………...U.S. Climate Mayors

GLOSSARY

Climate justice refers to a concept and social movement that (i) recognizes the inequitable impacts of climate change, (ii) acknowledges that climate change is driven by the historical and structural processes of environmental racism, settler colonialism, heteropatriarchy, and racial capitalism, all of which structure human-environment interactions, (iii) highlights the inequitable impacts of climate action, and (iv) advances the pursuit and mobilization of justice through climate action.

Just urban transitions refer to just, fair, and equitable processes aimed at moving towards a post-carbon society in cities.

Policy implementation refers to the processes and activities undertaken by city governments and other actors to achieve the goals and objectives articulated in a policy or program. It describes the process of translating public policies into operational programs.

Rulemaking refers to the process of developing and issuing rules and parameters to implement and enforce a policy.

Urban climate action refers to the policies and programs aimed at mitigating greenhouse gas emissions and/or addressing the risks and impacts of climate change in cities.

Urban climate finance refers to any funding, debt financing, and other hybrid mechanisms that are used by city governments to cover the costs of urban climate action.

Urban climate governance refers to the ways in which public, private, civil society, and other actors articulate climate goals, exercise influence and authority over urban climate action, and manage urban climate planning and implementation processes.

CHAPTER 1: INTRODUCTION

Climate change is now widely acknowledged as one of the most important ethical issues of the twenty-first century (Robinson and Shine, 2018), and cities play an essential role in the global response to this crisis (Bulkeley, 2021; Fuhr et al., 2018). As both major sources of greenhouse gas emissions (UN Human Settlement Program, 2011) and key sites with acute climate vulnerabilities (Shi et al., 2016), cities have become important leaders in mobilizing climate action beyond the national and international levels (Angelo and Wachsmuth, 2020; Bulkeley, 2010a, 2021).

Thousands of cities globally have adopted climate plans (Hsu et al., 2020b; Negreiros et al., 2021) and recent scholarship has demonstrated that urban climate policies are increasingly being connected to wider issues of social justice (Bulkeley, 2021; Chu and Cannon, 2021; Diezmartínez and Short Gianotti, 2022). Bold calls for "just urban transitions" have proliferated among scholars, practitioners, and advocates (Hughes and Hoffmann, 2020), and references to justice are already becoming prominent in urban climate efforts (Bulkeley, 2021; Caggiano et al., 2023; Cannon et al., 2023; Chu and Cannon, 2021; Diezmartínez and Short Gianotti, 2022).

Urban climate action (i.e., policies and programs aimed at mitigating greenhouse emissions and/or addressing the risks and impacts of climate change in cities) is now unfolding in a time of "interlocking global crises" (Long and Rice, 2021), with the confluence of climate change, the aftermath of COVID-19, and an impending economic recession (Long, 2021). Climate efforts impose significant costs to cities and urban governments around the world are facing the challenge of identifying new revenue streams or redirecting existing funding sources to pay for climate policies and programs (Bigger and Millington, 2020; Hughes, 2017; Long, 2021). More than ever, the fate of local climate efforts is tied up in unknown dynamics around city revenue streams, state and federal funding priorities, and national economic circumstances (Barnhart et al., 2020; Mattar et al., 2021). This inevitably entangles global climate futures to the dynamics of urban climate finance.

The implementation of climate policies is also tied to complex governance processes shaped by existing material infrastructures, and the social, cultural, and political landscapes of the city (Luque-Ayala et al., 2018). In this sense, climate action is an intrinsically political project that raises important questions about power and conflict (Paterson, 2021). Informing and evaluating progress on just urban transitions will require scholars to develop a deeper understanding of the politics, dynamics, and justice implications of multiple aspects of urban climate action (Hughes and Hoffmann, 2020; Westman and Castán Broto, 2021).

This dissertation contributes to this agenda through an examination of the planning, financing, and implementation of urban climate action across cities in the U.S. I explore how justice is embedded, contested, and operationalized in cities' climate mitigation plans (Chapter 2), the funding and financing of urban climate action (Chapter 3 and Chapter 4), and the implementation of building decarbonization policies (Chapter 5) (see **Table 1** for a summary of the research design). Across this dissertation, I employ a rich mixed-methods research design that combines systematic content analysis, multivariate logistic regression analysis, semi-structured interviews, participant observation, and in-depth case studies to address two overarching research questions:

QA How are cities in the U.S. incorporating justice into the planning, financing, and implementation of urban climate actions?

QB How are the politics of climate justice shaped by and reshaping climate action and finance in U.S. cities?

Theoretical background

Urban climate action and the governance of climate change

Cities have been important sites of climate action for more than two decades (Bulkeley, 2010a, 2021; Fuhr et al., 2018; Hughes, 2017). Cities generate more than 70% of global CO_2 emissions and are already experiencing the impacts of climate change (Shi et al., 2016; UN Human Settlement Program, 2011). With the capacity to dramatically reduce greenhouse gas emissions, climate action in cities is viewed as essential for meeting the 1.5 ºC target set by the Paris Agreement (Castán Broto and Westman, 2020; Fuhr et al., 2018). Thousands of cities globally have adopted climate action plans and some have made headway in implementing urban climate action on the ground (Bulkeley, 2021).

The "first-generation" of urban climate action scholarship documented the emergence of cities as key actors in global climate governance, examined the development of voluntary carbon accounting and mitigation policies at the municipal level, and developed theoretical frameworks of multi-level governance, where cities engage in "vertical" negotiations of authority and competency between different levels of government (e.g., local, state, and federal), as well as "horizontal" national and transnational climate action networks (Betsill and Bulkeley, 2004; Bulkeley, 2005; Bulkeley and Betsill, 2005, 2013; Luque-Ayala et al., 2018; Rice, 2010). This research also produced insights into the characteristics and motivations of cities that initiate climate action efforts and their resulting policies and plans (Bulkeley, 2010a, 2013; Castán Broto and Westman, 2020; Hsu et al., 2020b; Krause, 2011; Westman et al., 2019). Pioneer cities in the 1990s concentrated on a limited number of cities in North America and Europe (Bulkeley, 2010a). These cities were often motivated by a sense of dissatisfaction with national and international climate action (Bulkeley, 2010a), driven by policy leaders within city governments and active local constituencies (Fuhr et al., 2018; Hughes, 2017), and supported by transnational climate networks (Bulkeley, 2010a, 2021).

Over time, climate action has become increasingly mainstream and taken on a "strategic importance" for all kinds of city governments worldwide (Bulkeley, 2021; Bulkeley and Betsill, 2013). While cities with larger, more educated, and wealthier populations are repeatedly found to be more likely to engage in climate planning (Fünfgeld et al., 2023; Hughes, 2017; Liao et al., 2019), climate action has expanded to a more geographically diverse range of cities, including in both the Global North and Global South (Bulkeley, 2010a, 2021), as well as "unlikely pioneers" such as smaller cities with limited capacities (Homsy, 2018a). Climate action has also moved beyond its narrow focus on emissions reductions and both scholarship and practice on climate adaptation and resilience have rapidly expanded (Bulkeley, 2010a, 2013). Considerable advances in the literature have also been made to map a long list of "enabling factors" for climate action, including supportive political and legal contexts, city autonomy, access to funding, vertical and horizontal coordination among levels of government, participation in climate networks, collaboration with private and non-governmental actors, as well the presence of local policy champions (Fuhr et al., 2018; Homsy, 2018a; Hughes, 2017; van der Heijden, 2019). However, studies of urban climate governance continue to be skewed towards larger cities in the Global North and knowledge about the practices of smaller cities across different urban contexts is still scarce (Birkmann et al., 2016; Byskov et al., 2021; Homsy, 2018a; Hoppe et al., 2016; Lioubimtseva and Cunha, 2020; Simon et al., 2021).

In parallel to this scholarship, a growing body of work has highlighted the gaps between the rhetoric and reality of urban climate policy, with cities repeatedly found to underdeliver on climate goals and achieving only limited emissions reductions (Bulkeley, 2010a; Bulkeley and Betsill, 2005; Hughes, 2017; Keskitalo et al., 2016; Neij and Heiskanen, 2021; Ryan, 2015; van der Heijden, 2019, 2021; Woodruff and Stults, 2016). This notion of an "implementation gap" (Fransen et al., 2023) among scholars is primarily based on studies that evaluate the post-facto outcomes of cities' programs, compare them to the original goals or targets adopted in climate plans, pledges, and policies, and black box the process of policy implementation (i.e., the process through which city governments translate goals and plans into operational and enforceable programs) (Bulkeley, 2021; Hughes, 2017; Keskitalo et al., 2016; Laurian and Crawford, 2016; Malloy and Ashcraft, 2020; Ryan, 2015; van der Heijden, 2021; Westman and Castán Broto, 2021). While this collective scholarship has revealed multiple barriers to urban climate mitigation and adaptation, from funding constraints and limited capacities, to lack of political will and issues of authority (Eisenack et al., 2014; Fünfgeld et al., 2023; Ryan, 2015), *the politics and dynamics of policy implementation* remain understudied (Bulkeley et al., 2013, p. 201; Hughes, 2017; Westman and Castán Broto, 2021). Many questions remain about the "politics and contested nature of low carbon urbanism" (Luque-Ayala et al., 2018) and we have a limited understanding of policy implementation through political and justice lenses (Biesbroek et al., 2015; Hughes, 2017). New scholarship is needed to unravel how urban policies are playing out on the ground.

Urban climate action as an issue of justice

An expanding body of scholarship on urban climate action and climate justice has shown that climate policies can and have led to unjust outcomes in cities (Bulkeley et al., 2014, 2013; Hughes and Hoffmann, 2020; Rice et al., 2019; Shi et al., 2016). Although lacking a universal definition, urban climate justice can be understood as a concept and social movement that highlights the intersections between climate change, climate action, and wider justice concerns rooted in the persistent forms of intergenerational, racial, and socioeconomic inequities that pervade urban areas (Bulkeley et al., 2014, 2013; Chu and Cannon, 2021; Robinson and Shine, 2018).

Urban climate action produces co-benefits, redistributes resources, reorganizes urban space, and impacts infrastructure with uneven effects within and beyond city boundaries (Bulkeley et al., 2014; Carley and Konisky, 2020; Shi et al., 2016; Wachsmuth et al., 2016). In particular, climate adaptation and resilience efforts, such as green infrastructure, stormwater management, and climate resilient development, have been widely scrutinized because of the unequal distribution of their benefits (Garrison, 2019;

Majekodunmi et al., 2020; Nesbitt et al., 2019; Thomas and Warner, 2019), their potential to drive "green" gentrification and displacement (Anguelovski et al., 2016; Chu et al., 2017; Shokry et al., 2020; Thomas and Warner, 2019; Yazar et al., 2020), the lack of community engagement and transparency in decision-making processes (Chu et al., 2017), and the limited attention to the historical and intersectional drivers of vulnerability (Ranganathan and Bratman, 2021).

The justice implications of climate mitigation policies have received relatively less attention (Hughes and Hoffmann, 2020), but a nascent literature on just urban transitions and energy justice suggests that mitigation policies also impact multiple aspects of urban life (Carley and Konisky, 2020; Diezmartínez and Zhang, 2023; Sovacool et al., 2016). This includes disparities in energy access and pricing (Carley and Konisky, 2020; McKendry, 2016; Sovacool et al., 2016), inequitable access to clean technologies (Carley and Konisky, 2020; Franklin and Osborne, 2017; McKendry, 2016) and low-carbon transportation (Hölscher et al., 2019; Rice et al., 2019), unequally distributed employment opportunities (Carley and Konisky, 2020; Markkanen and Anger-Kraavi, 2019; Schrock et al., 2015) and green gentrification (Rice et al., 2019; Wolch et al., 2014).

Given the myriad of ways in which climate mitigation and adaptation efforts can impact urban life, cities' climate actions have the potential to create, exacerbate, or redress existing social inequities and vulnerabilities in urban areas (Bulkeley et al., 2014, 2013; Carley and Konisky, 2020; Hughes and Hoffmann, 2020; Steele et al., 2015). Urban scholars and decision-makers could therefore benefit from understanding how different cities have conceptualized, operationalized, and addressed the justice implications of climate action policies on the ground and identifying the policy tools that have been developed to target these complex issues in urban areas (Chu and Cannon, 2021; Hughes and Hoffmann, 2020).

Climate justice as site of politics and contestation

A defining feature of climate action in cities is the complex landscape of politics within which climate decision-making unfolds. Urban climate action unfolds not only within multi-level spheres of vertical and horizontal governance structures (Bulkeley, 2005; Bulkeley and Betsill, 2005, 2013), but also within specific social and political contexts. This includes different landscapes of power relations, histories of urban development and dispossession, and local understandings of justice and equity that are particular to each city (Anguelovski et al., 2021; Chu, 2016; Hughes, 2017; Luque-Ayala et al., 2018; Westman et al., 2019).

Within this context, climate justice is not only an outcome of urban climate policies and programs, but also an influencing factor of the politics that drive cities' attention to and action on climate change (Hughes, 2020; Hughes and Hoffmann, 2020; Shi et al., 2016). Existing research suggests that urban climate efforts are shaped by city actors' notions of justice (Bulkeley, 2013; Bulkeley et al., 2014; Bulkeley, 2021; Cox, 2023a), and these notions are, in turn, related to the social, economic, cultural, and political context of the city (Shi et al., 2016). Scholars suggest that urban climate action is shaped by everyday contestations over justice, either implicitly or explicitly, and that the ways in which justice is understood and operationalized in a particular place are critical determinants of how climate actions come to be developed, implemented, and contested (Bulkeley, 2021; Bulkeley et al., 2014). This means that the politics of urban climate action and governance cannot be understood without the politics of climate justice.

New research must "unbound the politics of the urban" (Chu et al., 2018) and engage with deeper interrogations of local-level interactions, power structures, and, more broadly, the intimate connections between climate action and the political landscapes of the city (Hughes, 2017; Luque-Ayala et al., 2018; Westman et al., 2019) Doing so recognizes climate action as a political process (Tanner and Allouche, 2011) and brings attention to the ways in which climate action intersects and affects people's lived experiences (Chu et al., 2018; Luque-Ayala et al., 2018; Westman et al., 2019). New scholarship is also needed to understand the political processes through which climate action produces winners and losers and how different interests are mobilized in favor of or to the detriment of more just outcomes (Chu and Cannon, 2021; Hughes and Hoffmann, 2020).

Climate finance as an entry point to climate politics and justice

Urban climate finance is one of the most conspicuous entry points to examine climate politics in cities, yet it remains a vastly unexplored area of research (Hadfield and Cook, 2019; Hughes, 2017). I use the term urban climate finance to refer to any funding (direct spending), debt financing, and hybrid mechanisms used by cities to cover the costs of efforts to reduce greenhouse gas emissions or address the risks and impacts of climate change (Keenan et al., 2019; Long, 2021; Negreiros et al., 2021).

Mitigating and adapting to climate change inevitably costs money and cities consistently face the challenge of identifying new revenue streams or redirecting existing sources of funding to finance climate programs (Hughes, 2017; Peterson, 2018). Whether and how cities secure various forms of climate finance can significantly influence both the effectiveness and social impacts of climate policies, as it can play a decisive role in determining who has the power to participate in climate action and to decide the sectors, types of interventions, neighborhoods, and populations to which climate investments are directed (Colenbrander et al., 2018). Existing literature suggests that climate finance decisions are linked to perceptions of and tolerance for risk among investors (Christophers, 2018; Hadfield and Coenen, 2022), encouraging cities to prioritize investor-friendly climate projects over other priorities (Bigger and Millington, 2020; Gray, 2021; Long, 2021; Shi and Varuzzo, 2020). These financial dynamics may also set temporal limits around when and how climate projects get financed, thereby serving to "discipline" cities' climate ambitions to the "pace of finance" (Hadfield and Coenen, 2022) – a pace that may not always be aligned with the types of projects needed to pursue climate justice through time. These insights reveal the deep linkages between finance and inequality in cities, bringing to light the potential "structuring role" of climate finance on urban climate action and justice (August et al., 2022).

Frequently identified as barrier to the implementation of urban climate actions, (Fünfgeld et al., 2023; Hughes, 2017; Shi et al., 2015), urban climate finance can become an important determinant of the accessibility of just urban transitions within and across cities (Castán Broto and Westman, 2020; Hadfield and Coenen, 2022; Painter, 2020;

Ponder, 2021). However, we currently lack knowledge of how urban climate policies are, or should be, financed to enable the implementation of just climate action (Peterson, 2018). New research is needed to (i) identify the finance strategies that are either being piloted or proven to be successful in operationalizing different types of urban climate policies and programs in a timely, democratic, and equitable way, and (ii) understand how climate finance itself shapes the distribution of power between government, the private sector, and other actors within the city (August et al., 2022; Chu et al., 2018; Hughes, 2017; Peterson, 2018).

Such theoretical developments necessitate more empirical evidence on how cities in different contexts are currently paying for climate action (Hadfield and Cook, 2019; Hughes, 2017), how just climate efforts (either profitable or not) can be financially supported, and how values such as climate justice and ethics of care have been embedded in climate finance (Hadfield and Coenen, 2022). This entails accounting for both the quantitative distribution of financial resources and the "qualitative redirection of the purposes to which that power is applied" across cities (August et al., 2022).

Dissertation significance and contributions

My dissertation bridges scholarship on urban climate policy and governance with critical accounts of urban geography and climate justice to build new understandings of urban climate action. Specifically, my dissertation advances knowledge in four ways.

First, throughout all chapters of the dissertation, I bring attention to the *justice implications of cities' climate mitigation policies*. As mentioned before, climate mitigation has received relatively less attention in the urban climate justice literature, but efforts to mitigate greenhouse gas emissions in cities intersect with many aspects of urban life and distribute benefits and burdens with direct and indirect consequences for vulnerable populations (Hughes and Hoffmann, 2020). My dissertation brings attention to the justice impacts of urban climate mitigation across multiple sectors and builds both theory and empirical evidence about whether and how cities are integrating justice concerns into their climate mitigation efforts, including in climate planning (Chapter 2), the funding and financing of climate policies and programs (Chapter 3 and Chapter 4), and the process of policy implementation (Chapter 5).

Second, Chapter 3 and Chapter 4 build novel evidence on how cities are *funding* and *financing* climate action and the impacts of these financial decisions on the pursuit of urban climate action and just urban transitions. In these chapters, I demonstrate how municipal finance is intertwined with the logics of debt financing and examine the impacts of these relationships on cities' climate action and climate justice efforts. I showcase the structuring impacts of finance on climate action and the built environment, and introduce pathways through which climate and justice considerations are already being integrated into, and potentially transforming, municipal finance in the U.S. My findings position municipal finance as an emerging site of climate and justice politics, with consequences spanning across city boundaries and at multiple scales.

Third, my dissertation answers calls to move beyond research on climate planning by examining the *implementation* of urban climate action and climate justice policies in two ways. Chapter 3 and Chapter 4 investigate the funding and financing of climate action, a key step in operationalizing climate plans and policies on the ground (Fünfgeld et al., 2023; Hughes, 2017; Shi et al., 2015), with important consequences for justice in cities (Bigger and Millington, 2020; Christophers, 2018). Chapter 5 delves further into policy implementation through an in-depth case study of the rulemaking process of a building decarbonization program. By examining the politics and processes through which city governments are operationalizing climate justice and climate action on the ground, I provide insights into the complex challenges that cities may face as they begin to operationalize climate justice. I argue for a shift in scholarship to politicize policy implementation and reframe climate justice as a *practice* that continues beyond policy planning.

Finally, the collection of cities examined throughout all chapters build novel empirical evidence on the practice of just climate action by capitalizing on the early experiences of pioneer cities in the U.S. Focusing on these "positive" cases provides an early opportunity to learn from the experiences of leaders and examine emerging innovations in an outcome of interest (i.e., climate mitigation plans that explicitly integrate justice concerns, municipal budgets that embed climate and justice, climate funding tools, implementation of just climate action, etc.) (Hughes, 2020). Moreover, by giving direct attention to *cities of all sizes* in Chapter 3 and Chapter 4, I also expand on existing scholarship on urban climate policy and climate finance, both of which have been overwhemingly dominated by large cities (Homsy, 2018a; Hoppe et al., 2016; Lioubimtseva and Cunha, 2020). Analyzing the particular successes and practices of smaller cities is critical in the context of climate action and climate finance, as these cities are generally found to lag behind as a result of fewer human and capital resources, less political power, less connections with urban climate networks, and are more largely dependent on state and regional policy institutions (Birkmann et al., 2016; Homsy, 2018b; Lioubimtseva and Cunha, 2020; Lusk and Gunkel, 2018). Chapter 3 and Chapter 4 respond to this gap by explicitly studying and comparing climate finance practices across small (25,000-100,000 residents), midsize (100,000-300,000 residents), and large cities (300,000+ residents).

Dissertation overview

The following section provides an overview of the motivation, research questions, methods, and key findings from each chapter of the dissertation. **Table 1** summarizes the dissertation's research design and contributions.

Table 1. Summary of research design

<table>
<tr><th colspan="2"></th><th>Research gaps</th><th>Methods</th><th>Contributions</th><th>Outputs</th></tr>
<tr><td>CLIMATE PLANNING</td><td>Chapter 2</td><td>• Little attention to mitigation in urban climate justice scholarship.
• Paucity of policy guidance on how to pursue just urban transitions.</td><td>• Systematic content analysis
• Logistic regression</td><td>• Builds a comprehensive picture of how justice concerns are articulated in urban climate mitigation plans across large cities in the U.S.
• Highlights local factors that may influence cities' level of engagement with justice.
• Collects novel empirical evidence from leading cities that are explicitly planning for justice.
• Identifies concrete policy tools that leading cities are using to operationalize climate justice efforts.</td><td>• Academic paper published in Nature Communications
• Conference poster
• Invited panel presentation
• Invited presentation</td></tr>
<tr><td rowspan="2">CLIMATE FINANCE</td><td>Chapter 3</td><td rowspan="2">• Lack of empirical evidence on how cities fund and finance climate action.
• Lack of theory on the relationships between urban climate finance, climate action, and climate justice.
• Lack of empirical research on the implementation processes of climate action, especially justice-oriented climate action.
• Little attention to smaller cities in urban climate action and climate finance literature.
• Little attention to mitigation in urban climate justice scholarship.</td><td>• Expert interviews</td><td>• Collects evidence of how cities of all sizes, including small and midsize cities, fund and finance climate action.
• Builds a theoretical framework about how climate finance impacts the implementation of climate policies and climate justice efforts.
• Examines how the pursuit of urban climate action and climate justice is impacting municipal finance.</td><td>• Academic paper published in Nature Climate Change
• Conference presentation
• Invited academic seminar
• Invited panel presentation for radio
• Featured in Smart Cities Dive magazine</td></tr>
<tr><td>Chapter 4</td><td>• Expert interviews
• Systematic content analysis</td><td>• Collects evidence of how cities of all sizes, including small and midsize cities, fund and finance climate action.
• Examines how the pursuit of urban climate action and climate justice is impacting municipal finance.
• Identifies policy tools that cities of all sizes are using to integrate of climate and justice concerns into municipal finance processes and decisions.</td><td>• Academic paper under review in Urban Studies
• Invited academic seminar
• Invited panel presentation for radio</td></tr>
</table>

CLIMATE ACTION	**Chapter 5**	• Lack of empirical research on the implementation processes of climate action, especially justice-oriented climate action. • Paucity of policy guidance on how to pursue just urban transitions. • Little attention to mitigation in urban climate justice scholarship.	• Participant observation • Semi-structured interviews • Systematic content analysis • In-depth case study	• Collects in-depth evidence about the politics and processes of implementing justice-oriented climate policies. • Collects novel empirical evidence on the strategies used by a leading city to operationalize climate justice in the context of a landmark building decarbonization program. • Identifies key challenges in translating climate justice from theory into practice.	• Academic paper under review in *Nature Cities*

Chapter 2. US cities increasingly integrate justice into climate planning and create policy tools for climate justice

Status. Published in Nature Communications (Diezmartínez and Short Gianotti, 2022).

Motivation and research questions. Chapter 2 responds to the limited attention to mitigation in urban climate justice scholarship by analyzing how the 100 cities with the largest populations in the U.S. have incorporated justice into their climate mitigation plans. This research complements insights from recent studies focused on climate adaptation and resilience planning and builds a comprehensive picture of urban climate justice efforts across the U.S. This chapter addresses two research questions:

> **Q2.1.** How has climate justice been integrated into urban climate mitigation planning?

Q2.2. What city characteristics influence cities' engagement with justice in climate mitigation planning?

Methods. I performed a systematic content analysis of the most recent climate action plans adopted by the 100 largest cities in the U.S. as of June 2021. I followed an iterative qualitative coding process, combining deductive and inductive coding. I first defined a preliminary protocol of coding themes and categories according to common topics discussed in the literature. I then moved beyond a purely deductive coding approach and allowed new themes and categories to emerge and be redefined inductively from the data. As I adapted the protocol, I conducted iterative rounds of focused coding to homogenize the analysis across all plans. I used ordinal logistic regression to identify local characteristics that may influence cities' level of engagement with justice in their climate mitigation plans and to determine whether cities' attention to climate justice has increased over time.

Results. There is a range of engagement with justice in urban climate mitigation plans. Forty of the 58 cities with a climate plan are attentive to justice (69%), either by *aspiring for justice* (20 cities, 34.5%) or by *explicitly planning for justice* (20 cities, 34.5%). Cities that aspire for justice articulate justice/equity as a goal, vision, guiding principle, or core value of their plan but do not describe policy actions or systematic strategies to implement or evaluate progress toward just climate mitigation. Cities that are planning for justice systematically embed justice/equity into the design of their climate policies through a variety of tools. Eighteen cities (31%) *do not articulate justice as a core feature of climate* *action*. These cities do not describe justice/equity as a goal of their plan and lack policies explicitly aimed at addressing these concerns.

Justice has become a more common feature of climate action planning in recent years. The year of publication of climate plans is a significant determinant of cities' level of engagement with justice, even after accounting for cities' sociodemographic, economic, and political characteristics. Several local factors may also increase the likelihood of cities incorporating justice into their climate action plans, including Median Household Income (MHI), poverty, population size, geographic location by the coast, and community engagement during the creation of the plan.

Pioneer cities are developing policy tools to integrate justice concerns into their climate policies. I categorize these tools as *justice partnerships, equity advisory boards, equity tools,* and *justice indicators*.

Chapter 3. Municipal finance shapes urban climate action and justice

Status. Published in *Nature Climate Change* (Diezmartínez & Short Gianotti, 2024)

Motivation and research questions. Chapter 3 responds to the lack of empirical data on urban climate finance practices and analyzes the relationships between municipal financial decisions and the implementation of climate action and climate justice efforts in cities. This chapter addresses four research questions:

Q3.1. How are city governments of all sizes funding and financing climate action?

Q3.2. How does urban climate finance influence the implementation of climate action in cities?

Q3.3. How does urban climate finance impact cities' ability to pursue climate justice efforts?

Q3.4. How does the pursuit of climate action and climate justice impact municipal finance?

Methods. I conducted a systematic analysis of 34 expert interviews focused on urban climate finance, climate action, and climate justice. I leveraged expertise from a diverse set of professionals working on different stages of the climate policy process and climate finance across cities of all sizes in the U.S. Participants were recruited using a snowball sampling method and the interviews followed a semi-structured approach. I transcribed and coded the interviews using an iterative qualitative coding process that combined deductive and inductive coding.

Results. Cities across the U.S. use a wide range of funding and debt financing tools for climate action. This includes municipal revenues, grants, municipal bonds, loans, and hybrid mechanisms such as public-private partnerships.

Climate finance is shaping the implementation of cities' climate action and justice efforts in contradictory ways. On the one hand, cities' investments and public spending decisions are underpinned by financial logics that may constrain climate action and reinforce cities' structural tendencies for uneven urban development. On the other hand, cities are also responding to increasing community pressures and funding requirements to incorporate climate action and justice into their financial practices and budgetary choices.

Financial constraints can limit the types of climate actions that cities can pursue, restrict the timing and lifespan of climate efforts, and shift power away from city governments and local communities to decide what climate programs and policies are worth investing in. This is true not only for debt financing tools, but also for the more mundane budgetary decisions and everyday practices that cities use to pay for climate action. City governments are incentivized to make public spending decisions that follow financial logics and enable them to enhance their revenues, shield their budgets, and increase their debt affordability. These financial choices may produce material consequences that are neither climate sound nor just.

At the same time, urban politics and the rise of justice-oriented funding mandates are increasingly pushing cities to give more attention to the intersection of climate action and justice. Some cities are already integrating climate and justice criteria to their budget allocation processes and re-imagining traditional funding tools to pay for climate action and shift the power to make public spending decisions back to the community. These early efforts may hint at possible avenues through which climate action and justice may transform cities' financial practices, democratize public spending, and reframe who and what is worthy of debt and funding in cities.

These results support the conceptualization of municipal finance not only as a force that structures public policy, but as a set of ethical and political choices that can be transformed in the service of justice.

Chapter 4. Climate change and municipal finance: budget impacts and just urban transitions

Status. Under review in Urban Studies.

Motivation and research questions. Chapter 4 builds on the results of Chapter 3 to explore how the increasing attention to urban climate action and climate justice may transform cities' financial practices. Chapter 4 contributes to research questions Q3.1. and Q3.4 described in Chapter 3.

Methods. Building on the expert interviews from Chapter 3, I conducted a systematic content analysis of the municipal budgets from fifteen cities of all sizes for the last five fiscal years (FY19-FY23). Selected cities met the following criteria: (i) the city has adopted a formal climate plan; (ii) the city has joined an urban climate network that welcomes membership from cities of multiple sizes (U.S. Climate Mayors and/or the Global Covenant of Mayors); and (iii) the city's adopted municipal budgets from FY 2019 - FY 2023 are publicly available online. I used an iterative qualitative coding process that combined deductive and inductive coding. For each city, I examined whether and how cities include any narratives related to climate and justice in their municipal budgets, identified policy tools cities are using to incorporate climate and justice considerations into budget allocation decisions, and identified proxy measures to estimate annual expenditures on climate action.

Results. Municipal budgets are facing increasing burdens as urban areas transition into climate-changed cities. Despite cities' growing attention to climate action and justice, climate policies and programs continue to be underfunded in U.S. cities, and these funding constraints exist across cities of all sizes. Both climate change and climate action generate new burdens on municipal budgets by increasing cities' expenditures and/or reducing their revenue streams. This, in turn, increases cities' fiscal vulnerability and reduces their capacity to (equitably) respond to climate change.

Even in cities that have been formally engaged in climate action for more than two decades, it is usually not possible to identify and monitor the amount of money that is being spent on climate action. The illegibility of climate expenditures in most municipal budgets suggests that budgetary processes, and municipal finance more broadly, have not fully been recognized as part of the realm of climate politics, and cities may not have received sufficient pressure to be accountable of their climate expenditures and investments.

There are two promising trends in the qualitative redirection of municipal finance. First, several cities have embedded climate and justice considerations into their municipal budgets by (i) recognizing the role that climate change and climate action play on cities' fiscal health; (ii) explicitly articulating climate action and/or justice as a budget priority area; and/or (iii) by developing budget allocation tools that systematically incorporate climate and/or justice criteria into budgetary decisions. Second, some pioneer cities are creating funding tools that earmark municipal revenues for climate action and climate justice efforts. Although budget allocation strategies and tax- and fee-based funding tools have long been part of the vernacular of municipal finance, the reimagining of these instruments for climate action is significant, as the lack of long-term, stable funding sources has been a constant barrier to climate action in the U.S. and beyond.

The growing fiscal challenges that cities are experiencing in the face of climate change and the emerging ways in which city governments are reimagining municipal finance to implement (just) climate action indicate that municipal finance will increasingly become an important site of climate and justice politics.

Chapter 5. Operationalizing climate justice in the implementation of Boston's Building Performance Standard

Status. Under review in Nature Cities.

Motivation and research questions. Chapter 5 continues the exploration of the dynamics and politics of policy implementation by analyzing the operationalization of climate justice through a case study of Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO). I investigate implementation by focusing primarily on the process of *rulemaking* (i.e., the development and issuing of regulations that establish rules and parameters to implement and enforce a policy). Rulemaking provides an arena for contesting and re-interpretating justice concerns already embedded in climate policies and thus is a critical space to analyze the implementation of climate action and justice. Chapter 5 responds to the following research questions:

Q5.1. How are city governments operationalizing climate justice through climate action policies?

Q5.2. How are justice concerns contested during the implementation of climate action policies?

Q5.3. What challenges are cities facing in operationalizing climate justice on the ground?

Methods. I used a mixed-methods approach rooted in five months of participant observation within the City of Boston's Environment Department, twenty expert interviews, and a systematic content analysis of hundreds of policy documents.

First, I conducted participant observation by working as a Policy Fellow at the City of Boston's Environment Department. In this role, I actively participated in the implementation of BERDO, with a particular emphasis on the rulemaking process. I worked directly with city staff to engage with community advocates, Boston residents, and regulated parties throughout the regulations process; prepare materials for public meetings; review and analyze public feedback; draft and revise rulemaking language; and support other implementation activities as needed. Second, I conducted twenty semi-structured interviews with city staff and community advocates and leaders involved in the implementation of BERDO. Finally, I conducted a content analysis of over 200 policy documents, records from public meetings, and public comments related to the rulemaking process. All data was analyzed using iterative qualitative coding process relying on inductive coding.

Results. To operationalize climate justice, city staff simultaneously sought to (i) elevate community voices in regulatory decisions through the formation of a Community Advisory Group composed of community advocates and leaders working on environmental justice, social justice, affordable housing, and climate action and (ii) maintain the buy-in of the regulated parties subject to BERDO, including real estate, hospitals, universities, and other building owners.

Contestations about justice formed an inextricable component of the implementation of BERDO. On the one hand, ideals of justice, equity, and fairness were mobilized by all actors to advance their interests and influence implementation decisions. These contestations impacted how BERDO was operationalized on the ground, both in terms of process (e.g. residents' engagement) and resulting implementation decisions (e.g., regulatory language). This was the case for a multitude of regulatory decisions, including seemingly technocratic topics without explicit justice mandates. On the other hand, policy implementation served as a site to contest and reinterpret the ordinance's justice goals and mandates, ultimately redefining what justice means and who is deserving of justice in the context of BERDO. This reveals climate justice not only as a principle of climate planning or as a policy outcome, but as a highly disputed political process in which competing ideals of justice are contested and translated into implementation decisions.

Three distinctive challenges arose from the pursuit to operationalize climate justice itself. First, implementing climate justice inherently requires action at multiple scales, and beyond the scope of a single program. A mismatch between goals and the reality of the legal boundaries of implementation can frustrate the operation of programs and weaken trust between city officials, advocates, and those who they aim to protect.

Second, translating climate justice into practice necessitates the *bureaucratization* or standardization of justice goals into concrete processes, measures, or criteria. This creates the risk of reducing justice into box-checking or scoring exercises that do not fully reflect justice ideals. However sophisticated, these tools also constitute projects of legibility that are never fully realized. Intangibles such as care, compassion, and understanding for others cannot be fully codified in artifacts like regulations and will need to evolve into everyday practices and quiet acts of justice through the mundane decisions that implementors will take moving forward.

Finally, justice can be *weaponized* to stall, impede, or co-opt implementation. Just implementation does require time to allow for meaningful engagement of community voices, particularly those who have been historically left out, but claims of procedural justice can also be strategically misused by some actors to impede implementation. New urban climate justice measures run the risks of being co-opted by actors to advance their own interests or used in bad faith or in ways that undermine participatory processes.

CHAPTER 2:

US cities increasingly integrate justice into climate planning and create policy tools for climate justice

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Abstract

Climate change is one of the most important ethical issues of our time. Urban scholars and policymakers now recognise the need to address justice concerns associated with cities' responses to climate change. However, little empirical research has examined whether and how cities have integrated justice into climate mitigation planning. Here, we show that large cities in the US are increasingly attending to justice in their climate action plans and that the recognition of structural and historical injustices is becoming more common. We demonstrate that justice is articulated differently across mitigation sectors, uncover local characteristics that may impact cities' level of engagement with justice, and introduce four policy tools that pioneer cities have developed to operationalise just climate policies on the ground. More attention to justice in policy implementation and evaluation is needed as cities continue to move toward just urban transitions.

Introduction

Climate change is increasingly understood as intertwined with concerns about justice and equity (Bulkeley et al., 2013; Falkner, 2019; Okereke and Coventry, 2016; Robinson and Shine, 2018; Shi et al., 2016). It is widely known that climate change is disproportionately impacting the most vulnerable populations worldwide, even as many of these groups have contributed the least to global greenhouse gas emissions (Reckien et al., 2017; Shi et al., 2016; Steele et al., 2015). More recently, the linkages between equity and climate responses, including both actions taken to mitigate and to adapt to climate change, have been recognized. Climate efforts produce benefits and burdens, distribute resources, reorganize space, and impact infrastructure with uneven consequences across communities and populations. Climate action thus has the potential to exacerbate or redress existing social inequities and vulnerabilities (Bulkeley et al., 2014, 2013; Carley and Konisky, 2020; Hughes and Hoffmann, 2020; Steele et al., 2015).

The nexus of climate action and justice is particularly pronounced in cities. Most of the world's population lives in cities and urban areas generate more than 70% of global CO2 emissions (UN Human Settlement Program, 2011). Cities have been important sites of climate action for more than two decades (Bulkeley, 2010a; Fuhr et al., 2018; Hughes, 2017; Okereke, 2018) and recent efforts such as the United Nations Race to Zero and the Race to Resilience aim to spur a transition to net-zero cities and catalyse urban climate projects. The actions cities take to reduce emissions and adapt to climate change will produce benefits as well as unintended consequences that are likely to be distributed unevenly within and beyond city boundaries (Bulkeley et al., 2014, 2013; Shi et al., 2016; Wachsmuth et al., 2016).

In light of the growing attention to climate justice at the global, national, and local scales, many city governments, advocates, and scholars have made bold calls for “just urban transitions” (Bulkeley, 2021; Hughes, 2020; Hughes and Hoffmann, 2020) or a “green and just recovery” (C40 Cities, 2020) following COVID-19. Informing and evaluating progress on this agenda requires a deep understanding of urban climate planning and action. While previous research suggests few cities have meaningfully incorporated equity or justice goals into their climate strategies (Bulkeley et al., 2013; Finn and Mccormick, 2011; Fitzgibbons and Mitchell, 2019; Hughes, 2015; Meerow et al., 2019; Mendez, 2015; Schrock et al., 2015; Van den Berg and Keenan, 2019), most analyses of urban climate plans focus primarily on climate adaptation and resilience (Chu and Cannon, 2021; Fiack et al., 2021; Fitzgibbons and Mitchell, 2019; Hughes, 2020, 2015; Lioubimtseva and Cunha, 2020; Meerow et al., 2019; Van den Berg and Keenan, 2019) or sustainability more broadly (Castán Broto and Westman, 2017; Pearsall and Pierce, 2010). The few studies that examine climate mitigation plans have been limited to a relatively small number of cities (Finn and Mccormick, 2011; Mendez, 2015; Schrock et al., 2015) or a few specific mitigation sectors (Hess and Mckane, 2021). We thus lack a comprehensive picture of how justice concerns have been integrated and institutionalised into urban climate action planning, and this has translated into a paucity of policy guidance on how cities can pursue more just urban transitions (Chu and Cannon, 2021; Hughes and Hoffmann, 2020).

Addressing this gap in knowledge is critical. Cities' policies to mitigate greenhouse gas emissions intersect with many aspects of urban life and redistribute resources with direct and indirect consequences for vulnerable populations. There is growing evidence that urban climate actions can lead to disparities in energy access and pricing (Carley and Konisky, 2020; McKendry, 2016; Sovacool et al., 2016), inequitable access to clean technologies (Carley and Konisky, 2020; Franklin and Osborne, 2017; McKendry, 2016) and low-carbon transportation (Hölscher et al., 2019; Rice et al., 2019), unequally distributed employment opportunities (Carley and Konisky, 2020; Markkanen and Anger-Kraavi, 2019; Schrock et al., 2015) and green gentrification (Rice et al., 2019; Wolch et al., 2014). Urban scholars and decision-makers could therefore benefit from understanding how different cities conceptualize the justice implications of climate mitigation policies and identifying the policy tools that have been developed to address these complex issues in urban areas.

Here, we show that large cities across the US are increasingly incorporating justice into their climate action plans and developing policy tools to integrate justice and equity concerns into their climate mitigation policies, particularly in the last five years. We conduct a content analysis of the most recent climate mitigation plans developed by the 100 largest cities in the US and provide a comprehensive assessment of the degree to which cities are attentive to justice in climate action planning. We find that the recognition of cities' historical patterns of racial segregation, disinvestment, environmental injustice, and exclusion is becoming more common in recent plans, although attention to justice is not equally distributed across mitigation sectors. We highlight local factors that may influence cities' level of engagement with justice in their climate action plans and uncover four concrete policy tools cities are using to implement and evaluate work toward "just urban transitions".

Results and discussion

Engagement with justice in urban climate action plans

Fifty-eight of the 100 largest US cities had an approved climate action plan as of June 2021 (**Supplementary Table 1**). For each of these cities, we conducted a content analysis of their most recent plan to evaluate if and how justice and equity are addressed in their climate mitigation policies. We coded climate plans across six main themes: (1) distributive justice; (2) procedural justice; (3) justice as recognition; (4) justice in climate mitigation sectors; (5) key definitions; and (6) key sections where justice is articulated (**Supplementary Table 2**).

We found a range of engagement with justice in urban climate action plans (**Table 2**). Forty cities (69%) are attentive to justice in their climate action plans, either by *aspiring for justice* (20 cities, 34.5%) or by *explicitly planning for justice* (20 cities, 34.5%). The 20 cities that aspire for justice articulate justice and/or equity as a goal, vision, guiding principle, or core value of their plan but do not explicitly describe policy actions or systematic strategies to implement or evaluate progress toward just climate mitigation. The 20 cities that are planning for justice systematically embed justice into the design of their climate policies by using justice and/or equity as a criterion to select policy interventions and/or by using justice focused policy tools to develop and operationalise climate action policies. Eighteen cities (31%) *do not articulate justice as a core feature of climate action*. These cities do not describe justice or equity as an objective of their plan and lack policy measures explicitly aimed at addressing justice concerns (**Supplementary Table 3**).

Table 2. Cities categorised by their level of engagement with justice in their climate action plan

Cities that do not articulate justice as a core feature of climate action	Cities articulating justice as an aspiration	Cities explicitly planning for justice
Austin, TX	Charlotte, NC	Anchorage, AK
Boise City, ID	Chula Vista, CA	Atlanta, GA
Chesapeake, VA	Columbus, OH	Baltimore, MD
Chicago, IL	Denver, CO	Boston, MA
Durham, NC	Detroit, MI	Cincinnati, OH
Fremont, CA	Indianapolis, IN	Cleveland, OH
Greensboro, NC	Madison, WI	Dallas, TX
Kansas City, MO	Milwaukee, WI	Houston, TX
Louisville, KY	Newark, NJ	Los Angeles, CA
Miami, FL	New Orleans, LA	Memphis, TN
Pittsburgh, PA	Norfolk, VA	Minneapolis, MN
Raleigh, NC	Oklahoma City, OK	New York, NY
Richmond, VA	Orlando, FL	Oakland, CA
Riverside, CA	Plano, TX	Philadelphia, PA
San Jose, CA	Reno, NV	Portland, OR
Santa Ana, CA	Sacramento, CA	San Antonio, TX
Stockton, CA	San Francisco, CA	San Diego, CA
Winston-Salem, NC	St. Louis, MO	Seattle, WA
	St. Paul, MN	St. Peterburg, FL
	Tampa, FL	Washington, DC

Justice has become a more common feature of climate action plans in recent years. Thirty-one of the 40 plans (78%) that incorporate justice were published between 2017 and 2021 (**Fig. 1**). Of the 22 plans published before 2017, only 22.7% articulated justice as an aspiration and 18.2% explicitly planned for justice. In contrast, of the 36 plans that were adopted between 2017 and 2021, 41.7% articulated justice as an aspiration and 44.4% explicitly planned for justice.

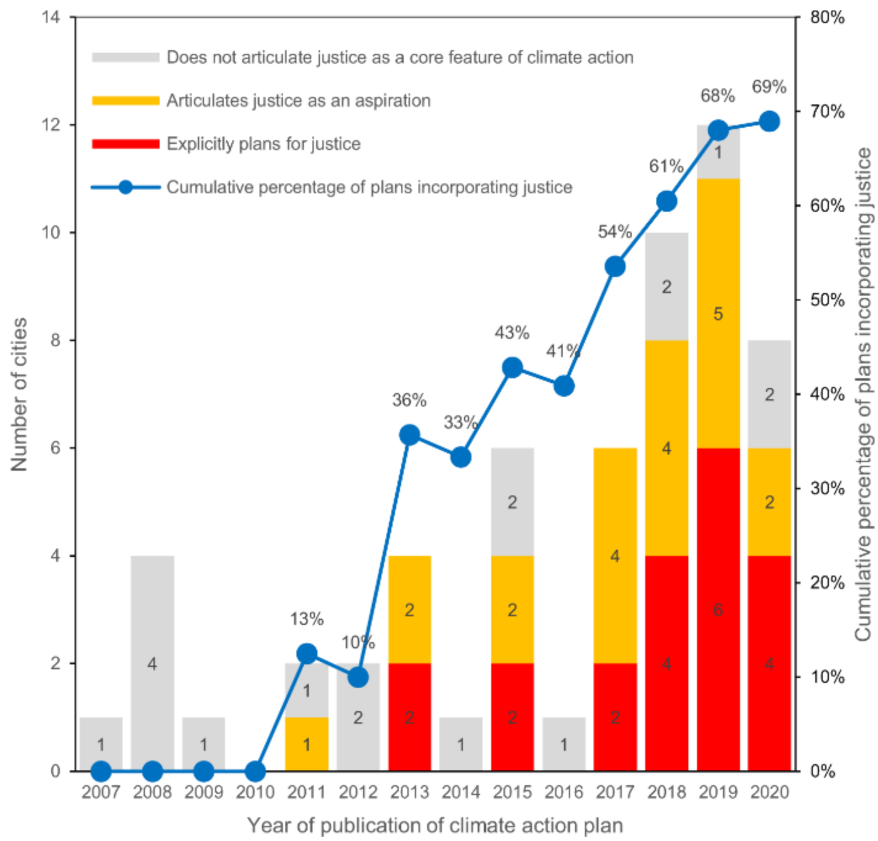

Figure 1. Engagement with climate justice over time
Number of cities in our sample that adopted or updated a climate action plan between 2007 and 2020. Cities are categorised according to their level of engagement with justice in policy action: cities that do not articulate justice as a core feature of climate action (grey), cities articulating justice as an aspiration (yellow), and cities explicitly planning for justice (red) (left axis). The blue line indicates the cumulative percentage of plans incorporating justice in any way (right axis). By 2020, 69% of all plans published between 2007 and 2020 include justice.

Using ordinal logistic regression, we confirm that the time of publication of the climate action plans is a significant determinant of cities' level of engagement with justice, even after accounting for cities' sociodemographic, economic, and political characteristics (**Table 3**). Although previous studies have found limited evidence of clear relationships between city characteristics and their degree of focus on justice in climate mitigation and adaptation planning (Fiack et al., 2021; Schrock et al., 2015), we find that several local factors may increase the likelihood of cities incorporating justice into their climate action plans. First, cities with a higher Median Household Income (MHI) and cities with higher levels of poverty have increased odds of incorporating justice into their climate plans. This suggests that cities with more economic inequities (i.e., high incomes and high poverty rates) are paying more attention to justice. Similar to Hess and Mckane (2021), we find no evidence that higher population diversity positively impacts cities' level of engagement with justice. However, our model supports the finding by Liao et al. (2019) that public engagement in climate planning is associated with greater attention to justice. We also find that cities with larger populations are more likely to have higher levels of engagement with justice. This may be due to the higher capacities of large cities to undertake more complex planning efforts (Chu and Cannon, 2021; Liao et al., 2019), but it might also reflect broader trends of big cities increasingly creating climate action plans in general (Bulkeley, 2021; Fuhr et al., 2018). Finally, we find that coastal cities have increased odds of engaging with justice, while legacy cities (i.e., post-industrial cities) have decreased odds. This could be explained by cities' differential levels of vulnerability to climate change and governance capacities. Case studies in these different types of geographies could help understand and disentangle the complex dynamics of climate action and justice planning in these contexts.

Table 3. Local factors and climate plan characteristics and their effect on cities' level of engagement with justice in climate action planning

Variable	Variable Description	Regression Results				
		Coefficients	Standard Error	*Z* value	P-value	Odds Ratio
After 2017	Climate plan published after 2017	2.3984	0.7317	3.278	0.0010 **	11.0053
Population	City population > 500,000	1.4528	0.6446	2.254	0.0242 *	4.2749
MHI	MHI > sample mean $61,532	3.2287	1.0585	3.050	0.0023 **	25.2472
Poverty	Percentage of persons in poverty, 2019	0.3997	0.1176	3.399	0.0007 ***	1.4914
People of color	Percentage of population who did not identify as "White alone, not Hispanic or Latino". This includes African American, Native American, Native Hawaiian and Pacific Islander, Asian, Hispanic or Latino, or two or more races, 2019	-0.0660	0.0245	-2.691	0.0071 **	0.9361
Coastal city	City is geographically located by the coast	2.7406	0.8063	3.399	0.0007 ***	15.4966
Legacy city	City has been classified as a legacy city	-1.5219	0.9222	-1.650	0.0989	0.2183
Engagement	City mentions engaging with local community members for the climate plan	3.6967	1.4454	2.558	0.0105 *	40.3139
Intercept Category 1 | 2		9.143	2.755	3.319	0.0009 ***	9,345.4134
Intercept Category 2 | 3		11.816	2.969	3.980	0.00006 ***	135,464.8602
McFadden Pseudo-R^2			36.72%			

Dependent variable is an ordinal variable that classifies cities' level of engagement with justice in their climate plans into three categories: Category 1: cities that do not articulate justice as a core feature of their climate plan; Category 2: cities that articulate justice as an aspiration; Category 3: cities that are explicitly planning for justice. Level of significance denoted as follows: *** *p-value* < 0.001; ** *p-value* < 0.01; * *p-value* < 0.05. P-value was calculated through two-sided z-test ($Z > |z|$, $\alpha = 0.05$).

Articulations of justice and equity

Cities tend to use the language of "equity", rather than "environmental justice" or "climate justice". We find that when cities provide a definition for these concepts, they generally define "justice" as prioritising historically vulnerable communities and those disproportionately affected by climate change, while "equity" tends to be more broadly defined as ensuring equitable access and distribution of the benefits of climate policies. Cities' articulation of "equity" in lieu of "justice" aligns with previous analyses of climate adaptation plans that found that discourses around the distribution of benefits and burdens of climate efforts dominate over deeper accounts of structural injustice (Chu and Cannon, 2021; Fiack et al., 2021; Fitzgibbons and Mitchell, 2019; Hughes, 2020; Meerow et al., 2019). Nonetheless, we also find that 15 cities (26%) recognise and articulate their histories of racial segregation, disinvestment, environmental injustice, and exclusion. For instance, the climate plans of Portland (2015), Dallas (2020), and Washington D.C. (2018) incorporate narratives of their own institutional discriminatory practices and identify the specific neighbourhoods or census tracts that have been historically disadvantaged within their boundaries. This attention to the history of structural injustice is recent, with 12 of the 15 plans (80%) that articulate narratives of structural injustice published in or after 2018.

Cities that recognise historical and current injustices are primarily focused on racial and income inequalities, with less consistent attention to vulnerabilities and injustices associated with gender, age, or disability. This emphasis on racial and economic justice has also been identified in climate adaptation plans (Chu and Cannon, 2021; Hughes, 2020; Meerow et al., 2019; Van den Berg and Keenan, 2019), perhaps reflecting US cities' long history of racial discrimination, segregation, and income inequalities, as well as the rise of grassroots movements demanding city governments to address these structural issues (Chu and Cannon, 2021; Hughes, 2020; Shi and Moser, 2021). The deficit of narratives connecting gender and disability with climate mitigation is noteworthy, but it is not unique to cities. Research has found that, from local to international spheres, few mitigation policies and regulations refer to gender, suggesting that the role of women is better recognised in adaptation than in mitigation (Huyer et al., 2020; Reckien et al., 2017). Similarly, scholars have identified a dearth of policy actions that are inclusive of people with disabilities in both climate mitigation and adaptation (Bell et al., 2020; Stafford et al., 2022; Stein and Stein, 2022).

While most plans analysed here were published before the outset of COVID-19, the City of Oakland's climate plan (2020) incorporates a narrative of how the pandemic has served to highlight the pervasive inequalities and disproportionate burdens experienced by "people of colour, small business owners, and income-insecure workers", and to further underscore the need for climate action "underpinned by climate equity and environmental justice". We can conjecture that new climate plans developed amid or after the COVID-19 pandemic will articulate similar narratives and include deeper accounts of structural injustice, particularly with respect to racial and economic inequities.

Attention to justice across mitigation sectors

We identified nine major mitigation sectors that US cities have included in their climate action plans: (1) energy efficiency (n = 57); (2) clean energy (n = 57); (3) land use and transport (n = 54); (4) waste (n = 50); (5) electric vehicles (n = 48); (6) urban greening (n = 29); (7) food (n = 18); (8) water (n = 21); and (9) air quality (n = 5). While equity concerns intersect multiple sectors (Hess and Mckane, 2021; Westman and Castán Broto, 2021), we find that cities' attention to justice is not distributed uniformly across policy areas (**Fig. 2a**). The most common sectors where cities connect mitigation to justice concerns are energy efficiency (47 out 57 plans addressing this sector incorporate justice), clean energy (36 out of 57), and land use and transport (34 out of 54). In contrast, less than half of the cities we analysed link justice to policies related to waste (21 out of 50), electric vehicles (17 out of 48), water (4 out of 21), and air quality (2 out of 5). Although relatively few cities address urban greening and food as part of their mitigation strategies, more than half of these cities connect these policy areas to justice (15 out of 29 and 12 out of 18, respectively).

Figure 2b presents the main themes and policies that cities articulate with respect to justice for each mitigation sector. Cities primarily focus on addressing the direct justice impacts of climate action policies (e.g., energy burdens, access to technologies and services, etc.). Explicit attention to indirect impacts such as displacement and gentrification have received less attention overall (n = 10) and these discourses are most often connected to energy efficiency and land use and transport interventions.

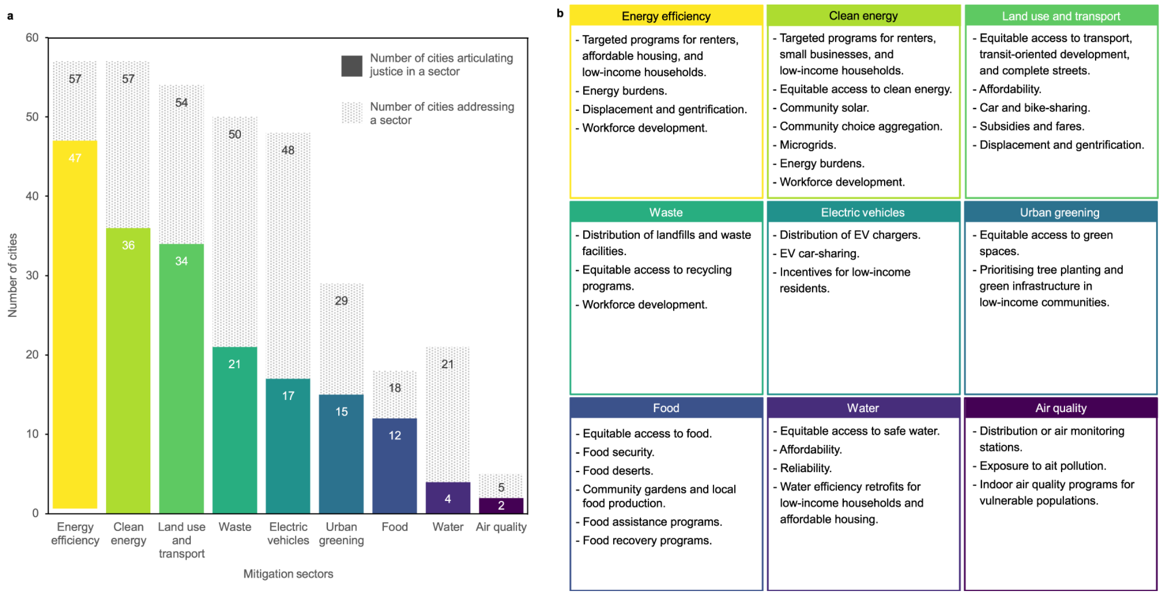

Figure 2. Attention to climate justice by mitigation sectors
a Number of cities that articulate justice in each mitigation sector. The dotted pattern represents the total number of cities that address each sector as a mitigation strategy within their climate action plan. Solid colours represent cities that articulate justice in each sector. **b** Main themes and policies discussed with respect to justice within each mitigation sector.

Several cities have also developed programs directed at targeted workforce development and outreach efforts. Fourteen cities (24%) include green jobs training programs for vulnerable populations such as people of colour, low-income residents, individuals with barriers to employment, women, youth, veterans, and workers affected by the energy transition. For example, the City of Madison's (2018) GreenPower Program hires under- and unemployed individuals and provides them with training for solar installation jobs. Eighteen cities (31%) also plan to undertake targeted outreach efforts aimed at informing historically vulnerable populations about available climate programs. For instance, the City of Dallas' plan (2020) includes the development of special engagement programs to reach low-income residents, the senior community, and nonnative English speakers, and provide them with information about new weatherization programs. Through this "focused engagement", the city expects to address common barriers to program participation and ensure that the benefits of weatherization reach those who need them the most.

Operationalising just climate policies

Several cities have already developed policy tools to implement and evaluate just climate policies. This finding is important, as scholars and practitioners involved in both climate adaptation and mitigation have repeatedly called out the lack of concrete tools and metrics to operationalise just climate policies on the ground (Bulkeley, 2021; Chu and Cannon, 2021; Hess and Mckane, 2021; Hughes and Hoffmann, 2020; Schrock et al., 2015; Shi et al., 2016; Woodruff and Stults, 2016). We categorise the policy tools we identified into four types: justice partnerships, equity advisory boards, equity tools, and justice indicators. Cities may use these instruments at one or more stages of the policymaking process, and they often involve the engagement of multiple community actors (**Fig. 3**).

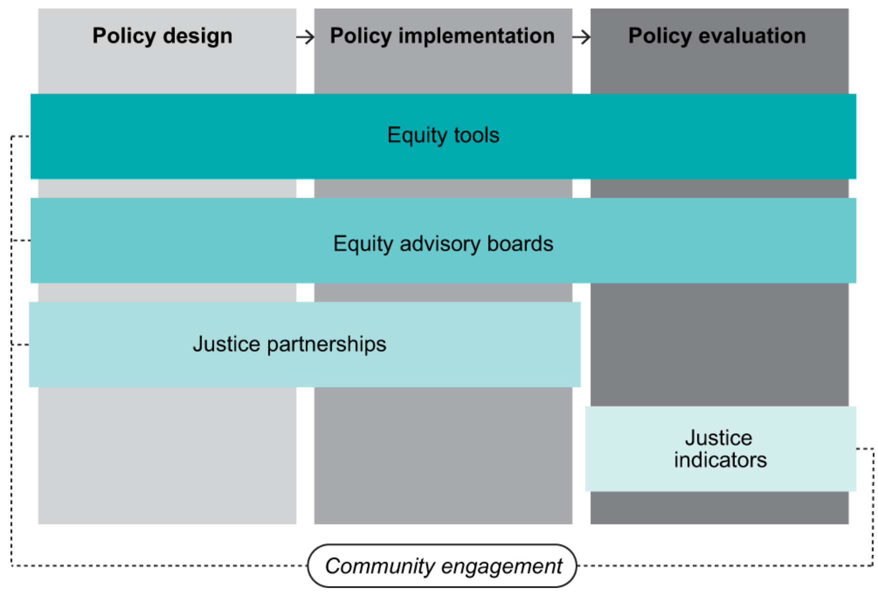

Figure 3. Policy tools and strategies to develop just climate policies
Equity tools and equity advisory boards can be implemented throughout the policy process. Justice partnerships are mainly focused on policy design and implementation. Justice indicators are used during policy evaluation. All policy tools and strategies may involve community engagement.

Seventeen of the 20 cities that are explicitly planning for justice describe leveraging justice partnerships to implement just climate policies. Community partnerships are a common strategy to operationalise climate policies overall. In fact, 40 cities in our sample (69%) mention the need to cooperate with local actors to reach their climate mitigation goals. In the context of justice, community partnerships are seen not only as practical necessity, but also as a tool to promote participation among historically underrepresented communities and to provide legitimacy to policies and programs. Justice partnerships are thus mainly focused on engaging with vulnerable groups, either directly or through environmental and social justice advocacy groups that represent them.

A second strategy to incorporate justice concerns into the operationalisation of climate policies is to create equity advisory boards (**Table 4**). These are groups of community members convened by city governments to facilitate the planning, implementation, and/or evaluation of just climate policies. Equity advisory boards are usually organised into one or more committees, subcommittees, or working groups and are granted varying levels of involvement throughout the policy process. In general, however, these boards are tasked with representing and engaging vulnerable populations, proposing justice centred policy objectives and actions, and reviewing policies and programs to ensure they are aligned with justice goals. In some cases, equity advisory boards are also responsible for developing equity tools themselves. Although the members of these boards are not explicitly listed in all climate action plans, we found that these groups are commonly comprised by residents, advocates, academics, representatives from the private sector, and government officials.

Table 4. Overview of equity advisory boards

City	Name of body	Policy stage	Members identified in climate plan	Main tasks and responsibilities
Anchorage, AK	(a) Steering committee (b) Advisory committee (c) Working group	Design, implementation, and evaluation	Community members, advocacy groups, academics, private sector, government officials.	(a) Community engagement and design of Equity Implementation Guide. (b) Review of plan drafts, equity-centred policy advice, implementation assistance. (c) Crafting equity-centred policy objectives and actions.
Atlanta, GA	Advisory group	Design and implementation	Community members, advocacy groups, private sector.	Crating policy goals, policy implementation advice, policy analysis and review.
Baltimore, MD	Sustainability ambassadors	Design	Community members	Community representation and engagement.

Boston, MA	Community working group	Design	Community members, advocacy groups, academics, private sector, government officials.	Policy design and advice.
Charlotte, NC*	Workforce development working group	Design	Advocacy groups, academics, private sector, government officials.	Ensuring equitable access and distribution of jobs.
Cleveland, OH	Equity and engagement subcommittee	Design and implementation	Advocacy groups, academics, private sector, government officials.	Design of Racial Equity Tool.
Dallas, TX	Environment and sustainability committee	Design and implementation	Government officials	Policy design, policy implementation guidance and assistance.
Los Angeles, CA	Climate Emergency Commission	Implementation	Community members, private sector, government officials	Community representation and engagement during implementation.
Minneapolis, MN	(a) Environmental justice working group (b) Community Environmental Advisory Commission	Design and evaluation	Community members, advocacy groups, academics, government officials.	(a) Community representation, policy design and advice, policy review. (b) Plan revision.
Oakland, CA	(a) Ad hoc advisory committee (b) Equity facilitator (c) Neighbourhood leadership cohort	Design and implementation	Community members, advocacy groups.	(a) Review of plan drafts, policy advise. (b) Community engagement, policy review, and design of the Racial equity impact assessment and implementation guide. (c) Community engagement.
Portland, OR	Equity working group	Design and implementation	Advocacy groups.	Policy design and advice, design of Equity implementation guide.
San Diego, CA	Equity stakeholder working group	Design and evaluation	Advocacy groups.	Policy design and advice, design of the Climate Equity Index
San Antonio, TX	Climate equity advisory committee	Implementation	Community members, advocacy groups.	Community representation, implementation guidance and assistance.

St, Louis, MO	Climate action planning equity advisory committee	Evaluation	Not stated in the plan.	Measurement of policy impacts.
St. Paul, MN	Advisory group	Implementation	Community members.	Policy implementation guidance assistance.
Washington, DC	Equity advisory group	Design and implementation	Community members.	Community representation and engagement, policy design, implementation guidance and assistance.

* This equity body is only focused on workforce development policies.

Six of the cities that are explicitly planning for justice have also developed or are in the process of developing an equity tool (**Table 5**). We define equity tools as decision-making frameworks that guide city governments to recognise and systematically incorporate justice and equity concerns throughout the policy process. Even though the scope of these instruments varies across cities, equity tools usually consist of a set of guiding questions or checklists that provide the basis for creating justice centred policies, identifying and engaging local community actors, developing implementation strategies, and/or analysing the justice and equity impacts of programs. Equity tools are one of the most novel strategies primarily geared toward the operationalisation of just climate policies. A recent example is the city of San Antonio's "Climate Equity Screening Tool", which includes over 30 guiding questions designed to identify the benefits and unintended consequences that policies may produce for local vulnerable groups. This tool will be used by key community actors to evaluate each strategy outlined in the climate action plan prior to implementation.

Table 5. Overview of equity tools

City	Name of tool	Policy stage	Main guiding themes	Authors and sources
Anchorage, AK	Equity implementation guide	Implementation and evaluation	Equity analysis, identification of community members, community engagement, evaluation.	Will be developed by the plan's Steering Committee and adapted from Portland's equity framework.
Baltimore, MD	Equity lens	Design, implementation, and evaluation	Community engagement, data gathering, accessibility, capacity-building, priorities of vulnerable populations, disproportionate impacts, economic opportunity, displacement, accountability.	Adapted from the Government Alliance for Race and Equity's "Equity Toolkit" and Portland's "Climate Equity Considerations".
Cleveland, OH	Racial equity tool	Design and implementation	Language, accountability and data, disproportional impacts, economic opportunity, neighbourhood engagement.	Developed by the plan's Equity and Engagement Subcommittee and adapted from the Government Alliance for Race and Equity and Portland's "Climate Equity Considerations".
Oakland, CA	(a) Racial equity impact assessment and implementation guide (b) Racial equity implementation guide	Design, implementation, and evaluation	(a) Equitable governance, community engagement, equitable investments, community resilience. (b) Racial equity outcomes, community engagement, data gathering, equity gaps, accountability.	(a) Developed by the plan's Equity Facilitator and adapted from the California Office of Planning and Research's "Resiliency Guidebook Equity Checklist", the NAACP's "Our Communities, Our Power"; the Movement Strategy Center's "Spectrum of Community Engagement to Ownership"; and material from the city of Oakland Department of Race and Equity (b) Developed by the city of Oakland Department of Race and Equity.
Portland, OR	Equity implementation guide	Implementation	Data gathering, accessibility, capacity-building, effective partnerships, equitable distribution of costs and benefits, community wealth building.	Developed by the plan's Equity Working Group.

San Antonio, TX	Climate equity screening tool	Implementation and evaluation	Access and accessibility, affordability, cultural preservation, health, safety and security.	Not stated in the plan.

Finally, eight cities have created or are planning to create justice indicators. These are comprehensive metrics to monitor and evaluate the justice and equity impacts of climate plans and policies (**Supplementary Table 4**). Unlike equity tools that provide broad guidelines to assess the consequences of climate programs, justice indicators enable cities to quantitatively measure the benefits and costs that climate policies bring to vulnerable populations and to track their progress toward their justice goals. For instance, the city of San Diego developed a "Climate Equity Index" to identify vulnerable communities across the city and measure the equity impacts of its climate policies over time. The index integrates over 30 standardised indicators covering multiple environmental, housing, mobility, socioeconomic, and health factors that are used to calculate a climate equity score for each of the census tracks within the city.

Moving toward just urban transitions

Our systematic analysis of climate action plans reveals that a transition toward urban climate justice governance is emerging in the US. This research complements insights from recent studies focused on climate adaptation planning and builds a comprehensive and nuanced picture of urban climate justice efforts across large cities in the US. Over the past two decades, cities engaged in climate planning have not only paid attention to justice with respect to climate adaptation. Justice and equity concerns have also played an increasingly important role in the design of urban climate action plans, progressively pushing cities to articulate more just and inclusive mitigation actions and to develop policy tools to implement and evaluate climate justice efforts.

While the increasing attention to justice is promising, we highlight three important caveats in this optimistic result. First, 42 out the 100 largest US cities have yet to adopt a city-wide climate action plan. Although urban climate plans have often been found to lack implementation guidance (Woodruff and Stults, 2016) and planning practice itself has led to mixed results in advancing climate action in the past (Chu and Cannon, 2021; Fuhr et al., 2018; Hsu et al., 2020b), the development of climate plans is still considered a critical step to systematise urban responses to climate change, provide engagement opportunities to local actors, and legitimise climate policies (Chu and Cannon, 2021; Finn and Mccormick, 2011; Hess and Mckane, 2021; Woodruff and Stults, 2016). Previous research shows that when municipalities report equity as a priority or goal in a formal planning document, they are more likely to adopt more actions related to social equity (Liao et al., 2019). Furthermore, climate plans provide a unique avenue to institutionalise justice-focused goals that can mobilise multiple community actors towards this collective purpose (Hofstad et al., 2021). Our findings regarding the increasing attention to climate justice and the recognition of structural injustice in cities suggest that urban policymakers and activists should regard local climate plans as a key tool to advance just urban transitions in their communities.

The second caveat emerging from our analysis is that there is a need for more comprehensive approaches to justice across and beyond climate mitigation sectors. Local climate actions plans are commonly organised by sector-specific chapters that reflect city government's own divisions across departments (Hess and Mckane, 2021). Our results indicate that this practice has translated into sector-specific articulations of justice, an uneven attention to justice and equity across mitigation sectors, and little emphasis on the indirect impacts of policies (Fig. 2). The articulation of sector-specific justice concerns is also present in climate adaptation planning (Chu and Cannon, 2021; Meerow et al., 2019). Previous analyses of climate adaptation plans have found that cities commonly articulate justice within the context of public health, affordable housing, transit, green infrastructure, and economic opportunities (Fiack et al., 2021; Fitzgibbons and Mitchell, 2019). This aligns with cities' attention to the burdens that energy efficiency, clean energy, transportation, and urban greening policies may impose on low-income households, as well as their focus on the equitable distribution of employment opportunities created by climate mitigation. However, we find that cities devote less consistent attention to public health in climate mitigation plans, which may explain the relatively few references to justice issues related to the food, water, and air quality sectors. These sectoral approaches across climate mitigation and adaptation plans are not always adequate to address the justice implications of climate change and climate policy because issues may arise at the intersection of two or more sectors or due to aggregation of multiple climate interventions (Bulkeley, 2021; Chu and Cannon, 2021; Hess and Mckane, 2021; Westman and Castán Broto, 2021). For example, the combination of low-carbon and adaptation policies such as urban greening, transit-oriented developments, and energy-efficient housing, may cause the displacement of low-income residents out of improved neighborhoods (Bulkeley, 2021; Rice et al., 2019). Just urban transitions require shifting away from narrow sector-by-sector approaches and pursuing systemic efforts to transform local economies and urban life itself (Bulkeley, 2021; Westman and Castán Broto, 2021). This calls for urban decisionmakers and scholars to look beyond the direct consequences of specific types of policies and address the broader, cross-sectoral implications of climate action. Investigating why cities devote unequal attention to justice across sectors and the implications of these sectoral differences are important open questions for future research.

A final caveat is that most climate plans in our sample have not yet articulated specific strategies to operationalise just climate policies on the ground. Moving towards just urban transitions entails the development and implementation of tools that can guide urban decisionmakers on how to allocate climate efforts and resources, how to recognise who should be prioritised, who needs to be included and informed about climate efforts, and what trade-offs are necessary to build a just low-carbon society (Hughes, 2020; Hughes and Hoffmann, 2020; Meerow et al., 2019). Our analysis identified a group of pioneer cities and four concrete implementation tools (i.e., justice partnerships, equity advisory boards, equity tools, and justice indicators) that can serve as models for other cities involved in climate action planning. Because most climate plans and policy tools examined here have been developed only in the past few years, our analysis cannot assess whether and how these tools have been successful at addressing historical and structural injustices, engaging and empowering vulnerable populations, and ultimately enabling socially just outcomes. However, our findings provide a baseline to inform and guide future research focused on just implementation efforts. Case studies in cities such as Oakland, Cleveland, Baltimore, or San Antonio, where just implementation and evaluation tools are being developed, can help address these open questions.

At the same time that cities have evolved into essential sites for global climate policy (Angelo and Wachsmuth, 2020; Henrique and Tschakert, 2020; Hughes and Hoffmann, 2020; Okereke, 2018), climate governance itself has become a strategic priority of urban politics (Bulkeley, 2021; Castán Broto and Westman, 2020). As questions of justice and equity in the city rise on the agenda, we can expect that climate justice will also become a fundamental component of urban governance over the next decade (Bulkeley, 2021). New opportunities arise as the COVID-19 pandemic and recent social movements such as Black Lives Matter increase the salience of systemic injustices and reignite collective calls for justice and social transformation (Henrique and Tschakert, 2020). At this critical time, this research can help urban decisionmakers and other key actors in cities to identify how climate justice can be embedded within local climate action efforts, recognise potential benchmarks and learning opportunities from other cities, and reflect upon the ways in which local policies may or may not be aligned to pursue just urban transitions.

Our study presents a comprehensive picture of how large cities in the US have integrated justice into climate mitigation planning and provides an important step towards understanding how new policy tools can support the implementation of justice focused urban climate policies. As urban climate justice becomes more prevalent in the US and globally, scholars and urban decisionmakers need to ask new questions about climate governance and identify the best pathways and policy tools that facilitate the implementation and evaluation of just climate policies. Understanding the emerging dynamics of climate justice governance and analysing how innovative policy instruments such as justice partnerships, equity bodies, equity tools, and justice indicators operate on the ground are crucial next steps to support and inform future efforts towards just urban transitions.

Methods

To examine the emergence of climate justice in urban climate mitigation planning, we analysed local climate action plans adopted by the 100 largest cities in the US. The list of cities included in our study was defined according to the US Census Bureau 2019 population estimates. We focus on large cities because (a) these urban areas are more likely to have more diverse populations that experience relatively pronounced poverty and income disparities (Fiack et al., 2021; Schrock et al., 2015) and (b) their governments are more likely to have more resources and capacities to undergo complex climate planning processes that incorporate justice and equity (Chu and Cannon, 2021; Homsy, 2018b). Moreover, focusing on large cities enables us to compare our findings across previous studies, most of which examine climate planning in large cities (Chu and Cannon, 2021; Fiack et al., 2021; Hess and Mckane, 2021; Hughes, 2020; Schrock et al., 2015; Van den Berg and Keenan, 2019).

Sampling of climate action plans

We built our sample by collecting the most recent climate action plan available for each of the 100 largest cities in the US. We define climate action plan as any formal local planning document adopted by a city government that explicitly addresses multiple sectors of climate mitigation. This definition includes climate plans exclusively focused on mitigation, climate plans integrating mitigation and adaptation or resilience, as well as sustainability and energy plans with chapters or sections explicitly dedicated to climate mitigation. We excluded city plans that are only focused on climate adaptation or resilience, plans that are written by state or regional entities, and plans that are written by local entities (e.g., local non-profits, universities) but not formally adopted by city governments. Our definition of climate action plan enabled us to capture a comprehensive and nuanced picture of cities' discursive representations of climate justice with respect to climate mitigation, while also maintaining a relatively consistent and comparable sample.

We collected plans through targeted internet searches in Google (e.g., "city name" + "climate action plan"), city government websites, and the Local Government Climate and Energy Goals database developed by the American Council for an Energy-Efficient Economy. For each city, we selected the most recently adopted climate action plan that fit our definition as of June 2021. Several cities in our sample had published multiple plans over the past decade. In cases where the most recent plan updated or superseded earlier plans, we reviewed only the most recent plan. However, in cases where the most recent plan complemented an earlier plan, we reviewed both the most recent and previous versions of the plan. In total, we found that 58 out the 100 largest US city had an eligible climate action plan to include in our analysis (**Supplementary Table 1**).

Coding protocol and procedures

We coded the selected climate action plans following a two-stage qualitative coding process. In stage 1, we defined a preliminary protocol of coding themes and categories according to common topics discussed in the literature (Bulkeley et al., 2014, 2013; Hughes, 2013; Schlosberg, 2012; Shi et al., 2016). These included the three dimensions of climate justice (distributive justice, procedural justice, and justice as recognition), as well as other key concepts related to justice and equity, mitigation sectors, and policy strategies. We define distributive justice as the fair allocation of the benefits and burdens of climate change and climate policy (Bulkeley et al., 2014); procedural justice refers to inclusive participation and engagement in decision-making processes (Hughes, 2020; Van den Berg and Keenan, 2019); and justice as recognition refers to the respect and valuing of all people in climate governance and requires the acknowledgement of historic and ongoing inequities as well as the pursuit of efforts to reconcile these inequities (Bulkeley et al., 2014; Carley and Konisky, 2020; Hughes, 2020).

The preliminary protocol was pre-tested independently by each author on five climate action plans. This pre-testing enabled us to assess the robustness and clarity of the protocol and to refine coding categories before proceeding to the next stage. In stage 2, we began by using the preliminary protocol designed to code all plans within our sample. Here, we moved beyond a purely deductive coding approach and allowed new themes and categories to emerge and be redefined inductively from the data. All emerging categories were continuously discussed and agreed upon by both authors. As we adapted the protocol, we conducted iterative rounds of focused coding to homogenise our analysis across all plans. The final protocol included 98 sub-categories and 18 main categories organized across six general themes: (1) distributional justice; (2) procedural justice; (3) justice as recognition; (4) justice in climate mitigation sectors; (5) key definitions; and (6) key sections where justice is articulated (**Supplementary Table 2**). We used NVivo 12 Pro software for all coding procedures.

Since our goal was to understand how cities are articulating climate justice with respect to climate mitigation, we only coded the sections and excerpts explicitly related to climate action in each plan. This means that in all plans not exclusively focused on mitigation, we did not code any chapters dedicated to climate adaptation, resilience, or any other sectors that were not explicitly recognised as a strategy to reduce greenhouse gas emissions. These restrictions helped us narrow our analysis to the climate justice discourses more directly associated with climate mitigation.

Logistic regression analysis

We use ordinal logistic regression to identify local sociodemographic, economic, and political characteristics that may influence cities' level of engagement with justice in their climate action plans and to determine whether cities' attention to climate justice has increased over time.

Our dependent variable is an ordinal variable that measures cities' engagement with justice according to the city categories found through our analysis (i.e., Category 1: cities that do not articulate justice as a core feature of their climate plan; Category 2: cities that articulate justice as an aspiration; and Category 3: cities that are explicitly planning for justice). Our predictor variables are comprised of a set of cities' local sociodemographic, economic, and political factors. This data was obtained from the 2019 US Census estimates and the 2015–2019 American Community Survey. We also control for important characteristics of the climate plans themselves, including the year of publication, which was used to determine whether attention to justice has increased over time. All predictor variables were pre-selected through a literature review of previous research on urban climate action and climate justice (Fiack et al., 2021; Homsy, 2018b; Lee, 2013; Liao et al., 2019; Schrock et al., 2015). **Supplementary Table 5** presents the descriptive statistics and description of the dependent variable and all predictor variables considered for analysis.

The specification of our model was selected through forward and backward stepwise regression using the Akaike Information Criterion AIC (Wasserman, 2004). We first fit a baseline model that included all predictor variables included in **Supplementary Table 5** and applied the stepAIC function from R's MASS package with "both" as the direction of the selection technique. This command uses forward and backward stepwise regression to select the model specification that minimizes the Akaike Information Criterion. We also performed ANOVA to test whether the final model selected through stepAIC is better at capturing that data than the baseline model. This enabled us to verify that the additional variables present in the baseline model do not significantly improve the fit of the model. We tested the assumption of no multicollinearity through the Variance Inflation Factor test, using the general rule that if the Variance Inflation Factor for all parameters is less than 5, there is no evidence of multicollinearity. We also tested for the proportional odds assumption using the Brant test, which assesses whether the observed deviations from the ordinal logistic model are larger than what could be attributed to chance alone. Although there is no single agreed upon measure of goodness-of-fit for logistic regression (Wasserman, 2004), we decided to include the McFadden Pseudo-R2 to assess the fit of our model. Higher values of McFadden Pseudo-R2 indicate a better model fit, and values between 20% and 40% are usually considered highly satisfactory.

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CHAPTER 3:

Municipal finance shapes urban climate action and justice

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Abstract

Implementing climate policies and programmes in cities requires substantial investments that inevitably entangle climate action with urban climate finance—the mechanisms and practices city governments use to pay for climate efforts. Here we use US cities as a case study to examine how climate finance impacts, and is impacted by, the pursuit of urban climate action and climate justice. Drawing on 34 expert interviews, we show how municipal financial decisions and budgetary practices are shaping how, when and for whom cities are responding to climate change. We demonstrate how public spending decisions are intertwined with the logics of debt financing and examine the impacts of these relationships on cities' climate investments. We showcase the structuring impacts of finance on climate action and the built environment, and we introduce pathways through which climate and justice considerations are already being integrated into, and potentially transforming, municipal finance in the United States.

Introduction

Climate action in cities plays an essential role in the global response to climate change (Bulkeley, 2021; Fuhr et al., 2018). As both major sources of greenhouse gas emissions (UN Human Settlement Program, 2011) and key sites with acute climate vulnerabilities (Shi et al., 2016), cities have become leaders in mobilizing climate action beyond the national and international levels (Angelo and Wachsmuth, 2020; Bulkeley, 2010a, 2021). Thousands of cities globally have adopted climate plans (Hsu et al., 2020b; Negreiros et al., 2021) and recent scholarship has demonstrated that urban climate policies are increasingly being connected to wider issues of social justice (Bulkeley, 2021; Chu and Cannon, 2021; Diezmartínez and Short Gianotti, 2022). Imaginaries of 'just urban transitions' (Hughes and Hoffmann, 2020) are permeating through city halls (Cannon et al., 2023) and elevating cities as important actors to not only address climate change itself, but also to create more just societies.

Cities require trillions of dollars annually to address climate change (Negreiros et al., 2021). In response to this 'financing gap', international and transnational organizations such as the World Bank and C40 have channelled investments and mobilized neoliberal experimentation into urban settings (Acuto and Rayner, 2016; Bigger and Webber, 2021; Bouteligier, 2013; Bracking and Leffel, 2021; Davidson and Gleeson, 2015; Knuth, 2023; Silver, 2023). Nevertheless, city governments worldwide still largely depend on their local budgets and fiscal policies to implement climate action (Bigger and Millington, 2020; Christophers, 2018; Hadfield and Coenen, 2022; Hadfield and Cook, 2019; Shi and Varuzzo, 2020). While this inevitably ties global climate futures to urban climate finance, scholarship has scarcely interrogated how municipal financial decisions are impacting, or are being impacted by, the pursuit of climate and justice efforts in cities.

Given the vast spectrum of strategies and actors involved in paying for climate action, urban climate finance has eluded a universal definition (Long, 2021; Weikmans et al., 2020). Acknowledging this complexity, we use this term to refer to any funding (direct spending), debt financing and hybrid mechanisms used by cities to cover the costs of efforts to reduce greenhouse gas emissions or address the risks and impacts of climate change (Keenan et al., 2019; Long, 2021; Negreiros et al., 2021). Scholarship in this area has scrutinized cities' increasing reliance on debt and novel 'green' financing tools to pay for climate action (Bigger and Millington, 2020; Christophers, 2018; Cousins and Hill, 2021; Cox, 2023b, 2022; Karpf and Mandel, 2018; Langley et al., 2021). Often framing it as a symptom of neoliberal paradigms (Bracking and Leffel, 2021) and crisis capitalism (Long, 2021; Long and Rice, 2021), scholars argue that debt financing exacerbates urban injustices. Debt can heighten vulnerabilities by shifting the costs of climate action to historically marginalized residents and further entangling existing socio-environmental risks with financial risks (Bigger and Millington, 2020; Christophers, 2018). Debt also produces inequalities across geographies, as demonstrated by the higher interest rates faced by majority-Black cities in the US municipal bond market (Ponder, 2021). Moreover, scholars suggest that, by 'capturing the imagination' of policymakers (August et al., 2022), financial logics are shaping the design of urban climate programmes, potentially sidelining justice priorities (Cox, 2022; Hadfield and Coenen, 2022; Keenan et al., 2019). While the role of private finance and debt financing is well recognized, few have interrogated the impacts of the full range of climate finance tools used by city governments or examined the implications of municipal fiscal policies and budgetary decisions (Hadfield and Coenen, 2022; Hadfield and Cook, 2019; Robin, 2022). Current scholarship lacks a complete picture of the fundamental financial dynamics that are shaping climate and justice efforts on the ground and the ways in which city governments are already adapting their financial practices to respond to climate change and calls for social justice.

To address these gaps, we use US cities as a case study to analyse the interrelationships among urban climate finance, climate action and justice. We draw on 34 expert interviews with municipal officials and other professionals working in climate policy and climate finance across cities in the United States. We show how budgetary choices and funding tools beyond debt financing can influence the 'types' of climate action implemented in cities, impact the 'timing' and 'lifespan' of climate programmes, and shift 'power' away from municipal governments and local communities. We demonstrate how public spending is intertwined with debt financing and examine the impacts of these dynamics on cities' financial decisions on climate change. We reflect on the structuring impacts of climate finance on the built environment and introduce promising avenues through which climate action and justice are currently being integrated into, and potentially beginning to transform, municipal finance in the United States.

Results

Unequal access to climate finance

Cities across the United States use a range of tools to pay for climate action (**Table 6**). However, any single municipality has limited tools to choose from due to restrictions in revenue-generating and jurisdictional powers. Respondents highlighted that local and state regulations often set debt limits and prevent cities from re-directing, increasing and/or creating earmarked revenues for climate programmes. Some funding sources are also inaccessible for cities with limited capacities. While some expressed enthusiasm about new federal grant programmes in the United States, complexity and lack of capacity were explicit concerns for respondents in smaller cities. As one city official noted, “under-resourced municipalities who don’t have enough staff time (…) are being asked to invest a ton of time in highly competitive grant programmes, which they may or may not receive, to do work that has a lot of additional reporting requirements” (MG12; see Methods for definitions of respondent code names). Another respondent added that “(for smaller cities) even the ability to do all the paperwork and documentation needed (…) to develop a project concept to the point where it can then secure financing is a major roadblock” (RE03). These constraints create distinct geographies of unequal access to climate finance across cities of different sizes and governmental structures, thereby limiting the transferability of successful solutions between municipalities.

Table 6. Urban climate finance tools and their challenges and limitations

Tool	Description	Challenges and limitations identified by respondents
Funding		
Municipal revenues	Local government revenues, generally collected from taxes (property taxes, sales taxes, use taxes, income taxes, etc.), fees, and other miscellaneous charges. Municipal revenues and expenditures are allocated through municipal budgets. Municipal budgets include an operating budget (day-to-day expenditures) and a capital budget (infrastructure and capital expenditures).	- Cities' revenue generating authority may be constrained across jurisdictions, including limitations to raise existing taxes, to create earmarked taxes and fees dedicated to climate action, and to re-direct revenue from one use to climate action (restricted funds). - Municipal budgets must be "balanced". This means that cities' expenditures cannot exceed their estimated revenue. - Cities' budgets are competitive and dependent on local politics. Policymakers need to make the case for climate budget items each year. - Cities' budgets are path dependent. Current budgets are based on the amount of money that has been budgeted in the past. Cities cannot exponentially increase their budgets from one year to another. - Public spending is limited by procurement laws.
Grants	Money awards granted by different funders, including state and federal governments, philanthropy, and the private sector. Grants may be competitive or non-competitive (e.g., formula grants)	- Grant applications are time and resource intensive. Grants may also include time-intensive reporting requirements. - Smaller cities and under-resourced municipalities are disproportionately burdened when applying and maintaining grants. - Grants may require that funds are spent for a specific purpose (earmarked) and during a limited time period. - Availability of grants from state and federal governments fluctuates depending on changing administrations. - Availability of philanthropic and private grants partially depends on the local presence of actors interested in funding climate action. - Some grants are set up as reimbursements. This means that cities must have the capacity to spend money from their own budgets in the first place.
Debt financing		
Municipal bonds	Debt obligations issued by cities. Bonds are generally used to raise money for infrastructure and capital projects. Municipal bonds include general obligation bonds, revenue bonds, and other bonds with different climate-related certifications (e.g., green	- Cities' borrowing capacity and interest rates depend on their creditworthiness. - Local regulations may prevent cities from issuing bonds above a certain limit, regardless of their credit rating. - Project costs must be either covered through cities' revenues or have a tangible return on investment.

	bonds, climate bonds, social impact bonds).	
Loans	Loans offered by state and federal governments and the private sector.	- Cities' borrowing capacity and interest rates depend on their creditworthiness. - Projects are usually expected to have a tangible return on investment aligned with traditional lending timeframes. - To attract private capital, cities may need to "de-risk" investments by e.g., providing loan guarantees or loan loss reserves ("socializing the losses and privatizing the profits")
Hybrid mechanisms		
Public-private partnerships (PPP)	Partnership between city governments and private sector actors, generally through a contractual agreement. PPP may include a mix of funding and debt financing. Private actors typically finance part of the upfront capital costs of a project or investment.	- Projects are usually expected to have a return on investment aligned with traditional lending timeframes. - Depending on the arrangement, private actors may take on different roles and have varying levels of influence in the design and implementation of the project.

Action, time and power constraints

Climate finance constrains urban climate action in at least three ways. First, climate finance imperatives push cities to prioritize certain 'types' of climate action that are perceived as profitable. This typically favours climate mitigation over adaptation and resilience. Mitigation programmes often create tangible revenues or savings that enable cities to frame them as "investment opportunities" (RE01) and/or make a "financial case" (CN32) for them within municipal budgets. In contrast, adaptation is perceived as "not bankable" (CO31, RE03, NP07) or lacking a "clear business model" (RE03). Adaptation benefits are often seen as "avoided costs" in the future (CN32, RE03, NP07), rather than present-value revenues or savings. Cities implementing adaptation programmes are often dependent on funding without expected paybacks (for example, grants) or earmarked revenues (for example, stormwater fees, seawall tolls, climate taxes), both of which are inaccessible for some cities. This incentivizes narrow forms of climate action and marginalizes more holistic urban transitions. Some respondents suggested that adaptation and resilience would need to be "packaged with bankable investment-grade solutions" (MG15) or "bundled with a whole lot of other things where the payback stream is clear" (NP06) to enable holistic urban transitions. However, others highlighted that even programmes that are supposed to bundle mitigation, adaptation and justice benefits, such as Ithaca's Green New Deal initiatives, are often still skewed toward projects most likely to be profitable.

Second, climate finance can determine the 'timing' and 'lifespan' of climate action. Respondents identified that funding and debt financing tools impact when and for how long cities can implement climate programmes by imposing constraints such as budgeting cycles, spending deadlines or timelines of return on investment. Several respondents warned that these limitations hinder climate responses that centre justice. For example, the need to spend budget allocations by the end of a fiscal year and the short-term nature of grant programmes mean that money may not be available to address problems at the right time or to sustain the long-term policies needed for just urban transitions. For instance, respondents mentioned that while federal COVID-19 assistance grants are being used by cities to further (just) climate action, all funds must ultimately be spent by December 2026. A municipal official succinctly described these issues as "a lack of availability of funds in a timely manner" (MG14). Temporal restrictions can also thwart effective engagement and trust building with marginalized communities. As one respondent explained: "there is a tension between the need to get money out the door and democratic participation. And the more you push fast without properly hearing from people, the riskier it is to the project as a whole, both from the sense that it might get stopped by political pushback and that you might not meet the needs of the people who need the support of government the most" (CN32).

Finally, climate finance creates relationships with financial actors and institutions that shift some 'power' away from city governments and local communities to decide whether, how and at what scale climate action is worth investing in. For example, cities have a "fundamental relationship with credit rating agencies" (MG15), as they determine how much debt municipalities can incur and at what cost. This incentivizes cities to make financial decisions that are rewarded by these agencies. Several respondents noted that this can include starving climate budgets or cutting maintenance budgets for critical climate infrastructure, including green spaces. One municipal official asserted that their city "went from a low credit rating to a AAA credit rating at the expense of maintaining parks and playgrounds" (MG15). Public, private and philanthropic funders can also "put a straitjacket on what cities can do" (CN33) and steer municipalities toward funders' priorities. In some cases, this includes prioritizing justice. Respondents reported that funders are increasingly incorporating justice requirements into their programmes. For example, the Justice40 initiative and the Climate Funders Justice Pledge require a percentage of funds to be dedicated to historically marginalized and BIPOC communities. Some city officials reported directly targeting grants that have explicit environmental justice components to fund projects already designed through a justice lens. Other respondents noted that funding requirements set by Bloomberg Philanthropies, the Barr Foundation, and state and federal governments have led to the design of justice-oriented projects and pivoted existing programmes to incorporate justice and community engagement components. While this increasing attention to justice is promising, a respondent cautioned that funders "are always going to have slightly different priorities from (city governments)" and thus, cities also "lose a little bit of control" (MG13).

Public spending, debt financing and climate (in)action

Scholarship on climate finance often implicitly suggests that public spending can be isolated from the world of finance and inherently produce more just outcomes. Our analysis shows, however, that public spending and debt are inextricably intertwined, and both depend on financial logics that incentivize cities to make budgetary decisions at the expense of climate action and justice. Respondents explained that budgetary decisions are dominated by the imperative to maintain cities' fiscal health in the eyes of lenders, investors and credit rating agencies. Because cities depend on debt to finance capital-intensive projects and good credit ratings facilitate borrowing capital more cheaply, municipalities are incentivized to make budgetary decisions that protect their debt affordability and creditworthiness. This creates a co-dependence between public spending and debt. As one city official explains, "there is no such thing as purely public spending". Rather, municipal finance is a "regulated capitalistic engagement with the private risk capital markets" (MG15).

These entanglements can condition cities' climate efforts in two ways. First, cities are incentivized to pursue investments that increase municipal revenues and reduce debt-to-revenue ratios in the short-term, even if they contradict climate goals or increase climate risks. For instance, cities may promote carbon-intensive activities that generate recurring revenues or enable real estate development in coastal, flood- or wildfire-prone areas to expand their property tax bases. As one respondent explained, "the property tax base is really important to cities (…) so (they) are really incentivized to prevent properties that are exposed to climate hazards from going down in value" (RE01). Because of this, some cities see climate adaptation and insurance reforms as putting "the fundamental growth model of a region at risk" (NP07). Similarly, cities may prioritize investments in wealthier neighbourhoods that contribute the most to municipal revenues or 'revitalize' areas that increase property values, often without attention to gentrification and displacement. Due to these dependencies, one respondent asserted that budgetary models are "almost by design going to lead to inequitable outcomes" (NP07). Second, municipalities are also incentivized to choose investments that limit their debt below their debt affordability. This means that cities are less prone to make 'risky' climate investments that may negatively impact cities' debt-to-revenue ratios and creditworthiness, even if they are beneficial from a climate or justice perspective. Some respondents believe that this particularly hinders climate resilience projects, which tend to be "new things" that cities have no experience implementing, are "exceptionally expensive" and impose "a very direct visible cost to the local government" (CN32).

Integrating climate and justice into municipal finance

Notwithstanding the dynamics presented before, respondents recognized that decisions to invest in climate action and justice are also political questions. Regardless of the resources available to cities, budget allocations are dependent on local politics. As one respondent explained, “whether there’s a focus on justice is going to really be determined by the social and political contexts (of cities) regardless of the funding source. (…) If you have a really active civil society that is able to engage with city government, or you have a city government that’s focused on justice, then I think that’s going to get baked in to a certain extent. And then, the financing might help determine what can actually happen” (RE03).

Several respondents expressed optimism about local leadership and claimed that some cities are institutionalizing ways of integrating climate and justice into financial decisions. For instance, Boston’s 2023–2024 budget includes targeted investments to support ‘a green and growing city’, explicitly allocating funding to building decarbonization, transportation, urban greening and housing. Boston’s capital plan formalizes this commitment more directly by screening project requests and prioritizing those with a strong alignment to climate resilience in the near term. New York City’s Comptroller Office now includes a Chief Climate Officer, and the city adopted a net-zero by 2040 investment goal for their pension systems. Respondents also highlighted examples of pioneer cities that created climate-specific funding tools with justice components. Denver’s Climate Protection Fund collects a percentage of local sales and use taxes and earmarks them for specific activities related to climate action and justice. The Portland Clean Energy Community Benefits Fund collects revenues from large retailer surcharges and channels them into grants for community-led climate and justice initiatives. Notably, a resident-driven committee holds the power to recommend expenditure allocations from this fund. One respondent described this as Portland "releasing some power, which from particularly an equity perspective is really important" (CN34).

A respondent cautioned that while these efforts are encouraging, more work is needed to deeply embed justice in climate finance: "people talk about environmental justice, people talk about equity, but they haven't quite gotten into the different kinds of justice such as distributive justice, procedural justice, recognitional justice. And these aren't terms that are thrown around in the field at all. And it needs to. There's a gap that could be filled" (CO27).

The structuring impacts of urban climate finance

Altogether, our findings reveal a complicated picture of the dynamics and impacts of urban climate finance (**Fig. 4**). Climate funding and debt financing decisions are shaped by complex interactions between the financial logics of municipal finance, local politics and real estate markets, as well as external pressures from public and private actors**.**

These dynamics produce contradicting incentives that drive cities to make financial decisions that can stop, advance or constrain climate and justice policies. Given the impacts of these efforts on urban landscapes, cities' financial decisions ultimately produce long-term material consequences that become embedded in the built environment, including uneven urban development, augmented climate risks, and gentrification and displacement. In this way, urban climate finance has structuring impacts that not only shape climate policies on the ground, but also configure the urban built environment itself.

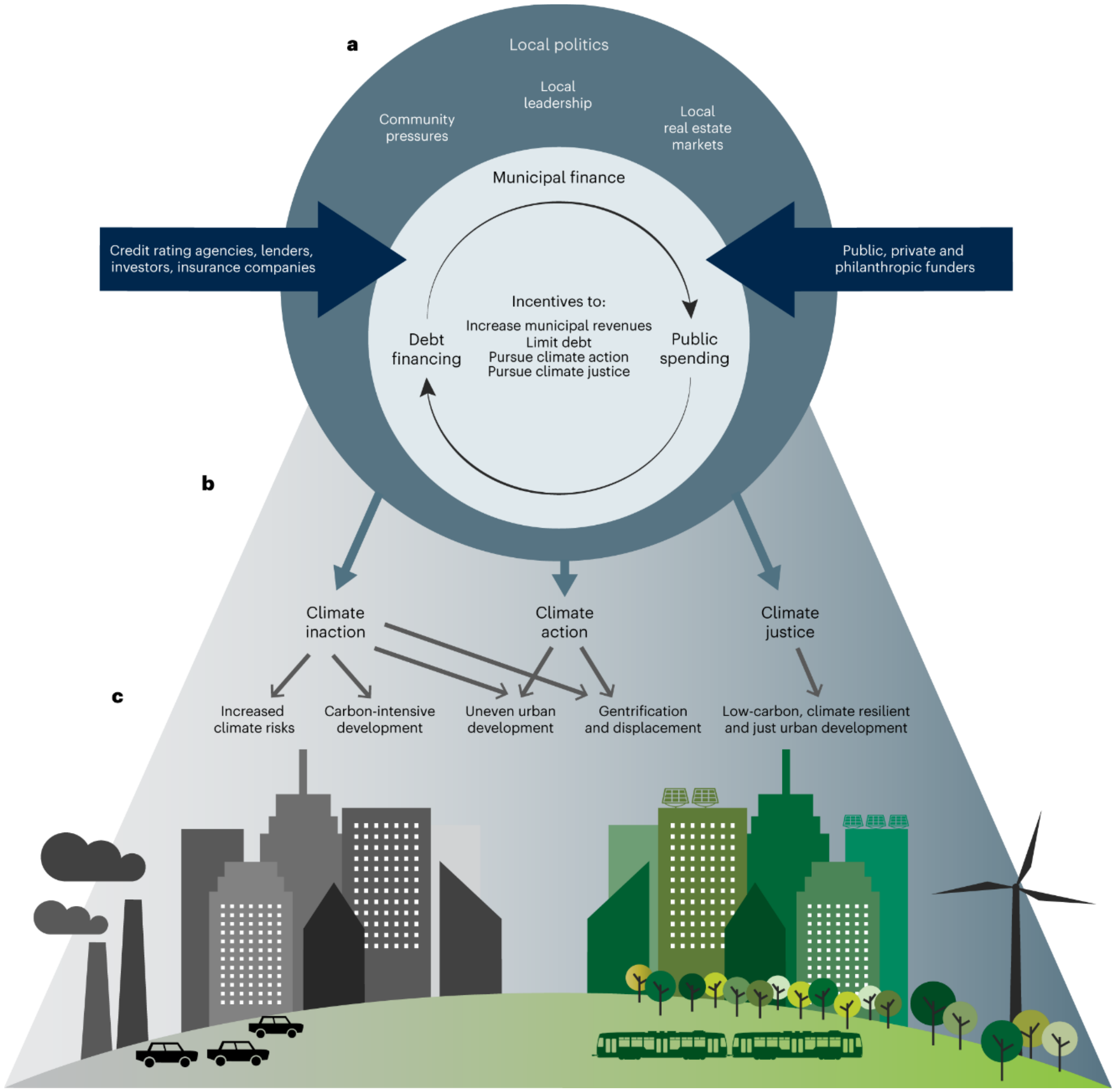

Figure 4. Climate finance shapes climate action and climate justice efforts in cities, and configures the urban built environment

a, Cities' financial decisions are shaped by contradictory dynamics created by financial logics, local politics and real estate markets, as well as external pressures from public and private actors, including funders, credit rating agencies, lenders, investors and insurance companies. **b**, Cities' financial decisions shape policies, programmes and investments that may sit anywhere on the spectrum of climate inaction, climate action and climate justice. **c**, Cities' financial decisions and the resulting policies, programmes and investments produce long-term material impacts in the built environment.

Discussion

Our research demonstrates that climate finance is shaping the implementation of cities' climate action and justice efforts in contradictory ways. On the one hand, cities' spending decisions are underpinned by financial logics and relationships that constrain climate action and reinforce cities' 'structural tendencies for uneven urban development' (Hadfield and Coenen, 2022). On the other hand, cities are also responding to increasing political pressures and funding requirements to incorporate climate action and justice into their financial practices.

We have shown that climate finance constraints can limit the types of climate action that cities pursue, restrict the timing and lifespan of climate efforts, and shift power away from city governments and local communities to decide what climate policies are worth investing in. This is true not only for debt financing tools, as previously argued in the literature (Bigger and Millington, 2020; Christophers, 2018; Hadfield and Coenen, 2022; Long, 2021; Long and Rice, 2021), but also for the mundane budgetary decisions and everyday practices that cities use to pay for climate action. As suggested by recent scholarship, city governments are incentivized to make public spending decisions that follow financial logics set by credit rating agencies (Cox, 2023b, 2023a, 2022) and investors (Bigger and Millington, 2020; Christophers, 2018), and that shield municipal revenues mediated through the real estate and insurance markets (Knuth et al., 2023; Shi et al., 2023; Shi and Varuzzo, 2020; Taylor and Aalbers, 2022; Taylor and Knuth, 2023a). Choices made under these logics produce material consequences that are often neither climate sound nor just. This has been seen across coastal cities in Massachusetts and

Florida, which depend on the expansion of property tax bases in low-lying areas to meet their budgetary needs (Shi et al., 2023; Shi and Varuzzo, 2020), and in Miami's 'densify to defend' adaptation model, which promotes high-end real estate development to fortify the city's long-term fiscal capacity to respond to climate change (Taylor and Aalbers, 2022). In these cases, the dynamics of urban climate finance serve to entrench new climate vulnerabilities and intensify gentrification and displacement pressures (Shi et al., 2023; Shi and Moser, 2021; Shi and Varuzzo, 2020; Taylor and Aalbers, 2022).

At the same time, urban politics and funding mandates are increasingly pushing cities to give attention to the intersection of finance, climate and justice. Some cities are already integrating climate and justice criteria to their budget allocation processes, and re-imagining traditional funding tools to pay for climate action and shift some power to make public spending decisions back to the community. These early efforts hint at possible avenues through which climate action and justice may transform cities' financial practices, democratize public spending, and reframe who and what is worthy of investments.

New research is needed to further explore these contradicting trends of climate finance across multiple urban contexts, and to understand when climate and justice politics come to dominate cities' financial decisions, under what conditions and to what end. If cities worldwide are to fund just urban transitions, scholars and practitioners must critically evaluate how to reshape municipal finance and the 'material, relational and normative factors' (Shi and Moser, 2021) that define existing fiscal systems to promote the implementation of just climate actions. A shift in scholarship and practice is needed to reframe municipal finance not as an inevitable force that structures public policy, but as a set of ethical and political choices (Jenkins, Destin, 2021) that can be transformed in the service of climate action and justice.

Methods

Defining urban climate finance

We defined urban climate finance as any funding, debt financing and hybrid mechanisms used by cities to cover the costs of efforts to reduce greenhouse gas emissions or address the risks and impacts of climate change. The term 'climate finance' has been used in a variety of ways and is not yet settled in the literature (Bracking and Leffel, 2021; Bridge et al., 2020; Long, 2021; Robin, 2022; Weikmans et al., 2020). Although the concept was popularized within international climate negotiations to refer to the transfer of financial resources to support climate efforts in the Global South (Bridge et al., 2020; Knuth, 2023; United Nations Framework Convention on Climate Change, 2023), 'climate finance' remains the most widely used term to examine the financial aspects of climate action at multiple scales (Bracking and Leffel, 2021; Christophers et al., 2020; Colenbrander et al., 2018; Cox, 2023b; Long, 2021; Negreiros et al., 2021; Robin, 2022). In the urban context, the Climate Policy Initiative introduced 'urban climate finance' as the resources directed to limiting city-induced greenhouse gas emissions or addressing climate-related risks faced by cities (Negreiros et al., 2021). However, disputes remain about 'what' and 'who' should be accounted for in (urban) climate finance (Bracking and Leffel, 2021; Robin, 2022; Weikmans et al., 2020). We aimed to clarify this concept in two ways. First, we highlighted the distinction between 'funding', which refers to direct spending and 'debt financing', which involves raising capital by selling debt instruments, often with an expected payback of both the principal and interest costs. Second, our definition purposefully captured all types of climate action, including mitigation, adaptation and resilience, and with or without an explicit 'climate' labelling. This distinguishes our research from more specific concepts such as 'adaptation finance' (Barrett, 2013; Bigger and Millington, 2020; Garschagen and Doshi, 2022; Khan et al., 2019), 'carbon finance' (Bridge et al., 2020) or 'transition finance' (Robin, 2022).

In this research, we purposefully focused on the dynamics of urban climate finance 'within' city governments. We recognize two caveats in this approach. First, we acknowledge that discussions on municipal finance and municipal budgets in the United States often omit or hide the financial decisions, practices and spending from quasi-public authorities such as (re)development agencies (Jenkins, Destin, 2021; Knuth, 2023) and utility enterprises (Rubin, 1988; Vinnari and Näsi, 2008). While not centred in our research, these quasi-public authorities play important roles in urban climate action and in city-making itself (Jenkins, Destin, 2021). Second, we recognize that municipal financial decisions do not operate in a vacuum and are interdependent with the behaviour of other public (for example, state and federal governments) and private actors (for example, real estate, insurance, lenders, credit rating agencies and so on) that operate within and beyond city boundaries (August et al., 2022; Cox, 2023b; Knuth et al., 2023; Shi et al., 2023; Taylor and Aalbers, 2022; Taylor and Knuth, 2023b). The aim of this research is not to obscure these relationships or to silo municipal finance. Rather, our objective is to highlight the importance of the more 'mundane' aspects of municipal finance within this context.

Expert interviews

We conducted a systematic analysis of 34 expert interviews focused on urban climate finance, climate action and climate justice in the United States. We leverage expertise from a diverse set of professionals working on different stages of the climate policy process and climate finance across cities of all sizes in the United States. The range of experiences we covered through our interviews include, but are not limited to, urban climate programme design and implementation, municipal capital planning and budget allocation processes, grant programme design, grant applications, design of climate finance policies and legislation, climate action and climate finance research and advocacy, and consulting on climate policy, climate finance and green banks.

Recruitment and sample. We recruited 34 experts working in urban climate action and climate finance across the United States using a snowball sampling method. Snowball sampling is a purposeful sampling technique in which a first set of interview participants that fit specific research criteria are asked to suggest new potential interviewees. This method is widely used in the social sciences to identify and recruit participants from a population that is hard to identify and access. For example, while it may be easy to identify staff working on climate programmes for a particular city government, it is hard to determine who within that staff has specific, in-depth knowledge on urban climate finance and municipal budgeting processes. Snowball sampling also enabled us to recruit participants identified as experts by their peers53. The first participants were identified through city websites, climate planning documents, media coverage on urban climate action and climate finance, as well as existing professional connections. We targeted a variety of experts working directly within municipal governments as well as consultants, researchers and staff from financial institutions and climate networks working with multiple cities to design, implement and finance climate programmes and policies. These first participants then recommended additional experts to reach out to. We continued to recruit and interview new respondents until we reached saturation and were no longer encountering new ideas (Baxter and Eyles, 1997).

Our final sample consists of eleven city officials currently working within agencies and departments related to climate work and municipal budgeting, six private consultants specializing in climate policy and/or climate finance, six staff members from non-profits working with cities on climate policy and/or climate finance, three staff members from urban climate networks operating in North America, five staff members from academic institutions, research centres and think thanks focusing on urban climate policy and/or climate finance research, two staff members from financial institutions involved in climate finance and one federal government official involved in federal grant programmes. Several respondents had experience in two or more of the expertise roles mentioned earlier. Respondents were identified in the paper using a unique code name (for example, MG15). Code names comprised two letters representing the current professional role of the respondent and a random number from 1 to 34. We used the code 'CN' for climate network staff, 'CO' for consultant, 'FG' for federal government official, 'FI' for financial institution staff, 'MG' for municipal government official, 'NP' for non-profit staff and 'RE' for research institution staff.

The sample includes respondents with experiences from a wide range of cities of all sizes and geographies across the United States. Three respondents work with multiple cities at the international level (including US cities); 13 work with multiple cities within the United States; and 18 work within a single city. Respondents include 14 interviewees who work with cities of all sizes; 8 who work with/within large cities (over 300,000 residents); 11 who work with/within mid-size cities (100,000–300,00 residents), and 1 who works within a small city (25,000–100,000 residents). The sample includes respondents with experience and insights from cities in the Northeast, Northwest, West, South and Mid-west regions of the United States. Most interviewees working within a single city were located in the Northeast and West. The sample also included respondents working with/within both coastal and land-locked cities. Due to the geographic span of the cities covered by the respondents, as well as the range of their expertise roles, our final sample reflects multiple types of diversity, including cities with different social, economic, demographic and political characteristics, as well as varying climate vulnerabilities. While respondents working within a single city mostly represented municipalities engaged in climate action (for example, cities that have adopted a climate plan, cities that are members of a recognized climate network), the rest of the respondents had experience working with cities with different levels of engagement with climate action, ranging from municipalities with no or minimal engagement with climate planning and implementation to cities considered as 'pioneers' or 'leaders' within the US context. The names and data from specific cities covered in the sample are not provided to protect the anonymity of the interviewees.

Interview design. We used a semi-structured interview approach. Most interviews lasted ~60 min, but interviews ranged from 30 min to over 2 h. The interviews consisted of a series of open-ended questions tailored to the position and expertise of individual respondents. While the exact questions and order of the interviews varied slightly across respondents, all interviews covered the following themes: (1) patterns and trends in the funding, debt financing and hybrid tools cities are using to pay for climate action; (2) challenges and innovations in paying for climate action; (3) the ways climate finance and fiscal policies shape the implementation of climate action in cities; and (4) the ways climate finance shapes efforts to pursue justice-oriented climate policies. A sample interview script can be found in **Appendix A**. Interviews were conducted in person or over Zoom. All interviews were audio-recorded and transcribed for analysis.

Data analysis. We coded the interview data using an iterative qualitative process that combined deductive and inductive coding. We first coded the transcripts on the basis of themes determined a priori. These themes followed the structure of our interview scripts and were selected to address existing gaps in the literature. These initial themes included the types of climate finance tool used by cities, climate finance challenges and opportunities, and the impacts of climate finance decisions. We then recoded the transcripts using emergent themes revealed during the first stage of analysis. We conducted iterative rounds of focused coding to homogenize our analysis across all interviews. The final coding protocol included the following themes: (1) climate finance tools and sources; (2) climate finance challenges; (3) factors that impact climate finance decisions; (4) impacts of climate finance decisions; (5) interplay between public spending and debt financing; (6)

finance of climate mitigation versus climate adaptation; and (7) innovations and opportunities in urban climate finance. The final coding protocol can be found in the **Appendix B**. We used NVivo 12 Pro software for all coding.

Study limitations. We used US cities as a case study to examine the dynamics of urban climate finance and their impacts on the implementation of climate action and justice efforts, and the making of the built environment. In many ways, US cities operate in a 'unique' context of fiscal federalism, in which the federal government has delegated multiple financial and budgetary powers to states and municipalities (Knuth, 2023). US cities have also been unusually friendly sites for fiscal financialization and financial experimentation, including a strong municipal bond market (Jenkins, Destin, 2021; Knuth, 2023). While city autonomy and budgetary structures vary worldwide, 'a notable trend in mainstream urban climate finance initiatives today is the export of US-derived instruments' (Knuth, 2023). Although a problematic trend (Bigger and Webber, 2021; Knuth, 2023; Silver, 2023), this means that understanding the dynamics of urban climate finance in the US context has implications for the trajectories of climate finance in cities across the world. However, future research focused on other contexts, including both the Global South and the Global North, is necessary to test the findings presented here.

Ethics and confidentiality. This research was approved by the Boston University Charles River Campus Institutional Review Board (Exempt Research 4886X) and complies with all relevant ethical regulations. All participants received a letter of informed consent before participating in an interview. Participants were offered no compensation. We took all reasonable measures to protect confidentiality of participants, including reporting responses anonymously.

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CHAPTER 4:

Climate change and municipal finance: Budget impacts and just urban transitions

Abstract

As cities around the world move from the adoption of climate plans to the implementation of climate actions on the ground, questions remain about whether and how city governments will be able to fund these climate efforts and with what consequences for justice. While the use of novel debt financing schemes has been examined in the literature, scholars have rarely interrogated how the more ordinary tools and practices of municipal finance can be applied or reframed to enable more just urban transitions. Here, we use the U.S. as a case study to investigate how climate change and climate action are impacting municipal budgets in cities and examine how city governments are adapting municipal finance to advance climate and justice efforts. Our findings reveal that while both climate change and climate action are imposing new burdens on municipal budgets, some cities are beginning to reimagine municipal finance in the service of more just urban climate futures. We position municipal finance as an emerging site of climate and justice politics, with consequences spanning across city boundaries and at multiple scales.

Introduction

Widely recognized as important sites of climate action for more than two decades (Angelo and Wachsmuth, 2020; Bulkeley, 2021; Long and Rice, 2019), cities are also now seen as core sites of the global struggle for climate justice (Bulkeley, 2021; Rice et al., 2023). Urban areas are protagonists of emerging imaginaries to build "just urban transitions" (Hughes and Hoffmann, 2020). As thousands of cities move to implement these climate efforts, questions loom large about whether and how city governments worldwide will be able to cover the costs of the societal and infrastructure transformations required to equitably respond to climate change (Knuth, 2023; Long, 2021).

Funding constraints have been a prevalent barrier to the implementation of urban climate actions, including both efforts to mitigate and adapt to climate change (Fünfgeld et al., 2023; Hughes, 2017; Shi et al., 2015). City governments often lack funding to operationalize programs and hire staff to take on new initiatives (Ryan, 2015). Cities struggle to find long-term funding sources for climate policies, and climate programs are likely to be abandoned to prioritize other needs (Fünfgeld et al., 2023; Hughes, 2017). In the face of these constraints, cities in the Global North have turned to debt financing and novel tools such as green bonds and carbon markets to deliver climate programs and urban infrastructure projects (Cousins and Hill, 2021; Cox, 2022; Hadfield and Coenen, 2022; Hadfield and Cook, 2019; O'Brien et al., 2019; O'Brien and Pike, 2019; Robin, 2022). Global institutions, such as the World Bank, are exporting these financial experiments to the rest of the world (Bigger and Webber, 2021; Knuth, 2023; Silver, 2023). Scholars have shown that these emerging finance solutions are exacerbating existing inequities in cities and shifting environmental and financial risks to the most marginalized communities (Bigger and Millington, 2020; Christophers, 2018; Hadfield and Coenen, 2022; Long, 2021). Direct public spending *within* city governments, however, also has the potential to produce and aggravate inequities, as cities are incentivized to make budgetary decisions that increase their revenues, shield their expenditures, and enhance their debt affordability and creditworthiness, often at the expense of climate action and justice (Diezmartínez and Short Gianotti, 2024). In this way, municipal finance has the potential to deepen cities' histories of uneven development and racialized climate vulnerabilities (Hadfield and Coenen, 2022; Rice et al., 2023).

In the U.S., this reality contrasts with cities' growing attention to climate action and climate justice (Cannon et al., 2023; Diezmartínez and Short Gianotti, 2022). Over the last five years, justice and equity concerns have played an increasingly important role in climate planning processes and many U.S. cities are developing policy tools to implement and evaluate justice-oriented climate policies (Caggiano et al., 2023; Diezmartínez and Short Gianotti, 2022). This calls into question whether and how the pursuit of these climate and justice efforts may impact cities' financial practices and how municipal finance could be *reimagined* to advance, rather than hinder, just urban transitions. Municipal finance is thus a key site to explore the *making* of more just climate futures in different contexts, with consequences within and beyond city boundaries.

In this paper, we argue that municipal finance must be understood as core a site of climate and justice politics. Using the U.S. as a case study, we examine how cities' municipal budgets are being impacted by climate change and urban climate action and explore whether and how city governments are purposefully reimagining municipal finance in the service of more just climate futures. We employ a mixed-methods approach that combines insights from 34 expert interviews with an in-depth, systematic content analysis of municipal budgets from fifteen cities across the U.S. Our research shows that municipal finance is a key site for scholars, practitioners, and activists to advance just urban climate futures.

Background

Urban fiscal geographies and climate change

Our research responds to recent calls among urban scholars to develop an "expanded conception of public finance in geography" (August et al., 2022) and give more attention to the "fiscal geographies" of cities (Tapp and Kay, 2019). Fiscal geographies foreground the spatial consequences of the public finance system, including government revenue, expenditure, and borrowing practices (Cirolia, 2020). In the urban context, scholars have focused on the role that fiscal processes (e.g., budget allocations) and instruments (e.g., taxes) play in the reproduction of urban inequalities, capital accumulation, and the making financialized cities (Cirolia, 2020; Tapp and Kay, 2019). Cities' fiscal practices are spatialized and embedded in the built environment through urban policies and planning tools that enable certain forms of private investments while disincentivizing others, create tax havens, designate zones of urban renewal and improvement, and/or shape property values within and across cities (Aalbers, 2020; August et al., 2022; Cirolia, 2020; O'Brien et al., 2019).

Urban fiscal geographies have seldom been connected to cities' climate action and justice efforts. However, recent scholarship has shown that fiscal policies impact how cities respond (or not) to climate change. For instance, urban decarbonization efforts are shaped by cities' unique landscape of buildings of different quality, longevity, and carbon intensity – features that are partially determined by the U.S. tax code (Knuth, 2020). Land-based fiscal policies incentivize cities to grow their revenues through the expansion of urban development, often in areas that are vulnerable to flooding, wildfires, or other climate impacts (Shi et al., 2023; Shi and Varuzzo, 2020; Taylor and Aalbers, 2022; Woodruff et al., 2021), thereby creating new geographies of risks (Shi and Bouma, 2023). In cities where municipal revenues depend heavily on carbon-intensive or resource-dependent industries (e.g., real estate development, tourism), municipal governments are likely protect and enable such activities, even if they exacerbate present and future environmental vulnerabilities (Gray, 2021; Taylor and Aalbers, 2022). The financial logics of municipal finance can also limit the types of climate actions that cities pursue, constrain when and for how long cities are able to sustain climate programs and shift some power away from city governments and residents to determine what climate interventions are worthy of investment, where, and for whom (Diezmartínez and Short Gianotti, 2024). Fiscal policies are therefore intimately connected to both cities' climate vulnerabilities and their capacities and willingness to respond to climate change.

In this paper, we expand on this literature by examining the impacts of fiscal policies on climate efforts and interrogating how the increasing pursuit of climate action and justice in cities may impact municipal finance itself. We highlight the dynamic interrelationships between climate action and municipal finance, positioning climate action not only as a subject of municipal finance, but as a driving force that can destabilize and reshape existing governance processes.

Municipal budgets as entry points to climate politics

Municipal budgets are planning documents in which cities estimate revenues and allocate expenditures across government operations, departments, and capital projects for a given fiscal year. The resources allocated in municipal budgets remain one of the primary means through which city governments provide basic goods and services, advance community priorities, and redistribute social wealth between populations and across space (Tapp and Kay, 2019). Nevertheless, municipal budgets have remained forgotten sites of urban climate politics. The logics and impacts of cities' budgetary choices are usually opaque and municipal finance has been increasingly dominated by post-political and technocratic processes that frame budget allocations as "objective" and reserve decisions on public monies to those with the "right" expertise and qualifications (Cox, 2023a; Knuth, 2023). However, at the core of municipal finance are ethical and political choices about *who* and *what* is worthy of investment (Knuth, 2023). Municipal budgets, and their underlying fiscal policies, are "infused with social and political life" (Cirolia, 2020).

Lacking uniform standards across the U.S., the content of municipal budgets varies widely across cities. However, these documents often include quantitative data on revenues and expenditures, as well as narratives describing cities' priorities and budget allocation processes. Municipal budgets therefore allow us to account for both the quantitative distribution of urban financial resources and the "qualitative redirection" of municipal finance across cities and through time (August et al., 2022). In this paper, we use municipal budgets as an entry point to explore how (just) climate efforts are being financially supported in cities and whether and how values such as climate action, justice, and equity are embedded in municipal financial decisions. This provides a unique lens to explore "how cities are grappling with their changing fiscal and political environments" (Hughes, 2017) in the face of climate change.

Methods

We use a mixed-methods approach to analyze how urban climate action and climate justice efforts are reshaping municipal finance across cities in the U.S. We combine expert interviews with a systematic content analysis of municipal budgets in the U.S. to provide both an assessment of the impacts of climate change and climate action in municipal finance across the U.S. and an analysis of municipal budgetary tools and practices from fifteen U.S. cities of all sizes.

Expert interviews

We conducted a systematic analysis of 34 expert interviews focused on urban climate finance, climate action, and climate justice in the U.S. A full description of methods for recruitment, sampling, interview design, and data analysis are described in Chapter 3. Interviewees included professionals with experience in city governments, private consulting, non-profits, urban climate networks, academic institutions, research centers, think thanks, financial institutions, and federal grant programs. We used a semi-structured interview approach and covered the following themes across all interviews: (i) patterns and trends in the funding, debt financing, and hybrid tools cities are using to pay for climate action; (ii) challenges and innovations in paying for climate action; (iii) the ways climate finance and fiscal policies shape the implementation of climate action in cities; and (iv) the ways climate finance shapes efforts to pursue justice-oriented climate policies. Our sample included interviewees with experiences from a wide range of cities of all sizes and geographies across the U.S., reflecting cities with different social, economic, demographic, and political characteristics, as well as varying climate vulnerabilities and levels of engagement with climate action. All interviews were transcribed and coded using an iterative qualitative process that combined deductive and inductive coding.

Qualitative content analysis of municipal budgets

We conducted a systematic content analysis of the municipal budgets from fifteen U.S. cities of all sizes for the last five fiscal years (FY). This includes municipal budgets adopted both before (FY 2019 - FY 2020) and after (FY 2021 - FY 2023) the start of the COVID-19 pandemic. We included both operating and capital budgets in our analysis.

We purposefully sampled cities that are known to be, or expected to be, implementing climate action and climate justice efforts on the ground and are thus more likely to include climate-related expenditures and narratives in their municipal budgets. Focusing on these "positive" cases provides an early opportunity to learn from the experiences of municipal leaders and examine emerging innovations in an outcome of interest (i.e., municipal budgets embedding climate action and justice) (Hughes, 2020). In recognition of the varying capacities and financial resources held by cities from different sizes (Fünfgeld et al., 2023), we selected five large cities (over 300,000 residents), five mid-size cities (100,000 - 300,000 residents), and five small cities (25,000 - 100,000 residents) for our analysis. All selected cities met the following criteria: (i) the city has adopted a formal climate plan; (ii) the city has joined an urban climate network that welcomes membership from cities of multiple sizes (U.S. Climate Mayors and/or the Global Covenant of Mayors); and (iii) the city's adopted municipal budgets from FY 2019 - FY 2023 are publicly available online. Since certain states had a higher number of cities meeting these criteria, we selected cities with attention to geography and diversity of socio-economic demographics. We excluded cities whose budgets consisted of only quantitative data and lacked qualitative narratives.

Our final sample (**Table 7**) represents different types of diversity. Eight cities have been engaged in climate action for more than two decades, while seven cities adopted their first climate plan in 2010 or later. Our sample cities have a wide range of population sizes (32,870 - 2,665,039 residents), median household incomes (\$40,973 - \$92,026), poverty rates (6.9% - 34.5%), and percentage of residents who identify as White alone (28.6% - 81.7%).

Table 7. Cities included in systematic content analysis of municipal budgets

City	City network *	Year of adoption of first climate plan	Year of most recent climate plan	Population **	MHI *,**	Poverty rate **	Percentage of population identifying as White **,***
Chicago, IL	USCMGCM	2008	2022	2,665,039	$ 65,781	17.1%	33.1%
San Diego, CA	USCMGCM	2005	2022	1,381,162	$ 89,457	11.6%	42.0%
Dallas, TX	USCM	2020	-	1,299,544	$ 58,231	17.7%	28.6%
Denver, CO	USCM GCM	2015	2018	713,252	$ 78,177	11.6%	54.0%
Portland, OR	USCM GCM	1993	2022	635,067	$ 78,476	12.6%	68.8%
St. Petersburg, FL	GCM	2019	-	261,256	$ 64,375	12.4%	63.9%
Providence, RI	USCM GCM	2019	-	189,563	$ 55,787	21.5%	34.1%
Springfield, MA	USCM	2017	-	154,064	$ 43,308	26.3%	28.9%
Columbia, MO	USCM GCM	2019	-	128,555	$ 57,463	19.9%	73.3%
Boulder, CO	USCM GCM	2006	2021	105,485	$ 74,902	20.9%	78.3%
Asheville, NC	USCM	2009	2023	93,776	$ 58,193	12.4%	77.5%
Portland, ME	USCM	2007	2020	68,424	$ 66,109	12.7%	81.7%
Burnsville, MN	USCM	2009	2020	63,963	$ 79,059	6.9%	65.3%
Annapolis, MD	USCM	2010	-	40,648	$ 92,026	9.2%	54.4%
Ithaca, NY	USCM GCM	2006	-	32,870	$ 40,973	34.5%	64.1%

* USCM = U.S. Climate Mayors; GCM = Global Covenant of Mayors; MHI = Median Household Income
** 2022 estimates from the U.S. Census Bureau; *** This excludes residents who identify as White and Hispanic or Latino.

We coded municipal budgets using an iterative qualitative process that combined deductive and inductive coding. We first coded the budgets using themes determined a priori based on insights gathered from the expert interviews We then re-coded the budgets using emergent themes revealed during the first stage of analysis. As we adapted the coding protocol, we conducted iterative rounds of focused coding to ensure consistency in our analysis across cities. The final coding protocol included the following main themes: (i) total budget and climate expenditures, (ii) narratives related to climate change and climate action, (iii) narratives related to climate action and COVID-19, (iv) budget allocation strategies including climate and/or justice criteria, and (v) climate funding tools. The final coding protocol can be found in **Appendix C**. We used NVivo 12 Pro software for all coding.

Results

Budgetary burdens and fiscal health

Our analysis of expert interviews and municipal budgets revealed that, as cities are adapting to a climate-changed world, municipal budgets are increasingly burdened by both the impacts of climate change and cities' growing need to implement climate policies and programs.

Interviewees highlighted that most cities do not allocate enough resources to climate action, and they often lack predictable funding sources to implement their climate programs. While cities tend to be opportunistic and often take advantage of one-off funding sources, interviewees agreed that climate action requires stable funding sources in the long-term. These dynamics are also explicitly recognized in the municipal budgets from several cities currently engaged in climate action. For example, in FY 2023, Boulder recognized that the original funding strategies that the city put in place for climate action are "now insufficient to address the scale and accelerating intensity of climate change that we now face". In FY 2021, Portland's (Oregon) budget narrative notes that resources dedicated to climate policy "are not commensurate with the scale of the immediate climate policy, programs, and actions the City needs to take in the face of the climate crisis". This is aggravated by the fact that a significant portion of Portland's budget devoted to climate work is reliant on one-time funding. The city explains that "this hinders [Portland's] ability to move projects forward in a timely way and to thoughtfully resource projects and community partners. Stable funding is foundationally critical to long-range planning and sustainability initiatives to provide equitable service and results in the community". In some cases, cities can also have limited flexibility to increase climate-related expenditures, despite their growing commitments to climate action. For instance, across the five FY, Columbia explicitly mentions that their budget does not dedicate any general source revenues to its Office of Sustainability. Rather, its costs are completely offset by savings generated by sustainability projects, grants, and funding from the utilities. This constraint has not changed, even after the adoption of the city's climate action plan in 2019.

Some cities explicitly note that expenditures have increased due to the impacts of climate change. In FY 2022 and 2023, both Boulder and Portland (Oregon) dedicated additional resources to wildfire resilience following destructive fire events. In FY 2022, Asheville also experienced increased expenditures related to storm responses, as the city continued "to see an increase in significant weather events due to climate change". In general, several cities included additional investments in flood and stormwater management and/or urban greening to respond to climate change in one or more FY. Notably, Boulder also reported that the city experienced a significant increase in insurance premiums in the last two FY and articulated that "the enhanced disaster risk due to climate change and wildfire impacts are the main drivers of the increased cost of insuring our properties". Several interviewees anticipate that insurance policies are likely to change dramatically with climate change in the next decades, but some are hopeful that these changes may help to add a present-value cost to future climate impacts, impose additional political pressure to act on climate resilience, and create backlash against climate-silent policies.

Climate change and climate action are also impacting municipal revenues. For example, in FY 2020, Annapolis reported that "city coffers also suffer" from climate change, as downtown visitors dip during flood events and the city is unable to get the associated revenue from parking fees, a loss that was estimated in the hundreds of thousands of dollars. Interviewees highlighted that municipal revenues are likely to decrease as the impacts of climate change become evident and begin to devalue existing properties or making them uninsurable. This is critical for cities that are heavily reliant on property tax revenues. As one interviewee explained, "whether it's coastal flooding area, or whether it's a wildfire-prone area, [all cities] have the same problem that if they tell people not to come or leave, then they lose their property tax bases, and then all the public services that people depend upon to use it". Paradoxically, cities' efforts to mitigate and adapt to climate change can also reduce municipal revenues in some instances. In FY 2022, Portland (Oregon) explained that existing revenue sources for the Bureau of Transportation are dependent on fossil fuel consumption, and that "as the city implements initiatives to reach its climate action goals, the bureau will see a corresponding reduction in resources necessary to fund these initiatives".

These cases showcase that, as municipal expenditures grow and revenues decrease due to climate change and climate action, cities are likely to increasingly suffer from fiscal stress and have reduced capacities to direct stable, long-term public spending to climate efforts, thereby fueling cycles of fiscal vulnerability (**Fig. 5**).

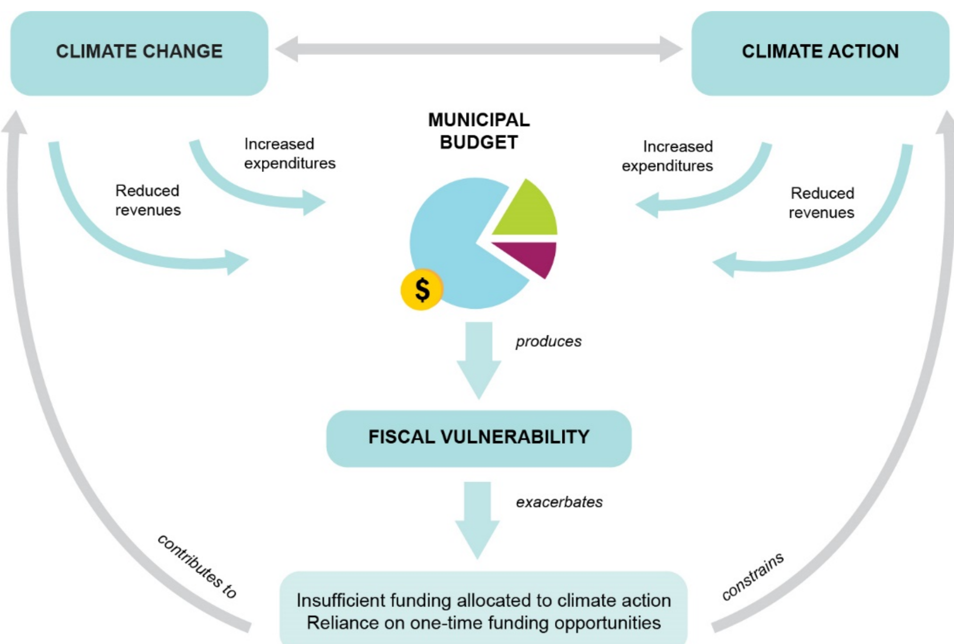

Figure 5. Impacts of climate change and climate action in municipal budgets
Both climate change and the pursuit of climate action affect cities' fiscal health by increasing expenditures and/or reducing municipal revenues. The resulting fiscal vulnerability incentivizes cities to allocate insufficient funding to climate action and to rely on one-time funding opportunities. This further constrains urban climate action and contributes to increased climate risks.

Illegibility of climate spending

Despite the relationships between climate action, climate impacts, and cities' fiscal health, we found that only five of the fifteen cities we analyzed explicitly reported climate expenditures in their municipal budgets (**Table 8**). Only two of these cities reported these expenditures for all five FY. San Diego is the only city in our sample that reported expenditures specifically related to climate action, while other cities bundled climate-related expenditures with broader environmental and public health investments. No small cities in our sample explicitly reported climate-related expenses.

Table 8. Reported expenditures in climate action or climate-related expenditure areas in constant 2022 MMUSD and as percentage of the total budget per FY

City	Expenditure area	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
San Diego, CA	"Implementation of the Climate Action Plan (CAP)", which includes investments across city departments that support the five strategic areas of the CAP, both directly and indirectly.	$181.22 (4.1%)	$453.28 (9.1%)	$9.91 (0.2%)	$523.03 (10.4%)	$475.78 (9.4%)
Columbia, MO	"Health and Environment Financial Use", which includes funding for the Office of Sustainability	$19.34 (3.6%)	$20.06 (3.6%)	$20.21 (3.8%)	$25.33 (4.8%)	$24.79 (4.7%)
St. Petersburg, FL	"Sustainability & Resiliency Strategic Investment and Funding Priority", which includes projects that advance the city's energy efficiency, clean energy, and greenhouse gas reduction goals.	-	$6.94 (0.9%)	$3.48 (0.5%)	$6.10 (0.8%)	$5.49 (0.7%)
Boulder, CO	"Environmentally Sustainable Goal Area", which includes progress towards Boulder's climate and energy goals	-	-	-	-	$51.63 (8.6%)
Dallas, TX	"Environment & Sustainability Strategic Priority", which includes being a global leader focused on climate change and environmental justice.	-	-	-	$645.53 (13.7%)	$628.00 (13.9%)

For most cities, it was not possible to track how much money is being allocated to address climate change. Without explicit reporting, we identified multiple barriers to pinpoint what expenditures should count as climate action within any given city. While in most cases it is possible to track expenditures from departments related to environmental work (e.g., Sustainability, Parks and Recreation), the scope and degree to which these departments contribute to climate action varies across cities according to their own organization and jurisdictional powers. In some cities, climate-related staff are not located within independent departments and their expenditures are "hidden" within the budgets of larger offices (e.g., Mayor's Office), making it harder to extract specific data related to climate expenditures. Moreover, many climate efforts may occur in departments outside of environmental sectors or without any explicit "climate" labelling. Additional challenges arise from cities' individual reporting discrepancies across time. As Table 2 shows, even cities that are currently reporting climate-related expenditures may not have historical data available to track progress across time. We found that budgetary reporting standards are constantly evolving and tend to change with new administrations, often impacting how legible climate spending is for a particular city.

Embedding climate and justice into budgetary decisions

Interviewees agreed that funding climate action in cities will require more than additional money. Urban climate action will require a reimagining of municipal finance in the service of climate and justice. When asked about emerging innovations in urban climate finance, an interviewee working at a climate network asserted that "the next big thing for cities" is to figure out how to align budgetary decisions with climate change. Several interviewees working in municipal governments explained that they have been working to change how their cities "make their budgets" by ensuring climate change and/or justice are part of decision-making processes early on. For example, municipal officials are pushing to incorporate climate criteria into capital planning and procurement practices to make sure that any additional money needed to fulfil a climate goal is included in budgetary requests. This ensures that departments are asking for "the correct amount of funding" since the beginning, rather than requesting additional funding for climate-related elements as an afterthought later in the process. A municipal official described this strategy as "essentially just flipping the order in which the conversations happen". Other interviewees described this as "integrated thinking" or the "un-siloing" of climate work within municipal finance. As one interviewee put it, the next frontier in urban climate finance is "when it becomes mainstream […] when this is not climate finance anymore. It's just finance".

Our analysis of municipal budgets revealed that some cities are indeed beginning to explicitly embed climate and justice criteria into budgetary decisions. We identified three strategies that cities are using for this purpose. First, a few cities in our sample are explicitly articulating climate action as part of their fiscal health and duty to maintain "fiscal responsibility" or "fiscal sustainability" (i.e., the ability to maintain a balanced budget in the long-term). For instance, in FY 2021, St. Petersburg incorporated the goals and actions of the city's Sustainability Action Plan into their fiscal policies to achieve "long-term fiscal sustainability through proper planning and prioritization processes". Since FY 2022, Denver also defines fiscal sustainability as "integrating social equity and inclusion, public health, climate change and other environmental impacts, and innovation into the budgeting and decision-making processes". Similarly, from FY 2021 onwards, Portland (Oregon) has articulated that, as part of their fiscal responsibility, "fiscal resiliency, climate action, equity, and the needs of our most vulnerable populations will be the focus of every budget decision". This explicit integration of climate action into cities' fiscal health is significant, as several interviewees highlighted that cities tend to be "fiscally conservative" and are unwilling to risk big climate investments partially because of their duties to maintain fiscal prudence.

Second, nine of the fifteen cities in our sample articulated climate action as a *budget priority area* for at least one FY (**Table 9**). Cities tend to frame budget priority areas as "strategic priorities" or "critical expenditures" and use them to "align" budget resources with existing planning documents, goals, or initiatives. In some cases, budget priority areas are used to direct resources to the implementation of specific climate actions (e.g., San Diego), while other cities use them to signal the relevance of environmental and/or climate efforts more broadly (e.g., Boulder). Budget priority areas help municipal governments decide where money should be spent, and as seen during the COVID-19 pandemic, where expenditures should not be cut. However, it is unclear whether and how budget priority areas are systematically used to allocate resources across departments and capital projects. As shown in **Table 8**, both San Diego and St. Petersburg experienced a steep decline in their climate spending in FY 2021 (the first budget adopted after the start of the COVID-19 pandemic), despite their explicit recognition of climate efforts as a budget priority area. **Table 9** also shows that budget priority areas related to climate action are transient in nature and can either change their scope over time, as seen in Columbia, or even disappear after a few years, as seen in Asheville and Burnsville.

Table 9. Budget priority areas including climate action

City	Budget priority area(s)	FY	Climate efforts included in budget priority area
Asheville, NC	A Clean & Healthy Environment / Environment	2020 - 2021	Climate resilience, energy, energy efficiency, waste, climate justice, urban greening
Boulder, CO	Environmentally sustainable	2023	Climate action (general)
Burnsville, MN	Environment / Adaptability	2019 - 2021	Climate resilience
Columbia, MO	Social equity	2019	Clean energy, energy efficiency, climate resiliency
	Infrastructure	2020 - 2022	Transportation, urban greening, energy, waste, climate resiliency
	Climate Action and Adaptation Plan	2023	Climate action (general)
Dallas, TX	Environment & Sustainability	2021 - 2023	Climate action (general)
Denver, CO	Environmentally Resilient	2019 - 2023	Climate action (general)
Portland, OR	Climate goals / climate action	2021 - 2023	Climate action (general)
San Diego, CA	Implementation of the Climate Action Plan	2019 - 2023	Energy efficiency, water, clean energy, transportation, waste, climate resiliency
St. Petersburg, FL	Sustainability & Resilience / Environment, Infrastructure, and Resilience	2019 - 2023	Energy, waste, urban greening, transportation

Finally, we found that six cities in our sample have created *budget allocation tools* to systematically embed climate action and/or justice as a lens to evaluate and make budgetary decisions (**Table 10**). In general, these tools set a series of goals, questions, and/or or prioritization scores that (i) help departments integrate climate and/or justice criteria into their policies, programs, and budget requests and (ii) provide a basis for municipal budget officers to assess budget requests and distribute budget allocations. Budget allocation tools tend to incorporate climate criteria into budgetary decisions by setting climate action as a goal, focus area, and/or desired outcome of cities' policies and investments. Justice criteria are most frequently operationalized as series of questions designed to assess whether and how community engagement was used to design policies and programs, whether and how departments are targeting marginalized communities, and what are the expected impacts of policies on vulnerable populations. Some budget allocation tools are also pushing city governments to make budgetary decisions based on standardized data, and a few cities have created their own set of metrics to aid in this process (e.g., San Diego's "Climate Equity Index" or Dallas' "Equity Indicators"). Budget allocation tools therefore move beyond budget priority areas by formalizing and systematizing the use of climate and/or justice criteria in budget decision-making processes.

Table 10. Budget allocation tools including climate and/or justice criteria

City	Tool	FY	Description	Climate criteria	Justice criteria
Boulder, CO	Sustainability, Equity, and Resilience (SER) Framework	2019 - 2023	The tool guides budgeting and planning processes by providing consistent goals necessary to achieve Boulder's vision of a great community and the actions required to achieve them. City departments perform a citywide program and project inventory and align identified programs to the SER Framework. The city identifies measurements and key performance indicators for program areas and uses this data to guide budget decisions.	X	X
Chicago, IL	Budget Equity Tool	2022 - 2023	The tool establishes a process for city departments to analyze progress, create racial equity goals for the upcoming year, and identify how their budgets will support those goals. This allows the city to align siloed efforts to citywide strategic plans and create goals related to both our processes and our outcomes.	X	X
Dallas, TX	Budgeting for Equity Tool	2020 - 2023	The tool establishes a set of questions shaped to support departments in developing equity lenses and		X

			understandings of equity frameworks. It aids departments in integrating equity into their budget proposals by asking them to analyze demographic data and identify potential disparities in operations or service provision based on race, ethnicity, or socioeconomic status.		
Denver, CO	Budget Equity Framework	2020 - 2023	The tool is intended to operationalize the identification and development of budget requests that support historically marginalized communities or mitigate impacts of budget decisions that may negatively impact these communities. Staff from the Mayor's Office of Social Equity and Innovation use this tool to review every line item for a budget change request and provide feedback.		X
Portland, OR	Budget Equity Tool	2019 - 2023	The tool establishes a set of questions to guide city bureaus and their Budget Advisory Committees in providing a holistic assessment of how budget allocations benefit and/or burden communities, especially Indigenous people, Black people, immigrants and refugees, people of color, and people with disabilities. This analysis is required and critical to implement changes, both in the short- and long-term, to help meet bureau and City equity goals.	X	X
San Diego, CA	Priority Score Policy	2019 - 2023	The policy establishes a capital planning prioritization process to optimize the use of available resources for projects and guide an objective methodology used to produce equal and equitable outcomes. Priority scores are given to projects to compare them to other similar projects of the same type within the capital budget.	X	X

Reimagining funding tools

Another emerging innovation that hints towards cities' reimagining of municipal finance is the creation of climate-specific funding tools. Four cities in our sample have created special revenue funds dedicated to climate action (**Table 11**). These funds collect revenues from fees, taxes, or other charges and earmark them for a specific climate-related department and/or a set of dedicated uses related to climate action. Some of these funding tools have been designed to prioritize justice and target specific vulnerable populations. For example, San Diego's "Climate Equity Fund" requires funded projects to be located in disadvantaged communities identified through the city's "Climate Equity Index". Similarly, Denver's "Climate Protection Fund" and the "Portland Clean Energy Community Benefits Fund" (PCEF) prioritize programs targeted to vulnerable communities. The PCEF is also significant due to its decision-making structure, which enables a community-driven committee to make expenditure recommendations to the Mayor and City Council. Several interviewees highlighted that, by creating consistent and stable revenue streams, these funding tools enable cities "to move and fund projects in ways that other cities just aren't able to do". However, some of these new climate funds are dependent on carbon-intensive activities, such as the use of natural gas utilities and the sale of gasoline. Interviewees also caveated that these solutions are not transferable to all cities in the U.S., as municipalities may be subject to different state laws that limit their revenue-raising capacities, and in some contexts, the creation of new taxes and fees can also create significant political blowbacks.

Table 11. Climate-specific funding tools

City	Funding tool	Year of adoption	Most recent annual revenue estimates	Description
Boulder, CO	Energy Impact Offset Fund (EIOF)	2015	$350 thousand	• Collects fees from marihuana license holders who are required to obtain 100% of their electricity use from renewables. In lieu of compliance, license holders may pay into the EIOF. • Revenues are used to catalyze local projects that directly reduce and/or offset the marihuana industry's greenhouse gas emissions.
	Construction and Demolition Deposit Fee	2020	Unknown	• Collects administrative fees required for building demolition permits. • Revenues are used to fund Boulder's Climate Initiatives department.
	Climate Tax	2022	$6.5 million	• Collects taxes from natural gas and electricity bills. • Revenues are used to fund climate resilience efforts that center equity and work toward systems change, with $1.5 million dedicated to wildfire resilience. • Includes "bonding authority", which allows Boulder to issue debt that would be repaid with future Climate Tax revenues. • Replaced Boulder's previous Climate Action Plan Tax (est. 2006) and Utility Occupation Tax (est. 2011), both of which provided resources for climate-related work.
Denver, CO	Climate Protection Fund	2020	$40 million	• Collects a portion of local sales and use taxes. • Revenues are dedicated to a set of permitted uses: workforce training for under-resourced individuals in clean energy technology and natural resources, neighborhood-based environmental and climate justice programs, adaptation and resiliency programs that help vulnerable communities prepare for a changing climate, programs and services that provide affordable, clean, safe and reliable transportation choices, upgrading energy efficiency of homes, offices and industry, and investments in renewable energy technology and battery storage.
	Green Building Fund	2022	$700 thousand	• Collects fees from commercial buildings that are 25,000 sq. ft. or larger who are required to comply with the Green Building Ordinance. In lieu of compliance, developers or owners can pay a fee and those fees go into the Green Building Fund.

				• Revenues are used to create and improve green space, green infrastructure, green roofs, urban forest, and advance solar and energy efficiency projects for low-income households.
Portland, OR	Community Solar Fund	2013	$8 thousand	• Collects revenue from two sources: (i) the electric utility companies, in the form of a fifteen-year stream of incentive payments based on the energy produced from each solar energy system; and (ii) donations from individuals, businesses and organizations who provide voluntary contributions. • Revenues are used to install new, small-scale solar electric systems on community buildings.
	Portland Clean Energy Community Benefits Fund (PCEF)	2018	$80 – 90 million	• Collects revenue from the Clean Energy Surcharge, a 1% surcharge on retail sales for large retailer businesses. • Revenues are used to provide grants for community-led projects and programs that reduce greenhouse gas emissions and advance social and economic benefits. • PCEF prioritizes communities of color, low-income residents, and other communities on the frontlines of climate change with clean energy funding, green infrastructure projects, and job training programs targeting historically disadvantaged groups, including women, people of color, and the chronically under-employed. • Funding decisions are made by the Mayor and City Council based on recommendations of a nine-member committee consisting of community members.
	Parking Climate and Equitable Mobility Transaction Fee	2022	$1.8 million	• Collects parking fees. • Revenues are used to invest in transportation affordability and access programs.
San Diego, CA	Climate Equity Fund (CEF)	2021	$9.1 million	• Collects a portion from gas and electric franchise fees, Transnet (sales tax), and the Gas Tax. • Revenues are used to help underserved communities effectively respond to impacts of climate change. CEF projects must have an impact on reducing greenhouse gas emissions, enhancing safety in the public right-of-way, relieving congestion, or achieve other climate equity concerns. • CEF projects must be located in a disadvantaged community within an area that scores between 0 and 60 on San Diego's Climate Equity Index.

Discussion and Conclusion

Our research shows that municipal budgets are facing increasing burdens as urban areas transition into climate-changed cities. Despite cities' growing attention to climate action and justice, there was consensus among interviewees that climate policies and programs continue to be underfunded in U.S. cities, and our analysis of municipal budgets show that these funding constraints exist across cities of all sizes. Both climate change and climate action generate new burdens on municipal budgets by increasing cities' expenditures and/or reducing their revenue streams. This, in turn, increases cities' fiscal vulnerability and reduces their capacity to (equitably) respond to climate change. Although previous scholars have estimated the *future* fiscal impacts of climate change in U.S. municipalities (Gourevitch et al., 2023; Shi et al., 2023; Shi and Varuzzo, 2020), our findings contribute to emerging evidence (Gilmore et al., 2022; Liao and Kousky, 2022) that some cities are already experiencing climate-induced fiscal stress. This hints at the increasingly important role that municipal finance will play in climate politics.

Our analysis also revealed that, even in cities that have been formally engaged in climate action for more than two decades, it is usually not possible to identify and monitor the amount of money that is being spent on climate action. This echoes previous literature that denounces different aspects of municipal finance as opaque or "hostile in many ways to meaningful democratic decision-making" (Knuth, 2023), and further highlights the need to elevate municipal finance as a site of climate politics. Although cities may face many challenges to track their climate spending, the illegibility of climate expenditures in most municipal budgets suggests that budgetary processes, and municipal finance more broadly, have not fully been recognized as part of the realm of climate politics, and cities may not have received sufficient pressure to be accountable of their climate expenditures and investments. This is critical, as the metrics that cities choose to be held accountable to reflect particular logics of cities' priorities, and can ultimately shape the conduct of municipal governments (Hughes et al., 2020). This lack of transparency and monitoring can further disempower local communities and non-governmental actors to demand climate action from cities (Hughes et al., 2020).

Although we were unable to quantitatively track the distribution of climate spending in most cities in our sample, our research revealed two promising trends in the "qualitative redirection" of municipal finance (August et al., 2022). First, we found that several cities have embedded climate and justice considerations into their municipal budgets by (i) recognizing the role that climate change and climate action play on cities' fiscal health; (ii) explicitly articulating climate action and/or justice as a budget priority area; and/or (iii) by developing budget allocation tools that systematically incorporate climate and/or justice criteria into budgetary decisions. Second, we find that some pioneer cities are creating funding tools that earmark municipal revenues for climate action and climate justice efforts. Although budget allocation strategies and tax- and fee-based funding tools have long been part of the vernacular of municipal finance, the reimagining of these instruments for climate action is significant, as the lack of long-term, stable funding sources has been a constant barrier to climate action in the U.S. and beyond (Fünfgeld et al., 2023; Hughes, 2017). However, since municipal budgets and some of these emerging climate funding tools continue to be reliant on the use of fossil fuels, it is unclear whether cities will be able to provide stable financial resources in the long-term, even with these emerging transformations. In creating new climate funding tools, policymakers should be mindful about how revenues are generated and whether these tools could inadvertently serve to further lock-in cities' fiscal dependence on carbon-intensive activities or, as argued by Shi et al. (2023), land and real estate development.

The advent of climate- and justice-oriented budget allocation processes and funding tools echo insights from several interviewees who claimed that "[…] we don't need to really invent anything new at this point. We just need to do what we do better". Rather than promoting the pursuit of novel debt financing schemes and financialized experimentation in cities (Bigger and Millington, 2020; Christophers, 2018; Knuth, 2023), the *ordinary innovations* we uncovered in this research are pushing cities to repurpose the tools and practices of public finance in the service of climate action and climate justice. This reimagining of municipal finance is generating new spaces and opportunities to contest and decide the making of (just) urban climate futures.

Conceptualizing municipal finance as a site of climate and justice politics opens new questions about the multi-scalar nature of fiscal geographies. As cities continue to reimagine municipal finance to advance just urban transitions, scholars must examine how these transformations interact with existing state and federal fiscal practices. Since states in the U.S. often set limitations for cities' revenue-generating authorities (*Authors, forthcoming*), the adoption of climate- and justice-driven funding tools may be constrained geographically and politically, further contributing to unequal geographies of climate action and climate risks (Shi and Bouma, 2023). Previous studies have shown that the fiscal impacts of local climate disasters are mostly absorbed by state and federal governments (Liao and Kousky, 2022; Miao et al., 2018; Shi et al., 2023). However, these higher levels of government are also expected to suffer public deficits due to climate change (Miao et al., 2018; Parrado et al., 2020), which may revert at least some recovery costs back to municipalities (Shi et al., 2023). The effectiveness and stability of municipal climate and justice-oriented financial solutions may be tested in these circumstances.

While our research focused on U.S. cities as a case study, recent scholarship has shown that municipal finance is a site of climate and justice politics in cities across the world, with consequences at multiple scales. For instance, participatory budgeting in Europe and Latin America is being used to challenge green growth paradigms and to embed justice criteria into climate action (Cabannes, 2021; Falanga et al., 2021; García-Lamarca et al., 2022). In Australia, cities are also leveraging municipal finance to facilitate equitable decarbonization outcomes and achieve extra-local renewable energy development despite unsupportive state and federal policies (Hadfield and Cook, 2019). In the Global South, the use of municipal finance for climate action and climate justice efforts is also entangled with multi-scalar relationships with other countries and multilateral organizations through global climate finance flows (Bracking and Leffel, 2021; Mohan and Tan-Mullins, 2019; Silver, 2023). This further positions municipal finance as a potential site to examine climate politics not only within a single municipality, but also across city boundaries and at multiple scales. Future research exploring the climate and justice politics of municipal finance should compare cities in different contexts and trace the climate and justice politics of public finance across different governance levels.

The growing fiscal challenges that cities are experiencing in the face of climate change and the emerging ways in which city governments are reimagining municipal finance to implement (just) climate action indicate that municipal finance will increasingly become an important site of climate and justice politics. Urban scholars, practitioners, and activists interested in advancing just climate action must begin to raise questions of municipal finance – how cities obtain and allocate public funding, for what, and for whom, what values and criteria are prioritized in those allocations, and who is able to contribute to those decisions. Municipal budgets, taxes, fees, and other mundane aspects of municipal finance must be seized as sites of conflict and contestation to create more just urban climate futures.

Acknowledgements

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CHAPTER 5:

Operationalizing climate justice in the implementation of Boston's Building Performance Standard

Abstract

Cities are moving to implement just urban transitions, but the politics and processes of policy implementation and operationalizing climate justice from theory into practice remain understudied. Here, we examine the implementation of climate justice through Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO), a landmark Building Performance Standard reflecting a transformative shift towards carbon neutrality in cities. We utilize a rich mixed-methods research design rooted in five months of participant observation within the City of Boston's Environment Department, twenty expert interviews, and a systematic content analysis of hundreds of policy documents. We find that implementing BERDO entails political contestation over differing conceptions of resistance and power relations around climate justice. Justice becomes subject to scope and scale discrepancies, the processes of bureaucratization, and even weaponization. In documenting these tensions, we provide insights into the complex challenges that cities may face as they begin to operationalize climate justice on the ground.

Introduction

Cities are now taking the lead in implementing just urban transitions (Bulkeley, 2021; Hughes and Hoffmann, 2020). Given the global push towards urbanization into metropolitan areas (Sovacool and Brown, 2010), and the devolution of some authority in climate decision-making to subnational actors, cities have been international leaders in climate action for over two decades (Bulkeley, 2010b; Hsu et al., 2020a; Stehle et al., 2022). More recently, city governments are increasingly recognizing the connections between climate change and social justice, and making headway in the integration of justice and equity concerns into climate plans and implementation tools (Caggiano et al., 2023; Cannon et al., 2023; Diezmartínez and Short Gianotti, 2022). This optimistic outlook, however, has been met with questions about whether and how cities will take just climate action from theory into practice.

While scholars have repeatedly criticized the gaps between the rhetoric and reality of urban climate action (Bulkeley and Betsill, 2005; Keskitalo et al., 2016; van der Heijden, 2021; Woodruff and Stults, 2016), existing literature has focused intently on either analyzing the development of plans, policies, and targets, or evaluating the post-facto outcomes of cities' programs (Bulkeley, 2021; Hughes, 2017; Keskitalo et al., 2016; Laurian and Crawford, 2016; Malloy and Ashcraft, 2020; Ryan, 2015; van der Heijden, 2021; Westman and Castán Broto, 2021). This collective scholarship has revealed multiple barriers to urban climate mitigation and adaptation, from funding constraints and limited capacities, to lack of political will and issues of authority (Eisenack et al., 2014; Fünfgeld et al., 2023; Ryan, 2015). These barriers result in, at best, insufficient greenhouse gas emissions reductions (Burley Farr et al., 2023), and at worst, the exacerbation of climate vulnerabilities and injustice in cities (Anguelovski et al., 2016; Carley and Konisky, 2020; Hardy et al., 2017; Sovacool, 2021).

Although cities purportedly continue to underdeliver on climate action and justice, the politics and dynamics of policy implementation – the process through which city governments translate goals and plans into operational and enforceable programs – remain understudied (Bulkeley et al., 2013, p. 201; Hughes, 2017; Westman and Castán Broto, 2021). Rather than recognizing the complexities of operationalizing climate action, existing theory from policy implementation suggests that either unique "configurations" of enabling factors (Ryan, 2015) or the mere removal of barriers should enable cities to successfully implement climate policies (Biesbroek et al., 2015; Eisenack et al., 2014). This thinking obscures the "politics and contested nature of low carbon urbanism" (Luque-Ayala et al., 2018, p. 4) and hinders the analysis of policy implementation through political and justice lenses (Biesbroek et al., 2015; Hughes, 2017), with scholars ultimately failing to address how the "recognition of socially vulnerable groups either carries through or drops out of the policy implementation process" (Malloy and Ashcraft, 2020).

Here, we examine the politics and processes through which city governments operationalize climate justice and climate action through a case study of Building Performance Standards, one of the latest policy approaches in building decarbonization, in the City of Boston (U.S.). Buildings are often one of the largest source of greenhouse gas emissions in urban areas (Salimifard et al., 2022; Walter and Mathew, 2021) and account for about 37% of global energy-related carbon emissions and more than 34% of direct energy consumption (United Nations Environment Program, 2022). Energy efficiency is one of the most common climate interventions across cities worldwide (Bulkeley, 2010b; Sethi et al., 2020), and the mitigation sector where U.S. cities articulate justice concerns the most (Diezmartínez and Short Gianotti, 2022). Existing policies, however, have produced only marginal improvements in building energy intensity (United Nations Environment Programme, 2024). Energy demand and emissions from the buildings sector have continued to increase globally, and few local efforts are aligned with achieving net-zero operational emissions from buildings (United Nations Environment Programme, 2024).

As one the first Building Performance Standards adopted in the U.S., Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO) represents a radical shift in building decarbonization. BERDO is an ordinance (local law) adopted in 2021 that mandates large residential buildings (≥15 units) and commercial buildings (≥20,000 ft^2) in Boston to progressively reduce their greenhouse gas emissions until reaching net-zero by 2050. BERDO requires building owners to (i) report their annual energy and water use, (ii) verify reported data through a third party on a regular basis, and (iii) reduce their annual emissions below an emissions standard corresponding to their building use type(s). Reporting and third-party verification are required for all buildings since 2022. Emissions compliance begins in 2025 for larger buildings (≥35 units or ≥35,000 ft^2) and in 2030 for smaller buildings (15-34 units or 20,000-34,999 ft^2). BERDO is lauded for being one of the few existing Building Performance Standards that incorporates explicit justice mandates within its ordinance. This includes the creation of a community-driven Review

Board with significant decision-making authority over the implementation of the program, and the establishment of the Equitable Emissions Investment Fund to support building decarbonization projects that benefit environmental justice communities.

We investigate the first two years of the implementation of BERDO with a particular focus on rulemaking, the process through with the City of Boston developed rules and regulations to implement and enforce the ordinance. We employ a mixed-methods approach that combines five months of participant observation within the City of Boston's Environment Department, twenty interviews with city staff and community leaders involved in the implementation of BERDO, and a systematic content analysis of over 200 policy documents related to rulemaking. We find that policy implementation served as an important site of political contestation and resistance around climate justice. Contestations about justice, equity, and fairness were mobilized by different actors to advance their interests in rulemaking, ultimately shaping the implementation of BERDO itself. We provide insights into the complex challenges that cities may face as they begin to operationalize climate justice on the ground and argue for a shift in scholarship to politicize policy implementation and reframe climate justice as a practice that continues beyond policy planning.

Results

Based on our mixed-methods research design (see "Methods" section), we organize our analytical insights according to three core themes: (i) the history and implementation process of BERDO, (ii) contested climate justice claims that arise during implementation, and (iii) challenges in translating climate justice from theory into practice.

The history and implementation process of BERDO

The implementation of BERDO began shortly after the adoption of the ordinance with the launch of the rulemaking process (**Fig. 6**). City officials described the goal of rulemaking as "creating clarity" for building owners on how to implement different compliance mechanisms to achieve emissions reductions (**Table 12**) and defining how justice mandates embedded in the ordinance (**Table 13**) work "not just in concept but in action". Regulations were adopted in three phases. Each phase was dedicated to specific regulatory topics and included several engagement components and public comment periods.

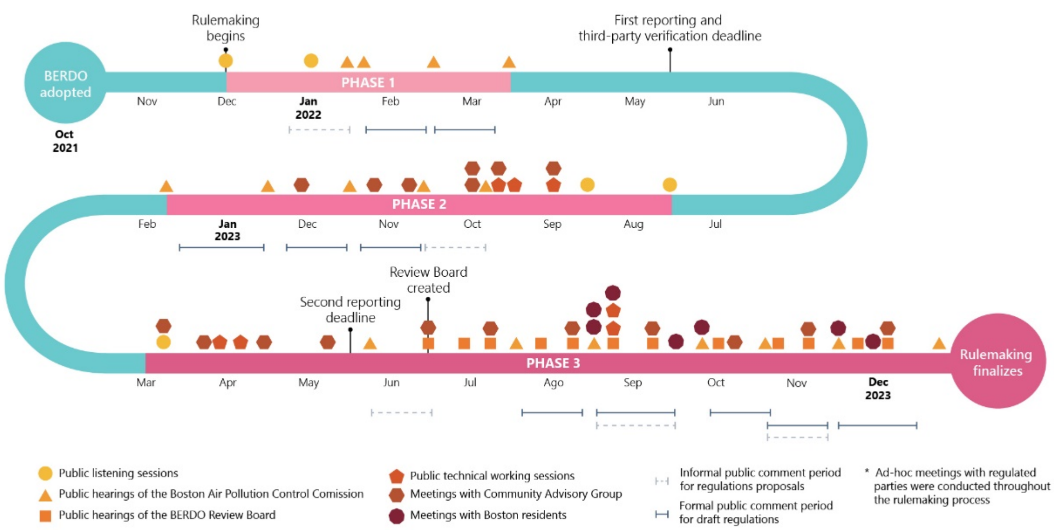

Figure 6. BERDO rulemaking process
The rulemaking process consisted of three phases. Phase 1 set rules for reporting and third-party verification. Phase 2 set rules related to the Review Board, emissions factors, compliance mechanisms associated with renewable energy, and other administrative regulations. Phase 3 set rules related to flexibility measures, the Equitable Emissions Investment Fund, and penalties and fines. Symbols are used to represent public comment periods and different engagement components that were part of the rulemaking process.

Table 12. BERDO compliance mechanisms

Compliance mechanism	Description
Direct emissions reductions in buildings	Owners may directly reduce emissions from electricity and fossil fuel consumption through building retrofitting and fuel switching. This includes improvements such as upgrading to high-efficiency electric appliances and lighting, electrification of heating, cooling, and cooking systems, insulation, and building envelope improvements.
Enrollment into Boston's municipal aggregation program	Owners and tenants may reduce emissions from electricity consumption by enrolling their electric accounts into Boston's Community Choice Electricity (BCCE) Program, a municipal aggregation program through which the City of Boston purchases MA Class I RECs on behalf of customers.
Local renewable energy generation	Owners may reduce emissions from electricity consumption through non-emitting renewable energy generation located on-site (e.g. rooftop solar) or off-site (e.g., community solar, Power Purchase Agreements in ISO New England grid).
Eligible Renewable Energy Certificates (RECs)	Owners may mitigate emissions from electricity consumptions by purchasing and retiring unbundled MA Class I RECs; or purchasing and retiring bundled MA Class I RECs as part of a Power Purchase Agreement in the ISO New England grid.
Eligible Power Purchase Agreements (PPAs)	Owners may mitigate emissions from electricity consumption by entering into a long-term energy contract with a generator of non-emitting renewable energy located outside the ISO New England grid. The PPA must meet an "additionality" requirement and associated RECs must be retired as part of the PPA.
Alternative Compliance Payments (ACPs)	Owners may mitigate emissions from electricity and fossil fuel consumption through ACPs. ACPs are priced at $234 for every metric ton of CO_2e emitted above the emissions standards. ACPs are not fines, but rather a compliance pathway.

Table 13. Key justice components embedded in BERDO

Component	Description
Goal	To "reduce the emissions of air pollutants, including greenhouse gases, from building energy production and consumption, and thereby to encourage efficient use of energy and water, develop further investment in building a green economy, including by encouraging the hiring and training of green jobs, protect public health, and promote equitable access to housing".
Review Board	A nine-member independent board that provides community oversight over the implementation of BERDO. Two-thirds of the Review Board (six seats) must be nominated by community-based organizations. One seat is reserved by the Chair of the Boston City Council's Environmental Justice, Resiliency, and Parks Committee. Two seats may be nominated by anyone. The Review Board has the authority to make funding decisions for the Equitable Emissions Investment Fund, approve and set conditions for flexibility measures requested by owners, enforce the ordinance, issue penalties and fines, propose updates to emissions standards and the price of Alternative Compliance Payments, and recommend revisions to regulations and compliance mechanisms.
Equitable Emissions Investment Fund	A special purpose fund that collects all Alternative Compliance Payments (see **Table 1**) and fines made pursuant to BERDO. The Review Board makes funding decisions, provided that money in the fund must be used to support local building carbon abatement projects and must prioritize projects that benefit environmental justice communities and populations disproportionately affected by air pollution.
Flexibility measures with	Owners may apply to obtain flexibility in complying with emissions standards. Flexibility measures must be approved by the Review Board and the Review Board may set conditions of approval, including conditions related to environmental justice. Flexibility measures include:

conditions of approval	• Building Portfolios, which enable owners to comply with a single emissions standard across a group ("portfolio") of buildings that share the same owner or Institutional Master Plan (a development plan approved by the Boston Planning & Development Agency). • Individual Compliance Schedules, which enable owners to request an alternative emissions reduction based on a baseline year. Individual Compliance Schedules must establish absolute emissions limits that decline every five years on a linear or better basis. Based on their selected baseline year, owners must achieve a 50% reduction in absolute emissions by 2030 and a 100% reduction by 2050. • Hardship Compliance Plans, which enable owners to request alternative emissions standards and/or emissions reduction schedule if facing a significant hardship in complying with the default emissions standards.

To operationalize climate justice, city staff simultaneously sought to (i) elevate community voices in regulatory decisions through the formation of a Community Advisory Group (CAG) composed of community advocates and leaders working on environmental justice, social justice, affordable housing, and climate action and (ii) maintain the buy-in of the regulated parties subject to BERDO, including real estate, hospitals, universities, and other building owners. CAG members met regularly with city officials to advise on how to align regulatory and implementation decisions to justice ideals and community priorities. For city staff, the CAG provided a space to "explicitly talk about equity" and enable "ground truthing" with community leaders with "true expertise and what is needed or wanted in a community". The CAG also provided a buttress against opposition for regulatory decisions designed for justice, as stated by a city official: "we had the backup to say 'we are talking to community members, and this is a concern that's being brought up'". CAG members described their role as representing the needs of their neighborhoods, ensuring that implementation "was aligned with equity" and does not disproportionately burden vulnerable communities, while making sure that BERDO "had teeth" and guardrails against “the tricks” building owners may use to circumvent obligations. Perceptions from CAG members about this process are summarized in **Fig. 7.**

Whereas CAG members provided direction to incorporate justice measures in rulemaking, city staff saw engaging with regulated parties as an important component of fulfilling justice goals in the long-term. As one city official stated: “we need to bring all building owners along in this process to actually see building decarbonization happen”. Regulated parties engaged in rulemaking through public comment letters, public hearings, and ad-hoc meetings with city officials. In this regard, city officials explained that “having a clear process for hearing and responding to feedback was really important”. “People notice that, and it matters. Even if they're not all going to be happy with exactly where you ended up, they understand how you got there and felt like they weren't left out of the process”, and it “builds some goodwill with stakeholders, even when we weren't taking all of their recommendations.”

Beyond rulemaking, implementing the early stages of BERDO also involved operationalizing the procedural and recognitional aspects of justice in everyday decisions and practices. This included managing reporting and third-party verification processes, a helpdesk, outreach and education for building owners, and the Review Board’s nomination and seating process. In these processes, city officials sought to implement justice by creating resources to help “getting everyone subject to BERDO across the finish line” with reporting and emissions compliance, and by giving “time, attention, and resources towards under-resourced residents and owners”.

New and unique	"The fact that the city engaged a group of in this advisory board was unique" "It was really an experiment in how to have policymaking and a regulatory process be more collaborative" "The fact that we were able to bring in the perspectives of people who otherwise would not have had their feedback heard, whether or not it was incorporated, is important and meaningful"
Open and intentional	"I found [the process] to be very thoughtful and intentional." "I think [the city] really make an effort to make sure that stakeholders in EJ communities fully participate in it, and I can say that we try our best to fully participate" "I think the city was very open and willing to learn" "I love that the city made a huge effort to include people in every community, and it's really open and willing to talk to people." "This whole process to get community input that was very structured and clear" "I found the CAG process to be very organized. The fact that there was a repository of documents [...], the determination of the city officials to be present at the meetings [...], they had office hours. If you wanted to talk to someone, you could talk to someone"
Collaborative	"I never felt there was anybody trying to hide anything. It was pretty transparent" "It was a very collaborative process" "I didn't feel like I was working against the city in any way. I really felt like we were working together and that we wanted the same things."
Impactful	"I can see my participation in the regulations" "Engagement is, I think, the most important thing that has happened." "This is a great model and other cities should do that." "We can see in the regulation, where the community voice has been integrated. Did we get to community ownership? I don't think so, but I think this is a much better place than before."
Quick	"It was a rushed process because of its timeline" "We were under a tight timeline to come up with the content of the regulations" "I know that it's easier said than done when it comes to public processes, but even more time would have been better. You got to go slow to go fast and build trust" "I think that the city did the best it could in the situation [...] you've got to be moving things along at a pace, whereas the group didn't always feel informed or understanding what was going on"
Top-down	"I got the impression that some people on the CAG really wanted [the process] to be more bottom up than it was. But it was much more bottom up than other people even tried to do, and I think it became more bottom up as people gave feedback about how the meetings were going" "I think that the frustration of the group was that [the process] was on the timeline of having to promulgate the regulations, instead of stepping back and saying to the group 'what are the major issues that you want to talk about?'"
Complex	"As an advisory group member, it was challenging. It's just so much information. I think we really would have benefited from some in person longer session meetings" "One of the biggest challenges that I felt throughout the process was being able to break down and explain what a lot of these like highly technical policies mean and what they would actually like result in". "The city heard things that we didn't hear from other people, and they also had to make decisions that are based on things that we may not have been aware. So that felt frustrating."

Figure 7. Perceptions of Community Advisory Group process

Summary of perceptions from CAG members about the process and approach of the CAG. Data comes from interviews with CAG members.

Justice contestations in policy implementation

Rulemaking not only set the groundwork for BERDO, but also provided a site for CAG members and regulated parties to contest and reinterpret the justice goals and mandates embedded in BERDO. These justice contestations centered on (i) the distribution of benefits and burdens, (ii) power, representation, and accountability, and (iii) the recognition of different groups (**Fig. 8**).

While BERDO may produce impacts at multiple scales, contestations about distributing benefits and burdens primarily centered on building owners, tenants, and environmental justice communities. CAG members generally advocated for removing perceived regulatory loopholes that would allow building owners to avoid or delay compliance, rely on compliance mechanisms that do not provide localized benefits, or pass burdens onto tenants through increasing rents or energy bills. As explained in a comment letter from CAG members: "we are concerned that the benefits of BERDO compliance (i.e., building improvements, improved air quality, jobs) may not adequately reach those in environmental justice populations, and that the burdens of compliance (i.e., financial costs, displacement) may be inequitably shouldered by those same populations".

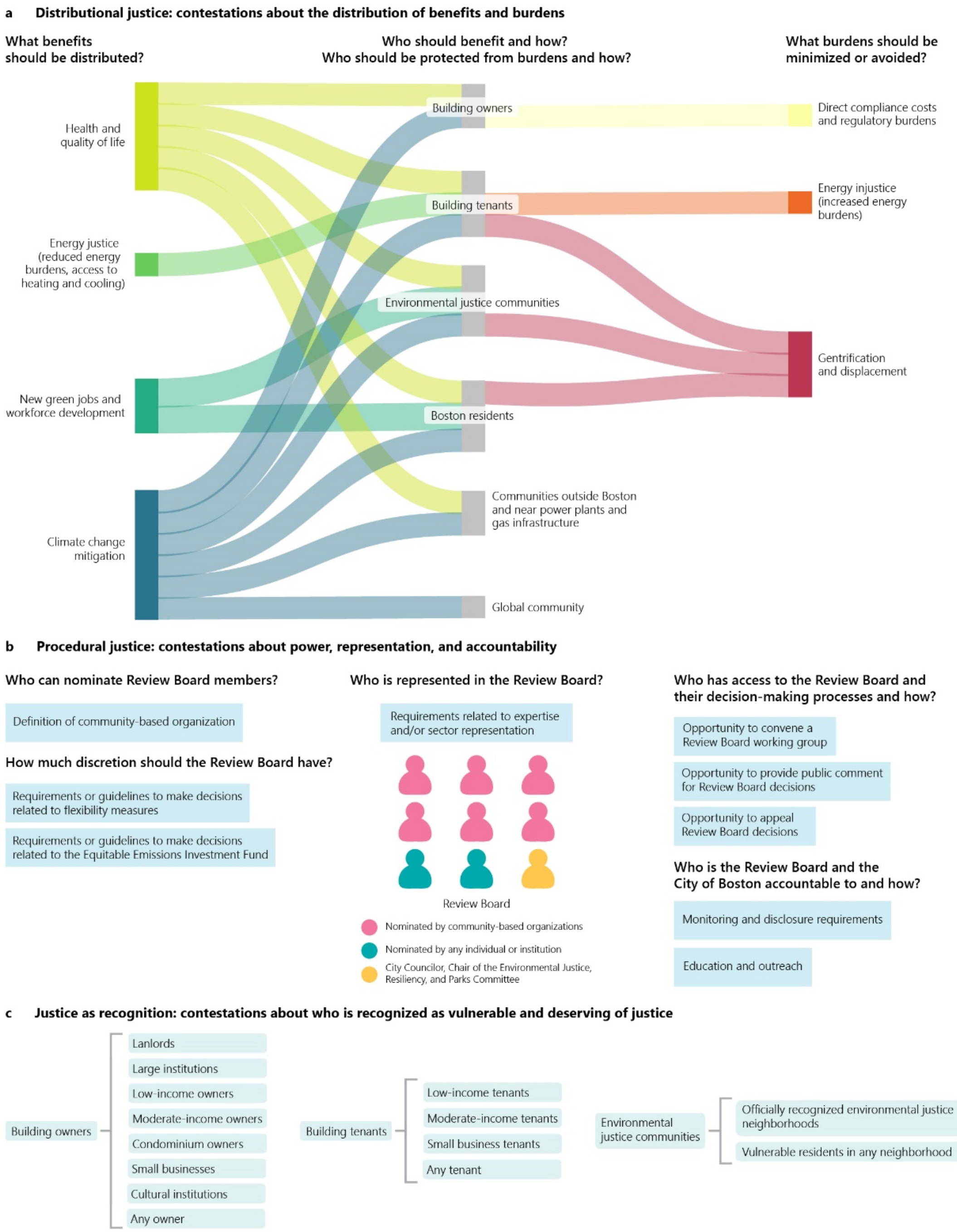

Figure 8. Justice contestations in rulemaking process

Different actors framed and mobilized multiple contestations around ideals of justice, equity, and fairness to advance their interests and shape implementation decisions. Contestations focused on issues of distributional justice, procedural justice, and justice as recognition.

Regulated parties rarely advocated for the creation of additional benefits or the distribution of existing benefits. Most of their requests were related to providing flexibility to building owners and minimizing costs and regulatory burdens, often arguing that regulations would “unfairly”, “unduly” or “overly” burden them. In some instances, regulated parties were reluctant to accept regulations mandating building owners to distribute benefits in the community. In public feedback related to conditions of approval for flexibility measures, some regulated parties argued that distributing benefits such as housing and energy affordability, health, and climate resilience “are outside the scope of emissions reductions in covered buildings” and “go beyond the intent of the BERDO ordinance”. In other cases, regulated parties mobilized the idea of environmental justice benefits to advance regulatory decisions that favor them. For example, in public comment letters regarding the Equitable Emissions Investment Fund, some regulated parties pushed for the prioritization of projects that produce larger emissions reductions as this “is the greatest benefit to environmental justice and all populations”. Such decision would have favored applications from larger carbon-intensive institutions as opposed to more holistic projects that benefit the community in other ways.

Contestations about process, power, and representation revolved around the Review Board, who has the authority to approve flexibility measures, allocate funding from the Equitable Emissions Investment Fund, and enforce the ordinance through penalties (**Table 13**). Regulated parties sought to strengthen their representation in the Review Board by urging the city to select members with technocratic expertise and expand the definition of “community-based organizations”, which can nominate two-thirds of the Review Board, to include the business community. Unsuccessful in these efforts, regulated parties then advocated for regulations that would limit the Review Board's discretion, provide them access to the Review Board through working groups, or enable owners to easily appeal Review Board decisions.

In contrast, CAG members supported giving power to the Review Board, although it proved challenging to balance maintaining the Review Board's discretion versus outlining decision-making processes with prescriptive justice measures. CAG members also advocated for tenants and residents to have a voice in Review Board processes and regulatory decision-making, which led to additional meetings with Boston residents during rulemaking. While both regulated parties and CAG members supported some monitoring and disclosure requirements, only the CAG focused on tracking environmental justice metrics and implementing outreach and education efforts beyond building owners.

Contestations about distributional and procedural justice revealed underlying debates about *who* is recognized as vulnerable and deserving of justice under BERDO. Although BERDO regulates all types of building owners, CAG members largely focused on restricting the behavior of *landlords* and *large institutions*, sometimes overlooking burdens placed on other building owners. Some CAG members pushed for more nuanced discussions and highlighted how certain owners are also vulnerable. As stated in a CAG meeting: "if we want justice, justice is not just displacing burdens on private owners". This frames building owners as subjects of justice and questions the assumption that protecting tenants at the expense of owners is always just. While CAG members generally agreed on prioritizing benefits to environmental justice populations, communities of color, tenants, and low- and moderate-income residents, specifics about how to operationalize such priorities were oftentimes contested. For instance, when discussing the Equitable Emissions Investment Fund, some suggested money should only be directed to environmental justice neighborhoods and were wary of including "geographic equity" as a part of the Review Board's funding criteria, fearing that this would channel resources to wealthier neighborhoods. Others argued that regulations should recognize the differences between environmental justice neighborhoods and that projects in wealthy communities can also serve vulnerable residents. Reflecting on issues of recognition, a city official commented: "I have a specific responsibility to even the scales for folks at the margins because they've historically been uncared for, but that doesn't need to express itself as callousness or disregard to those in the middle. […] In this role, I don't think it is right or ethically just for me to just not care about people. That is a practice of dehumanization is a big problem within our movements too. I would like us to get to the point where we lack the ability to demonize anyone".

Although justice contestations featured prominently in regulations related to BERDO's justice components (**Table 13**), concerns about justice were also mobilized in regulatory topics not commonly associated with justice and/or without an explicit justice mandate emanating from the ordinance. For instance, concerns about asthma in children and air pollution in communities of color were mobilized by CAG members to support assigning an emissions factor to fossil-fuel derived district steam. This decision was opposed by some regulated parties, who argued such rule places an "unfair financial burden" and "disproportionately burdens district steam customers". In advocating to restrict the use of Power Purchase Agreements, CAG members argued that despite existing challenges in renewable energy markets, "we cannot allow the current reality to further entrench existing inequity at the expense of environmental justice populations". Conversely, regulated parties argued that relaxing third-party verification requirements to allow for in-house data verification would be "a key workforce development opportunity" that "would create a powerful incentive for large existing buildings to hire energy efficiency experts long-term". These examples show how justice contestations appear in seemingly opaque or technical decisions and beyond spaces explicitly labelled for justice. As one city official explained, even where the ordinance does not specifically require it, "regulations can still accommodate additional thoughts on what it means to advance equity goals".

Even though CAG members and regulated parties were not always successful in influencing implementation decisions by mobilizing ideas of justice, justice contestations came to define how the City of Boston operationalized climate justice in BERDO and shaped the implementation of BERDO itself. This could be seen in the evolution of the rulemaking process with the addition of meetings with Boston residents and additional public comment periods as a result of requests from the CAG and regulated parties. Contestations were also reflected in the final rulemaking language, which was drafted and revised to resonate with justice ideals mobilized throughout the process (**Fig. 9**).

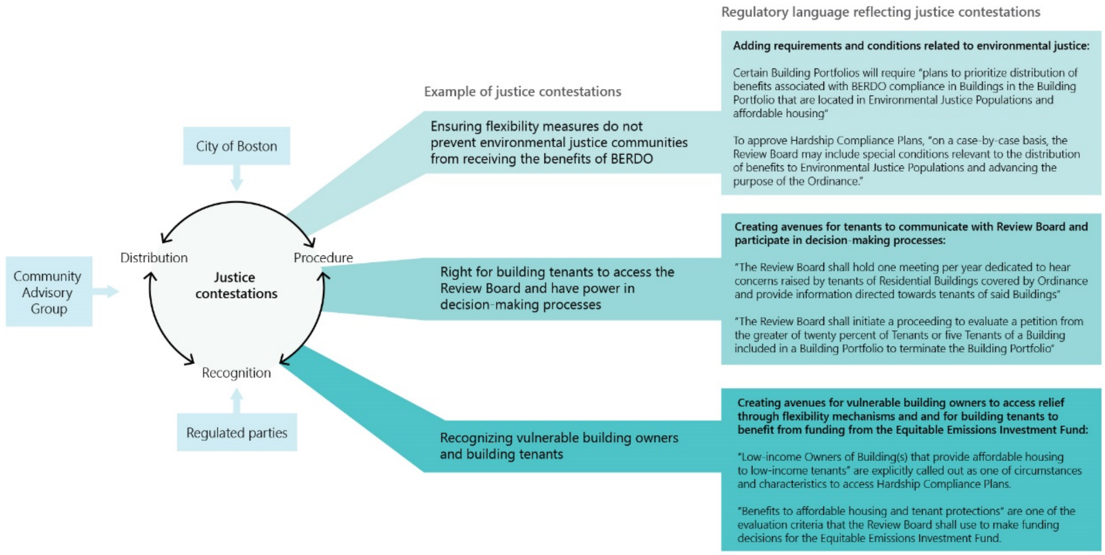

Figure 9. Examples of the impact of justice contestations in rulemaking
Examples of how justice contestations are reflected in regulatory language.

Challenges in translating climate justice from theory into practice

Interviewees identified several common barriers to policy implementation in BERDO, including capacity and budget constraints, technical complexity, uncertainty, and data quality/availability. However, additional distinctive challenges stemmed from the pursuit to operationalize climate justice itself. We categorized these challenges into (i) scope and scale discrepancies, (ii) bureaucratization of justice, and (iii) weaponizing of justice.

The first challenge in implementing climate justice is that it inherently requires action at multiple *scales*, and beyond the *scope* of a single program. As stated by an interviewee, "the ordinance was reflective of some community priorities and goals that would never really be able to be addressed through just BERDO alone". In addition to the legal constraints attached to any given program, scope and scale discrepancies partially originate from the multiplicity of meanings of justice. For some, operationalizing justice in BERDO meant implementing the program in a way that avoids harm and distributes benefits inherently produced by building decarbonization. For others, justice also meant "increasing the pot of benefits that are on the table and then distributing those", potentially crossing the legal scope of BERDO.

This issue was best exemplified in discussions about gentrification and displacement, with advocates persistently pushing for BERDO to include tenant protections. For context, the majority of Boston's households (65%) are renters (City of Boston Office of Housing, 2022). Across Greater Boston, 65% of Black residents and 70% of Latinx residents are renters, compared to only 33% of White residents, and more than half of the region's renters were cost burdened in 2022 (Kennedy et al., 2023). Symptoms of green gentrification have already been reported in Boston as a result of intersecting pressures from urban greening and climate initiatives and redevelopment strategies (Anguelovski et al., 2022; Planas-Carbonell et al., 2023). In this landscape, the implementation of BERDO may be perceived, rightly or wrongly, as another installment in patterns of historical marginalization. Although BERDO includes a goal related to housing justice, municipalities in Massachusetts lack the authority to institute rent control, and BERDO offered limited avenues to integrate rent stabilization and tenant protections. This showcases how even if a policy is explicitly designed with a justice lens and city staff and advocates agree on principles such as *"climate justice is housing justice"*, individual climate programs may not always have the scale or scope to operationalize those goals.

Scope and scale discrepancies were omnipresent throughout rulemaking, with BERDO implementation serving as a battleground for multiple issues that could not be directly or fully addressed through this program, from evictions and slow permitting processes to the marketing of renewable natural gas. This often let to tensions and some CAG members felt that they were unable to "set the agenda" during rulemaking (**Fig. 7**). Some members explained that "making the regulations was not always in line with what the group wanted to talk about" and "the response that 'we can't do anything about rent control because that's a state issue' is really unsatisfying for people and can be really disempowering". Such frustrations were illustrated in a statement during a public meeting: "we keep talking about buildings and not people".

The second challenge in translating climate justice into practice is that it necessitates the *bureaucratization* or standardization of justice goals into concrete processes, measures, or criteria. This creates the risk of reducing justice into box-checking or scoring exercises that do not fully reflect justice ideals. As one city official explained "[Before] I understood environmental justice as a way to dismantle power and distribute power, [but] to write policy, you have to write environmental justice in a measurable, actionable way, […] which it's not the way the people really talk about it". This can be seen in environmental justice assessments that rank initiatives based on justice-oriented metrics, or in definitions and indexes of environmental justice communities, which despite compiling multiple sociodemographic variables, may not always reflect who residents perceive as vulnerable. Justice is in many ways imperviable to codification. As stated by a city official: "I don't think you can 100% ever codify justice. There are some things like love, which I believe has to be a critical component to how we live in the world, and how am I supposed to write that? How do we do this with love and grace?"

The bureaucratization of justice is not only driven by the state's need to standardize rules and processes. Rather, it can be promoted by myriad actors. For instance, bureaucratization can come from advocates seeking to further justice when they push for blanket justice requirements that may serve a purpose in some contexts but are ill-fitting in others. It can also come from regulated parties seeking to limit justice when they demand constraining justice-oriented decision-making to "objective" or "data-based scoring systems". Both approaches bureaucratize justice, either by reducing it to for-the-sake-of-it mandates or by forcing its objectification and quantification.

Additional challenges emerge when justice is *weaponized* to stall, impede, or co-opt implementation. Throughout rulemaking, some CAG members and regulated parties pushed for implementation delays by mobilizing ideas of justice and fairness. Some interviewees questioned the value of such hold-ups, which can expose policies to political turmoil, put them at risk of being legally challenged, and ignore that "we also have a deadline from a climate perspective". Just implementation does require time to allow for meaningful engagement of community voices, particularly those who have been historically left out. As stated by a CAG member: "some of us have not historically been asked to be involved in these types of groups, so even giving people time to just mature into those roles requires more time". However, claims of procedural justice can also be strategically misused by some actors to impede implementation. A city official explained: "you have some people that are accusing [Boston] of going too slow because of equity, and other people who, from the equity perspective, are accusing [Boston] of going too fast". Beyond implementation delays, city staff and CAG members expressed concerns that flexibility measures and funding opportunities created for under-resourced building owners could be exploited by large institutions with enough resources to navigate the system and make their case to the Review Board. A CAG member cautioned: "some of the exceptions could swallow the good intentions of the ordinance". Regulations also needed to balance ideals of procedural justice with the risk of public participation being perversely used to challenge Review Board decisions, either to advance NIMBY claims or to redress past issues with building owners. A city official explained: "[BERDO] isn't your opportunity to right wrongs that you perceive as being done. Everybody has to be treated in the same way for consistency […] so that no single decision can be picked apart under the eyes of the law and overturned".

Discussion

Our analysis shows that contestations about justice form an inextricable component of the implementation of BERDO. On the one hand, ideals of justice, equity, and fairness were mobilized by all actors to advance their interests and influence implementation decisions. These contestations impacted how BERDO was operationalized on the ground, both in terms of process (e.g. residents' engagement) and resulting implementation decisions (e.g., regulatory language). This was the case for a multitude of regulatory decisions, including seemingly technocratic topics without explicit justice mandates. On the other hand, policy implementation served as a site to contest and reinterpret the ordinance's justice goals and mandates, ultimately redefining what justice means and who is deserving of justice in the context of BERDO.

The implementation of BERDO illustrates that the politics of climate justice transcend the stage of policy planning and can be used as a tool to ensure, transform, or impede implementation. This supports prior theories suggesting that climate policy is shaped by contestations over justice (Bulkeley et al., 2014) and that the ways in which justice is understood in a particular place are critical determinants of how climate programs come to be developed and implemented (Bulkeley, 2021; Bulkeley et al., 2014; Cox, 2023a). This reveals climate justice not only as a principle of climate planning or as a policy outcome, as often treated in the literature (Hughes, 2017; Westman and Castán Broto, 2021), but as a highly disputed political process in which competing ideals of justice are contested and translated into implementation decisions.

Our research highlights important caveats for policymakers and advocates seeking to implement climate justice on the ground. First, while visions of climate justice in the city such as the “Green New Deal” and “just urban transitions” necessitate multi-sectoral and multi-level governance approaches (Westman and Castán Broto, 2021), implementing justice through a single climate program is inevitably subject to scope and scale constraints. To that regard, community-driven implementation approaches such as the CAG and Review Board must begin with a shared understanding of the scope and scale of the program at hand. This is not to say that policies should be implemented in a vacuum or avoid challenging existing power relations and siloing practices within a city. However, a mismatch between goals and the reality of the legal boundaries of implementation can frustrate the operation of programs and weaken trust between city officials, advocates, and those who they aim to protect.

Second, the implementation of climate justice will inherently involve a degree of "administrative ordering of nature and society" (Scott, 1998, p. 4). Implementation requires rendering justice legible through bureaucratic tools that, for instance, standardize environmental justice communities into a legal definition or simplify justice into a checklist of regulatory requirements or a series of benefits to be distributed. However sophisticated, these tools are "projects of legibility" (Scott, 1998, p. 80) that are never fully realized. Intangibles such as care, compassion, and understanding for others cannot be fully codified in artifacts like regulations and will need to evolve into everyday practices and "quiet acts" (Ranganathan and Bratman, 2021) of justice through the mundane decisions that implementors such as city officials and Review Board members will take moving forward. As stated by a city official: "as much as it is codified in the ordinance and supported in regulations, environmental justice is a practice as well".

Finally, the prospective weaponizing of justice highlights the need for a critical lens in the implementation of justice. Policymakers should interrogate who is mobilizing justice claims, to what extent, and why, and question when, how, and who may misuse or co-opt justice measures. Well-intentioned environmental laws have been perversely used to block projects that climate policies seek to promote, as seen with lawsuits under the California Environmental Quality Act, which have been weaponized to advance economic agendas from the private sector and NIMBY claims against housing and greening projects that would serve people of color and diversify communities (Hernandez, 2018). Under the

National Environmental Policy Act, indigenous justice concerns have been co-opted by non-indigenous groups to oppose offshore wind development, thereby perpetuating colonial relations (Bacchiocchi et al., 2022). New urban climate justice measures run the same risks if co-opted by actors to advance their own interests or used in bad faith or in ways that undermine participatory processes.

Our research furthermore highlights what is lost when policy implementation is omitted from studies of climate governance, or when it is over-simplified into combinations of barriers and enabling factors, without recognition of the inherent political complexities of the policy process. As cities increasingly integrate justice into their climate planning and governing practices (Caggiano et al., 2023; Cannon et al., 2023; Diezmartínez and Short Gianotti, 2024, 2022), scholars, advocates, and practitioners should look at policy implementation as key site of political contestation and resistance, where opposing conceptions of justice are fought out and translated into action. Furthermore, future scholarship should examine climate justice not only as a goal or outcome of policies, but as a set of often "quiet" (Ranganathan and Bratman, 2021) practices and acts of care and resistance that continuously unfold throughout the implementation of climate action.

Methods

We use a mixed-methods approach that combines participant observation, semi-structured interviews, and content analysis to analyze the politics and process of implementing climate justice through BERDO. We understand implementation as the *process* of translating public policies into operational and enforceable programs (Rosenbaum, 2020). We primarily investigate implementation through the process of rulemaking. Through rulemaking, city governments develop and issue specific regulations that establish rules and parameters to implement and enforce a policy (Rinfret, 2011). In this way, rulemaking is one of the first and most critical steps of the policy implementation process. Rulemaking is also a critical site to analyze the operationalization of climate justice on the ground. Rulemaking is where issues of politics and power most clearly intersect with policy implementation by providing an arena for city governments and other actors to contest and re-interpretate the justice goals and mandates that were already embedded in climate policies during the policy planning process (Kerwin and Furlong, 2019).

Participant observation

I conducted participant observation by working as a Policy Fellow at the City of Boston's Environment Department. In this role, I actively participated in the implementation of BERDO, with a particular emphasis on the rulemaking process. I worked directly with city staff to (1) engage with community advocates (Community Advisory Group), Boston residents, and regulated parties throughout the regulations process; (2) prepare materials for public meetings; (3) review and analyze public feedback; (4) draft and revise regulations language; and (5) support other implementation activities as needed. I conducted over 580 hours of participant observation over five months, from June to December 2023. This period covered the majority of Phase 3 of the rulemaking process (**Fig. 6**). During participant observation, I took detailed notes focused on the justice themes that emerged during rulemaking, whether and how different actors articulate, contest, and re-interpret justice concerns, and how said concerns were translated (or not) into a specific regulatory or implementation decision. All notes were anonymized and transcribed into a digital format for analysis. Participant observation provided us with an in-depth insight into the social, cultural, and political context in which BERDO unfolds and enabled us to directly track and experience the *process* through which the justice goals and mandates embedded in BERDO were contested, re-interpreted, and ultimately translated into a specific regulatory and implementation decisions. Participant observation also enabled us to add nuance to the data collected through interviews and content analysis and facilitated the identification of "subtleties of meaning" (Baxter and Eyles, 1997, p. 509) among city staff and community advocates.

Interviews

I conducted twenty semi-structured interviews with city staff and community advocates and leaders involved in the implementation of BERDO. Interviews are well suited for tracing the chronology of events and movement of policy ideas(Wood, 2016) and building understanding of how "certain events, practices, or knowledges are constructed and enacted within particular contexts"(Secor, 2010, p. 199), making them effective tools to analyze both the history and politics of policy implementation and situated views on climate action and justice. I used a semi-structured interview approach to ensure all interviews covered key topics, while allowing a conversational approach that enables respondents to tell their own stories and allows for new topics to emerge. While the exact wording and order of questions were tailored to each respondent, all interviews consisted of a series of open-ended questions that solicited information about the respondent's role, influence, and perceptions on the BERDO implementation process. This included respondents' perceptions about the justice implications of BERDO, the successes and challenges of the implementation process, justice concerns that have been addressed during implementation, justice concerns that remain unaddressed, and opportunities and challenges for the future implementation of BERDO. Sample interview scripts can be found in **Appendix D.**

Respondents were identified through participant observation. Our final interview sample included ten city staff involved in the rulemaking process and/or other implementation activities for BERDO and ten community advocates who were part of the Community Advisory Group during rulemaking. Some respondents had been involved with BERDO since the policy planning process, while others became involved at different phases of the rulemaking process and implementation of BERDO. Interviews ranged between 30 and 65 minutes, but most lasted 50 minutes. Interviews were conducted in-person or over Zoom. All interviews were audio recorded and transcribed for analysis.

Quotes from interview respondents are identified in the main text as coming from a "city official", "city staff", or "CAG member". The term "interviewee" is also used sporadically to grant additional anonymity to respondents.

Content analysis

I conducted a content analysis of relevant policy documents, records from public meetings, and public comments related to the rulemaking process. I used this data to complement and triangulate our analysis from participant observation and interviews, as well as to confirm the elements of the regulations that were explicitly linked to equity and justice at different stages of the rulemaking process. I gave special attention to justice controversies related to the implementation of BERDO and the role and positions of regulated parties, community advocates, and other actors in proposing specific regulations language or implementation decisions and strategies. This analysis included the final regulatory language adopted through the rulemaking process, minutes and materials from 15 public hearings of the Boston Air Pollution Control Commission, minutes and materials from 12 public hearings of the Review Board, minutes and materials from 11 Community Advisory Group meetings, minutes and materials from 12 public meetings held by the City of Boston's Environment Department, 134 public comment letters received as part of the rulemaking process, and 9 documents including city staff responses to public comment letters. A list of public meetings included in this analysis can be found in **Supplementary Table 6**.

Data analysis

I coded all participant observation, interview, and content analysis data using an iterative qualitative process of inductive coding. I first coded data according to emergent themes revealed by each source independently (i.e., participant observation notes, interview transcripts, and policy documents). I then conducted multiple iterative rounds of focused coding to homogenize our analysis across all data sources. The final coding protocol included the following themes: (1) justice contestations; (2) implementation process; (3) implementation decisions and outcomes; and (4) implementation challenges. The final coding protocol can be found in the **Appendix E.** We used NVivo 20 software for all coding.

Ethics and confidentiality

This research was approved by the Boston University Institutional Review Board (Exempt Research #6907X) and complies with all relevant ethical regulations. City staff and community advocates that were part of the Community Advisory Group received a letter explaining the goals and scope of the research project prior to the beginning of the participant observation process. All interview respondents received a letter of informed consent prior to participating in an interview. Participants were offered no compensation. We took all reasonable measures to protect confidentiality of participants, including reporting findings from participant observation and interview responses anonymously.

Acknowledgements

We are grateful to all the city officials and community leaders who generously shared their time, knowledge, and experiences for this research.

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CHAPTER 6: CONCLUSION

The collection of works in this dissertation demonstrates that cities are transcending their established roles as leaders in climate action to become key pioneers in the global struggle for climate justice. From policy planning to municipal finance and policy implementation, an increasing number of cities in the U.S. are transforming their existing practices to integrate and address issues of justice and equity in urban climate action.

Chapter 2 reveals that justice and equity concerns are playing an increasingly important role in urban climate planning, including for both climate mitigation and adaptation efforts. Increasingly, cities are explicitly articulating justice in their climate action plans and developing new policy tools to operationalize climate justice on the ground. These emerging planning practices can serve to legitimize the pursuit of just climate action and facilitate the future implementation of just centered climate efforts.

Chapter 3 demonstrates that the processes and dynamics of municipal finance can shape cities' ability to pursue climate justice efforts. Municipal finance can limit the types of climate actions that city governments can implement, constrain when and for how long cities are able to sustain climate programs, and shift some power away from city governments and local communities to determine what climate interventions are worthy of investment, where, and for whom. As shown in Chapter 4, these financial constraints are exacerbated by the impacts of climate change and the increasing pursuit of climate action in cities, as both impose new burdens on municipal budgets through increased expenditures and reduced revenue streams. This further increases cities' fiscal vulnerability and reduces their capacity to equitably respond to climate change.

However, Chapter 3 and Chapter 4 also reveal that cities are beginning to reimagine municipal finance in the service of more just urban climate futures. Urban politics and funding mandates are increasingly pushing cities to give attention to the intersection of finance, climate, and justice, and several cities in the U.S. have embedded climate and justice considerations into their municipal budgets, budget allocation processes, and funding tools.

Chapter 5 demonstrates that climate justice is becoming an inextricable component of the implementation of urban climate action. Ideals of justice, equity, and fairness are now mobilized by all kinds of actors to advance their interests during policy implementation. These justice contestations can be used as a tool to ensure, transform, or impede the implementation of climate programs. This reveals climate justice not only as an emerging principle of climate planning or as an outcome of policies, but as a highly disputed political process that is a critical determinant of how urban climate action comes to be developed and implemented on the ground.

Finally, Chapter 5 also illuminates the unique and complex challenges that cities may face in translating climate justice from theory into practice. This includes discrepancies between the scope and scale of climate justice ideals and the reality of implementing a single climate program with specific the legal boundaries; the bureaucratization of justice into standard processes, measures, or criteria; and the weaponization of justice by actors operating in bad faith and in ways that undermine participatory processes.

Fig. 10 summarizes the findings of this dissertation, highlighting the interrelationships between the politics of urban climate justice and emerging urban climate planning, funding and finance, and climate action practices identified across the U.S. cities.

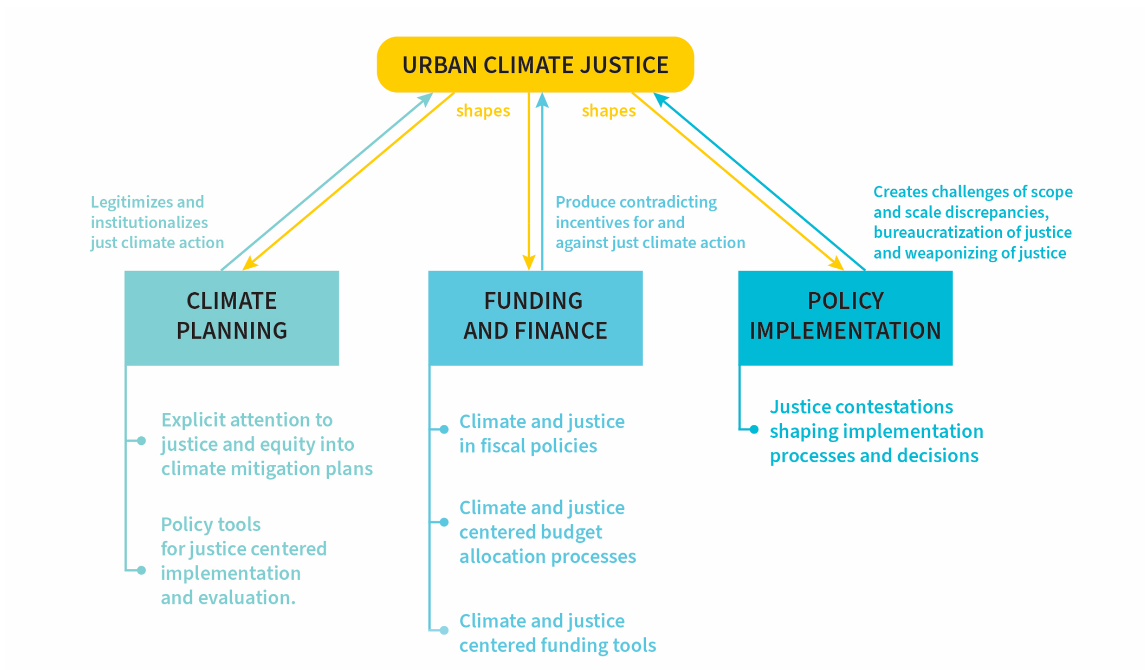

Figure 10. Summary of findings of the dissertation.
The politics of urban climate justice are increasingly shaping urban climate planning, funding and finance, and climate policy implementation in U.S. cities. These emerging practices and ordinary innovations are, in turn, reshaping the politics of urban climate justice and cities' ability to implement just climate efforts.

Altogether, this dissertation highlights the need to conceptualize and bring attention to different aspects of urban climate action as key sites of justice politics, including the more mundane and opaque components of the policy process. This dissertation unveiled multiple *ordinary innovations* and *practices* through which cities are repurposing existing policy tools and municipal practices in the service of climate action and climate justice. This can be seen in the ways city governments are reimagining climate action plans (Chapter 2), municipal finance (Chapter 3, Chapter 4), and rulemaking processes (Chapter 5) to mobilize climate justice. Planning documents, municipal budgets, fiscal policies, and rulemaking processes are not novel components of urban climate action. However, they are now being seized as new sites to contest, decide, and operationalize the making of just urban climate futures.

Scholarship on urban climate justice has increasingly focused on the need for "transformative action", "systems change", and "transformative innovation" as a condition to achieve justice and equity in cities (Amorim-Maia et al., 2022; Hadfield and Coenen, 2022; Hölscher et al., 2019; Long and Rice, 2021; Shi et al., 2016; Shi and Moser, 2021). While emphasizing the need for structural change is an important component of the climate justice movement in both scholarship and practice, a myopic focus on large-scale or radical transformations may overlook the mundane and quiet acts through which just urban transitions have already begun to unfold on the ground and discount the impacts of such efforts on urban life. Although unjust socioeconomic systems continue to prevail in the U.S., the *ordinary innovations* and *practices* presented in this dissertation represent more than incremental advancements toward climate justice that *will* produce material impacts for urban communities and the built environment. These efforts and their consequences are deserving of attention. Through the insights presented in this dissertation, I interrogate the implicit devaluing of less-than-transformative changes present in current literature and call for scholars to look beyond extravagant and conspicuous innovation efforts and adopt a more nuanced understanding of what progress for climate justice looks like.

The findings of this dissertation are primarily based on novel empirical evidence from pioneer cities in the U.S. that have implemented early efforts to incorporate justice in climate planning, climate finance, and climate action. Given the novelty of climate justice efforts in the urban context, prioritizing these new "positive" cases enabled me to lay the groundwork for building a deeper understanding of the opportunities and challenges of mobilizing justice centered climate action in cities. While the insights from early movers are promising, scholarship will need to engage with new types of cities across multiple geographies and political contexts to build a more comprehensive landscape of the politics and dynamics of urban climate justice and to learn not only from perceived successes, but also from cities' failures.

Future research can utilize the insights in this dissertation to advance our understanding of the *practice* of urban climate justice in different ways. First, future scholarship may focus on understanding how innovative policy instruments such as justice partnerships, equity bodies, equity tools, and justice indicators, are operating on the ground following the adoption of justice centered climate action plans (Chapter 2). This can help to illuminate whether and how the codification of justice in these policy tools serves to shape the *practice* of climate justice after the stage policy planning. Beyond the experiences of leading cities that are "explicitly planning for justice", future studies should consider if and how the *practice* of climate justice may emerge among city governments without formal climate planning processes and/or without policy tools that explicitly aim to integrate justice into climate action. This could further contribute to debates about the importance of planning in the context of urban climate justice and the ways in which the codifying justice can shape processes and outcomes on the ground.

Second, new research is needed to further explore how the impacts of municipal finance in climate action and climate justice efforts operate across multiple urban contexts, and to understand when climate and justice priorities come to dominate cities' financial decisions, under what conditions and to what end (Chapter 3). Similarly, as cities continue to reimagine municipal finance to advance just urban transitions, scholars must examine how these emerging financial practices and tools in cities interact with existing state and federal fiscal practices (Chapter 4). Such research should compare cities in different contexts and trace the climate and justice politics of public finance across different governance levels. To extend beyond the findings in Chapter 3 and Chapter 4, these comparative studies should continue to explore the practices of municipal climate finance across cities of different sizes, but with additional attention to geographic diversity in both the Global North and Global South, as well as in cities not usually recognized as climate leaders. This would help unravel the dynamics of climate finance in different political and economic systems and test whether the promising trends identified in this dissertation have reached or impacted the municipal financial practices of other cities that are otherwise not engaged in climate action.

Finally, scholars should bring more attention to policy implementation and its role as key site of political contestation where conflicting conceptions of justice are fought out and translated into action (Chapter 5). In this new scholarship, climate justice must be examined as a series of *everyday practices*, “different ways of acting” (Amorim-Maia et al., 2023) or “quiet acts” (Ranganathan and Bratman, 2021) that are taken by city governments and other actors throughout the policy process.

Bringing attention to these everyday practices can help to unravel the challenges cities are facing in translating climate justice into action on the ground (Chapter 5). Scholars should investigate how city governments, advocates, and other urban actors are working within the constraints of scope and scale discrepancies and/or transcending some of these boundaries to advance transformative climate action; when and how the bureaucratization of justice into policy tools serves to advance just climate action, rather than becoming box-checking exercises; when and how justice is weaponized by different actors and with what consequences; and how city governments can prevent or mitigate the weaponization of climate justice while fostering and healing relationships with vulnerable communities. Answering these questions will require uncovering new sets of *“ordinary innovations”* that are likely to emerge as more cities come to *practice* climate justice and reshape existing processes, practices, and power relations in urban climate governance.

Scholars, practitioners, and advocates interested in advancing just urban transitions must begin to raise more questions about the mundane aspects of climate action in cities. A shift in scholarship and practice is needed to conceptualize and operationalize climate justice as more than the mere component of a climate plan, a funding tool, or an implementation checklist. Rather, climate justice must be understood as a complex set of practices and acts of care and resistance that continuously unfold throughout the planning, funding and financing, and implementation of urban climate action. However mundane, these everyday practices are at the heart of the social, ethical, and political decisions that are paving the way toward just urban transitions.

SUPPLEMENTARY TABLES AND APPENDICES

Supplementary Tables

Supplementary Table 1. List of analyzed climate action plans for Chapter 2

Pop. Rank	City	State	Plan type*	Plan year	Plan title
1	New York	NY	CP	2019	A Livable Climate. OneNYC 2050: Building a Strong and Fair City
2	Los Angeles	CA	SP	2019	L.A.'s Green New Deal: Sustainable City pLAn
3	Chicago	IL	CP	2008	Chicago Climate Action Plan: Our City. Our Future
4	Houston	TX	CP	2020	Houston Climate Action Plan
6	Philadelphia	PA	EP	2018	Powering Our Future: A Clean Energy Vision for Philadelphia
7	San Antonio	TX	CP	2019	SA Climate Ready: A Pathway for Climate Action & Adaptation
8	San Diego**	CA	CP	2015	City of San Diego Climate Action Plan (+ 2019 Annual Report)
9	Dallas	TX	CP	2020	Dallas Comprehensive Environmental and Climate Action Plan
10	San Jose	CA	CP	2018	Climate Smart San Jose: A People-Centered Plan for a Low-Carbon City
11	Austin	TX	CP	2015	Austin Community Climate Plan
14	Columbus	OH	SP	2015	The Columbus Green Community Plan: Green Memo III
15	Charlotte**	NC	EP	2018	Charlotte Strategic Energy Action Plan (+ 2019 Annual Report)
16	San Francisco	CA	CP	2019	Focus 2030: A Pathway to Net Zero Emissions
17	Indianapolis	IN	CP	2019	Thrive Indianapolis
18	Seattle**	WA	CP	2013	Seattle Climate Action (+ 2018 Update)
19	Denver	CO	CP	2018	Denver 80x50 Climate Action Plan
20	Washington D.C.	DC	CP/EP	2018	Clean Energy DC: The District of Columbia Climate and Energy Action Plan
21	Boston	MA	CP	2019	City of Boston Climate Action Plan 2019 Update
24	Detroit	MI	CP	2017	Detroit Climate Action Plan
25	Oklahoma City	OK	SP	2020	Adaptokc: Adapting for a Healthy Future
26	Portland	OR	CP	2015	Climate Action Plan
28	Memphis	TN	CP	2020	Memphis Area Climate Action Plan
29	Louisville	KY	CP	2020	Louisville Greenhouse Gas Emissions Reduction Plan
30	Baltimore	MD	SP	2019	The 2019 Baltimore Sustainability Plan
31	Milwaukee	WI	SP	2013	ReFresh Milwaukee: City of Milwaukee Sustainability Plan 2013 - 2023
36	Sacramento	CA	CP	2015	General Plan Appendix B: Climate Action Plan Policies and Programs
37	Atlanta	GA	EP	2017	Clean Energy Atlanta: A vision for a 100% Clean Energy Future

38	Kansas City	MO	CP	2008	Climate Protection Plan: City of Kansas City, Missouri
41	Raleigh	NC	CP/EP	2012	A Roadmap to Raleigh's Energy Future
42	Miami	FL	CP	2008	MiPlan: City of Miami Climate Action Plan
45	Oakland	CA	CP	2020	Oakland 2030: Equitable Climate Action Plan
46	Minneapolis	MN	CP	2013	Minneapolis Climate Action Plan: A Roadmap to Reducing Citywide Greenhouse Gas Emissions
48	Tampa	FL	EP	2011	City of Tampa Energy Efficiency and Conservation Plan
50	New Orleans	LA	CP	2017	Climate Action for a Resilient New Orleans
53	Cleveland	OH	CP	2018	Cleveland Climate Action Plan 2018 Update: Building Thriving and Resilient Neighborhoods for All
57	Santa Ana	CA	CP	2015	Santa Ana Climate Action Plan
58	Riverside	CA	SP	2016	Economic Prosperity Action Plan and Climate Action Plan
62	Stockton	CA	CP	2014	City of Stockton Climate Action Plan
63	Saint Paul	MN	CP	2019	Saint Paul Climate Action & Resilience Plan
64	Cincinnati	OH	SP	2018	2018 Green Cincinnati Plan
65	St. Louis	MO	CP	2017	Climate Action & Adaptation Plan for the City of St. Louis
66	Pittsburgh	PA	CP	2018	City of Pittsburgh Climate Action Plan Version 3.0
67	Greensboro	NC	SP	2020	Sustainability Action Plan Greensboro, North Carolina
69	Anchorage	AK	CP	2019	Anchorage Climate Action Plan
70	Plano	TX	CP	2020	City of Plano Cleaner Air & Reduced Emissions Strategy
71	Orlando	FL	SP	2018	2018 Community Action Plan
73	Newark	NJ	SP	2013	The City of Newark Sustainability Action Plan
74	Durham	NC	CP	2007	City of Durham & Durham County Greenhouse Gad and Criteria Air Pollutant Emissions Inventory and Local Action Plan for Emission Reductions
75	Chula Vista	CA	CP	2017	Chula Vista Climate Action Plan
78	St. Petersburg	FL	SP	2019	Integrated Sustainability Action Plan
82	Madison	WI	EP	2018	100% Renewable Madison: Achieving 100% Renewable Energy & Zero Net Carbon for City Operations & Leading the Community
85	Reno	NV	SP/CP	2019	City of Reno Sustainability & Climate Action Plan
90	Winston-Salem	NC	CP	2008	Winston-Salem Greenhouse Gas Inventory and Local Action Plan to Reduce Emissions
91	Chesapeake	VA	SP	2009	Chesapeake Sustainability Plan
92	Norfolk	VA	CP	2019	The City of Norfolk Climate Action Plan
93	Fremont	CA	CP	2012	City of Fremont Climate Action Plan
97	Richmond	VA	SP	2011	City of Richmond RVAgreen: A Roadmap to Sustainability
98	Boise City	ID	EP	2019	Boise's Energy Future: A Community-wide Energy Plan

* CP: Climate plan; SP: Sustainability plan; EP: Energy plan. ** Cities with more than one analysed document.

Supplementary Table 2. Final coding protocol for Chapter 2

<table>
<tr><th>Main theme</th><th>Sub-theme</th><th>Main category</th><th>Sub-category</th></tr>
<tr><td rowspan="4">1. Distributional justice</td><td rowspan="2">A. Awareness</td><td>A1. Does the plan acknowledge that climate mitigation will procedure benefits that can advance or hinder justice? If yes, what benefits are considered?</td><td>A1.1. Health benefits
A1.2. Economic benefits
A1.3. Environmental benefits
A1.4. Technological benefits
A1.5. Resilience benefits
A1.6. Other</td></tr>
<tr><td>A2. Does the plan acknowledge that climate mitigation will produce costs that can unequally distributed around the city? If yes, what costs are considered?</td><td>A2.1. Health costs
A2.2. Economic costs
A2.3. Environmental costs
A2.4. Technological costs
A2.5. Resilience costs
A2.6. Other</td></tr>
<tr><td>B. Policy actions</td><td>B1. Does the plan include provisions to ensure that the benefits and costs of climate mitigation are distributed equitably? If yes, what provisions are included?</td><td>B1.1. Targeting or prioritising vulnerable groups and their needs
B1.1.1 Targeted workforce training
B1.2. Providing special benefits to vulnerable groups
B1.3. Avoiding or minimising burdens to vulnerable groups
B1.4. Improving access to benefits of climate action
B1.5. Justice or equity-oriented policy development
B1.5.1. Equity tools to design or implement policies
B1.5.2. Justice or equity as a policy design criterion
B1.5.3. Other systematic strategy
B1.6. Other</td></tr>
<tr><td>C. Policy evaluation</td><td>C1. Does the plan include provisions to monitor or evaluate the distribution of climate mitigation outcomes? If yes, how?</td><td>C1.1. Justice indicators
C1.2. Justice evaluation tool</td></tr>
<tr><td>2. Procedural justice</td><td>D. Engagement and participation</td><td>D1. Have local community actors been engaged in the planning, implementation, or evaluation of mitigation policies? If yes, what groups have been represented?</td><td>D1.1. Advocacy groups
D1.1.1 Climate or environmental justice
D1.1.2 Racial justice (not climate or environmental)
D1.1.3 Gender justice
D1.1.4 Economic justice
D1.1.5 Religious interests
D1.1.6 Other interests
D1.2. Vulnerable groups
D1.3. General public
D1.4. Private sector
D1.5. Educational institutions</td></tr>
</table>

			D1.6. Other
		D2. In which stage of the policy process have local community actors been engaged?	D2.1. Policy planning and design D2.1.1. Justice-oriented steering committee D2.1.2. Justice-oriented advisory committee D2.1.3. Justice-oriented working group D2.2. Policy implementation D2.2.1. Justice-oriented implementation bodies D2.2.2. Justice-oriented partnerships. D2.3. Policy evaluation
	E. Access to information	E1. Does the plan include provisions to facilitate access to information related to climate change or climate mitigation policy? If yes, how is access to information provided?	E1.1. General outreach and education about climate change and mitigation E1.2. General outreach about available city policies, programs, and engagement opportunities E1.3. Outreach to the private sector about city policies, programs, and technical assistance opportunities E1.4. Targeted outreach to vulnerable populations about available city policies, programs, and engagement opportunities E1.5. Other
		E2. Has the plan been translated to other languages? If yes, to what extent?	E2.1. The plan was completely translated to one or more languages. E2.2. A summary of the plan was translated to one or more languages.
3. Justice as recognition	F. Historical or structural inequities	F1. Does the plan recognise the historical or structural roots of inequity in the city? If yes, what forms of inequities are recognised?	F1.1. Racial inequities F1.2. Economic inequities F1.3. Gender inequities F1.4. Age inequities F1.5. Other inequities
	G. Current inequities	G1. Does the plan recognise the intersection between climate mitigation and the current, everyday challenges of local residents? If yes, what challenges are articulated?	G1.1. Health challenges G1.2. Economic challenges G1.3. Environmental challenges G1.4. Technological challenges G1.5. Resilience challenges G1.6. Other
		G2. Does the plan recognise the current inequities experienced in the city? If yes, what forms of inequities are recognised?	G2.1. Racial inequities G2.2. Economic inequities G2.3. Gender inequities G2.4. Age inequities G2.5. Other inequities
		G3. Does the plan include commitments to address or rectify historical and	G3.1. Targeting or prioritising vulnerable groups and their needs

		current inequities experienced in the city? If so, how?	G3.2. Providing special benefits to vulnerable groups G3.3. Avoiding or minimising burdens to vulnerable groups G3.4. Improving access to benefits of climate action G3.5. Justice or equity-oriented policy development G3.6. Facilitating access to information G3.7. Actor engagement G3.8. Other strategies
	H. Recognition of Indigenous communities	H1. Does the plan recognise differences in the value that nature has over the cultural or individual identity of Indigenous or Native American communities? If so, how?	
4. Justice in climate mitigation sectors	I. Climate mitigation sectors	I1. What sectors are recognised and included as climate mitigation in the plan?	I1.1. Clean energy I1.2. Energy efficiency I1.3. Land use and transport I1.4. Electric vehicles I1.5. Urban greening I1.6. Waste I1.7. Food I1.8. Water I1.9. Air quality
		I2. In which sectors did climate mitigation policies included notions of justice?	I2.1. Clean energy I2.2. Energy efficiency I2.3. Land use and transport I2.4. Electric vehicles I2.5. Urban greening I2.6. Waste I2.7. Food I2.8. Water I2.9. Air quality
5. Key definitions	J. Justice	J1. Is justice defined in the plan? If so, how?	
	K. Equity	K1. Is equity defined in the plan? If so, how?	
6. Key sections where justice is articulated	L. Key articulations of justice	L1. Are justice or equity included in one of the following features or sections of the plan?	L1.1. Goal or objective L1.2. Vision L1.3. Principles or values L1.4. Mayor's letter L1.5. Letter from other city official

Supplementary Table 3. Key criteria to categorize cities by their level of engagement with justice in policy action (Chapter 2)

Cities that do not articulate justice as a core feature of climate action	Cities articulating justice as an aspiration	Cities explicitly planning for justice
Cities in this category do not demonstrate that they have included justice or equity as core feature of their plan. This means that cities do not articulate justice or equity as a goal, objective, vision, principle, or value of their plan, and they do not demonstrate that they have systematically embedded justice into the development of their policy actions.	Cities in this category must demonstrate that justice or equity are part of the plan's goals, objectives, vision, principles, or values. This may be expressed in any section of the plan, including the Mayor's letter and/or other city official's letter. Cities must thus meet one or more of the following criteria: L1.1. Goal or objective L1.2. Vision L1.3. Principles or values L1.4. Mayor's letter L1.5. Letter from other relevant city official Cities in this category do not demonstrate that they have systematically embedded justice into the development of their policy actions. This means that cities do not meet the following key criteria: B1.5. Justice or equity-oriented policy development B1.5.1. Equity tools to design or implement policies B1.5.2. Justice or equity as a policy design criterion B1.5.3. Other systematic strategy C1.2. Justice evaluation tool	Cities in this category must demonstrate that they have systematically embedded justice into the development of their policy actions. Key criteria to consider are: B1.5. Justice or equity-oriented policy development B1.5.1. Equity tools to design or implement policies B1.5.2. Justice or equity as a policy design criterion B1.5.3. Other systematic strategy C1.1. Justice indicators C1.2. Justice evaluation tool D2.1. Policy planning and design D2.1.1. Justice-oriented steering committee D2.1.2. Justice-oriented advisory committee D2.1.3. Justice-oriented working group D2.2. Policy implementation D2.2.1. Justice-oriented implementation bodies D2.2.2. Justice-oriented partnerships

Supplementary Table 4. Cities articulating justice indicators for policy evaluation (Chapter 2)

City name	Description of justice-oriented indicators
Baltimore, MD	The city reports that it will monitor its ability to advance equity and sustainability goals. This will be done in three ways: **(1) annual reporting**: annual reports will include "thoughtful indicators" that evaluate city's efforts and effectiveness of acting in a "racially equitable way"; **(2) annual open house**: the city will check in every year with its residents to identify new strategies and actions towards equity; **(3) periodic updates**: at least every three years, the city will update strategies, set new benchmarks, and identify new or refined metrics. The indicators are not explicitly included in this version of the plan.
Charlotte, NC	The city reports that the Charlotte Resilient Delivery Team (CREDIT) will continuously monitor all projects as they are being implemented to ensure "an equitable approach" is taken. The indicators are not explicitly included in this version of the plan.
Dallas, TX	The city reports that all programs and initiatives will be evaluated based on performance metrics that include "equity indicators". The plan includes a table of draft metrics that may be potentially used for this purpose.
Minneapolis, MN	The city reports that it will include "equity indicators" to measure whether the plan's strategies, investments, and emissions and energy burden reductions are experienced equitably across neighborhoods, income classes, and races. The indicators are not explicitly included in this version of the plan.
Portland, OR	The city reports that it will develop "climate-equity metrics" to track the degree to which Portland's Equity Considerations are integrated into decision-making processes and implementation of the plan, as well as progress on "equitable outcomes". The indicators are not explicitly included in this version of the plan, but the city articulates that metrics should measure distributional, procedural and structural equity.
San Antonio, TX	The city reports that it will identify and track "key climate equity indicators" as part of the plan's implementation. The indicators are not explicitly included in this version of the plan.
San Diego, CA	The city developed the Climate Equity Index to measure the "equity impacts" of the plan. The index incorporates 35 environmental and socioeconomic indicators and calculates a climate equity score for each of the census tracks intersecting the city.
St. Petersburg, FL	The city reports that one of its "early actions" for implementation will be to build on existing performance tracking tools to measure progress on "equity", among other topics. The indicators are not explicitly included in this version of the plan.

Supplementary Table 5. Descriptive statistics and description of dependent and predictor variables (Chapter 2)

Variable	Min - Max	Mean	Standard Deviation	Description
Dependent variables				
City Category	1 – 3	2.0344	0.8158	3: City is explicitly planning for justice (*n* = 20). 2: City articulates justice as an aspiration of their climate plan (*n* = 20). 1: City does not incorporate justice into their climate plan (*n* = 18).
Predictor variables				
Climate plan characteristics				
After 2017	0 – 1	0.6207	0.4895	1: Climate plan published after 2017. 0: Climate plan published before 2017.
Plan Type	0 – 1	0.6552	0.4795	1: Climate plan is focused on climate change. 0: Climate plan covers climate change, but it is not only focused on climate change.
First Plan	0 – 1	0.6552	0.4795	1: Climate plan is the city's first plan. 0: Climate plan is a revised or updated plan.
Engagement	0 – 1	0.9138	0.2831	1: City mentions engaging with local community members for the climate plan. 0: City does not mention engaging with local community members for the climate plan.
Local city characteristics				
Population	0 – 1	0.4655	0.5032	1: City population > 500,000. 0: City population < 500,000.
Median Household Income	0 – 1	0.4138	0.4968	1: MHI > sample mean $61,532. 0: MHI < sample mean $61,532.
Poverty	4.30 – 35.0	17.50	5.84	Persons in poverty 2019, percentage.
Gini Index	0.4004 – 0.5815	0.4918	0.0409	Gini Index of income inequality 2015-2019.
People of color	16.80 – 90.60	58.57	16.81	Population who did not identify as "White alone, not Hispanic or Latino", 2019. This includes African American, Native American, Native Hawaiian and Pacific Islander, Asian, Hispanic or Latino, or two or more races. Percentage.
Median Age	30.70 – 42.90	34.74	2.29	Median age of population, 2015-2019.
Bachelor Attainment	15.00 – 64.00	38.02	11.73	Persons with a bachelor's degree or higher 2015 – 2019, percentage of persons age 25+ years.

Government Type	0 – 1	0.5517	0.5017	1: City has a "strong mayor" government type. 0: City does not have a "strong mayor" government type.
Democrat Vote	38.70 – 92.80	64.50	12.23	Democrat vote share for the 2016 presidential election in the city's main County, percentage.
Climate Network	0 – 1	0.6724	0.4734	1: City is a member of Global Covenant of Mayors. 0: City is not a member of Global Covenant of Mayors.
Coastal City	0 – 1	0.3621	0.4848	1: City is geographically located by the coast. 0: City is not geographically located by the coast.
Legacy City	0 – 1	0.2586	0.4417	1: City has been classified as a "legacy city". 0: City has not been classified as a "legacy city".

Supplementary Table 6. Public meetings included in content analysis for Chapter 5

Rulemaking phase	Date	Meeting	Data sources		
			Slide deck *	Public minutes *	Participant observation
Phase 1	12/01/2021	Listening session on reporting and data verification	X	X	
	01/07/2022	Listening session on draft regulations	X	X	
	01/12/2022	Air Pollution Control Commission (APCC) monthly hearing	X	X	
	01/19/2022	APCC special hearing on BERDO	X	X	
	02/14/2022	APCC monthly hearing	X	X	
	03/16/2022	APCC monthly hearing	X	X	
Phase 2	07/19/2022	Listening session on Review Board regulations	X	X	
	08/18/2022	Listening session on emissions factors and renewable energy purchases	X	X	
	09/07/2022	Technical working session on blended emissions standards, change of ownership, designating a tenant as "owner", and vacant buildings	X	X	
	09/14/2022	Technical working session on grid emissions factors, renewable energy purchases, and fossil fuel emissions factors	X	X	
	09/21/2022	Technical working session on district energy emissions factors	X	X	
	09/28/2022	APCC special hearing on BERDO regulations	X	X	
	10/19/2022	APCC monthly hearing	X	X	
	11/16/2022	APCC monthly hearing	X	X	
	12/14/2022	APCC monthly hearing	X	X	
	01/25/2023	APCC monthly hearing	X	X	
Phase 3	03/06/2023	Listening session on Phase 3 regulations topics	X	X	
	03/29/2023	Technical working session on Building Portfolios	X	X	
	04/05/2023	Technical working session on Individual Compliance Schedules	X	X	
	05/23/2023	APCC special hearing on BERDO	X	X	
	06/12/2023	BERDO Review Board bi-weekly meeting	X	X	
	06/26/2023	BERDO Review Board bi-weekly meeting	X	X	X
	07/10/2023	BERDO Review Board bi-weekly meeting	X	X	X
	07/19/2023	APCC monthly hearing	X	X	X

	07/24/2023	BERDO Review Board bi-weekly meeting	X	X	X
	08/07/2023	BERDO Review Board bi-weekly meeting	X	X	X
	08/16/2023	APCC monthly hearing	X	X	X
	08/21/2023	BERDO Review Board bi-weekly meeting	X	X	X
	08/22/2023	Technical working session on Hardship Compliance Plans	X	X	X
	08/23/2023	Technical working session on the Equitable Emissions Investment Fund	X	X	X
	09/11/2023	BERDO Review Board bi-weekly meeting	X	X	X
	09/27/2023	APCC special hearing on BERDO regulations	X	X	X
	10/02/2023	BERDO Review Board bi-weekly meeting	X	X	X
	10/18/2023	APCC monthly hearing	X	X	X
	10/23/2023	BERDO Review Board bi-weekly meeting	X	X	X
	11/06/2023	BERDO Review Board bi-weekly meeting	X	X	X
	11/15/2023	APCC monthly hearing	X	X	X
	11/20/2023	BERDO Review Board bi-weekly meeting	X	X	X
	12/04/2023	BERDO Review Board bi-weekly meeting	X	X	X
	12/20/2023	APCC special hearing on BERDO regulations	X	X	X

* Slide decks and minutes for these meetings are publicly available on boston.gov/berdo-regulations, boston.gov/berdo-review-board, and boston.gov/departments/environment/air-pollution-control-commission.

Appendix A. Sample Interview Script for Chapter 3

The sample script below was used as a guide to conduct semi-structured interviews with professionals working in urban climate policy, climate finance, and climate justice across cities in the U.S. The precise wording and order of the questions varied according to the respondents' location, profession, and experience. Interviews were also responsive to the themes raised by respondents, often leading to unique follow-up questions and alternative framing of questions.

1. How are cities paying for climate action projects?
    a. How stable or predictable are these funding sources?
    b. Do cities rely significantly on one-time funding sources?
2. What are the obstacles or challenges to accessing funds for climate action?
    a. How are these challenges different for climate mitigation versus climate resilience?
3. How does the availability or lack of funding shape what climate actions get done in cities?
4. How do different funding sources shape what climate actions get done in cities?
5. How do different funding sources influence cities' efforts to address climate justice concerns?
6. What do you see as the most promising innovations or next frontiers in urban climate finance?

7. As we continue to design this project, we are planning to talk with a variety of people involved in urban climate efforts and municipal finance. What are some cities or professionals you would encourage us to connect with?
    a. What are some cities that stand out in your mind for implementing innovative financial tools or funding sources for climate action?
    b. What type of professionals would it be important to connect with besides city staff?
8. Before, we end our interview, I want to give some space to discuss any final thoughts or recommendations you have for this research. As you think about climate finance and climate justice in cities, are there any other topics or issues that strike you as important but that we did not talk about in this interview?

Appendix B. Final Coding Protocol for Chapter 3

1. Climate finance tools and sources
    a. Municipal revenue
        i. Taxes
        ii. Fees
        iii. Other
    b. Grants
        i. Federal government
        ii. State government
        iii. Philanthropy and private sector
    c. Bonds
    d. Public-private partnerships
    e. Other
2. Climate finance challenges
3. Factors that impact climate finance decisions
    a. Built environment
    b. Characteristics of climate policies and programs
    c. City fiscal health and credit ratings
    d. City size
    e. Community pressures
    f. Justice concerns
    g. Political leadership

    h. Powers and resources of climate or environment department

    i. Pivotal events

    j. Climate goals and formal climate planning

    k. Local and state laws

    l. Other city factors

4. Impacts of climate finance decisions

    a. Impacts on implementation of climate actions

    b. Impacts on climate justice efforts

    c. Impacts on built environment

5. Interplay between public spending and debt financing

6. Finance for climate mitigation versus climate adaptation

7. Innovations and opportunities in urban climate finance

Appendix C. Final Coding Protocol for Chapter 4

1. Total budget and climate expenditures
    a. Total budget
    b. Total reported climate spending
2. Narratives related to climate change and climate action
    a. Climate-related budget priority areas
    b. Climate-related investments or efforts
        i. General highlighted investments or efforts
        ii. Department-level investments or efforts
    c. City-wide climate goals and achievements
    d. Municipal budget constraints
    e. Changes in expenditures or revenues due to climate change or climate action
    f. Climate action as part of fiscal health
3. Narratives related to climate action and COVID-19
    a. COVID-19 impacts on municipal budgets
    b. COVID-19 impacts on climate action
4. Budget allocation tools including climate and/or justice criteria
5. Climate funding tools

Appendix D. Sample Interview Scripts for Chapter 5

Sample interview script for Community Advisory Group members

- How did you / your organization get involved in the BERDO regulations development process?
  - [If needed] What were the goals of your organization in this process?
  - [If needed] Were you or your organization involved in the process that led up to adoption of the Ordinance in 2021?
- Who do you think will benefit from BERDO and who do you see as most vulnerable to the impacts of BERDO?
- [If applicable] Your organization was involved both in the advocacy process that led up to the Ordinance and in the more recent process of developing regulations. I'm curious about your perceptions of these different stages and if/how your involvement shifted at those stages.
  - [If needed[How did you see discussions of justice or equity change from the development of the Ordinance to the regulations process?
- What do you see as the biggest successes from the regulations process?
  - [If needed] In what ways do you see the final regulations reflecting the concerns/goals of your organization?
  - [If needed] Are there any successes related to justice and equity?
  - [Follow up] What enabled these successes?
- What were the major challenges of the regulations process?

    - [If needed] Were there challenges related to the justice and equity goals you talked about before?
- What goals do you think remain unfulfilled or unaddressed after the regulations process?
    - [If needed] What about the goals related to justice and equity you mentioned before?
    - [Probe] What led you to that conclusion?
- As the City of Boston moves forward with the implementation of BERDO, what will a just or equitable BERDO look like?
    - [If needed] What will an unjust or inequitable BERDO look like?
- What do you see as the major challenges to continue to implement justice and equity through BERDO as we move beyond the regulations process?
- How have your experiences with BERDO been similar or different from other interactions/advocacy work with the City of Boston?
- Beyond BERDO, how are you hoping to work with the City of Boston in the future?
- Before we end our interview, I want to give you some space to discuss any final thoughts. As you think about the implementation of BERDO and its implications for environmental justice and climate justice, are there any other topics or issues that strike you as important but that we did not talk about in this interview?

Sample interview script for City of Boston staff involved in rulemaking

- What do you see as the main goals of the City of Boston during the regulations development process of BERDO?
- Who do you think will benefit from BERDO and who do you see as most vulnerable to the impacts of BERDO?
- [If applicable] You were involved in both the process that led up to the Ordinance and in the more recent process of developing regulations. I'm curious about your perceptions of these different stages and if/how the City of Boston's strategies shifted at those stages.
    - [If needed] How did discussions of justice or equity change from the development of the Ordinance to the regulations process?
    - [If needed] How did the engagement, communication, or other strategies of the City of Boston change between the Ordinance process and the regulations process?
- During the regulations process, city staff were tasked with translating broad mandates in the Ordinance into specific rules to make BERDO implementable and enforceable. How did concerns about justice and equity play a role in this process?
- What do you see as the biggest successes from the regulations process?
    - [If needed] Are there any successes related to justice and equity?
    - [Follow up] What enabled these successes?
- What were the major challenges of the regulations process?

  - [If needed] Were there challenges in translating the justice and equity goals from the Ordinance into specific regulations?
- What are the regulations or implementation decisions taken by the City of Boston that you see as most critical for justice and equity?
  - [If needed] In what ways do you see the final regulations reflecting the Ordinance's justice and equity goals?
- What justice or equity issues do you think remain unaddressed after the regulations process?
- [If applicable] Apart from BERDO, you have been involved in other climate and environmental processes and programs implemented in the City of Boston. In what ways have justice and equity played a similar or different role in those initiatives?
- As the City of Boston moves forward with the implementation of BERDO, what will a just or equitable BERDO look like?
  - [If needed] What will an unjust or inequitable BERDO look like?
- What do you see as the major challenges to continue to implement justice and equity through BERDO as we move beyond the regulations process?
- What strategies would you recommend to city staff in other cities involved in the implementation of justice centered climate policies?
- What information or resources are needed for cities to implement more just climate policies?

- Before we end our interview, I want to give you some space to discuss any final thoughts. As you think about the implementation of BERDO and its implications for environmental justice and climate justice, are there any other topics or issues that strike you as important but that we did not talk about in this interview?

Sample interview script for City of Boston staff involved in other implementation activities

- What do you see as the main goals of the City of Boston during the implementation of BERDO?
- Who do you think will benefit from BERDO and who do you see as most vulnerable to the impacts of BERDO?
- What do you see as the biggest successes of the implementation of BERDO so far?
    - [If needed] Are there any successes related to justice and equity?
- What are the main challenges to implement BERDO?
    - [If needed] Are there challenges related to justice and equity?
- How does justice and equity come up in the daily implementation of BERDO?
    - [If needed] What concerns do you hear from building owners and/or community members?
    - [Follow up] How do concerns differ across different community members and building owners?

- You are tasked with implementing both broad justice and equity goals that were integrated into the Ordinance, as well as more specific environmental justice measures adopted in regulations. What are the major challenges to translate these justice goals and regulations into specific day-to-day implementation activities?
- [If applicable] Apart from BERDO, you have been involved in other climate and environmental processes and programs implemented in the City of Boston. In what ways have justice and equity played a similar or different role in those initiatives?
- As the City of Boston moves forward with the implementation of BERDO, what will a just or equitable BERDO look like?
    - [If needed] What will an unjust or inequitable BERDO look like?
- What do you see as the major challenges to continue to implement justice and equity through BERDO as we move beyond the regulations process?
- What strategies would you recommend to city staff in other cities involved in the implementation of justice centered climate policies?
- What information or resources are needed for cities to implement more just climate policies?
- Before we end our interview, I want to give you some space to discuss any final thoughts. As you think about the implementation of BERDO and its implications for environmental justice and climate justice, are there any other topics or issues that strike you as important but that we did not talk about in this interview?

Appendix E. Final Coding Protocol for Chapter 5

1. Justice contestations
    a. Distributional justice
        i. Benefits
            1. Health and quality of life
            2. Energy justice
            3. Green jobs / workforce development
            4. Climate change mitigation
            5. Other
        ii. Harms and burdens
            1. Compliance costs / regulatory burdens
            2. Energy injustice
            3. Gentrification and displacement
            4. Other
    b. Procedural justice
        i. Outreach and education
            1. Building owners
            2. Residents and tenants
        ii. Power and representation
            1. Building owners
            2. Residents and tenants
            3. Nominating community-based organizations

            4. Review Board
        iii. Rulemaking process
            1. Community Advisory Group process
            2. Feedback process
        iv. Transparency, disclosure, and accountability
    c. Justice as recognition
        i. Who receives benefits
        ii. Who is vulnerable
2. Implementation process
    a. Goals
    b. Successes
    c. Planning versus implementation process
3. Implementation decisions and outcomes
    a. Providing certainty for building owners
    b. Constraining building owners
    c. Flexibility for building owners
    d. Environmental justice measures
    e. Protecting Review Board powers / discretion
    f. Regulations timeline / approach
    g. Transparency and disclosure
    h. Other
4. Implementation challenges

a. Bureaucratization of justice

b. Capacity issues

c. Complexity

d. Engagement process and approach

e. Legal constraints

f. Measuring justice

g. Scope and scale discrepancies

h. Timeline

i. Trust issues

j. Uncertainty

k. Weaponizing of justice

    i. Misuse of justice measures

    ii. Delays

l. Other

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