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Governance and Policy

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This chapter is dedicated to Alex Aylett, a bright and kind co-author. His engagement and passion will always be remembered.

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Urban Governance for a Changing Climate

Greenhouse gas (GHG) emissions and climate risks in cities are not only municipal government concerns. They challenge a range of actors across jurisdictions to create coalitions for climate governance. Urban climate change governance occurs within a broader socioeconomic and political context, such as the landmark international negotiations during the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate change in Paris (2015). As such, actors and institutions at a multitude of scales shape the effectiveness of urban-scale interventions. These interventions may be particularly powerful if they are integrated with co-benefits related to other development priorities (such as health, biodiversity, and poverty reduction), thus creating urban systems (both built and institutional) that are able to withstand, adapt to, and recover from climate-related hazards.

Collaborative, equitable, and informed decision-making is needed to enable transformative responses to climate change, as well as fundamental changes in energy and land-use regimes, growth ethos, production and consumption, lifestyles, and worldviews. Leadership, legal frameworks, public participation mechanisms, information sharing, and financial resources all work to shape the form and effectiveness of urban climate change governance.

Major Findings

- While jurisdiction over many dimensions of climate change adaptation and mitigation resides at the national level, along with the relevant technical and financial capacities, comprehensive national climate change policy is still lacking in most countries. Despite this deficiency, municipal, state, and provincial governmental and non-governmental actors are taking action to address climate change.

- Urban climate change governance consists not only of decisions made by government actors, but also by non-governmental and civil society actors in the city. Participatory processes that engage these interests around a common aim hold the greatest potential to create legitimate, effective response strategies.

- Governance challenges, such as disconnects between electoral cycles and climate change planning horizons, as well as inconsistencies or contradictions among climate policies at different levels of government, often contribute to gaps between the climate commitments that cities make and the effectiveness of their actions.

- Governance capacity to respond to climate change, including human resources, financial resources, legal frameworks, and legitimate institutions, varies widely within and between low- and high-income cities, creating a profile of different needs and opportunities on a city-by-city basis.

- The challenge of coordinating across the governmental and non-governmental sectors, jurisdictions, and actors that is necessary for transformative urban climate change policies is often not met. Smaller scale, incremental actions controlled by local jurisdictions, single institutions, or private and community actors tend to dominate city-level actions.

- Scientific information is necessary for creating a strong foundation for effective urban climate change governance, but governance is needed to apply it. Scientific information needs to be co-generated in order for it to be applied effectively and meet the needs and address the concerns of the range of urban stakeholders.

Key Messages

While climate change mitigation and adaptation have become pressing issues for cities, governance challenges have led to policy responses that are mostly incremental and fragmented. Many cities are integrating mitigation and adaptation, but fewer are embarking on the more transformative strategies required to trigger a fundamental change toward sustainable and climate-resilient urban development pathways.

The drivers, dynamics, and consequences of climate change cut across jurisdictional boundaries and require collaborative governance across governmental and non-governmental sectors, actors, administrative boundaries, and jurisdictions. Although there is no single governance solution to climate change, longer planning timescales; coordination and participation among multiple actors; and flexible, adaptive governance arrangements may lead to more effective urban climate governance.

Urban climate change governance should incorporate principles of justice in order that inequities in cities are not reproduced. Therefore, justice in urban climate change governance requires that vulnerable groups are represented in adaptation and mitigation planning processes; priority framing and setting recognize the particular needs of vulnerable groups; and actions taken to respond to climate change enhance the rights and assets of vulnerable groups.

16.1 Governance and Institutional Capacity for Mitigation and Adaptation

Cities account for approximately 70% of CO_2 emissions (depending on measurement protocols) yet, in many cases, only a small fraction of the emissions produced within a city are under the direct control of municipal governments (Seto et al., 2014). Other jurisdictions and actors, such as national governments, the private sector, and individuals often control a significant portion of GHG emissions. At the same time, urban populations, economic activities, and infrastructures (see Section III of this volume) are vulnerable to a suite of negative impacts that climate change might aggravate (e.g., mortality from heat waves and damages from floods). Furthermore, carbon and climate are cross-scale issues. As such, urban areas are affected by actions beyond their boundaries, and urban emissions, risks, and actions create effects far outside of the demarcations of city limits. Therefore, GHG emissions and risks in cities are not only municipal governmental concerns; they challenge a range of actors across sectors to create coalitions for climate governance in order to mitigate emissions and adapt to climate risks (Aylett, 2013).

In this context, we define urban climate change governance as the set of formal and informal rules, rule-making systems, and actor networks at all levels (from local to global), both in and outside of government, established to steer cities toward mitigating and adapting to climate change (Biermann et al., 2009). Thus, urban climate change governance occurs within a broader socioeconomic and political context, with actors and institutions at a multitude of scales shaping the effectiveness of urban-scale interventions.

Although mitigation and adaptation are emerging as some of the most pressing issues faced by urban areas, both the study and practice of climate governance have historically addressed them separately, with mitigation referring to measures aimed at reducing resource-use impacts and adaptation referring to actions aimed at managing these impacts, before or after they are experienced (Field et al., 2014). However, in reality, these goals interact in potentially synergistic or conflicting ways (see Section 16.3.2). The notions of *response* and *response capacity* are ways of defining the institutional capacity to govern carbon and climate in cities (Tompkins and Adger, 2005). A *response* is any action taken by governmental and non-governmental actors to manage environmental change, either in anticipation of known change or after change has happened. *Responses* are fashioned through power, though consensus, compromise, or coercion, often by actors who frame mitigation and adaptation in the context of other environmental concerns (e.g., energy and disaster risk management), development pressures and goals (e.g., economic growth and human well-being), and in pursuit of a range of often conflicting values and priorities (Romero-Lankao et al., 2013). *Response capacity* relates to a pool of resources and assets that governmental and non-governmental actors may draw on for climate change mitigation and adaptation while attending to other development needs (Yohe and Tol, 2002; Burch and Robinson, 2007; Romero-Lankao et al., 2013).

This chapter will explore some of the dimensions of the capacity to develop governance solutions for carbon and climate change in cities including:

1. Different types of mitigation and adaptation actions developed and implemented in urban areas
2. Actors and networks at multiple levels
3. The nature, opportunities, barriers, and limits that multilevel governance poses to local climate policy
4. Gaps between the policy discourse and the challenges that local climate action needs to address under real-world conditions

Given that GHG emissions continue to increase quickly in many jurisdictions (Field et al., 2014), there is growing recognition that the scale of the challenge is greater than can be addressed by the modest and isolated responses that are most common in cities around the globe. Incremental reform may prove inadequate, requiring instead a transformative approach that fundamentally alters elements of the system such as energy and land-use regimes and their underlying power relations, worldviews, market structures, and governance systems (Park et al., 2012). Concerted action by governments, disruptive innovation in the private sector, and pressure from civil society may be required to trigger such transformative processes. However, the question of what exactly needs to be transformed, and why, how, and in whose interest remains open (O'Brien, 2012). Moreover, the factors driving or triggering the necessary fundamental transformations remain uncertain. Therefore, rather than prescribing the most appropriate scope of responses needed to achieve transformational policies, in this chapter we build on previous work identifying the challenges cities face (Park et al., 2012; Moser and Ekstrom, 2010) to evaluate the scope and scale of existing response actions to climate change.

This chapter also seeks to outline a governance framework that can be applied to urban areas (Romero-Lankao et al., 2013). Its interconnected elements include the issue of concern (i.e., mitigation of GHG emissions and adaptation to climate risk[1]); the response actions with their guiding goals and targets (e.g., to reduce fossil fuel use and to avoid or lessen climate change impacts (Parris and Kates, 2003); the governmental and non-governmental actors; the broader social and environmental context in which they operate; and the limits, barriers, and options[2] these actors face during the different phases of the decision-making process, from problem definition to implementation and evaluation (Park et al., 2012).

Urban responses for mitigating and adapting to climate change, as identified in previous research and practice, range

1 Following (Field et al., 2012), we define risk as the possibility of loss, injury, and other climate-related impacts on things we value; as the outcome of exposure to hazards and the capacity to perceive and respond to these hazards. See Chapter 2 of this report.

2 While barriers have been described as being "mutable, subjective, and socially constructed" (Adger et al., 2009: 338), limits, which are more rigid and fixed (Rothman et al., 2013).

from short- to long-term and vary widely in their effectiveness and outcomes. Some examples are shown in Figure 16.1 and include the following domains (see Sections 16.2.1 and 16.2.2):

1. *Understanding of the problem*: Through an inventory of GHG emissions, which provides a baseline against which mitigation targets can be assessed; assessments of the climate risks urban populations may face under a changing climate; and assessments of the drivers of both emissions and risks
2. *Incremental responses*: For example, mitigation actions focused on municipal government buildings and vehicle fleets or adaptation actions that build on ongoing disaster risk management.
3. *Broader scope, longer term responses* seeking to alter urban form, institutions, and behavior. These include:
   a. Actions and infrastructural investments that: (i) reduce vehicle kilometers traveled, promote mixed-use development, improve destination accessibility, and reduce distance to transit by concentrating development and thus reducing transport energy use (Hamin and Gurran, 2009); (ii) discourage growth in risk-prone areas and protect or restore the ecosystem functions and services such as infiltration, flood, surge protection, and temperature regulation. These may influence not only GHG emissions, but may also shape the vulnerability of individuals, populations, and sectors to climate hazards;
   b. Actions that build capacity by enhancing the assets and options afforded to individuals from diverse socioeconomic groups to use low-carbon energy sources and to adapt to the impacts of climate change;
   c. Actions that reduce hazard exposure including risk mitigation (e.g., through engineered protection systems such as dikes and barriers)
4. *Transformative responses* that contribute to profound changes in energy and land-use regimes, growth ethos, production and consumption, lifestyles, and worldviews (Field et al., 2014). Some of these actions target the underlying drivers of GHG emissions and vulnerability, such as systems of production and consumption, and the social inequalities that give rise to the coexistence of substandard housing, illiteracy, and poverty alongside wealth-related consumptive practices that are at the heart of our climate challenge. As such, transformative actions hold the potential to trigger a broader shift toward sustainable and resilient development pathways (Shaw et al., 2014; Burch et al., 2014).

Responses are initiated and shaped by state, community, and private-sector *actors,* defined here as individuals, communities, organizations, and networks that participate in decision-making related to urban mitigation and adaptation (Biermann et al., 2009). Such actors are involved both in defining the issue of concern and in seeking solutions. As such, they hold varied and often conflicting interests and visions about the best course of climate change action. For example, whereas some urban actors might consider nuclear energy to be a safe and proven alternative to fossil fuels, or hard infrastructures a feasible option to provide fresh water and sanitation and protect coastal cities from sea level rise, other actors might see these as poor choices (Romero-Lankao and Gnatz, 2013) (see Section 16.4.3). These differences result in competing discursive and material constructions of *response action*s and the potential for resulting fragmented or conflicting policies (Pelling and Manuel-Navarrete, 2011).

Furthermore, scholarship on urban climate governance has been concerned with the gap between the rhetoric and reality of carbon and climate action (Betsill and Bulkeley, 2007; Burch and Robinson, 2007) and, for the reasons just outlined, on the mechanisms by which multilevel governance arrangements shape responses. This chapter explores key factors or drivers shaping the scope and effectiveness of responses, which vary with context. These factors include multilevel actors and interactions (Section 16.3.2), mechanisms in place for actor engagement and participation (Section 16.4.3), legal frameworks (Section 16.4.1), generation and transmission of different ways of knowing (Section 16.4.2), financial resources, decision-making power (Section 16.3.3), and leadership (Section 16.4.4).

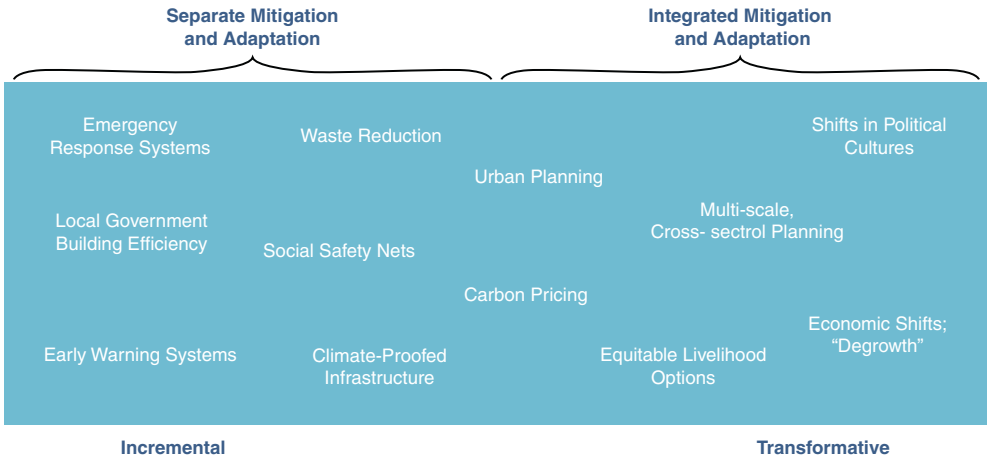

Figure 16.1 *A sample of urban climate change governance strategies, ranging from incremental responses that address adaptation and mitigation in isolation to potentially transformative strategies that integrate mitigation and adaptation. Relative location along the y-axis is not significant.*

Taken together, these dimensions reveal the complexity and dynamism inherent in urban carbon and climate governance. There is no single aspect of a governance system that can guarantee effective action to address climate change. Rather, it is the combination, synergy, and tradeoffs of several elements that may facilitate, or hinder, inclusive and actionable decision-making. Compelling examples of action, novel approaches to stakeholder engagement, and deeper insights into the drivers of effective governance have emerged in the communities of research and practice. This chapter weaves together case-based analysis with an assessment of established and evolving literature to identify the key challenges and opportunities of governing climate change in urban spaces (see Case Study 16.1).

16.2 Urban Climate Governance: A Brief Overview of Approaches to Mitigation and Adaptation

The initial recognition of the importance of cities to climate change governance came in the mid-1990s in the form of emissions reduction programs developed by urban actors in Europe and North America (Betsill and Bulkeley, 2007) and in frontrunner cities of middle-income countries (e.g., Cape Town and Mexico City) (Holgate, 2007; Romero-Lankao, 2007). Adaptation is a more recent addition to urban climate change governance, and first came into focus in low-income countries where a long tradition in disaster management exists and the impacts of climate change were more obvious before being taken up by middle- and high-income countries (Satterthwaite et al., 2007; Betsill and Bulkeley, 2007; Krellenberg and Hansjürgens, 2014). It has become apparent that the prospects for effective adaptation and sustainable development depend on accomplishing substantial mitigation. This poses the need for transformative change in existing technological, economic, social, and institutional systems (Field et al., 2014). Sections 16.2.1 and 16.2.2 outline the different urban mitigation and adaptation governance strategies identified to date, as well as their scope (see Figure 16.1). Sections 16.2.3 and 16.2.4 reflect on the ways in which these options relate to each other, with other key local priorities, and with what transformative approaches would entail.

16.2.1 Adaptation Responses

Five categories of adaptation responses available to governments, households, the private sector, and communities have been shown to hold the potential to address risk by reducing hazard exposure and vulnerability and by enhancing the capacities of urban actors. These categories are not necessarily mutually exclusive and can be pursued simultaneously.

1. *Institutional and behavioral actions* focus on changing the procedures, incentives, or actions, and often work through existing urban competencies and hybrid actor arrangements in sectors such as planning, health, and water (Fisher, 2013). Examples include disaster risk reduction (DRR), early warning systems, climate-sensitive management protocols, and disease surveillance in the health sector, or demand-side management in the water sector (McDonald et al., 2011). These are often initiated by municipal governments and bolstered by national or regional governments (Ziervogel and Parnell, 2014; Vasi, 2007), business, or civil-society actors (Brown et al., 2012).
2. *Technological and infrastructural actions* seek to discourage growth in risk-prone areas and protect urban infrastructure systems through changes to design, operational, and maintenance practices. Early responses to long-term climatic variability in transport, water, sanitation, telecommunications, and green infrastructure are often less costly than deferring action (Revi et al., 2014). Proactive planning helps to address the inherent uncertainty in many of these interventions, as do multistakeholder planning processes. The Thames Estuary 2100 project, which has drawn upon a wide range of actors to assess infrastructure for managing changing tidal risk, is an example of this strategy (Ranger et al., 2013). Some technological interventions may be driven exclusively by governments, such as investments in major flood defenses or siting decisions for infrastructure investments in the transportation, water, and sanitary services sectors (Brown et al., 2012). They may also result from community-based adaptive strategies, such as elevating houses in informal settlements or building floodwater drainage and sewer systems (Jabeen et al., 2010). Yet many community responses are not sufficient on their own to significantly reduce the vulnerabilities of urban populations. State interventions are therefore needed to foster adaptive capacity, for instance, by working collaboratively with different non-governmental actors so that municipal infrastructure investments are designed to enable more effective responses on the part of civil-society actors (Romero-Lankao et al., 2014).
3. *Economic and regulatory instruments* seek to create an enabling environment for autonomous action on the part of governmental, private and civil society actors and to support broader development goals. A recent survey of 350 ICLEI – Local Governments for Sustainability member cities (The Urban Climate Change Governance Survey, or UCGS) shows that most cities have been unable to effectively link their adaptation policies to their other local development goals (Aylett, 2014). Identifying such synergies is particularly important for gathering broad support in low- and middle-income countries (Huq et al., 2007). Prospects for progressing and mainstreaming climate change agendas, therefore, depend on being able to demonstrate how these are not in conflict with development priorities, as often claimed, but instead are essential and complementary to them (Simon, 2011).
4. *Urban planning*, or the policy process through which strategic decisions about a city's future are made, is a key instrument for anticipating climate change impacts and fostering early action, yet it does not always achieve these aims on the ground (Carmin et al., 2012; Bracken, 2014). For instance, some authorities might be concerned with avoiding growth in risk-prone areas or incorporating climate hazards into planning. These priorities, however, often compete for regulatory space within a policy agenda that is already coping with a very wide range of economic and capitalistic drivers of development (Romero-Lankao et al., 2013a). Furthermore, the level

of authority and autonomy of urban planning can vary significantly between cities. Even so, in some cities, a shift in the urban planning tradition is occurring away from reactive and toward more proactive approaches (Hansen et al., In press).

5. *Funding programs* from public and private sectors are fundamental. By strategically allocating funding (whose scale and sources vary widely and depends in part on how much local authorities can tax residents, property owners, and business), urban governments can effectively respond to risks. Still, according to a survey of 468 cities conducted by Carmin et al. (2012), 60% of city governments are not receiving any financial support to undertake adaptation. Furthermore, many ongoing activities may not be explicitly called adaptation, but may be considered to reduce vulnerability and enhance adaptive capacity. Subsequent research by Aylett (2014) identified a lack of financial resources (and associated lack of staff time and institutional resources) as the dominant challenges that cities report as affecting their climate change planning and implementation (for both mitigation and adaptation) (see Figure 16.2).

Although these responses can expand the capacity of urban actors and areas to cope with a changing climate, barriers and limits to adaptation exist. Barriers to action include short-term planning horizons, uncertainty of climate change impacts, and other socially constructed obstacles (Burch, 2010; Moser and Ekstrom, 2010). Limits occur when actions to avoid intolerable risks are not possible or not currently available (Rothman et al., 2013; Field et al., 2014). These limits suggest that transformational change may be a requirement for sustainable urban development in a changing climate.

16.2.2 Mitigation Responses

Mitigation responses are being undertaken by city governments through auto-regulation (a government addressing its own emissions), mandatory regulations, economic incentives, and facilitation (Kern et al., 2008; Castán Broto and Bulkeley, 2013). As with adaptation, many mitigation actions require city governments to work with non-governmental actors and other scales of government (see Section 16.3). Here, we explore how these options induce changes in energy and land use by affecting urban form and accessibility, consumption, living and housing type, infrastructures, and the carbon content of energy.

1. *Auto-regulation,* or voluntary self-regulation. These are the most common actions implemented by local authorities. A survey of 350 cities conducted by Aylett (2014) found that these have focused on municipal government buildings (89%) and vehicle fleets (72%), on waste reduction (55%), and public transit use (36%) The UCGS found that auto-regulation is the most common way in which city governments have achieved measurable emissions reductions (Aylett, 2014). The most common areas where emissions reductions have been made are municipal government buildings (89%) and vehicle fleets (72%) and waste reduction (55%) (see Figure 16.3).
2. *Mandatory regulations,* the most effective but least pursued by city governments, are enacted to reduce GHG emissions when urban authorities have legal jurisdiction over such sectors as energy, transport, land use, and waste. Authorities can introduce codes and ordinances for new building constructions as well as retrofits that enhance building energy efficiency and environmental performance (e.g., Toronto's green roof bylaw [in 2009], or Vancouver's Neighbourhood Energy Connectivity Standards and Green Homes Program [in 2014]; (Mehdi et al., 2006; Lutsey and Sperling, 2008). Other actions being used in middle- and low-income countries include vehicle emissions standards, fuel standards, appliance efficiency labeling, and renewable electricity portfolio standards.

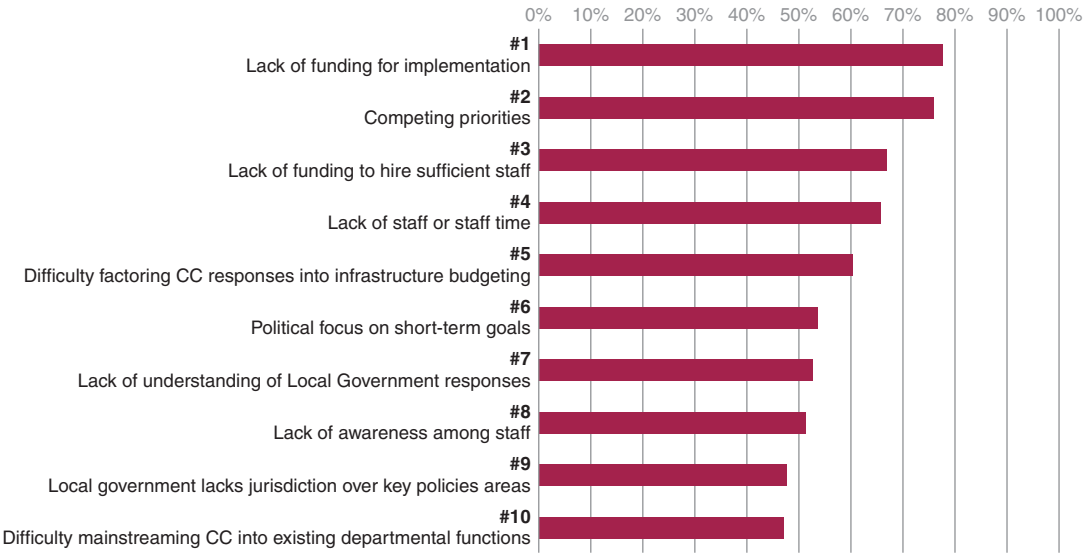

Figure 16.2 *Top ten challenges reported by cities in the Urban Climate Change Governance Survey, ranked according to the percentage of cities reporting that these issues were significant or major challenges to their climate change planning and implementation work.*

Source: Aylett, 2014

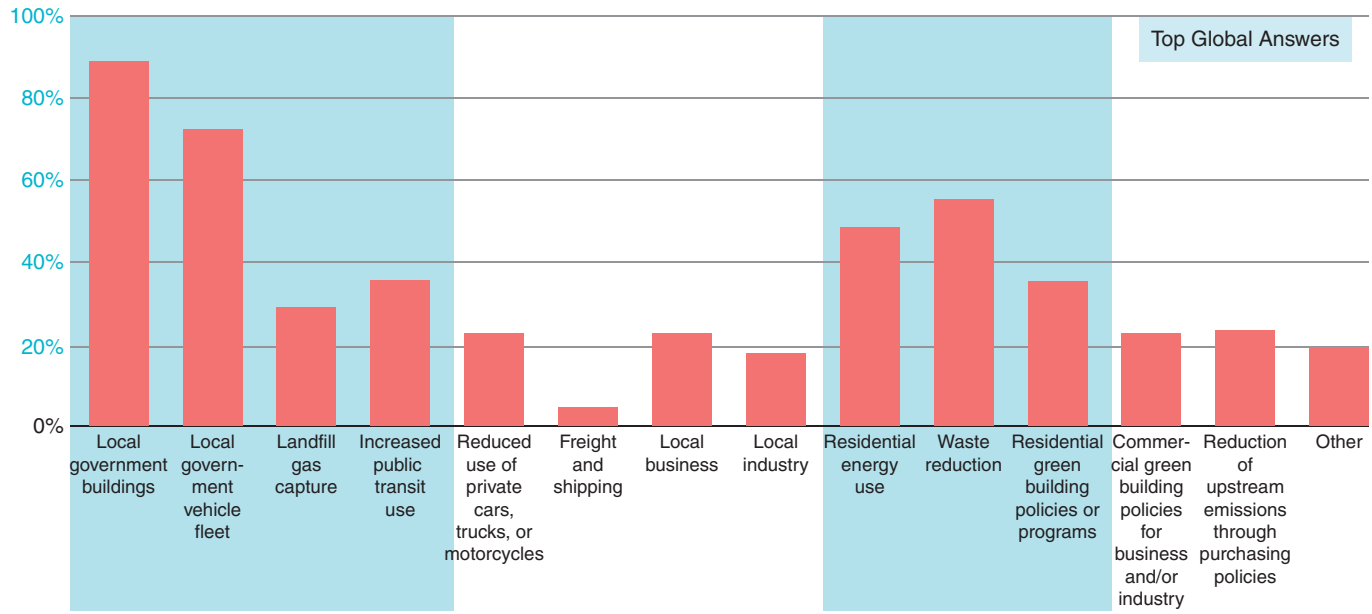

Figure 16.3 *Where cities have made measurable emission reductions. Cities can pursue a wide range of activities to reduce their greenhouse gas emissions. This figure shows the percentage of cities globally that report making measurable emissions reductions across fourteen different areas.*

Source: Aylett, 2014

3. *Economic incentives.* Municipal governments (when they have legal jurisdiction) offer grants, subsidies, tax credits, and other economic and financial incentives to facilitate the adoption of sustainable technologies, build efficiency retrofits, and create small-scale renewable energy systems (e.g., the Toronto Atmospheric Fund) (Zimmerman and Faris, 2011; Fisher, 2013). Market-based tools such as carbon taxes and cap-and-trade systems, while not typically initiated at the urban scale, directly affect urban actors and emissions.
4. *Facilitating measures* mostly focus on new services and infrastructure development. For example, cities can pursue climate change mitigation through public–private partnerships, through educational campaigns to citizens, or through guidance to the private sector. Incentives can also help to foster initial innovative actions. As illustrated by Portland's Clean Energy Works and Solarize Portland programs, the synergies associated with reducing local GHG emissions can also serve as additional motivations for non-governmental actors to support climate-related initiatives (Aylett, 2013; Burch et al., 2013; Castán Broto and Bulkeley, 2013).

Despite the rising prominence of mitigation in the policy arena and the emergence of ambitious targets, mitigation actions remain fragmented, focused on auto-regulation, and the realities of achieving reductions in GHG emissions are often more challenging than anticipated. The following sections will explore some of the factors why this is so.

16.2.3 Different Metrics Used to Evaluate Mitigation and Adaptation

Evaluating and increasing the effectiveness of both mitigation and adaptation responses is progressively becoming a focus for researchers and practitioners. For mitigation, the impact of a policy can be measured by assessing the total tonnes of CO_2 equivalent reduced. These reductions are measured against a baseline inventory, which many cities are conducting globally using a variety of methodologies proposed and promoted by groups such as ICLEI, UN-Habitat, the World Bank, and the World Resources Institute. The multiplicity of approaches has meant that comparisons between cities and across time are problematic. A push to harmonize the different reporting techniques led to the creation of a Global Protocol for Community-Scale Greenhouse Gas Emissions reporting (GPC) in 2012, which has since been the basis for revised emissions accounting procedures such as ICLEI's Harmonized Emissions Analysis Tool (HEAT+). An additional challenge is presented by the gap between urban areas' pledges to achieve GHG emissions reduction targets and the real mitigation potential of their actions, which are often limited based on city government control and jurisdiction. As a handful of high-income country studies illustrate, many urban mitigation actions fall short of the emissions reduction targets needed to avoid a 2°C increase in global mean temperature (Reckien et al., 2014). The global mitigation impact of urban responses is, hence, unclear (Hutyra et al., 2014).

Although for adaptation no universally accepted assessment metric exists, adaptation policies are generally effective if they reduce negative impacts of climate change or enhance the underlying adaptiveness or resilience of populations, infrastructures, and other systems at risk. This complicates matters, not least because vehicles such as the Kyoto Protocol's Adaptation Fund encounter challenges when trying to compare the adaptive effect of projects in order to allocate funds efficiently (Stadelmann

et al., 2011). Of the cities surveyed by Carmin et al. (2012), 65% expect impacts on stormwater management, 39% loss of natural systems, 35% droughts, 34% coastal erosion, 30% urban heat island effects, and 29% loss of economic revenue. These problems can be addressed by reducing the exposure and sensitivity of people and assets and by enhancing capacity to perceive and respond to these hazards, but adaptation responses still lag behind mitigation (Carmin et al., 2012; Revi, 2014). Following up on Carmin's work, Aylett's (2014) survey of ICLEI member cities found that 73% of respondents were planning for both mitigation and adaptation and are treating the issues in an integrated way that takes into consideration the synergies and conflicts between planning in the two areas (see Figure 16.4).

This research shows that adaptation has established itself in a policy space formerly dominated by mitigation. It also highlights the importance of better understanding the tradeoffs and synergies that exist between mitigation and adaptation, as well as between climate action and other local policy priorities. The broader sustainability implications of climate change action are increasingly being considered, leading to calls for more holistic and even transformative planning in cities. These issues are addressed in greater detail in Section 16.2.5.

16.2.4 Barriers Resulting from Different Timeframes at Which Mitigation and Adaptation Operate

One challenge for mitigation and adaptation policies is the lag between the timing of investments in implementation and the point at which investments yield financial, environmental, or social returns. Minor efficiency measures may recoup their costs quickly, but the associated GHG reductions are limited. Large-scale investments in infrastructure and urban form, such as smart grid technologies or public transit, take decades to recoup their high upfront costs and to realize their mitigation potential. This is similar for adaptation measures that increase the resilience of urban infrastructure. Although the overall costs are justified by projections of avoided damage and associated recovery costs, it can take more than a decade before those gains are realized (and these gains may not just be adaptive, but may also reduce GHGs in the long term). For example, a robust strategy to protect New York's electrical system from flooding and wind damage while also increasing efficiency and reducing GHG emissions would require an investment of roughly US$3 billion. It would take 15 years for the financial returns from these investments (in terms of avoided damage and increased efficiency) to hit the break-even point (Arup RPA, 2014). In the short term, it is cheaper to pay for repairs than to make the investments needed to increase resilience. This is exacerbated by the short time horizon of local electoral cycles that can push officials to favor immediate returns and lower costs (Bulkeley, 2010). Nevertheless, there are also low-cost adaptation activities, such as those that foster green spaces or immediate energy conservation, which show positive short-term benefits.

Financial returns are not the only domain in which the timeframes of action and outcomes are likely to be misaligned. In a world of short-term political and media cycles, it can be challenging to capture and maintain the interest of elected officials and the public to sustain climate change action and build governance structures.

16.2.5 Overlaps, Synergies, and Conflicts among Adaptation, Mitigation, and Urban Development

In an effort to increase the direct local benefits and political attractiveness of climate change response strategies, much work has gone into identifying the synergies and co-benefits among adaptation, mitigation, and broader development priorities (Beg et al.,2002; UN-Habitat, 2011; Shaw et al., 2014).

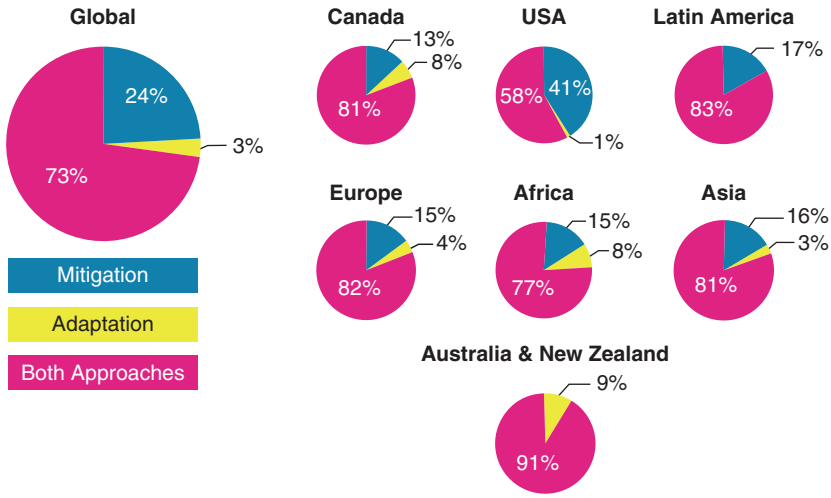

Figure 16.4 *Percentage of respondents in the 2014 MIT-ICLEI Urban Climate Change Governance Survey who reported that their climate change work was focused on adaptation, mitigation, or both.*

Source: Aylett, 2014

Mitigation measures can reduce local air pollution and improve respiratory health or produce financial savings through energy efficiency (while reducing energy associated emissions), for example. Likewise, adaptive measures to address flooding can also benefit local populations by improving local water quality, or providing sanitary infrastructure (Bai, 2007; Gore, 2010). But despite these documented examples of effective synergies in the research and best-practices literature, most cities have yet to effectively link their emissions mitigation work to achieving other local development priorities. The Aylett survey (2014) shows that across a broad list of possible social, economic, environmental, and infrastructure priorities, cities consistently report that mitigation measures have made little to no contribution; the key exceptions to this are actions directly linked to other environmental goals (e.g., increasing access to basic services) (see Figure 16.5). Reasons for this can include inertia behind out-of-date planning practices, lack of political will or of expertise in identifying and exploiting synergies, and the relatively nascent state of climate change policy.

In addition to interacting with other development priorities, mitigation and adaptation measures can also overlap and reinforce each other. Smart grid technologies, for example, can both decrease local GHG emissions and create a robust local energy system that is better able to withstand the impacts of extreme weather events. Green areas can also play a crucial role because they can serve as carbon sinks, provide flood mitigation services, and reduce the head island effect (Müller and Höfer, 2014; Locke et al., 2014).

These synergies are reframed and further developed in the emerging discourses around "smart" and "resilient" cities (Lööf et al., 2012; Stumpp, 2013). Through technologically enabled interventions into urban space, smart urban systems (ranging from traffic control, energy, and water management) hold the promise of creating infrastructure that is both low-carbon and more adapted to the potential impacts of a changing climate. Thus, the resilient city is also a social effort. Technological solutions are only one component of enhanced resilience. Effective synergies among adaptation, mitigation, and other local development priorities also function as part of the connective tissue that underlies urban resilience. Co-benefits help enable multiple urban actors to collaborate in order to create urban systems (both built and institutional) that are able to withstand, adapt to, and recover from climate-related hazards. These co-benefits already exist in many projects around the world but have not been well captured by research.

Identifying synergies, or what are now often called co-benefits, and building them into the design of climate change actions provides technical and financial benefits by allowing actors to realize multiple objectives simultaneously. Capitalizing on synergies or co-benefits also removes climate change policies from a narrowly "environmental" category and anchors them to other local priorities, particularly those faced by cities in many low- and middle-income countries, as explained earlier. This has powerful political benefits because it helps climate policies to move through the complex political economy of municipal decision-making and the multiple priorities of city governments. It also facilitates the mainstreaming of climate policies and programs into existing planning and decision-making mechanisms rather than having to deal with them as exceptions or a separate budget category in competition for scarce funds (Simon, 2011).

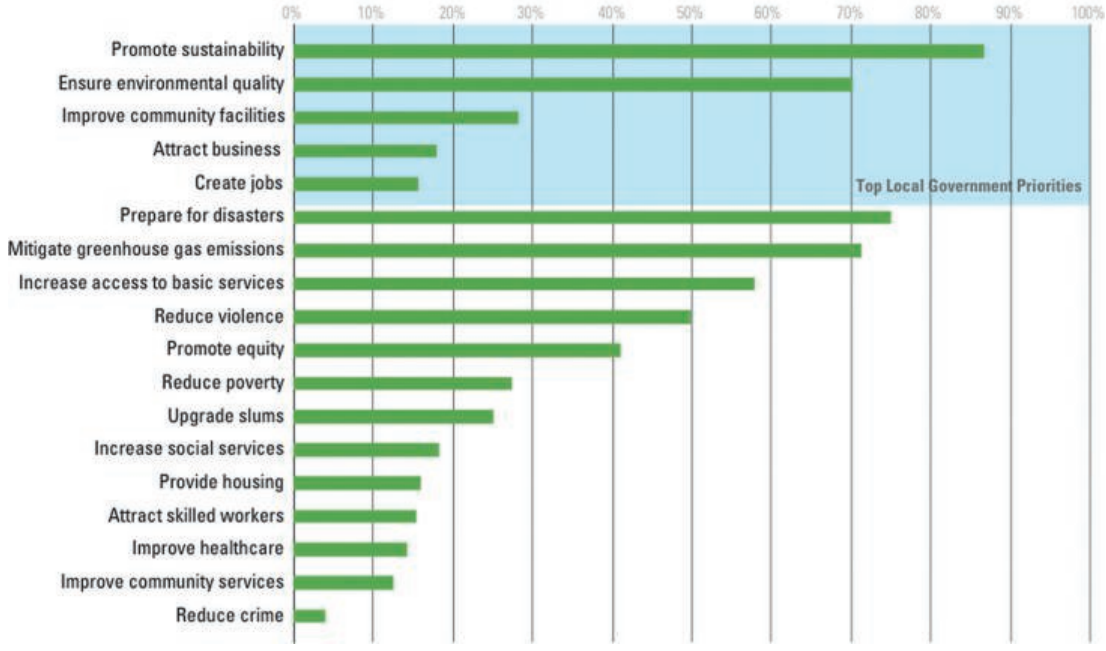

Figure 16.5 *Contribution of mitigation to other development priorities. This figure shows the percentage of cities that report that their climate change mitigation work has contributed significantly to other local development priorities. Priorities highlighted in blue were the top overall development priorities reported by cities.*

Source: Aylett, 2014

However, not all climate change actions will find obvious synergies with local development goals or other climate change-related policies. Diesel-powered emergency electrical generators may increase resilience to climatic disruptions to regional electrical grids, but at the cost of increased emissions. Reducing GHG emissions in locations dependent on carbon-intensive industries may require difficult decisions and tradeoffs (Simon, 2012). Local economic development priorities based on growth and increased consumption will in most cases also result in increased energy use and GHG emissions. Similarly, adaptation measures may not affect all urban residents equally, so it is particularly important to develop context-specific measures to reduce vulnerability (Hughes, 2013; Krellenberg and Welz, 2016). In some cases, for example, when a development is established in floodplains, it may be necessary to relocate populations, businesses, and infrastructure. While the long-term benefits of doing so may justify these decisions, attention and compensation to those who bear the costs of these types of tradeoffs is critical. The strategic identification and operationalization of co-benefits can be a powerful tool to driving forward the design, implementation, and mainstreaming of local responses to climate change. But there are limits to what can be accomplished in this fashion. Strategically using synergies and co-benefits to build coalitions of support that are robust enough to help address inevitable tradeoffs is an important component of successful local climate governance.

16.2.6 The Challenge of Consistency and Coherence

Neither adaptation nor mitigation is a discrete area for policy-making or action. They overlap, and multiple other local development priorities implicate a varied network of public and private actors and have costs and impacts that cross multiple geographical and temporal scales. Maintaining coherence and consistency in this reality is a critical challenge. Integrating mitigation and adaptation planning into broader spatial and development planning processes is one way to help ensure that policies and actions do not work at cross-purposes. Another key is to pay strategic attention to the relationships between various levels of both public and private organizations. In the next section, we will focus on this multilevel governance approach.

16.3 Multilevel Governance, Actors, and Interactions

16.3.1 Categories of Actors

As introduced in Section 16.1, climate change is a socially and biophysically pervasive phenomenon, challenging actors at different scales to come together and create multilevel governance coalitions. These actors have both consistent and inconsistent values, goals, and priorities (Adger, Lorenzoni, and O'Brien, 2009). None of these groups is homogeneous, while shifting alliances and varying levels of power create challenges for coherent and legitimate urban climate change governance. The mix of actors engaged in responding to climate change more broadly is also changing: what was once the domain of formal state-to-state negotiations has become the contested territory of an evolving array of governmental and non-governmental actors. Networks of actors play multiple roles in urban climate change governance: as providers of resources, facilitators of interactions with other cities that face similar challenges, and shapers of the climate change discourse more broadly (Betsill and Bulkeley, 2007). Many cities are independently taking action even in the absence of national climate change policy frameworks. Some actors, such as the private sector, may operate independently to address climate change within their own domain or form partnerships to achieve a common goal. Suboptimal outcomes may result, however, if these autonomous actions are not integrated with other development and environmental activities.

In some cases, national governments have helped to stimulate local action. For example, in 2008, the government of India developed the National Climate Change Action Plan. The city of Delhi subsequently adopted its own plan, the Climate Change Action Plan of 2009 (the Delhi Plan) to pursue an agenda of being a climate change leader in India. The Delhi Plan determines targets, objectives, strategies, and responsible departments and blends mitigation and adaptation objectives. Each objective is aligned with a national priority, and the city strategically bundled climate change and development issues to achieve broader outcomes (Aggarwal, 2013). Some risks and pressures, such as population growth and water security challenges, were described as "emergent opportunities" even as the exposure to extreme coastal flooding acted as a more routine hazard. However, the local political and administrative environments present barriers – particularly the short termism of election cycles and the multiple overlapping jurisdictions governing Delhi that inhibit the development of institutional capacity (Aggarwal, 2013). Delhi's climate action plan foregrounds the ability of cities to respond to national-level initiatives, but success rests on improved coordination of institutional action. Emerging and significant criticisms of the Delhi Plan include its relatively weak adaptation agenda and its lack of focus on poverty and justice inherent in addressing climate change in the city (Aggarwal, 2013; Hughes, 2013).

However, in countries as diverse as Canada, the United States, Mexico, and South Africa, innovative climate change governance has been largely led by state and municipal governments, often in spite of the lack of comprehensive or ambitious climate change policy at the national level (Rabe, 2007; Macdonald, 2009; Romero-Lankao et al., 2013; Roberts and O'Donoghue, 2013; Ziervogel and Parnell, 2014). Despite their ambitions, these urban actors are constrained in their capacity to influence national climate policy, and many face barriers not only related to influence, resources, and institutional culture but also from the competing priorities with which urban decision-makers grapple (Gore, 2010; Burch, 2010; Measham et al., 2012).

One example of a city that has successfully encouraged private-sector involvement is Berlin. The city of Berlin has reduced emissions from 1,300 public buildings with twenty-five Energy Savings Partnerships since 1996. An audit in 2011 reported €60 million in private investment in energy efficiency measures and the reduction of 600,000 tonnes of CO_2. To make the projects viable, the annual (overarching) energy bill must be at least €250,000. As a result, Berlin set up a system allowing building owners to pool buildings into one project tender. Since unprofitable buildings are also integrated, "pooling" leads to a profitable cross-calculation. The Berlin public–private financing arrangements have been exported to develop projects in Slovenia, Bulgaria, Latvia, Poland, Mexico, and Estonia. Project partners are required to innovate to overcome financing barriers.

This complex landscape creates both opportunities and barriers. While more creative, locally relevant, and equitable strategies may be uncovered if engagement is undertaken in a meaningful way, conflicting jurisdictions or vested interests frequently present obstacles to effective governance. This suggests the need for a variety of actions that include adaptive management, deep and ongoing public participation, private-sector innovation, grassroots initiatives, contestation (e.g., Climate March 2014), and holistic planning that consider the synergies and tradeoffs among various policy priorities.

16.3.2 Governing Complex Actor Interactions

Although much of climate change governance for the past two decades has centered on the nation-state level, other actors (including cities) are now taking on significant responsibilities. This leads to a variety of interactions: transnational networks of cities, bilateral partnerships between cities, coalitions between state- and non-state actors (such as private companies and municipal governments), and independent actions by non-state actors. Three elements increasingly characterize the governance of these complex actor interactions: extensive vertical and horizontal interplay between actors, cross-sector partnerships, and networks at a variety of scales.

Actors, and the institutions of which they are a part, do not operate in isolation but rather in the context of a complex web of interactions. The issue of interplay brings to light the ways in which institutional arrangements at varying (vertical interplay) and similar (horizontal interplay) levels of organization are interdependent (Young, 2002; Urwin and Jordan, 2008). This creates challenges: the actors participating in the governance of climate change in urban spaces often have very different mandates, consider different time scales, and utilize different expertise or ways of knowing. For instance, in Cape Town, South Africa, both the provincial and city governments pursue climate change mitigation. Even so, differences in ruling parties and politics mean few mechanisms exist for structured interaction between the two governments, and collaboration happens only on an ad hoc basis (Holgate, 2007). It must be recognized at the outset, however, that in many larger urban areas, which comprise two or more local and even state authorities, each authority can act only within its boundaries, so that the overall impact may be limited unless there is horizontal collaboration among neighboring authorities or an overarching strategic metropolitan authority exists to ensure citywide action. Dakar in Senegal provides an extreme example of this problem since the city region comprises forty-three autonomous municipalities (of which nineteen comprise the Dakar department), and there is no metropolitan council (Guèye et al., 2007).

The increased prominence of non-state actors in urban climate change governance has led to growing calls for partnerships across the public–private divide (Osofsky and Koven Levit, 2007; Bontenbal and Van Lindert, 2008; Andonova, 2010). These partnerships play an important role in overcoming gaps in capacity, translating the climate change impacts and response options into language that is meaningful to different groups and individuals, and accelerating the development of solutions. Follow-up analysis of the 2014 MIT-ICLEI Climate survey shows that these partnerships have an important impact on the scope of concrete emissions reductions (Aylett, 2014). Cities that report high levels of partnerships among public, private, and civil-society actors are significantly more able to achieve measurable emissions reductions in areas outside of direct municipal government control (such as residential energy use, emissions from local businesses, or reduced use of private vehicles). For example, in early 2010, the region of Metro Vancouver on the west coast of Canada launched a partnership with seven municipalities and a small sample of small and medium-sized enterprises (SMEs) to conduct a program of GHG management training for SMEs. The three parties agreed to work together to carry out GHG management training, employ a GHGs management tool, and provide technical assistance for SMEs, the costs of which are shared equally among the three partners (Burch et al., 2013).

Networks have emerged that connect diverse stakeholders to create more coordinated, global approaches to climate change mitigation and adaptation (Betsill and Bulkeley, 2004; Burch et al., 2013; Krellenberg et al., 2014). An example of increasingly important global networks that influence climate change responses is ICLEI's Partners for Climate Protection program (Andonova, 2010). Policy action in the Netherlands provides another example of what can be achieved through international partnerships. Even so, the wide variation in jurisdictional power, organizational culture, organizational structure, and political context has constrained the ways that these stakeholders interact with one another and, hence, the effectiveness of mitigation and adaptation policies. The Netherlands has developed a clear methodology of "learning-oriented" environmental policy (National Environmental Policy Plan NEPP 1-IV 1989–2002), and this is being applied to its cities' agendas, specifically using transition experiments to accelerate movement toward sustainability. The development of a Climate Adaptation Partnership has encouraged the sharing of delta-city knowledge and technology and policy transfers between the port cities of Rotterdam and Ho Chi Minh City. This work has the potential to cross cultures and geographies for innovative outcomes.

16.3.3 Justice in Urban Climate Change Governance

Actors vary in the extent to which they have influence over the governance of climate change, legitimacy in the eyes of decision-makers, and the resources to take action. For example, those communities that are most vulnerable to climate change are often not those who are responsible for the bulk of GHG emissions. Climate change also has the potential to exacerbate existing societal inequalities in terms of income distributions and access to resources and options. A growing body of research reveals that climate change governance strategies can produce or reproduce (un)just decision-making processes and outcomes or result in an (in)equitable distribution of climate change risks and resources (see Chapter 4, Mitigation and Adaptation).

Justice in urban climate change governance requires that vulnerable groups are represented in mitigation and adaptation planning processes, that priority setting and framing recognize the adaptation needs of vulnerable groups, and that the impacts of adaptation enhance the freedoms and assets of vulnerable groups in the city (Hughes, 2013). Urban climate change governance systems have multiple entry points at which justice and injustice can be experienced, including decision-making processes, criteria for taking and facilitating actions, and the mechanisms that manage the relationships between climate change impacts and other policy areas (Thomas and Twyman, 2005).

There are scalar dimensions to experiences of justice in urban climate change governance, from individuals through neighborhoods to countries. From a global perspective, cities in low- and middle-income countries have limited adaptive capacity and relatively high reliance on natural resources; as a result, they are considered more vulnerable than cities in high-income countries.

Within cities, there are sociospatial differences that help determine vulnerability and influence on decision-making and thus on differentiated options and assets to respond to risk (Simon, 2011; Kuhlicke et al., 2012; Welz et al., 2014). City authorities may reach out to vulnerable populations but do not necessarily assume responsibility for climate impacts resulting from previous government policies and practices (Bulkeley et al., 2013). Emissions, vulnerability, and risk are linked to equity and poverty in complex ways that require sophisticated policy responses (Hardoy and Pandiella, 2009; Romero-Lankao, Qin, and Borbor-Cordova, 2013). One example of such a strategy is "pro poor adaptation" that uses investments in the assets (both physical and intellectual) of vulnerable and poor communities to reduce vulnerability and improve capacity (Moser and Satterthwaite, 2010).

16.3.4 The Challenge of Fragmentation and Coordinated Action

Although city governments are at the forefront of acting on climate change, it is well documented that the existence of a variety of practical barriers to developing coordinated and cross-sectoral climate change actions is hampering implementation. The importance of the comprehensiveness of these plans is thus also the challenge in regard to horizontal and vertical coordination between actors fragmented across different agencies, utilities, and city administrative departments (Betsill and Bulkeley, 2004; Kern et al., 2008; Bulkeley, 2010; Betsill and Bulkeley 2007).

It has also been observed that, within city governments, climate change expertise often remains concentrated in environmental departments, which makes cross-sectoral coordination within the organizational hierarchy of city government even more challenging because of a limited capacity to implement actions (Kern et al., 2008). The participation of different municipal agencies in climate change planning and implementation is highly uneven. Agencies responsible for environmental planning, land-use planning, and solid waste management tend to be important contributors to local climate action. Those responsible for transportation, water, and building codes occupy a middle ground, whereas other city government agencies responsible for sectors such as health, economic development, and the local electrical utility (where these exist) remain largely on the sidelines (Aylett, 2014). Those agencies currently less engaged represent potential sources of new partnerships, ideas, and resources that could enable even more effective urban responses to climate change.

Fragmentation in governance systems occurs not only as a function of the physical separation of actors. The implementation of climate change activities is also hampered by a multitude of formal and informal institutional constraints and barriers and by the varied visions, interests, and decision-making power of involved actors (Næss et al., 2005; Agrawal et al., 2012; Romero-Lankao and Gnatz, 2013). For example, coordination is more difficult across sectors than within sectors because different sets of institutional rules tend to evolve in departmental divisions. Addressing fragmentation as cross-sectoral climate change planning is essential if undesirable tradeoffs are to be avoided and potential synergies exploited (Biesbroek et al., 2009; Larsen et al., 2012).

The Danish municipality of Aarhus provides an example of how to overcome fragmentation. In 2007, the city set a goal of carbon neutrality by 2030. Networking both within the municipal government and between the government and private actors has helped to produce more coordinated action. The city's Climate Secretariat is driven by visionary leaders willing to circumvent organizational norms and develop informal relationships among the lower levels of the administrative hierarchy. Municipal marketing and the promotion of climate change action with development potential is focused on attracting private companies. Indeed, the Climate Secretariat has brought thirty-two businesses together in a formal network involving housing, clean technology, Aarhus University, and the engineering sector where linkages promote benefits to all parties (Cashmore and Weis, 2014). This networking approach has created demands for urban government to act, which in turn bypasses some intraorganizational constraints. In spite of fragmentation and conflicting ambitions and values, the Climate Secretariat leveraged around 50 million DKR (approximately US$9.2 million) in climate change investments in 2012 (Cashmore and Weis, 2014).

16.4 Other Determinants of Effective Urban Climate Change Governance

In this section, we explore other drivers of effective urban climate change governance to provide explanatory insight and identify possible opportunities for effective actions. The role of each driver is likely to be different in different contexts, and an important area for future research is to further explore the conditions under which the insufficiencies of different drivers, or combination of drivers, act as barriers to effective urban climate change governance. Furthermore, pursuing effective governance measures in and of themselves can mask underlying political tensions and conflicts. For example, while a governance system may reflect or achieve common metrics of good governance,[3] these do not necessarily remove underlying political conflicts (Jessop, 2001).

16.4.1 Legal Frameworks and Mandates

The legal context in which urban climate governance takes place plays a key role in determining the extent to which climate change actions, regulations, and programmatic priorities are legitimized, incentivized, and prioritized. Absent or inadequate laws dealing with mitigation and adaptation can be an obstacle to developing and implementing actions. However, changing legal frameworks is time-consuming and entails complex processes at different political levels. The presence of appropriate legal frameworks can facilitate the development and implementation of mitigation and adaptation action and set the basis for further action. Legal frameworks can also mediate the relationship between the public and decision-makers, providing political structures for participatory planning and decision-making (or not) according to prevailing democratic norms and political cultures.

Legal frameworks determine if mitigation and adaptation action can be undertaken autonomously at the city level. Whereas in centralized systems regional and local actors are significantly conditioned by national decision-making, laws, funding, and distribution of competencies, in decentralized systems municipal governments are more likely to have jurisdiction over climate change–related policy areas such as energy supply, transportation, water supply, and land use. Legal reforms fostering decentralization can sometimes provide opportunities for effective climate change action when there is a coherence between powers and responsibilities on the one hand and available resources and revenue sources on the other, especially when led by one or more champions within the local authorities (Finan and Nelson, 2009; Brockhaus and Kambiré, 2009) (see Section 16.4.4).

Local reforms can also initiate changes to broader legal frameworks. Mexico City's Federal District government has invested heavily in the institutionalization of climate change governance (Hughes and Romero-Lankao, 2014). The Federal District has established a Climate Change Division within the Ministry of Environment, responsible for tracking and modeling GHG emissions and conducting citywide vulnerability assessments. It has assumed full responsibility for developing and implementing the Mexico City Climate Action Plan. The Division has resisted, or been immune to, changes in administration. Its existence formalizes the organizational structures necessary for mainstreaming climate change expertise, planning, and funding. In 2010, the Federal District passed the Law for Mitigation and Adaptation to Climate Change (Romero-Lankao et al., 2015). Decision-makers in the Climate Change Division fostered a conducive environment for passing the law, and, in doing so, legitimized and shielded climate change policy from the political cycle and administrative and policy shifts. Mexico City's leadership has helped to inform the 2012 General Law of Climate Change passed by the Mexican federal government, which sets GHG reduction targets. Mexico City, however, is faced with challenges, such as fragmented governance arrangements, asymmetries in access to information, and top-down and technocratic decision-making (Romero-Lankao et al., 2013).

Legal frameworks play additional roles. They can influence the adaptiveness of climate change governance (Birkmann et al., 2010). Top-down, inflexible governing mechanisms subject to electoral cycle discontinuities, poor coordination, underfunding, and a lack of local specificity fail to meet the needs of cities. Adaptive legal frameworks, on the other hand, authorize and support an integrated agenda necessary to deal with multiple levels and sectors in the face of uncertainty. Finally, legal frameworks are important because of their ability to develop and channel resources for urban climate change governance. Drawing again on the example of Mexico City, the government of Mexico City passed the Climate Change Act, which established climate change as a line item in the city's budget, thus helping to solidify and institutionalize climate change as a part of the city's normal business. Legal frameworks can also determine the number of staff dedicated to climate change and the information resources that can be marshaled for supporting decision-making. Legal frameworks give mandates and missions that often translate into resources for effective governance.

16.4.2 Generation of and Access to Information

Urban climate change governance requires access to new, context-specific, and complex sources of information, such as future climate projections, GHG inventories, and climate vulnerability assessments. The ways in which this relevant information is generated and conveyed among scientists, practitioners, and decision-making communities will help to determine the effectiveness of climate governance for two reasons. First, the availability and accessibility of information can enhance

3 The "good governance" agenda represents an ever-broadening set of concepts, but commonly includes checks and balances in government, decentralization, efficient/equitable/independent judiciary, a free press, and a sound regulatory system (Grindle, 2004). Added to this are cross-cutting principles such as participation/inclusion, nondiscrimination/equality, and rule of law/accountability (UNDP, 2011).

decision-making capacities by helping decision-makers to evaluate and prioritize climate change (Yohe and Tol, 2002; Engle et al., 2011; Romero-Lankao et al., 2013). Second, the process of co-producing and disseminating climate change information can engage stakeholders, raise awareness, and improve the specificity and usability of the information (Dodman and Carmin, 2011; Healey, 2013). Both the process and the outcomes of incorporating science in decision-making, therefore, influence the effectiveness of climate change governance (see Case Study 16.1).

The availability, transmission, and use of information are essential components of the capacity for effectively governing carbon and climate in cities. However, rather than being a technical exercise in information collection and insertion into the policy process, climate-relevant information is politically determined and can reflect the broader priorities of decision-makers (Hughes and Romero-Lankao, 2014). For example, in Latin American cities, information availability, transmission, and use are problematic because there are opaque and limited relationships between the relevant decision-making agencies, between levels of government, and between government and communities (Romero-Lankao et al., 2013). The characterization and communication of uncertainty continues to challenge the relationship of city governments to climate change information. A better understanding of the ways in which governmental and non-governmental actors access climate change information and use it for routine decision-making is needed in order to better incorporate science in urban climate change governance (see Case Study 16.1). Problems of access to information are particularly important in the area of adaptation policy. Forty percent of cities surveyed by Aylett (2014) report that a lack of information on the local impacts of climate change poses a significant challenge to climate change planning and implementation (compared to the 27% who report being challenged by a lack of information on GHG emissions).

City governments draw in information and guidance from a broad array of sources (see Figure 16.6). Horizontal and vertical links to other governmental agencies are among the most important. Looking across the top-ranking groups, it is clear that professional contacts within government agencies and the networks that facilitate them are critically important. Cities learn from other cities, and government agencies learn (in large part) from other government agencies. In addition, civil-society organizations, educational institutions, and research institutes also play a key role in this space. Private-sector actors are seen to be less important. These global averages also mask the important role of the UN, development agencies, and multilateral development banks in Asia, Latin America, and Africa (Aylett, 2014).

Scientists also have a responsibility to provide carbon and climate information in a way that is easily accessible and usable by decision-makers (Krellenberg and Barth 2014) (see Case Study 16.1). This needs to be a two-way communication that considers the very valuable knowledge of stakeholders and also opens up a platform for ongoing exchange (Ansell and Gash, 2007; Barton et al., 2014).

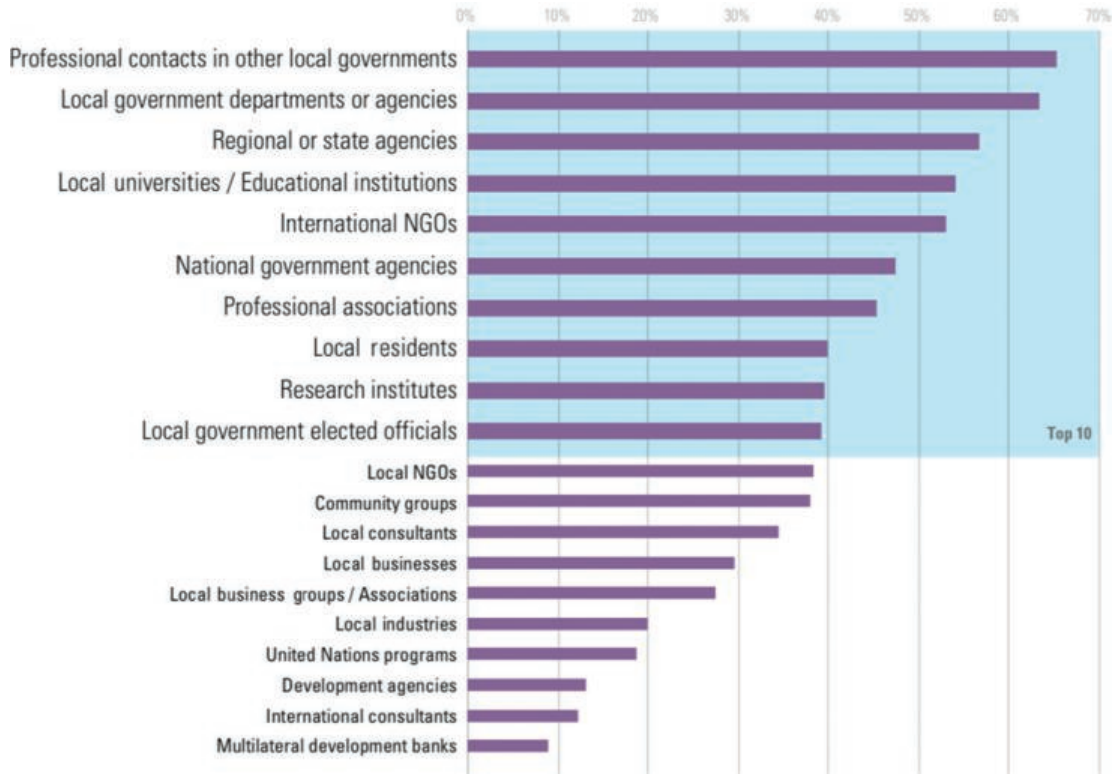

Figure 16.6 *Sources of information and guidance for climate planning. This figure illustrates the percentage of cities that report that they rely significantly on specific groups and organizations for information and guidance related to their climate change planning activities in terms of both mitigation and adaptation.*

Source: Aylett, 2014

Case Study 16.1 Science-Policy Interface in Santiago de Chile: Opportunities and Challenges to Effective Action

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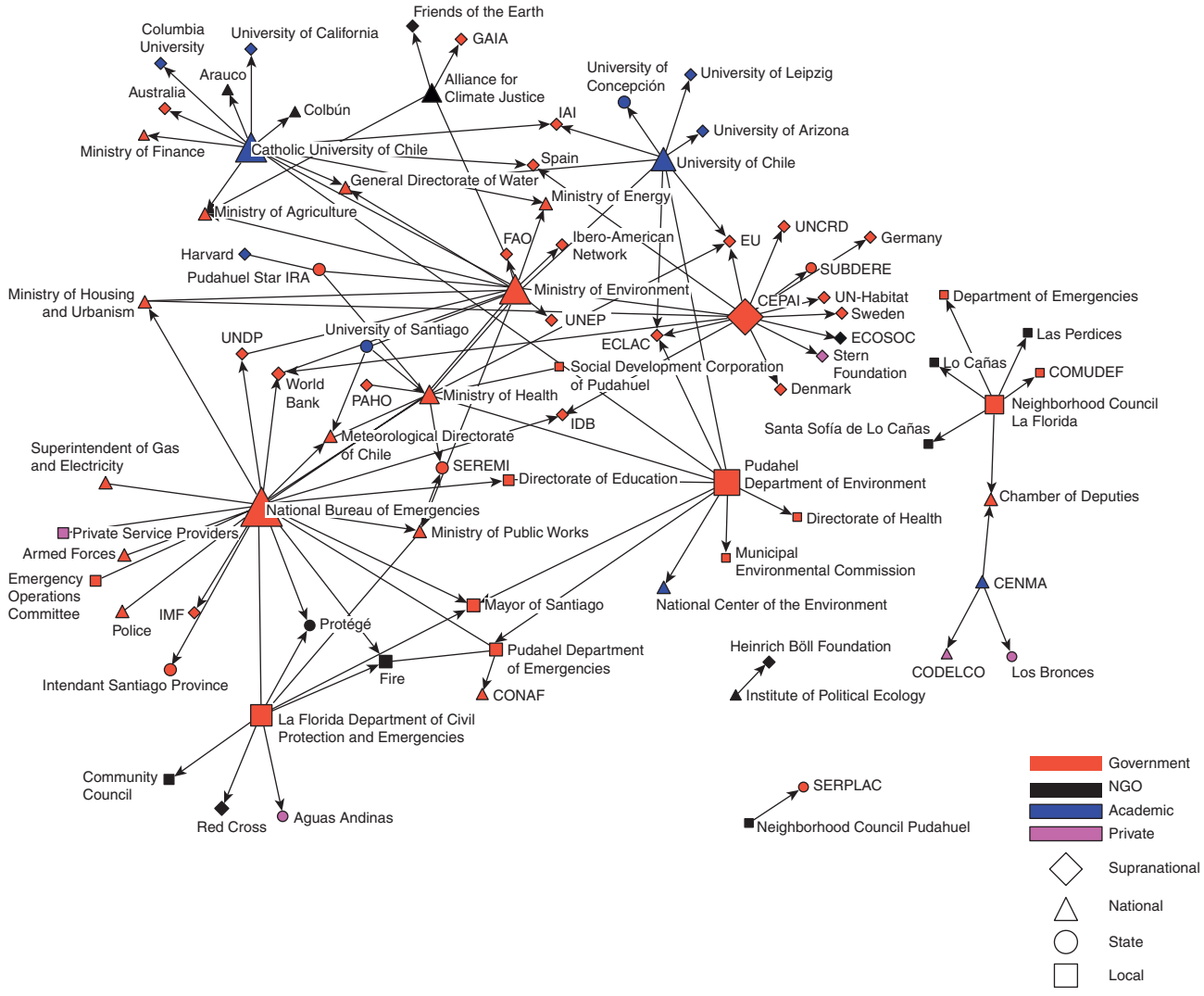
Keywords	Science-policy, impact assessment, adaptation measures
Population (Metropolitan Region)	6,883,563 (Instituto Nacional de Estadísticas [INE], 2010)
Area (Metropolitan Region)	15,403.2 km² (INE, 2010)
Income per capita	US$13,530 (World Bank, 2017)
Climate zone	Csb – Temperate, dry summer, warm summer (Peel et al., 2007)

An inter- and transdisciplinary (ITT) approach was elaborated to develop a Climate Change Adaptation Plan for the Metropolitan Region of Santiago de Chile (MRS). This approach functioned as an interface between 30 social, natural, and engineering scientists, and another 40–50 governmental and non-governmental actors (Krellenberg and Barth, 2014, Barton et al., 2015).

The presence of international and national organizations has been instrumental here, as in other cities, in establishing climate change on the policy agenda (see Section 16.2). Thus, it was only possible given the very strong, long-lasting, and trusting collaboration with all Chilean partners, scientists, and other actors. Participating in trans-national networks has opened possibilities for urban authorities in MRS to obtain resources and learn from other cities. Notwithstanding this, the constraints to institutional response capacity embedded in the social and political fabric of the city have thus far prevented effective climate change actions (Romero-Lankao et al., 2013). In



Case Study 16.1 Figure 1 *Santiago working network. The size of nodes is proportional to the number of respondents reporting to work with that actor.*

Source: Romero-Lankao et al., 2013

the city's fragmented governance structure, vertical and horizontal coordination among sectors and tiers of government is still a challenge. For many reasons often related to authoritarian culture or jurisdictional boundaries, environmental authorities seldom interact with development authorities, and tiers of government rarely collaborate (see Case Study 16.1 Figure 1). Priorities in urban planning are dominated by economic concerns. Information is poorly transmitted between levels of government, and the information that is transmitted to the public is for largely informational purposes (e.g., evacuation notices or flood warnings) rather than for learning and engagement (Zunino, 2006). It depends now on a strong administrative leadership if the Plan is to be realized, the commitment of the various implementing organizations guaranteed, and long-term decisions made.

16.4.3 Culture and Constituency

Evaluating the effectiveness of urban climate change governance is itself a contested notion: effectiveness will be determined by the cultures and constituencies affected by, and engaged with, a city's climate change responses. Notions of "the good life," the appropriate role of government, or the demographic make-up of a city can all shape support for climate change responses and their effectiveness. The extent to which urban residents perceive climate change as a risk also influences their support for different policy responses (Zahran et al., 2006) and can produce socioeconomic and institutional barriers to mitigation and adaptation. Furthermore, the existing geographic, economic, and political challenges that cities and urban residents face will determine what mitigation and adaptation responses are feasible and appropriate. In this sense, effectiveness is again a matter of fit – and engenders tradeoffs – between the demands of affected individuals, businesses, and governments and the climate change challenge itself.

One way to further align urban climate change governance with culture and constituency is through ongoing conversations and negotiations with and among governmental and non-governmental urban actors. This means that cities should find ways to develop "an honest and creative deliberative approach that can be more democratic and can yield genuine benefits" for mitigation and adaptation (Few et al., 2007). For example, community risk assessment methods are existing tools cities can use to develop adaptation priorities and strategies jointly with community members (van Aalst et al., 2008. Engaging stakeholders in the climate change decision-making process can also help to build community resilience and social capital (Ebi and Semenza, 2008). Different approaches have been developed in various cities, and ongoing networking can help to work on the transferability of useful approaches to other cities while acknowledging the specific contexts of each city. Urban cultures and constituencies therefore not only shape the options for and barriers to urban climate change response but should also influence our evaluation of the effectiveness of these responses.

16.4.4 Championship and Leadership

Behind the efforts of many cities that are taking steps to address climate change lies the work of one or more leaders, often termed *policy champions* or *institutional entrepreneurs*, who promote climate change as a policy issue and get climate change onto the political agenda (Betsill and Bulkeley, 2007). The strengths of these actors include "motivation, will, intentionality, interest, choice, autonomy, and freedom," and involve actors' ability to operate somewhat independently of institutional constraints (Battilana and D'aunno, 2009). Effective champions manage to leverage resources to create windows of opportunity and initiate new practices (Maguire et al., 2004). Effectiveness is not only ascribed to a champion's individual qualities, but also to their position within a set of social relationships and ability to navigate within a broader institutional environment (Campbell, 2004; Ziervogel et al., 2016).

Successful leadership strategies include the ability to leverage resources, use and create the right narratives, generate collective consensus, and establish a shared understanding about the city government's direction for the climate work (Cashmore and Wejs, 2014). Narratives able to initiate action may include promoting adaptation for future cost savings and using mitigation to foster green growth (Juhola et al., 2011; Cashmore and Wejs, 2014; Wejs, 2014). Engagement in international networks has been found to allow champions to gather information and mobilize actors and resources (Urwin and Jordan, 2008). Champions have also established local networks to initiate exploratory projects with local businesses, to leverage funding, and to show quick results and kick-start partnerships. Overall, leadership from a mayor, senior elected officials, or senior management has been identified as the most important enabler of successful climate mitigation strategies (Aylett, 2014). However, climate change work within a city government cannot rely on individuals in the long term because these people might not stay in their positions or may lose their legitimacy for action. The work of policy champions must be complemented with legal and regulatory changes. Furthermore, in many cities, the influence of governmental and non-governmental champions in shaping climate agendas and facilitating a learning process has not been enough to push real and effective policy responses. Fragmented governance arrangements, asymmetries in access to information, and top-down and technocratic decision-making pose challenges to effective governance, as does the fact that climate change is still secondary when compared to growth priorities (Romero-Lankao, 2007; Aylett, 2013).

One example of a successful climate change leader comes from Energy Island in Sweden. In 1997, Samsø Municipality, a small island community of 4,300 people, won support from the Danish Ministry of Environment to transform itself through green growth and business development to 100% renewable energy in

10 years. The effort was highly successful: today Samsø isn't just carbon-neutral, it actually produces 10% more renewable energy than it uses. The surplus feeds into the Danish electricity grid, providing revenue to Samsø residents. The 4,300 islanders have made approximately US$80 million of investments in renewables and have reduced their carbon emissions by 140%, which means that each inhabitant emits −3.7 tonnes CO_2 per year. Furthermore, the project has created jobs and businesses. A contributing factor to the island's success was the leadership of Søren Hermansen – environmentalist, teacher, and local community member. Since 2007, he has been CEO of Samsø Energy Academy, a center for renewable energy studies. In 2008, Søren Hermansen was named "Hero of the Environment" by *Time* magazine and received the Göteborg Award in 2009, sometimes called "the Nobel Prize in Environment" (Jakobsen, 2008).

16.5 Conclusions

This chapter analyzed some of the dimensions of the capacity to govern carbon and climate change in cities. It identified an array of urban climate change strategies, going from incremental actions that target mitigation and adaptation in an ad-hoc and isolated way to potentially more transformative strategies. It examined the dynamic mix of actors and networks at multiple scales involved and some of the mechanisms by which issues of interplay such as different mandates, timescales, and ways of knowing create challenges to effective climate governance. It also explored other institutional determinants of the gaps between the policy discourse and the real-world challenges local climate action needs to address.

Although many institutional supports and frameworks for climate change governance reside at the nation-state level, in many jurisdictions, innovative climate change governance has been led by relevant municipal, state, or provincial levels of government, often in spite of the lack of comprehensive or ambitious climate change policy at the national level. Even so, fruitful negotiations at the international level (such as those that took place as part of COP21 in Paris, 2015) may spur domestic policy-making and ratchet up levels of ambition.

For many years, these urban climate governance strategies focused solely on mitigation and were initiated predominantly by cities in high-income countries. More recently, there has been an increase in climate responses by cities in middle- and high-income countries that attempt to integrate mitigation and adaptation actions; however, the bulk of responses in all cities have tended to be incremental and fragmented, with very few cities moving toward transformative urban development pathways that can lead to climate resilience. Due to this lack of transformative pathways, a gap continues to exist between the commitment of cities to respond to carbon and climate change and the effectiveness of their responses.

Part of the reason for this gap lies in a tension that exists between the predictability and stability of institutions and the flexibility of more informal and unplanned strategies. A contradiction arises because the coordination across sectors and jurisdictions is necessary to create transformative policies, yet the added complication of bringing all the forces and interests at play into alignment often leads to smaller scale actions controlled by local jurisdictions or single institutions and private and community actors.

Another reason for this gap is that while scientific information is necessary for effective governance, scientific information is insufficient to trigger action on its own and often does not mesh with realties on the ground. At play here is a lack or limitation of a connection between the production of science and the production of policy. The science that urban actors look for to support actions is often not produced at the spatial and temporal scale at which it is required nor is it incorporated into decision-making in participatory and iterative ways. Decisions, furthermore, are often based on values, political expediency, and habit, rather than on a rational assessment of scientific information. In some cases, the use of an iterative science policy interface has shown potential to help decision-makers discover the co-benefits of policy actions as a way to foster climate change mitigation and adaptation policies and programs. A more proactive collaboration between science and policy is needed to better address the needs of politicians and practitioners and to better communicate scientific information. Deeper engagement with the social sciences, including social psychology, sociology, and political science, will also serve to reveal powerful drivers of changes in practices and behaviors both at the collective and individual levels.

Another issue hindering effective action is the difficulty many cities have in identifying and realizing co-benefits between their climate change work and other key local development priorities and aspirations. Here, engagement with different ways of knowing can also play a major role in identifying the co-benefits more explicitly.

By understanding these challenges, creative, locally relevant, and equitable strategies may be uncovered and promoted by governmental and non-governmental actors to coordinate efforts in meaningful and effective ways. Urban actors able to maintain these partnerships can significantly increase the scope of their climate change actions. However, overlapping or conflicting jurisdictions or vested interests can prevent such coordination, leading to fragmented actions and policies. Many key urban actors, both inside and outside of city government, remain on the sidelines and represent pools of untapped resources that could be brought to bear as cities continue to address the climate challenge.

Improvements in the metrics used to evaluate mitigation and adaptation efforts will be critical for effective planning and comparison between cities. In mitigation efforts, recent attempts to standardize emissions reporting procedures have been useful in making meaningful comparisons, but gaps still exist at many levels of emission inventorying and in the

evaluation of the real mitigation potential of existing actions. Until common frameworks and metrics are also developed for adaptation and longer time horizons are employed, it will be difficult to evaluate and compare the effectiveness of policy responses across cities.

Although they face many obstacles, city governments possess a variety of tools, incentives, and policy options for climate change governance (e.g., land-use plans, transit systems, building codes, and closer ties to constituents than might be found at higher levels of government). These tools can help reinforce and catalyze action by other levels of government and non-state actors. While the level of autonomy and capacity to govern carbon and climate varies across cities, there are still many potential and often untapped synergies available to urban actors to create effective climate actions. Cities and urban actors vary in their levels of leadership, access to information, legal mandates, and financial resources. The most fruitful approaches will, therefore, necessarily include both bottom-up and top-down strategies that can help foster successful responses and achieve effective and fair urban climate change governance.

Annex 16.1 Stakeholder Engagement

The study and practice of urban climate change governance requires the engagement of a variety of stakeholders. As such, this author team endeavored to represent the values of participatory processes and the importance of multiple sources of knowledge in both the process and content of this text. Throughout the writing process, authors discussed the key findings of the chapter with colleagues in the communities of research and practice, considering alternative framings of key governance issues and more inclusive ways of capturing the challenges of justice, collaboration, and fragmentation. The author team itself consisted of individuals who play roles in government and civil society, as well as in academia, thus creating opportunities to improve the central conclusions of the chapter and ground them in the reality of climate change governance. Furthermore, much of the empirical work that informs the core of the chapter involved a variety of stakeholders both in research design and dissemination of findings. The process of stakeholder engagement does not end with the publication of this assessment, but rather continues as its findings are applied and explored in urban contexts around the world.

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Case Study 16.1 Science-Policy Interface in Santiago de Chile: Opportunities and Challenges to Effective Action

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