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Administrative Decentralization and Climate Change: Concepts, Experience, and Action

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01

Introduction

International and domestic efforts to respond to the severe global challenge of climate change are on the rise and evolving. Signatory countries committed in the 2015 Paris Agreement to keep global temperature change under 2.0°C above pre-industrial levels while also pursuing efforts to limit it to 1.5°C and to more aggressively adapt to climate change impacts. Formulating effective responses depends on a diverse array of scientific and technical expertise, which, although foundational, in turn depends on the governance of climate change action. In other words, effective response demands action by competent governments able not only to work across country boundaries and at the national level, but also to collaborate with various partners and at different scales within domestic intergovernmental systems.

Despite the importance of action from multiple levels of government, public sector reforms to address climate change and to promote decentralization and/or intergovernmental relations tend to be designed and managed separately. There are efforts to improve specialized government systems and capacity to manage low-carbon and environmental transitions in developing countries, but these are not typically in tandem with broader reforms that shape the roles, functions, and resources of subnational governments (Hickman et. al. 2017; Puppim de Oliveira 2019). Similarly, there is limited indication that broader decentralization and intergovernmental reform efforts have been particularly coordinated to include domestic and international climate change initiatives.

Intergovernmental relations have administrative, fiscal, and political dimensions. This paper focuses on climate action at the subnational government level through administrative decentralization and intergovernmental collaboration. The objective was to review and synthesize the thinking and lessons drawn from literature on decentralization, climate change, and disaster management, among other related topics, to identify ways that administrative functions can support subnational climate action. Based on that review, the conclusions included here offer guidance on how to think about advancing this agenda. Given the breadth of the topic of administrative decentralization, the paper is illustrative rather than comprehensive. A companion paper (Martinez-Vazquez 2021) covers fiscal decentralization and climate change, examining subnational expenditure and revenue authority and action. Both administrative and fiscal functions are, of course, essential to climate action and must be considered together, along with political considerations, in designing policies and support.

The Paris Agreement acknowledges the climate change-decentralization connection, noting a need for the "engagement of all levels of government and various actors." Central government parties to the agreement submit non-binding climate action plans in the form of Nationally Determined Contributions (NDCs). Subnational government roles, however, were addressed only superficially in the first round of NDCs. An analysis of forest sector climate actions in 60 country NDCs, for example, found that 18 simply mention subnational governments, and another 21 indicate a subnational role in implementation, capacity-building/knowledge exchange, or decision making, but mostly with limited detail (Sarmiento Barletti, Larson, and Cisneros 2018).

Since the Paris Agreement, transnational, multi-stakeholder initiatives for climate action have emerged. Transnational actors increasingly try to influence subnational governments to take climate action at different scales across multiple sectors. A review of nine reporting platforms, for example, found that 823 cities and 101 regions across the globe, with a combined population of 846 million, have made net zero emission pledges (Data-Driven EnviroLab and New Climate Institute 2020). The impact of this activity on government restructuring and recalibrating, however, mostly remains a "black box" (Hickmann et al. 2017).

A significant factor hindering progress in defining specificity on the administrative roles of subnational governments in the climate change arena is the lack of a strong theoretical basis and robust empirical evidence. There are established principles for fiscal decentralization (fiscal federalism) and empirical work in that area, but there is no comparable unified theory of administrative decentralization. This reflects the much broader array of diverse functions that are covered under its rubric. Moreover, the empirical evidence that does exist is relatively fragmented across distinct administrative functions and research fields and is often based on specific cases and/or largely anecdotal.

Further challenges are posed by the very nature of climate change. Climate risks are characterized by considerable uncertainty regarding their potential severity and the timing of their impacts. In addition, there are different priorities and relationships between local issues and those that are broader or even global in scope, complicating decisions about the specific roles and related actions of the various actors. Location-specific climate stressors and vulnerabilities also influence particular climate action needs.

The bottom line is that the appropriate mix of subnational climate actions will vary because climate change needs and feasible responses, as well as intergovernmental structures and the nature/degree of decentralization, differ across countries. Thus, the relative roles of different government levels and other actors—and the relationships among them—are necessarily quite diverse. Even within countries, asymmetric treatment of subnational actors may be justified by varied conditions, needs, and capacities. These differences must be considered in assessing an appropriate role for subnational governments in administrative decentralization reforms that support climate action and ensure clear lines of accountability .

The rest of the paper is organized as follows.

- **Sections 2 and 3, respectively, provide concise summaries of basic climate change issues and policies and the principles and practices of decentralization and intergovernmental relations.** These basics may be unnecessary for some readers, but others may find it useful to review this material before proceeding to the treatment of how administrative decentralization can support action on climate change.

- **Section 4 covers the intersection of climate change action and decentralization.** It briefly outlines the actual and potential roles of subnational

governments in responding to priority climate change issues in diverse intergovernmental systems, as well as some of the associated prospects for and constraints on developing better linkages between subnational governments and climate change action.

- **Section 5 reviews administrative decentralization for climate change action, the focus of this paper.** It outlines four categories of administrative functions: regulatory, operational, information and analytics, and collaborative governance. The section selectively considers specific functions within these broader categories, the opportunities and challenges they present, and some of the connections among them.

- **Section 6 presents illustrative cases drawn from secondary materials to illustrate how selected administrative functions are used in specific situations and the types of interactions among them.** Each case focuses on a different challenge (in some cases more than one), collectively covering a mix of administrative functions in the context of different intergovernmental systems.

- **Section 7 concludes with some synthetic observations and offers general guidance on assessing the prospects for enhancing and supporting subnational administrative action on climate change.** Variations in climate issues and the contexts in which they must be addressed, as well as the breadth of possible solutions, preclude the development of a universal comprehensive framework to prescribe specific policy measures. Instead, the section outlines basic considerations to support a more systematic assessment of what might be done in a particular case.

02

Some Fundamentals on Climate Change Issues and Actions

This section summarizes some basics on climate change issues and remedial policies. It is not specific to subnational governments but simply provides a mapping of some climate change essentials used later in the paper in considering how administrative decentralization can support climate change action.

2.1 Major Climate Change Action Areas

Climate change response requires action on two fronts: decarbonization and adaptation. Decarbonization is the process of reducing net greenhouse gas (GHG) emissions to zero. It is increasingly used in place of mitigation, the term that appears in the Paris Agreement and many national climate change strategies, because it better captures the key policy objective. Mitigation, which is used here only when the literature cited specifically uses it, entails incremental reductions in GHG emissions. Decarbonization requires more fundamental structural changes in economic activity along four fronts: decarbonization of energy sources; electrification; increased energy efficiency; and preservation and increased use of natural carbon sinks for carbon dioxide removal. Adaptation refers to adjustments in ecological or socioeconomic systems in response to actual or expected climate change and its effects on human and natural systems, including steps to exploit benefits (IPCC 2018).

Decarbonization and adaptation are two umbrella objectives that cover other challenges addressed through climate policy. Four key challenges include: reducing or avoiding GHG emissions, decarbonizing local economies, managing physical risk from extreme climate events, and adapting to the slow-onset environmental impacts of climate change. It must be recognized, however, that these challenges are related and have some common policy solutions.

- **Reducing or Avoiding Greenhouse Gas Emissions.** Growth in carbon dioxide emissions from fossil fuels and other heat-trapping gases like methane and nitrous oxide are driving global warming, and the last 10 years were the hottest on record.[1] Globally, total GHG emissions increased 1.5 percent per year from 2009 to 2018, reaching 2.0 percent in 2018 (UNEP 2019). For consistency with sustainable development pathways that stabilize warming levels at 2.0°C, GHG emissions must fall 7.6 percent annually until 2030. Such drastic reductions remain far out of reach under the Paris Agreement's initial national commitments, as the current rate is projected to lead to a 3.2°C warming by the end of the century (UNEP 2020).

- **Decarbonizing Local Economies.** Accelerating the transition to net zero carbon emissions is needed to halt global warming, avoid the socioeconomic and environmental risks linked to fossil fuel–based development, and create job opportunities in the 21st century energy transition (Bazaz et al. 2018). Low-carbon economies would rely on renewable power resources with very low fossil carbon in key sectors, for example, electricity, industry, buildings, and transport (LEED and EC 2015). Transition to low, or "net zero," carbon economies poses challenges that require active management, such as sequencing policy changes and investments backwards from mid-century net zero targets. As action grows more stringent over time, making regular progress against targets has major consequences for the near-term investment decisions needed to avoid lock-in to carbon intensive infrastructure and associated financial risks from stranded assets.

- **Managing Physical Risks from Extreme Climate-Related Hazards.** Physical disaster risk is a product of hazard, exposure, and vulnerability in a specific time and place. Certain locations are inherently risky, for example, dense neighborhoods with housing and commercial activities on steep slopes. Physical risks arise from a mix of factors, such as population growth, land use and economic development patterns, and GHG accumulation in the atmosphere, increasing the variability and intensity of extreme weather events. These changes increase extreme flooding, wind intensities in tropical storms, and wildfires from longer and hotter droughts that cause physical damage (Mirza 2003; Stott 2016). The variability and intensity of climate hazards and physical destruction and monetary losses will rise under a 2.0°C mean global temperature increase compared to 1.5°C (IPCC 2018). Recent modeling exercises indicate that regions in some countries could experience up to six climate hazards a year without aggressive emission reductions (Mora et al. 2018).

- **Adapting to Slow Onset Environmental Change.** Slow onset environmental change requires urgent reductions in the intensity of natural resource use and improvements in adaptive capacity to cope with threats to human prosperity and development. These latter include water scarcity, desertification, infectious diseases, and biodiversity decline. Permanent changes in agricultural zones, extreme surface heat, and sea-level rise are three threats from slow onset environmental change, each of which could make some areas uninhabitable in the next 30 years (Hassell et al. 2017; Kang and Eltahir 2018). Certain types of slow onset change, such as ecosystem degradation and desertification, reduce the productivity of land and ocean carbon sinks that sequester half of human-caused emissions. Feedback effects between climate systems suggests that slow onset environmental change is non-linear and unpredictable over different time scales (Friedlingstein et al. 2019). Crossing tipping points could enhance negative feedback effects that spiral beyond the coping capacity of governments, spilling over subnational and national borders and causing widespread damages and losses.

1. See T. Frank, "The 2010s Were the Hottest Decade—the 2020s Will Top Them," Scientific American, E&E News, January 16, 2020, https://www.scientificamerican.com/article/the-2010s-were-the-hottest-decade-the-2020s-will-top-them/.

2.2 Measures to Address Climate Change

Emissions stabilization pathways consistent with a 2.0°C warming require limiting growth rates in final energy demand, switching to renewable energy, reducing the carbon intensity of electricity and energy use in industrial sectors (i.e., decarbonization), and increasing the share of electricity in final energy use (IPCC 2018). Although phasing out carbon dioxide in both production and consumption is required urgently, draw down of carbon emissions is expected to be more rapid after 2030 under current national commitments. To stabilize global warming below 2.0°C, deep reductions in methane emissions are also required (Saunois et al. 2016).

Decarbonization and GHG mitigation measures include a range of options in the major emitting sectors, including energy, industry, transport, buildings, and agriculture, forestry, and other land use. Table 2.1 lists the common measures outlined by the Intergovernmental Panel on Climate Change (IPCC). The impacts of these measures across sectors are interdependent, with changes in one requiring changes in others. For instance, reduced emissions in transport through mass transit electrification require energy sector changes (grid-scale renewables and energy storage). Models in which warming is stabilized at 1.5°C include the deployment of technologies to capture and remove carbon dioxide from the atmosphere. Some technologies, such as bioenergy with carbon capture and storage, require previously unimaginable increases in demand for land and water when deployed at levels capable of generating climate scale impacts (Rueda et al. 2021). The appropriate set of measures, in terms of feasibility or affordability, depends on country- and region-specific characteristics.

Responses to the extreme physical risks associated with climate change are commonly advanced through a range of disaster management policies and actions, spanning various types of interventions. These include risk identification (carrying out risk assessments from project to regional scale); emergency preparedness and response (increasing local disaster response readiness, developing and operationalizing early warning systems, building and maintaining resilient preparedness and response infrastructure such as shelters); risk reduction (developing and enforcing risk-informed land-use planning, constructing or retrofitting physical assets to levels that withstand projected climate impacts), and financial protection (creating and managing disaster contingency funds and insurance arrangements). Specific actions depend on climate hazard and asset and population exposure patterns. For instance, some physical risks can be avoided through proactive land-use plans and enforcement, such as using flood plain maps to guide land sales and development restrictions in coastal areas. Ultimately, options for reducing physical risks should be consistent with the goal of limiting future economic and other losses from extreme events.

Table 2.1. Selected Decarbonization and GHG Mitigation Measures

Sector	Measures
Energy	• Renewable energy (wind, solar, hydro, geothermal, bioenergy) • Increase in electricity share of energy supply • Fossil carbon dioxide capture and storage (CSS) • Methane leakage prevention, capture, and storage
Industry	• Reduction in the demand for energy • CO2 and other GHG emissions intensity reductions • High-energy efficiency heating and steam generation (e.g., motors) • Reduction in use of industrial material/enhancement of product quality • Energy management systems in industrial facilities
Buildings	• Electrification of buildings • Building of distributed renewable energy systems • High efficiency air conditioning/switching of cooling gases • Building of envelope improvements to reduce cooling/heating demand • High efficiency lighting, appliances, and water heating equipment

Sector	Measures
Transport	• Reductions in travel demand • Fuel carbon intensity for heavy duty trucks and urban logistics vehicles • Electrification of private vehicles and mass transit • Shift from private passenger vehicles to public transit, biking, and walking • Compact urban forms
Agriculture, Forestry, and Other Land Use	• Reduction in the demand for agricultural and forest products • Reduction in the rates of deforestation • Afforestation and reforestation (e.g., peatland restoration) • Changes in livestock feed composition to reduce methane emissions • Changes in fertilizer efficiency to reduce nitrous oxide

Source: IPCC (2014 & 2018).

The link between extreme physical risks and social vulnerability can be compounding, adding to the range of measures needed to adapt to a higher variability and intensity of weather events. For instance, in coastal areas with concentrated populations and physical assets, extreme risk events can concurrently involve damaging winds, storm surges, flooding, heat, and vector-borne diseases. These familiar climate-related hazards can cascade in unpredictable ways through service delivery systems to magnify damages and losses to vulnerable population groups and communities, as when a major disaster event overwhelms water treatment and waste management systems and leads to infectious disease outbreaks and epidemics (Watson, Gayer, and Connolly 2007; Cook 2021).

Adaptation responses are diverse and can include, for example, integrating medium- and long-term climate risks into planning, adapting social protection, and increasing public and private infrastructure investment resilience (Hallegatte et al. 2017; Hallegatte, Rentschler, and Rozenberg 2019). Medium- and long-term risk integration entails cross-sectoral and transboundary land-use planning. Given the uncertainty associated with projections of climate impacts downscaled to local areas, governments should use inclusive and data-driven planning to pinpoint vulnerabilities in specific population groups or asset classes and prioritize remedies even in the absence of climate change (Hallegatte 2009). Adapting social protection systems includes direct public investment to reduce population vulnerability (e.g., social programs, disaster risk financing). Integrating climate resilience into infrastructure investment entails increasing the focus of public investment planning to reduce exposure of populations and infrastructure vulnerability to climate hazards while simultaneously improving infrastructure design and materials consistent with changing environmental conditions. Table 2.2 lists some common adaptation measures as outlined by the Global Commission on Adaptation (GCA 2019).

Table 2.2. Selected Adaptation Measures

Sector	Adaptation Measures
Food Systems and Livelihoods of Small-Scale Producers	• Digital farmer services, weather and seasonal forecasting services • Farm diversification and increased market access • Bundled crop and/or livestock insurance
Natural Environment	• Restore wetlands to absorb and filter flood waters • Restore watercourses, expand greenspaces, introduce porous surfaces • Restore coastal wetlands, including enhanced engineered measures
Water	• Building/improving multipurpose reservoirs, creating interconnected regional water systems, and enhancing groundwater recharge • Exploring new water sources (wastewater reclamation, desalination plants

Sector	Adaptation Measures
	• Increasing supply by fixing leaky water mains, reclaiming wastewater and stormwater, or desalinating seawater using renewable energy
Cities and Urban Areas	• Increasing tree cover and green spaces to battle heat island effect • Organizing community gardens to help increase water retention while encouraging community-building and local conservation • Greening rooftops to reduce summer heat, provide winter insulation, and reduce stormwater runoff • Increasing permeable surfaces and wetlands to increase natural infiltration of rainwater and reduce stormwater runoff
Infrastructure	• Less construction in high-risk areas • Added redundancy for key infrastructure links • Higher standards for critical infrastructure links (pavement designed to resist melting temperatures, roadway elevated to reduce flood risk, drainage designed for heavier rainfall)

Source: GCA (2019).

03

Some Fundamentals on Decentralization and Intergovernmental Systems

This section summarizes some basics of decentralization and intergovernmental relations. It is not specific to climate change but offers an overview of intergovernmental system diversity and certain features of decentralization used below in considering climate action.

3.1 The Decentralization and Intergovernmental System Landscape

Decentralization of the public sector has been adopted or enhanced in many developing countries in recent decades. It is often motivated by politics, but the stated official purpose is usually some mix of enhancing public management, governance, and accountability; improving public service delivery; promoting economic development; increasing equity in service delivery and development outcomes; and promoting a more stable and peaceful state, among others. The goals and specific structure reflect the circumstances and needs of a particular country.

Decentralization involves sharing public functions and resources among government levels.[2] The concept is often simplistically framed, but in practice decentralization occurs in varied forms and contexts and can be complex.[3] Using or improving intergovernmental systems—including to support climate action—requires documenting and understanding their current status and future potential. Decentralization must also be seen as an ongoing process, as its structure and operations evolve over time. Basic elements and other possible features

2. Overviews of decentralization from varied perspectives are provided, for example, in Bahl, Linn and Wetzel (2013); Faguet and Poschl (2015); Smoke (2015); Bahl and Bird (2018); Rodden and Wibbels (2019); and Ahmad (2020).
3. Intergovernmental system diversity is challenging to document systematically, but there are some broad global overviews, e.g., UCLG (2010); and OECD-UCLG (2016, 2019) and comparisons of selected regions or countries, such as World Bank (2005); Boex (2013); Smoke (2013, 2019); Ellis and Roberts (2016); Yoshino and Morgan (2017).

of the intergovernmental landscape that those working in decentralized environments should be aware of are summarized in table 3.1.

There may be varied relationships among levels and actors in the intergovernmental system. In some cases, each government level has autonomy over certain functions; in others, there is a hierarchy, such that a lower level needs higher-level approval for administrative or fiscal decisions. Particularly in federal systems, state/regional/provincial governments often have more control over local governments than the federal government. Collaborative mechanisms among levels and actors (both governmental and nongovernmental) are commonly used to manage functions with shared responsibility. These mechanisms are also used horizontally, such that neighboring subnational jurisdictions that are individually empowered work together on functions that can be more effectively planned and implemented over larger geographic areas.

The specific assignment and sharing of public functions and revenues among levels of government and nongovernmental actors has significant implications for accountability. If one level of government has been assigned responsibility for a function but does not have access to or control over the necessary resources, these entities cannot be truly accountable. Similarly, if multiple levels are supposed to share service delivery but the specific role of each is not clear, then holding specific actors accountable for performance is difficult. A devolved level of subnational government has fundamentally different accountability relationships than one that is not, and special purpose entities that deliver a particular service can be governed in different ways.

Table 3.1. The Decentralization and Intergovernmental Institutional Landscape

Features	Elements	Comments
Government Structure	**Federal:** central government shares sovereignty with intermediate tier **Unitary:** authority rests fully in the central government	Main significance is that **in federal systems, states/regions/ provinces tend to have strong authority over lower tiers**
Intergovernmental Structure	**Intermediate:** state, region, province **Local:** cities, towns, counties, districts, etc.; may be subdivisions under any **Special:** entities with specific functions that may cover multiple general-purpose governments	**Can be variation in relative size and empowerment;** intermediate or lower tiers can have more powers; certain government types, e.g., cities, may also have greater authority
Forms of Decentralization	**Deconcentration:** primarily upward accountability **Delegation:** delegated entity accountable to delegating entity **Devolution:** stronger accountability to elected subnational governments	**Commonly some mix of these three forms in particular countries;** variation can occur in multiple ways, including across levels of government or across government functions
Dimensions of Decentralization	**Administrative:** managerial functions, including financial, human resource **Fiscal:** expenditure and revenue (including borrowing) functions **Political:** electoral and non-electoral accountability mechanisms	Some dimensions closely related to specific forms (e.g., political elections in devolved systems), but the **strength and mix of these dimensions can vary greatly in any decentralized system**

Features	Elements	Comments
Vertical Intergovernmental Relations	**Independent:** individual levels have autonomy over specific functions **Hierarchical:** lower tiers must seek approval from higher tiers **Collaborative:** mechanisms for sharing functions and decision making	**Degrees of independence and hierarchy can vary considerably** in any system and may differ across functions; many types of collaborative arrangements are used among government levels
Horizontal Intergovernmental Relations	**Mandatory:** collaboration entities for neighboring subnational governments with compulsory participation **Voluntary:** decision to participate is made by eligible subnational governments choosing to work together	Collaboration mechanisms, e.g., metropolitan development authorities, may be **mandated and supported (incentivized) by the center or optional and funded by voluntary member contributions**
Partnerships/ Nongovernmental actors	**Quasi-governmental:** government entity with broader governance **Private:** contacting of private actors for minor or major public functions **Other nongovernmental:** partnership with community/civil society actors	**Commonly some mix of these three forms in particular countries;** variation can occur in multiple ways, including across levels of government or across government functions

The diversity of systems in terms of organization and operation has critical consequences for how reforms to improve public functions, including in climate action, can or should be approached. What seem like normatively desirable actions may not be realistic or sustainable, and if used they must be adapted to context. It may be possible to modify intergovernmental structures and procedures that create severe challenges for the effective performance of public functions, including those relevant for climate action, but this is not always feasible.

3.2 The Broader Developmental Role of Subnational Governments

Mainstream public finance theory (fiscal federalism) essentially frames decentralization as central government assignment of specific powers and functions to subnational governments according to normative criteria. The theory prioritizes allocational efficiency, such that lower levels of government provide public services for which demand varies across jurisdictions, but higher-level intervention is needed for services that exhibit scale economies or externalities.

The underlying logic of fiscal decentralization is that subnational governments have certain locational and governance advantages. They are expected to have greater knowledge of their jurisdictions and a stronger accountability connection to local residents. Local spending decisions should be more closely tied to real resource costs, and there may be stronger incentives to innovate. Detailed coverage of this theory and its application in practice is offered in the companion fiscal decentralization and climate change paper Martinez-Vazquez (2021). The subnational role in administrative functions, however, is not covered by a unified theoretical framework and depends considerably on the fiscal structure (expenditure and revenue assignments).

Mainstream approaches that focus on assigning specific functions largely overlook the potential of subnational governments to pursue *integrated* sustainable development. This advantage is based

on their stronger motivation to consider public needs and functions in their territories in a more holistic way than siloed national sectoral ministries. If public services are interdependent—for example, schools and clinics need access to electricity, roads, water, and sanitation—subnational governments may be better placed than higher-level agencies to ensure that these services are provided jointly, although they may need financial and technical support to do so.

Also less emphasized in mainstream decentralization is the concept of a general mandate for subnational governments to provide for the overall development and welfare of their territories and constituents (CLGF 2013; Romeo 2013; Romeo and Smoke 2016; EC 2016). General mandates imply a stronger, and within legal constraints, more autonomous role for subnational governments to act beyond specific functions officially assigned to them in the national legal framework. Such a mandate exists in some countries and can widen options for subnational governments to deal with territorial needs, including climate action.

There is, of course, a need to balance—even in highly decentralized systems—legitimate national mandates and standards with the potentially greater subnational ability to deal with specific needs on the ground.[4] Preferred arrangements will partly depend on contextual factors, such as specific functions under consideration and the level of subnational government capacity, among others. This balance can change over time as conditions evolve and subnational governments prove their ability to act effectively. Whichever level of government has the lead role on functions involving multiple actors or different functions that are interdependent, task-appropriate collaboration and partnerships are always required.

4. This is covered in the synthetic literature cited in footnote 2 as well as various comparative studies, evaluations, and guidelines, including World Bank (2008); LDI (2013); USAID (2013); Rao, Scott, and Alam (2014); EC (2016); and World Bank (forthcoming).

04

The Intersection of Decentralization and Climate Action

How do the climate change issues and remedial actions outlined in section 2 play out in the landscape of decentralization and intergovernmental relations outlined in section 3? The answer, of course, is in many ways. This section briefly considers how subnational climate change action is and could be situated in the intergovernmental system. The treatment here more broadly covers the potential subnational role in climate action, while section 5 offers more detail about decentralized administrative functions that are the focus of this paper.

4.1 The Role of Subnational Governments in Addressing Climate Change

Neither climate change impacts nor remedies respect fixed jurisdictions. Some aspects of national climate policy in intergovernmental systems have been extensively examined, such as externalities associated with pollution and spillovers that cross boundaries. Emissions in one jurisdiction can move into another, and major risks stemming from climate change (storms, floods, drought, fires, agricultural zone change, forced migration) are transboundary. National commitments to reduce emissions imply asymmetric risks for jurisdictions dependent on fossil fuels, and some regions benefit disproportionately from renewable energy. These realities may imply a need for a strong central role, but national governments are not necessarily able to manage the varied issues, actors, and possible actions involved in local and regional climate response.

Subnational governments are motivated to address climate change for different reasons. For many, climate action focuses on resilience for economic growth, industrialization, and resource security. Others prioritize reducing climate risks, enhancing well-being and livelihoods, and dealing with previous investments that exacerbate vulnerability (Chu 2016; Puppim de Oliveira 2019). Subnational governments may incorporate climate considerations into routine functions, such as planning or information analytics, based on their experience with past climate-related disasters, a desire to display leadership, or response to domestic and international incentives (Anguelovski and Carmin 2011; Carmin, Dodman, and Chu e 2013). Whatever their motivation, what can subnational governments actually do to support climate action within the parameters of the intergovernmental system?

Some functions commonly assigned (in full or in part) to specific subnational government levels are directly relevant to climate change action. These include fiscal functions covered in Martinez-Vazquez (2021) and administrative functions described here. Decarbonization and adaptation goals, for example, can be supported by appropriate assignment of responsibility (dedicated and shared) for specific infrastructure and public services. Equally important is how functions are to be financed. Expenditure and revenue assignments have implications for the administrative functions needed to deliver services and manage revenues, for example, various regulations and standards, planning and financial management processes, the management of data needed to make decisions and monitor progress, and arrangements to engage appropriate partners, among others.

Beyond specific assigned functions, the potential comparative advantage of subnational governments to plan in an integrated way for public functions provided in their territories is highly relevant to climate change. For example, specialized national sector ministries may oversee schools, water infrastructure, and road construction, and an environment ministry may be responsible for ensuring positive environmental impacts of infrastructure. Such investments involve multiple related activities and require extensive coordination on the ground. Subnational governments, whatever their current official role in these investments, may often have a better sense of how they can be synergistically planned and implemented in specific locations to reduce emissions, protect against specific climate risks, or yield benefits for specific adaptation needs.

Although some climate action functions are more clearly defined and parameters for their implementation prescribed in intergovernmental frameworks, subnational governments may undertake other appropriate actions as part of their general mandate where provided for in the national legal framework. They could initiate or accelerate actions to address gaps or ambiguities in the framework and undertake experiments (Bulkeley 2019; Carmin, Dodman, and Chu 2013; Castán Broto and Bulkeley 2013; Chu 2016). Subnational governments have early-mover advantage due to their control over some sources of GHG emissions (e.g., landfills), land-use authority, influence over local transport, building regulation oversight, and role in public building energy management. Many subnational governments are already taking autonomous climate actions, although these may not be recognized and appreciated by the central government.

Even where subnational governments can be assigned a specific role or take independent action, some climate change policies must be subject to national regulations and mandates. Subnational governments, for example, may have authority over the implementation of clean electricity standards and development of ordinances to curtail emissions from electricity generated by fossil fuels, but these measures must respect national standards. Individual efforts by single governments will be insufficient to achieve consistent or sufficiently rapid progress at the scale required to contribute to stabilizing global warming levels. Nevertheless, despite the need for a national framework and legitimate oversight, national climate policies and action plans should generally try to respect decentralization and intergovernmental legal frameworks.

Whether the central government or subnational governments lead on specific climate actions, vertical and horizontal coordination and nongovernmental partnerships are often essential to support the large-scale energy and environmental transitions required to arrest the drivers and impacts of climate change. Nationally led initiatives to set emissions reduction targets or promote decarbonization in transport, for example, require subnational governments to prioritize compact land use and procure appropriate low-carbon transport technologies, such as battery electric or plug-in hybrid energy vehicles. Similarly, subnational governments may have legal responsibility for relevant infrastructure, but production and provision may best be shared with or delegated to utilities, private firms, and other governmental and nongovernmental actors.

Given the intrinsic uncertainty associated with local climate change impacts and local sources of GHG emissions, subnational administrative responses can benefit from experimentation. Trial initiatives based on official subnational functions or a general mandate allow the testing of new ideas and can create platforms for developing productive approaches and reforms. Pilots are commonly pursued through opportunistic partnerships among varied mixes of public, private, and civil society actors. Urban government efforts to curtail building emissions or to electrify transportation, for example, may rely on inputs from firms, academics, and other actors. Local governance experiments have also been a first step to increasing investment in sectors, such as steel and building materials, characterized by high GHG emissions and high costs of abatement technologies (Vogt-Schilb, Menuier, and Hallegatte 2018). The various actors in these partnerships have unique capabilities that can help to better translate subnational government mandates into concrete action that benefits local populations and contributes to national climate goals.

Subnational governments can also play an important role in the assessment of frameworks, policies, experiments, and partnerships designed to respond to climate change. Whether these elements are nationally or locally initiated or national or subnational in scope, it is important to document their performance on the ground and assess the need for modifications and the potential for scaling them up. Subnational governments can significantly contribute to such efforts because of their connection to specific territories in which these policies are being implemented, but this requires the establishment of constructive linkages among the various actors involved and feedback channels within the intergovernmental system. If subnational climate response initiatives are successful, both the national and other subnational governments can learn from them and use the lessons to take specific actions or develop more general policies and operational reforms.

4.2 The Urban Perspective and a Note on Rural Climate Action

Cities and urban management merit special consideration in the context of subnational climate action (Bazaz et al. 2018). Although occupying less than 3 percent of global surface area, cities consume nearly 80 percent of global energy and account for as much as 70 percent of emissions (Seto et al. 2014). Outdated city land use regulations and zoning practices are strongly associated with carbon-intensive and vulnerable settlement patterns. Where urbanization is rapid, failure to plan and enforce regulations to support compact, connected, and clean cities risks locking in emissions trajectories that will exceed global carbon targets (Erickson and Tempest 2015). This is the case, for example, in cities of emerging market countries in Africa and South Asia, where most global urban demographic and income growth will occur in the next 30 years (Hogarth, Haywood, and Whitley 2015). Urban sprawl can lock in future emissions through carbon-intensive infrastructure and uncontrolled conversion of peri-urban farms, grasslands, and forests that reduce land-based carbon sinks.

Subnational governments will likely play an important role in urban emissions reductions.[5] A recent study found that 14 percent of the urban GHG abatement potential by 2030 falls within the primary authority or influence of local governments, while 19 percent is shared with, and 67 percent is led by, national or regional governments (Coalition for Urban Transitions 2019, 97). This finding includes authority over decarbonization of electricity provision and functions related to urban land use, waste management, travel demand, and public transport. Excluding decarbonization of electricity, 28 percent of urban GHG abatement potential is under city governments. National and regional government authority is concentrated on decarbonizing electricity supply, switching to lower-emission fuels in buildings and transport, promoting energy efficiency standards for appliances, and boosting vehicle fuel economy.

Urban governments will play an important role in managing physical risks. According to one estimate, future sea level rise and storm surges alone could cost coastal cities US$1 trillion annually by the end of the century (Hallegatte et al. 2013). A recent survey of 151 local governments in seven regions around the world found they had the most influence over developing an overall city vision or strategic plan for infrastructure resilience (Gencer 2017) but the least influence in developing and enforcing building codes and connecting services to early warning systems.

5. Given country diversity, empirically assessing the potential of subnational governments in climate action is complicated. Methodological approaches include estimating emissions using future scenarios or questionnaires to survey subnational officials. Research requires simplifying assumptions, for instance, that subnational authorities have control over emissions or detailed knowledge of climate risks downscaled to their jurisdiction. These assumptions, along with issues of the comparability of cross-sectional or longitudinal data, give rise to valid concerns over findings.

There has been substantial innovation in cities, particularly where subnational governments work collaboratively with higher levels (Hughes, Chu, and Mason 2018). Urban climate adaptation remains an emerging domain of multilevel planning. This occurs through adaptation action planning, integrating probabilistic cost-benefit analysis into investment decisions, and location-specific implementation of national policies, incorporating nature-based solutions (compared to hard infrastructure), facilitating partnerships for climate services, and initiating independent monitoring, evaluating, and learning systems (Chu et al. 2019; Mfitumukiza et al. 2019).

Although this paper is more urban focused, rural considerations should be noted. Rural areas are highly dependent on natural resources and heavily impacted by climate change, which can increase vulnerability and create special challenges for effective responses.[6] Urban and rural areas do share common climate change remedies, such as improving land use and managing coastal areas and energy efficiency, but they may manifest differently and require distinctive policies, including varied roles for subnational actors. Nevertheless, coordinated action may be required.

Other policy areas, such as agriculture and forestry, are more rural specific even though they impact urban areas, for example, by affecting food security and migration. Improved food production efficiency can decrease agricultural emissions, reduce pressure on land, and enhance food supply stability. Conservation agriculture, sustainable intensification, improved livestock management, and irrigation efficiency are often recommended approaches. Reforming forestry management reduces land degradation, preserves or augments the quantity and quality of water from forest ecosystems, and increases carbon storage. Infrastructure is particularly critical to rural climate actions. Infrastructure policies have been planned and implemented in diverse ways across regions and countries, and many strategies remain experimental or are primarily managed by central governments.[7] There is, however, some experience and considerable opportunity for more active subnational government roles and rural community-based support.[8]

4.3 Challenges in Subnational Climate Action and Implications for Strategy

Framing or reforming subnational powers and relationships in intergovernmental systems generally faces design and implementation challenges.[9] Some, such as a lack of clarity in functional assignments, finance policy issues, and funding shortfalls, are covered in Martinez-Vazquez (2021). In administrative decentralization, there are often comparable gaps, redundancies, and disconnects in, or excessive controls on, subnational administrative functions. Insufficient coordination and capacity deficits are also common.

Many of these challenges apply to climate change action. More than one level of government may have regulatory authority over some functions, such as building regulations. Inadequate linkages between development planning and budgeting are particularly acute for adaptation and disaster risk reduction investments, given a strong bias to fund infrastructure without providing for operation and maintenance costs. Instances of undue interference occur, for example, in heavy central control of land use and excessive restrictions on subnational human resource management, procurement, or private sector partnerships essential to climate action. In some cases, these behaviors disregard national legal frameworks and could be counterproductive by limiting subnational government buy-in (Clar and Steurer 2019). In other cases, however, the framework provisions being violated by the center are demonstrably flawed and require modification.

6. The International Panel on Climate Change (IPCC), which is producing its sixth comprehensive report, regularly documents rural issues in its assessments and has produced a number of rural-specific reports. The World Bank Climate Change Action Plan 2021-25 has a section on agriculture, food, water, and land that considers climate change challenges shared by urban and rural areas as well as some unique to rural areas. Other international organizations have done assessments and developed policies and programs to support rural climate change, such as GIZ, the International Fund for Agricultural Development, the Center for International Forestry Research, the OECD, and the Inter-American Development Bank, among many others. Finally, there are specific multi-actor efforts targeting rural climate change action, such as the REDD+ initiative for deforestation and forest degradation.
7. This is documented by Chirisa and Nel (2021) and illustrated by other references in the next footnote.
8. There is a wide range of literature in various fields that considers the role of subnational governments and local communities in rural climate change action. Examples include Ribot (2003, 2008, 2010, 2017); UNDP, UNCDF, and UNEP (2010); Vogel and Henstra (2015); Lund, Rutt, and Ribot (2018); Martin et. al. (2018); Mikulewicz (2018); Bausch and Koziol (2020); Chirisa and Nel (2021); Libert-Amico and Larson (2020); Ziervogel et. al. (2019); Fischer (2021); and Medina, Pokorny, and Campbell (2022).
9. See, for example, various treatments of these challenges in Martinez-Vazquez and Vaillancourt (2011); Smoke (2015); Frank and Martinez-Vazquez (2016); Grady et al. (2016); Bahl and Bird (2018); and Cook and Chu (2018).

Weak coordination is common in climate change–related functions—vertically, horizontally, and locally. A national government ministry, for example, may plan an infrastructure investment that violates (knowingly or unknowingly) national or local environmental regulations, or a local public works department may cut down trees without consulting the local environmental protection department. Insufficient collaboration among subnational governments (at the same or different levels) can affect land-use planning partnerships, information sharing essential to managing transboundary risks, and the synchronized contracting needed for joint production/provision.

Issues with information technology and the availability and quality of data required for climate action are a well-known challenge. Some are intrinsic to uncertainties in climate-specific data (downscaled climate risk assessments, vulnerability), and slow-onset hazards (drought, desertification, epidemics). In certain cases, there may be good information technology and data on specific matters, but little or no information on other issues that are equally relevant to establishing climate priorities and planning action. Some existing information systems and datasets were created through external assistance, and these are not always institutionalized and sustained.

Any of the above considerations can be influenced by political economy and bureaucratic dynamics, including relationships with external development partners in aid-dependent countries. Intergovernmental institutional structures and functions, for example, are often shaped by national political priorities that trump normative principles pointing to specific desired reforms. Efforts to define and implement climate actions can also be affected if different national ministries and subnational departments involved in dealing with specific issues have conflicting perspectives and agendas, and these disagreements may be reinforced by the interests of different donors.

These various challenges are, of course, often interdependent. Functional redundancies and data issues, for example, may at least partly result from ambiguity in legal frameworks and weak collaboration among relevant actors. Any of them can be affected by more fundamental concerns, such as weak capacity (fiscal, technical, managerial) and national or subnational political economy dynamics. Thus, developing workable improvements requires documenting the existence and severity of the specific challenges to pursuing climate action, their interrelationships, and their fundamental underlying drivers.

Given the complex landscape of climate change and intergovernmental relations, generalization about appropriate roles for subnational governments in climate change action is elusive. Normative frameworks offer a useful starting point, but formulaic approaches to dealing with climate change and overly prescriptive application of normative decentralization frameworks will not provide sufficient guidance and may be misleading. There simply is no unified conceptual or robust empirical basis for easily determining the appropriate balance between centralized and more decentralized approaches to dealing with climate change in specific situations.

Lacking a compelling framework, a more contextualized strategic approach is needed, with careful attention to implementation and how the roles of different levels of government and other actors may evolve over time. In any country, there would likely be certain clearly justifiable assignments of climate change–related functions to national and subnational governments tailored to conditions and intergovernmental systems. But where there are gaps and uncertainties in the legal framework or in practice, and/or differences among the conditions in different jurisdictions, creative experimentation of the type noted earlier can be transformative. Subnational governments may test new kinds of vertical and horizontal partnerships among governments, private actors, and communities to create or change systems and procedures that work in context and can be adjusted as needed. There have been some efforts to outline and illustrate such asymmetric polycentric approaches (Morrison et al. 2017; Ostrom 2012, 2010; Shobe 2020)

In short, there is considerable scope for subnational engagement in climate change action if properly framed in terms of specific needs, intergovernmental systems, and other contextual considerations that will likely evolve over time. Asymmetric and adjustable multi-actor approaches recognize not only the value of principles but also that there is no standard path to integrating climate change and decentralization policies. With this in mind, the next section turns to the core theme of this paper: how administrative decentralization has been and could be used to support climate change action.

05

Subnational Administrative Functions that Support Climate Action

Four categories of administrative functions are important for subnational governments in acting on climate change:

- **Regulatory** (zoning and land use, energy efficiency standards, emission standards, etc.)
- **Operational** (development planning, procurement, budgeting, financial management, etc.)
- **Information and Analytics** (emissions inventory, vulnerability analysis, performance in meeting environmental standards, etc.)
- **Collaborative Governance** (intergovernmental coordination, multi-actor partnerships, community engagement, etc.)

These categories are neither based on an established classification nor comprehensive, but they cover a significant range of administrative functions relevant to climate action. These administrative functions ultimately need to work together with fiscal functions, which are covered in the companion fiscal decentralization paper Martinez-Vasquez (2021).

This section reviews selected functions in each category (table 5.1). As the scope of administrative decentralization precluded comprehensive coverage, the focus is on functions that emerged from the available literature. Inclusion of a function does not imply it should always be decentralized—an appropriate subnational role in any function depends on context. Thus, this section highlights illustrative efforts to incorporate climate issues into subnational administration and to situate them within the context and dynamics of the intergovernmental system.

Table 5.1. Select Key Issues Across Subnational Administrative Functions

Function	Key Issues
Regulatory	• Legal and administrative assignment of climate regulations • Climate regulation development and maintenance • Implementation and climate regulation enforcement
Operational	• Planning in transboundary infrastructure networks • Connecting climate risks across development plans, budgets, financial management • Greening subnational public procurement
Information and Analytics	• Determining the scope of emissions for a subnational GHG inventory • Collecting and analyzing multidimensional climate vulnerability data • Generating/reporting subnational government performance data on climate action
Collaborative Governance	• Forums and partnerships for coordinating civil society and private sector mitigation targets and action • Scientific and citizen participation in hazard mapping and climate risk assessment • Community leadership in climate adaptation decisions

For each category, the definition and scope of the function are provided, along with information on their role and performance in the intergovernmental system. The coverage of key issues is anchored in examples drawn from sector and cross-cutting decarbonization, mitigation, and adaptation measures, some of which were listed in tables 2.1 and 2.2. Given the interdependencies involved, some of the examples provided cut across functional categories, and this is noted where relevant.

5.1 Regulatory Functions

5.1.1 Definitions and Scope

National and subnational climate policies increasingly depend on regulations to incentivize specific actions or investments toward decarbonization and adaptation objectives. Regulatory functions are carried out across sectors using different means, such as technology requirements, performance standards, and information disclosure, among others. The most stringent regulation design is a binding standard, requirement, or disclosure codified in a formal rule or statute and backed by enforceable sanctions or penalties. On the other end of the spectrum, regulatory functions can be implemented using soft standards or requirements that are voluntary or do not involve punitive sanctions or penalties (Kasa, Westskog, and Rose 2018; Keskitalo et al. 2016). Table 5.2 below briefly summarizes building sector regulations for energy efficiency in three subnational jurisdictions.

Table 5.2. Building Energy Efficiency Regulations in Three Subnational Jurisdictions

	Rio de Janeiro (Brazil)	Jakarta (Indonesia)	Himachal Pradesh (India)
Subnational Regulation	Qualiverde Certification Program (Decree 3.5745/2012)	Governor Regulation of DKI Jakarta No. 38/2012	Energy Conservation Building Code 2018
Approach	Mix of prescriptive and performance provisions	Mix of prescriptive and performance provisions	Mix of prescriptive and performance provisions; differentiated across two climate zones
Key Instruments	Point system for certification covering different building systems; successful certification eligible for tax benefits	Technology requirements (e.g., electrical system) and performance standards (e.g., water efficiency)	Technology requirements (e.g., lighting control) and performance standards (e.g., maximum allowable transformer losses)
Building Sector Targets	New commercial and multifamily buildings, some retrofits	100% of new buildings and 60% of existing buildings comply by 2030	All commercial buildings with electricity load of 50 kW or heat/air-conditioned space of 500 sq meters+
Emissions Reduction Goals	N/A	3.37 million tons CO2e	30% reduction in building energy consumption

Source: C40 (2014); Government of Jakarta (2020); EESL (2018).

There is no strong rule on the appropriate conditions for choosing between the harder and softer forms of regulatory design. In the absence of climate-sensitive national regulations, subnational governments are often the first movers on climate action and experiment with voluntary, non-binding standards or requirements imposed through local statutes and ordinances. Softer forms of regulation allow subnational governments to introduce changes into markets tailored to local conditions, collect performance information, and monitor responses from relevant actors. Backed by programmatic support or alternative forms of discipline like reputational threats, softer approaches like sector guidelines can help to avoid unintended consequences, such as nominal cost increases, that are passed onto vulnerable communities through higher prices.

Softer regulations may also be less likely to face immediate resistance or compel legal review by higher authorities. However, they do not have the force and urgency of binding national standards. If sanctions-based subnational government regulations are poorly designed or contravene national regulations with provisions that preempt specific subnational government action, they can invite legal challenges that slow or reverse progress across multiple localities.

Three key issues stand out in the area of subnational government regulations:

- Legal and administrative assignment of climate regulations
- Climate regulation development and maintenance
- Implementation and climate regulation enforcement

The remainder of this section reviews these three issues using examples from building and infrastructure codes that are highly relevant to subnational regulation, given local and regional government influence in the built environment. Energy-related CO2 emissions associated with buildings alone totaled 9.95 gigatons of carbon dioxide (GtCO2) in 2019, with combined emissions, including construction, comprising nearly 40 percent of total GHG emissions (UNEP 2020).

5.1.2 Legal and Administrative Assignment of Climate Regulations

Legal and administrative assignment relates to whether subnational governments can promulgate rules and regulations within a sector and the degree of autonomy given to them to perform tasks associated with those rules. Depending on the type of jurisdiction, some subnational governments are more likely to already be embedded in a complex mix of legal and administrative assignments. Coastal areas are a noteworthy example of overlapping regulations across mitigation and adaptation policy areas, given the combination of broad population vulnerability, polluting infrastructure (e.g., shipping ports, warehouses, and transport facilities), carbon sinks (e.g., mangrove forests), marine biodiversity hotspots (e.g., coral reefs and fisheries), and material hazard exposure (e.g., physical assets damaged by coastal flooding).

In the building sector, energy efficiency regulations involve multiple functions that are commonly decentralized. These are assigned either directly by central governments or indirectly via subnational government authority exercised in development plans or through control of construction on subnational government land. National building codes, energy conservation building codes, and other measures in the building sector controlled by central governments often apply at the subnational government level as standards to be either adopted completely or modified based on local conditions. Even where regulatory frameworks do not specify building energy codes as a subnational function, local governments can often issue bylaws covering energy use or efficiency in buildings under their general development mandate in the built environment as a form of regulation (see the case of Argentina in section 6, summarized in box 5.1).

Rarely does any single level of government or entity control all areas of climate risk–informed building and infrastructure regulations. For instance, enforcement of national or regional standards to control stormwater and sewage—key to preventing damages and losses from more intense precipitation and storm events—typically falls to local governments and other agencies at the most decentralized level. Local governments may be responsible for drainage performance standards for infrastructure on their land, while a central- or intermediate-level government road agency implements drainage regulations along a regional highway or major thoroughfare. There is also evidence from major metropolitan areas that even where there is good assignment for floodplain or hazardous site regulations in the intergovernmental system, private land and property developers shift investments between proximate municipalities to avoid them (Shi 2020).

Box 5.1. Introducing Solar Water Heaters into Municipal Building Regulations in Rosario

Under the direction of ambitious local climate leaders, the municipal government in the city of Rosario in Argentina introduced Public Ordinance 8784 in 2012 to require all new and retrofitted public buildings under municipal management to use solar water heaters to heat at least 50 percent of the building water supply. There were no national building energy regulations at the time, so the city used its legal autonomy under the constitution to issue bylaws for the built environment as part of the local government's Sustainable Building and Energy Efficiency Program. The city took over a year to formulate the ordinance, with key technical support provided by the environmental nongovernmental

organization (NGO) Taller Ecologista and the National Technology University located in the city. The initial effort has contributed to enhanced intergovernmental cooperation, particularly between the local financial institutions and the provincial government, to create revolving credit lines and other loan products to support market expansion of solar water heaters in the buildings sector. Still, stronger national and provincial government regulations are needed to expand the early success of the ordinance (30 solar water heater installations built in 2018).

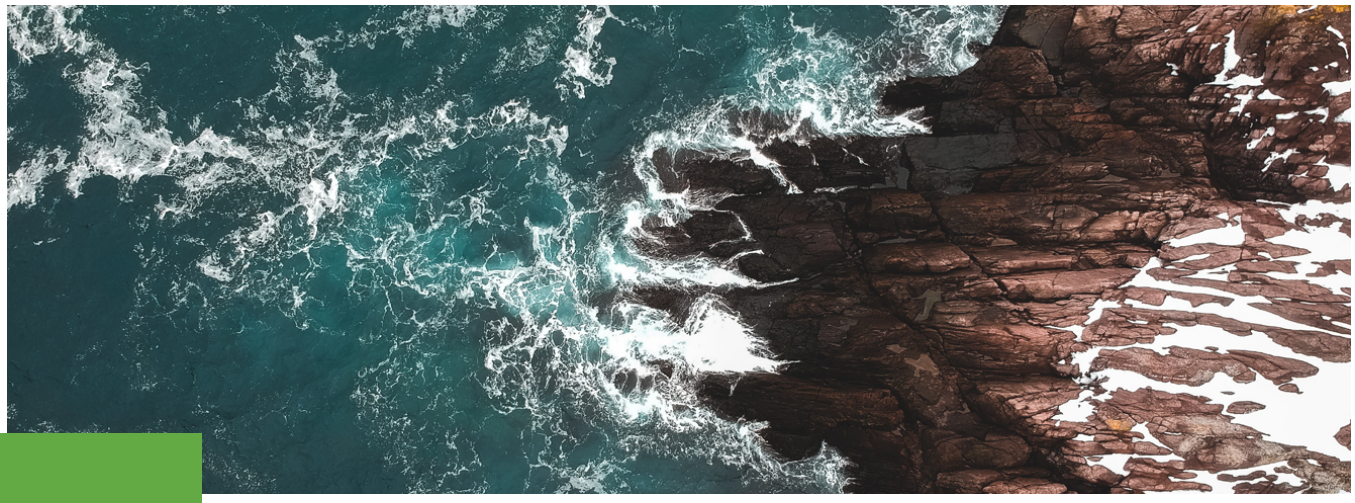
The range of potential climate impacts and emergence of new technologies and material standards developed beyond the public sector's purview require that regulations governing public-private partnerships (PPPs) be updated. There are two major considerations. First, subnational government PPP policies and frameworks promulgated before due attention to climate considerations might not recognize the subnational government responsibilities outlined in climate policies and strategies. This misalignment might encourage PPP projects to circumvent climate-relevant engineering or infrastructure codes (e.g., promotion of nature-based solutions) that impact how a project is structured or where it is located. Second, dedicated climate-related PPP projects that require higher design standards or experimental materials usually entail new or heightened project execution risks (across identification, transaction, and contract management), necessitating additional oversight into how subnational governments and private actors distribute them in alternative arrangements. For instance, even where they are successful, climate-informed design standards (e.g., Leadership in Energy and Environmental Design [LEED] certification in buildings) or restrictions on environmental impact can lead to longer project preparation periods and increased preparation costs that might be more effectively managed with greater participation from independent professional standards bodies.

5.1.3 Climate Regulation Development and Maintenance

Regulation development and maintenance, if consensus-based and open, depends on consultation and other forms of participation from residents and industry stakeholders (see section 4.4 on collaborative governance). Such an approach should, in principle, increase acceptance. There are, however, nontrivial technical considerations to work through in developing subnational regulations to support climate mitigation and adaptation goals. Subnational government ambition around technology choices and emissions targets must be balanced with an emphasis on affordability and feasibility, given the possibility that new standards that drastically increase costs beyond local resources can drive builders and developers to evade regulations through the informal sector. Codes and other regulatory standards should be revisited, evaluated, and revised on regular timelines of three–five years, given the rapid pace of energy efficiency technology development, diffusion of passive design standards in the building sector, and uncertainty about the precise level of future climate hazard variability and intensity downscaled to local areas.

On the technical options for building energy codes, subnational authorities can choose from three approaches: (1) prescriptive, (2) performance based, and (3) outcome based. The two most common are prescriptive and performance-based codes (Becqué et al. 2016). Prescriptive codes feature detailed specifications for individual building components, such as the building envelope, heating, ventilation, and air conditioning (HVAC), and other systems. Under prescriptive codes, each measure details a specific technology or minimum performance level required. Performance-based codes, in contrast, are set for the building as a whole and establish a ceiling on energy performance compared to a reference building to establish code compliance. Performance-based codes allow building developers to make tradeoffs between individual building systems to comply with the desired code level. Outcome-based codes, which are the least commonly used, establish a narrow time period in which a performance level must be achieved and verified.

Like energy efficiency codes, resilient building and infrastructure regulations for adaptation can be prescriptive or performance based. Technical decisions on climate proof regulations for buildings and infrastructure should account for hazard exposure, potential structural failure under hazard loads, and the social consequences of structural failure (World Bank 2015). Both prescriptive and performance-based regulation require at least two measures to guide development: linking standards to all-hazard exposure measurements (identified by place and recorded on maps) and differentiating provisions according to building



type and occupancy. In the context of extreme physical disaster risks, some facilities, such as hospitals, schools, and public security, constitute critical infrastructure that should be accounted for in subnational regulatory standards. The most important issue is updating codes that are not originally designed based on climate projections to ensure they reflect the variability and intensity of potential future climate-related hazards.

The overlap of building energy and climate resilience codes and other forms of building sector and infrastructure design regulations presents many complex design and maintenance challenges for subnational governments. At the most general level, principal challenges involve navigating two tradeoffs. The first is progressively higher standards that increase short-term costs, with payback and benefit periods potentially delayed until other system-level changes occur. The second is between promoting binding regulations to strongly signal near-term time preferences on the one hand (e.g., changes in building energy management preferences to reduce risk exposure to extreme disasters), and ensuring flexibility in local decisions on land use, housing, and economic development on the other. Regulation development and maintenance must take into account whether proposed standards and other requirements are consistent with the capabilities of industry professionals across relevant segments of the building and infrastructure development sectors.

5.1.4 Implementation and Climate Regulation Enforcement

Subnational governments are inevitably involved in implementation and enforcement of building energy codes and climate resilient infrastructure design standards. These encompass a range of functions, including spot or other forms of verification and inspections, bureaucratic and private sector systems for monitoring compliance, and dispute resolution. In each there are key distinctions between a focus on new construction and retrofits, whether resources are allocated to certain areas within a jurisdiction (central business district compared to. peri-urban slum settlement), and the costs of permits differentiated by regulatory standards for types of buildings (residential, commercial, industrial) and infrastructures. For instance, for flood risk reductions, new regulations that prioritize green infrastructure and nature-based solutions can be low-cost alternatives to expensive stormwater drains. Enforcing regulations prioritizing these alternatives, however, invariably runs up against local capacity constraints when subnational governments have few engineers with technical training and experience with natural systems (Mguni, Herslund, and Bergen Jensen 2016).

High local recognition of health and other co-benefits from building regulations (such as residential energy cost reductions) and other infrastructure design standards can help subnational governments to implement and enforce building energy codes. Enforcement of multiple overlapping regulations in geographic areas like coastal zones can be highly complex and entail ongoing coordination and education efforts best coordinated at higher levels of government. A recent study of local integrated coastal management in South Africa and Mozambique (Rosendo, Celliers, and Mechisso 2018) reports that basic knowledge of regulatory roles and implementation responsibilities varied considerably across South African municipal

managers and other local government officials in coastal areas. If a regulatory requirement is binding, clarity in enforcement responsibility is important for the credibility of regulators. The penalty for non-compliance must outweigh the costs and be backed by credible threat of sanction. Working with national authorities, subnational governments can develop certification and disclosure programs that include awards or public labels as incentives to help encourage compliance with new building energy codes or infrastructure design standards that potentially offset some of the costs of more traditional enforcement.

5.2 Operational Functions

5.2.1 Definitions and Scope

Certain routine operational functions of subnational governments can be used to support climate change goals. These include investment and spending decisions within development planning and budgeting systems based on updated emissions inventories and climate vulnerability assessments aligned with mitigation and adaptation targets. For instance, the Durban (South Africa) comprehensive climate action plan sector priorities and targets were based on an emissions inventory baseline from 2015 and rolling vulnerability assessments in key sectors. Table 5.3 shows targets and other relevant data as one of many examples of subnational governments incorporating climate data into development planning. The process of integrating climate change into core functions is a data-intensive process (see section 5.3 on information and analytics functions).

Emissions inventories and climate vulnerability assessments can help highlight where subnational development priorities fail to focus on reducing emissions or account for specific transboundary risks linked to climate impacts. For instance, new development plans to promote compact spatial patterns and provide public transit systems might be driven by goals to increase access to public transport and employment. If plans are not connected to updated inventories or climate vulnerability assessments, they may not account for embodied and operational emissions in component design choices (e.g., use of concrete) that inadvertently increase carbon emissions or drive exposure to major climate hazards, such as more intense heatwaves or flood events.

Table 5.3. Durban (South Africa) Climate Action Plan Targets

Emissions Baseline (Year)	• 20.8 million tCO2e (2015) • Key sources: manufacturing and construction (41%); transportation (30%); residential buildings (12%); commercial and institutional buildings (12%); waste (2%)	
Key Climate Hazards	• Urban heat island: Kwamashu and Phoenix areas are more than 3°C warmer than surrounding areas; city center temperature spikes of 6°C above surrounding areas • Drought: dry years (<700mm precipitation/year) up 3 times as often compared to 2015 • Storms/flooding: once-in-a-decade extreme rainfall events happening three times as often • Sea level rise: up to 1 meter under 4°C warming	
	2030 Sector Targets	**2050 Sector Targets**
Energy	• 40% electricity by renewable energy • 30% energy efficiency in buildings • 100% net carbon zero new buildings • 100% net carbon zero municipal infrastructure	• 100% electricity by renewable energy • 100% of all buildings are energy efficient • 100% net carbon zero new buildings • 100% net carbon zero municipal infrastructure
Water and Flooding	• Increase alternative water supply capacity to meet 100% of escalated demand • 80% drainage infrastructure upgraded	• Increase alternative water supply capacity to meet 100% of escalated demand • 100% drainage infrastructure upgraded

	2030 Sector Targets	2050 Sector Targets
	• 3,600 km of riverine corridors to be climate resilient, clean, safe, and healthy	• 7,400 km of riverine corridors to be climate resilient, clean, safe, and healthy
Transport	• 55% of passengers using public and non-motorized transport • Shift 20% of vehicles to low emission vehicles	• 70% of all passengers use public and non-motorized transport • Shift 70% of vehicles to low emission vehicles
Health	• In compliance with National Ambient Air Quality Standards (NAAQS) Maintain urban heat levels at average 2005-2015 temperatures (20.6°C)	• World Health Organization air quality compliance • Maintain urban heat levels at average 2005-2015 temperatures (20.6°C)
Waste	• Diversion of 50% of waste from landfill	• Diversion of 90% of waste from landfills

Source: eThekwini Municipality (2019).

Integrating climate concerns into operations requires strong technical capacity. This is often done through training and progressively mainstreaming consideration of decarbonization and adaptation benefits and costs across the mandates of all subnational departments and agencies— not just the obvious sectors like water or public works. In rural areas, central government extension services often lead to mainstreaming climate into subnational staffing and training. In urban areas, there has been a recent push, with mixed results, to create cross-cutting chief mitigation or resilience officers in subnational governments to spearhead adaptation to climate change.

A critical operational function is the linkages between development plans and budgets (capital and recurrent) to ensure infrastructure and services are adequately financed, as well as appropriately operated and maintained once built. This is important to key subnational mitigation targets, such as energy efficiency in subnational facilities (and operations) and methane control at solid waste landfills (Kaza et al. 2018). For adaptation and disaster resilience, creating linkages using information on climate risks is important because major climate stressors can severely impair revenue performance and upend the financial models on which government service delivery depends. There is now conclusive evidence that climate change increases the borrowing costs of governments in vulnerable countries and regions (Kling et al. 2018; Beirne et al. 2020).

Additional key operational functions that can support climate action are procurement practices and related systems, which influence a substantial portion of subnational public sector expenditures. The purchasing power of subnational governments is significant. According to the World Observatory on Subnational Government Finance and Investment, subnational government spending accounted for a quarter (24.1 percent) of total public spending and 8.6 percent of GDP in 2019 (OECD and UCLG 2019). Low-carbon and climate resilient frameworks can be developed to apply to a portion or progressively all of subnational government procurement.

Three key issues stand out in the functional area of subnational government operations:

- Planning for emissions reductions and systemic climate risks in transboundary infrastructure networks
- Promoting resilience through stronger risk-informed linkages between development plans, recurrent budgets, and financial management
- Greening subnational public procurement

The remainder of this section reviews these three issues with illustrative applications from the transport, energy, agriculture, and water sectors.

5.2.2 Planning for Emissions Reductions and Systemic Climate Risks in Transboundary Infrastructure Networks

Planning for subnational climate action has both in- and trans-boundary components. It thus depends on inputs and actions led by various actors at different territorial scales, ranging from neighborhood (e.g., slum or informal settlement) to regional (e.g., water catchment areas) and national (e.g., electricity distribution networks) (Ramaswami et al. 2017). Subnational governments can use in-boundary planning to locate public facilities so as to encourage dense, connected settlements with lower emissions and less exposure to climate hazards (Coalition for Urban Transitions 2019). Compact, connected areas allow modal transport shifts from combustion engine vehicles to walking, bike riding, electric vehicles, and lower emission mass transit like electrified buses. Moreover, subnational land use and planning to promote dense settlement patterns frees up peri-urban land for grid-scale solar and wind power installations, which typically require large plots. Where planning conversion of agricultural land is controlled by central and regional governments, local governments aiming to use their planning authority to promote renewable energy must integrate their development plans with higher level plans.

Development planning to promote compact land-use patterns is necessary but not sufficient for low-carbon local economies. Whether urban or rural, subnational operational functions must interact with energy utilities and private firms to ensure provision of new energy infrastructure, such as battery or fuel cell charging stations, distributed solar and wind energy microgrids, and smart meters to better manage energy loads (see China case in section 6, summarized in box 5.2). Mid-century decarbonization targets increasingly being adopted under the Paris Agreement imply that subnational development plans must consider regionally stranded infrastructure that cannot be decoupled from the fossil fuel economy (Gupta et al. 2017).

Box 5.2. New Energy Vehicles for Net Zero Urban Logistics in China

China's intergovernmental system has helped the country accelerate the adoption of battery electric, plug-in hybrid, and hydrogen fuel cell vehicles to decarbonize urban logistics and reduce harmful levels of carbon dioxide and particulate matter pollution in major cities. Local and provincial governments are empowered to set ambitious targets supported by national mandates and fiscal support channeled from the central government. They also are encouraged to experiment with different mixes of demand and supply side measures under the special status granted to them as part of interlocking national environmental, industrial, and market development strategies (e.g., National Pilot Zones for Ecological Conservation). In Shenzhen, the city government's fleet of electric vehicles expanded from 300 in 2015 to around 62,000 in 2018. The provision of supporting infrastructure to enable battery-powered vehicles requires complimentary planning measures that are most effectively carried out at the local level, such as locating battery charging stations to maximize vehicle operators' travel distance and timing based on warehouses, logistical hubs, and other factors that influence where delivery trips originate and terminate.

Some national- and intermediate-level government laws increasingly recognize the need for transboundary climate planning, mandating regional strategies to coordinate climate actions between rural districts, city governments, and regional authorities. Collaborative scenario planning between subnational governments and transboundary institutions, potentially supported by domestic nongovernmental organizations (NGOs) or international organizations, can improve development plans to account for transboundary risks (whether from climate impacts or associated with energy transition decisions). Given the high levels of uncertainty, scenario planning that uses representations of multiple, plausible futures of climate stressors based on the best available information can help local officials to develop a broader understanding of joint energy transition threats, opportunities, and vulnerability to climate impacts.

Obtaining local co-benefits from decarbonization or adaptation measures for health (e.g., lower air pollution), employment (e.g., labor-intensive outreach and monitoring for forest protection), and livelihoods requires planning for transboundary land and infrastructure systems that extend beyond individual jurisdictional borders. Spatial aspects of transboundary risks can be understood in terms of both geophysical (see Indonesia case in section 6, summarized in box 5.3) and economic interdependencies. On the latter, interconnected supply chains mean that damages incurred due to flooding from severe storms at key export clusters can cause production delays that may lead to output losses in subnational economies on the other side of the world (Haraguchi and Lall 2015). Improved information on transboundary climate risks support development plans that can better prioritize investment in infrastructure around less hazard-prone locations, signaling to households, commercial businesses, industrial firms, and other stakeholders where land value might decrease or increase under future climate impact scenarios.

Box 5.3. Slowing Carbon Emissions from Peatland Destruction and Land Use Conversion in Indonesia

Indonesia's tropical peatland is one of the largest land-based natural carbon sinks in the world, sequestering around 28 billion tons of carbon. Its destruction, through land-use conversion and wildfires, threatens to accelerate depletion of the world's carbon budget for remaining under 2°C, along with biodiversity losses and higher flood risks. Indonesia's peatland is concentrated in six of the country's 34 provinces (Papua, Riau, Central Kalimantan, West Kalimantan, South Sumatra, and East Irian Jaya), making land-use conversion and wildfire prevention a key transboundary management issue. The 2015 peatland fires cost the Indonesian economy US$16.1 billion, with carbon dioxide emissions spreading across borders and causing health impacts for vulnerable populations in neighboring provinces and countries. District and provincial governments still control land use permitting, while the national government supports peatland protection and restoration. Key national measures include sustained peatland mapping, moratoriums on clearing forests and peatland, and village efforts for peatland rewetting and rehabilitation. Local control over permitting and land-use conversion, where these functions exacerbate fire risk during the dry season, remain major transboundary management challenges within the intergovernmental system.

5.2.3 Mainstreaming Resilience through Climate Risk-Informed Linkages between Development Plans, Recurrent Budgets, and Public Financial Management

The potential disruptions of extreme risk events like flooding or droughts require stronger linkages between development plans, recurrent budgets, and financial management in subnational governments. Local government revenue bases, whether anchored by user charges or the property tax, are highly vulnerable to climate impacts (Shi and Varuzzo 2020). More broadly, a common disconnect is a poor linkage between development planning and budgeting. Proposed climate action priorities are not reflected in development budgets, and/or the costs of operating expenses for new climate-proofed facilities are not reflected in the recurrent budget.

The drought in Cape Town lasting from 2015 to 2018 caused major disruptions to the metropolitan government's operational funding model, as revenue projections failed to account for water consumption plummeting by 50 percent in those three years. The drought created a double shock, in which an increase in alternative water sources and an increase in consumption among high-end water users led to revenue gaps, necessitating cuts to spending and impairing cross-subsidization for low-income water users (Simpson et al. 2019). Such situations point to the role of national governments in providing fiscal assistance and their operational ability to do so through contingent or force majeure arrangements, as discussed in Martinez-Vasquez (2021).

In some countries, national public financial management frameworks set out formal criteria to define domestic and donor finance for local climate action. Kenya's recent *Public Finance Management Act (2012),* for example, included regulations requiring the Climate Change Fund to devolve finance for priority climate change actions. In some countries, criteria for what counts as climate finance are determined in ad hoc lists of qualified activities or interventions attached to specific-purpose grant transfers or loans disbursed through various channels of intergovernmental finance. These ad hoc lists might be a useful starting point, but they rarely systematically strengthen linkages across development plans, the general budget, and financial management systems.

Whether national legal frameworks formally define climate finance for subnational planning, subnational governments can highlight risk linkages between plans and budgets by using climate tags across operational areas. For instance, many are introducing climate-related budget and expenditure tags to track linkages between development plans, recurrent budgets, and financial management, generating detailed data on the extent to which spending patterns and revenue flows support mitigation and adaptation. In the Philippines, for example, municipal governments can use 191 adaptation expenditure codes to plan and evaluate their budgets and spending patterns. These codes are connected to four instruments (policy development and governance; research, development, and extension; knowledge sharing and capacity building; and service delivery) spanning eight strategic priorities subdivided into 15 intervention areas.

5.2.4 Greening Subnational Public Procurement

Many subnational governments are going beyond climate-informed development planning to climate-friendly public procurement. Greening subnational procurement means using the purchasing authority of subnational governments to (1) limit emissions and ecosystem damage from public sector consumption and (2) support the formation and expansion of supplier markets for low-carbon and resilience goods and services (Agyepong and Nhamo 2017). Greening procurement is not intended to steer subnational governments to higher costs, but rather, to promote a wide range of benefits in addition to emissions reductions and climate resilience. For instance, adopting different selection criteria and terms allows green procurement to help localize supplier markets and facilitate fairer competition between goods and service providers.

Greening public procurement requires at least two changes to existing practices. First, new costing methodologies must be introduced to account for all environmental and financial costs over the full product lifecycle. Doing so will result in prioritizing the purchase of goods that have lower embodied and operational emissions. For instance, subnational governments might purchase smaller midsize vehicles with better fuel efficiency rather than a heavy-duty imported truck, even when the monetary (sticker) costs of the heavy-duty option are lower. Green procurement can also favor goods or services that are more durable to wider ranges of climate variability. This might require other changes to prevailing asset management frameworks, such as the use of accelerated asset depreciation in order to be able to respond more effectively when future disasters occur.

Second, tender conditions and procurement award criteria, often uniform for subnational public work projects (e.g., roads), must be modified to account for low-carbon, local alternatives. Capacity considerations are paramount because private firms bidding on contracts or procurement agents making decisions may not be prepared to meet different and less flexible tender conditions and criteria. They may also be unfamiliar with lifecycle costing techniques and may need dedicated support to develop the requisite skills. Where the green procurement market is small or initially emerging, central government departments can support the formation of relationships between subnational purchasing agents and suppliers of low-carbon goods and services.

5.3 Information and Analytics Functions

5.3.1 Definition and Scope

Information and analytics are clearly essential to climate planning and action, including to regulatory and operational functions covered above and collaborative governance functions described below. Basic functions include collecting information on emissions quantity (both point and nonpoint sources) and quality (emissions with different climate forcing potential like carbon dioxide, methane, or nitrous oxide). These make it possible to benchmark climate mitigation action and evaluate its impact over time. Other core functions include monitoring air quality around local emission hotspots, tracking development impact on local and transboundary ecosystems, and measuring hazard exposure and socioeconomic conditions to capture the multidimensional nature of vulnerability. Both quantitative and qualitative data are needed to understand the local impacts of climate change and to fully characterize the downscaled climate risks from transboundary hazards, such as flooding, fires, landslides, and coastal erosion.

Many more recent efforts by subnational governments commonly feature the deployment of low-cost sensor networks linked to central agencies that record pollution and climate conditions in real time. Many long-run datasets covering transboundary climate stressors, such as heat, precipitation, or water scarcity, are maintained by specialized national or regional government departments or agencies because of their expertise in meteorology and environmental assessment. Even where national authorities have responsibility for specific climate-related data, they often depend on regular or periodic inputs from subnational governments and frontline service delivery units. Updated data on climate stressors from central governments or specialized weather service agencies can be combined with subnational government demographic data and localized knowledge to downscale risk assessments to specific subnational jurisdictional borders.

Transparency in subnational government data functions is also vital to effective monitoring of subnational government regulatory and planning performance within intergovernmental systems (e.g., supreme audit institutions) and by civil society and the private sector. This requires compliance performance be published so that the benefits and costs of adherence to specific standards and their impact can be assessed. Subnational compliance data are a key component in multi-jurisdictional disaster risk indices used to price specialized financing and insurance products for subnational government assets. More broadly, data collection on operational performance, such as the quality of mainstreaming climate risk into subnational government plans, must be captured to monitor and evaluate progress toward meeting national climate and environmental policy objectives within the intergovernmental system.

Three key issues stand out in the area of subnational government data:

- Identifying emissions sources and designing a subnational GHG inventory
- Collecting multidimensional social vulnerability data to understand local climate risks for vulnerable populations
- Generating and reporting subnational government institutional performance data upward in intergovernmental systems.

The remainder of this section reviews these three issues using illustrative points from the energy, transport, and water sectors.

5.3.2 Identifying Emissions Sources and Designing a Subnational Government Greenhouse Gas Inventory

Subnational government GHG inventories are a core information and analytics function that supports decarbonization planning within and across the sectors falling under the mandate of subnational authorities. Depending on local capacity to identify emissions sources for the purposes of planning, local and regional governments can select different GHGs

and geographic scopes to target. Doing so helps narrow the data to the emissions sources that they could subsequently influence through mitigation planning and action. Box 5.4 outlines where subnational governments new to collecting emissions data can start.

Box 5.4. Getting Started with Emissions Data: Where Can Subnational Governments Focus First?

Numerous protocols exist for different territories (e.g., cities) and sectors (e.g., forestry, agriculture, and land use) and for different policy, project, and product levels to support the design of a subnational GHG inventory.[10] Of the full range of emissions sources falling under a subnational government mandate, direct organizational emissions are typically the easiest to identify, measure, and monitor. They include sources from assets (buildings, facilities, vehicles, etc.) controlled by subnational governments, such as stationary and mobile combustion, chemical production, and other fugitive emissions. Other actors of course also produce emissions in the operational territories controlled by subnational governments, implying a wider range of potential sources that should be counted.

Central governments can support subnational government GHG inventories by providing technical support, developing protocols and associated standardized terms of reference, and creating national information technology platforms to host inventory data. Each is important because the challenges to collecting accurate, consistent, and comparable data on emissions are numerous. Careful accounting of inter-temporal changes requires that emissions sources be balanced across multiple scope boundaries (Fong et al. 2014). Scope 1 includes GHG emissions from sources within the jurisdictional boundary, Scope 2 includes GHG emissions occurring as a result of the use of grid-supplied electricity, heat, steam, and/or cooling within the jurisdictional boundary, and Scope 3 includes all GHG emissions that occur outside the jurisdictional boundary but that result from activities taking place within it.

5.3.3 Collecting and Analyzing Multidimensional Climate Vulnerability Data

Considerable progress has been made in establishing systems to measure and monitor climate hazards and population exposure, but innovations in measuring and tracking vulnerability among different social groups has lagged. Local climate risk assessments based only on hazard and exposure information are incomplete and in turn can lead to spurious conclusions on relevant climate action. Recent efforts by national governments and international organizations on hazard and exposure data have benefited from satellite technologies and remote sensing instruments. Improvements in big data computing resources, the expansion of weather stations and other remote sensing gauges to monitor weather conditions in real time, and catastrophe modeling have helped to establish datasets for probabilistic risk assessment. This kind of assessment is necessary to understand the potential losses and damages from future, hypothetically more variable or intense, climate stressors.

Box 5.5. Decentralizing Climate Information Services in Kenya

Following Kenya's new constitution in 2010 that created substantial devolution, the Kenya Meteorological Department has been decentralizing climate information services planning to the county level consistent with the 2016 Climate Change Act. Establishing director posts for county meteorological services in the 47 counties has generated notable benefits, including the provision of tailored climate information products, such as seasonal or onset/cessation rainfall forecasts, to pastoralists and smallholder farmers. With extensive ongoing support from the National Adaptation Consortium (ADA), county climate information service plans are being developed, along with local training on how to incorporate climate information into county integrated development plans. Ongoing challenges include managing incentives for tailoring top-down climate information to local short-term time preferences (seasonal) and conditions, rather than long-term trends to support adaptation goals by county planning officers.

10. See the Greenhouse Gas Protocol hosted by the World Resources Institute (https://ghgprotocol.org/). CDP develops protocol for states and regions and an online response system for subnational governments (https://www.cdp.net/en/cities/states-and-regions).

In most local contexts, vulnerability is as much or more of a determinant of risk than physical exposure. Systemic vulnerability, however, is harder to measure than hazard and exposure. Systemic vulnerability to climate change has multiple dimensions beyond commonly understood conditions such as monetary poverty, and these include gender, community structures, and the formulation and valuation of knowledge and intangible resources (e.g., community ties) that underpin local adaptive capacity. Mobilizing multi-stakeholder collaborations between scientific research institutions and affected communities to measure and map systemic vulnerability to climate change can be a constructive approach to generating more actionable local risk information.

5.3.4 Generating and Reporting Subnational Government Performance Data in Intergovernmental Systems

Information and analytics functions extend beyond producing specialized data on existing impacts and future climate risks specifically to institutional arrangements for generating information on the annual performance of regulatory and operational functions and reporting in intergovernmental systems. Monitoring the regulations and operations that apply to some sectors of mitigation action is complex and potentially costly, given the geographic scale of activities and opportunities for evasion. Examples of regulations with a broad geographic scale that are easy to evade in the absence of robust monitoring include, for instance, energy efficiency codes for buildings or rural water pumps. Monitoring subnational government performance on regulatory and operational functions for adaptation outcomes can also be particularly challenging for higher levels of government. Qualitative information can be collected on the extent to which appropriate decision-support tools (e.g., probabilistic cost-benefit analysis) are utilized for key investments in adaptation and disaster risk reduction (Nay et al. 2014). Still, tracking adaptation progress is complicated and subject to limitations, such as inconsistent definitions, incomparable baselines, and limited data (Ford and Berrang-Ford 2016; Olazabal et al. 2019).

Although generating and reporting data to assess climate policy outcomes at the subnational level is important, tracking policy process *outputs,* such as vertical alignment between national and local laws and strategies, also adds value. A key process output for climate policy at the subnational level is alignment, integration, or engagement between national climate policy instruments and tools (e.g., action plans) and the legal decentralization framework that underpins intergovernmental relations. The vertical alignment between national strategies and resources and local opportunities for action facilitate an assessment of the extent to which subnational government action is consistent with and contributing to meeting climate policy objectives and targets outlined in NDCs as part of the Paris Agreement.

An important general point about climate change data is that although progress has been made, it has been difficult to develop and to use information technology systems effectively at both the national and subnational levels in many countries. Some data deficiencies might be intrinsic to uncertainties in climate-specific data (downscaled climate risk assessments, vulnerability). They also result from such factors as lack of resources, capacity limitations, and weak collaboration, among others. Subnational governments in poor regions may not have regular access to or capacity for the most advanced hazard and exposure assessment tools, but closing this gap is increasingly a priority for transnational climate organizations. In other cases, there may be good information technology and data covering historical fluctuations in weather patterns and ecosystem changes, but little or no information on historical enforcement of standards that are also important to national and subnational climate change priorities. In short, much needs to be done to improve climate change information generally and the role of subnational governments.

5.4 Collaborative Governance Functions

5.4.1 Definition and Scope

Collaborative governance encompasses the norms and mechanisms for engagement between subnational governments and stakeholders in civil society and the private sector. Collaborative governance can help build a shared understanding of risks and vulnerabilities and thus the need to act. It is important because it helps to build consensus among multiple public and private stakeholders about appropriate policy responses, which ultimately these stakeholders must follow if there is to be meaningful action on climate change. Mechanisms that support transboundary collaboration and coordination are essential to implementing more ambitious subnational action and to ensuring that transboundary risks are managed to benefit the most vulnerable local population groups.

Mechanism designs must acknowledge and accommodate different interests and time preferences around action even as they address the urgency of improving resilience to the intensity of compounding shocks and variability in local stressors. Core mechanisms include platforms to share relevant climate data and plans, inclusive participatory institutions that enable meaningful community engagement by marginalized populations on decisions that affect them, and multi-stakeholder forums and partnership arrangements designed to coordinate action at different transboundary scales. The uncertainty around current and future climate impacts underscores the importance of scientific inputs and legitimacy in collaborative governance functions. Mechanisms that increase consensus around priorities for climate action and regular disclosure of updated climate risk information in formats accessible to vulnerable population groups support productive interaction with government institutions that have authority over decisions at the neighborhood, town, city, and regional scales to better cope with existing impacts.

Three key issues stand out around collaborative governance functions carried out by subnational government:

- Forums and partnerships for coordinating commitments by private sector and civil society to mitigation action
- Scientific and citizen collaboration in hazard mapping and climate risk assessment
- Community leadership in climate adaptation decision processes

The remainder of this section reviews these three issues using illustrative points from the energy, industrial, and coastal resilience sectors.

5.4.2 Forums and Partnerships for Coordinating Mitigation Targets and Action between Private Sector and Civil Society Groups

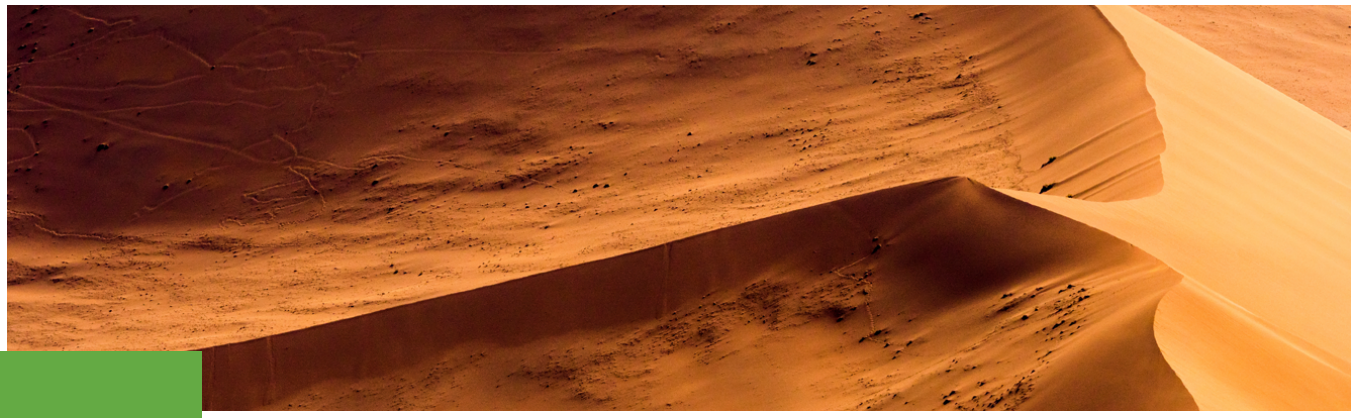
Many businesses that anchor local and regional economies face both local risks from climate impacts and transition risks from the design and implementation of climate policies, regulations, and plans. For the private sector, these risks can affect costs (and profitability) within regional production systems in unpredictable ways. Fossil fuel energy providers and certain industrial sector firms face high transition risks under more ambitious midcentury decarbonization targets. Institutional forums or partnerships to discuss how best to manage these risks for private sector stakeholders in response to proposed mitigation targets and action, with key inputs from civil society groups that represent local constituent interests, can help facilitate cross-stakeholder interaction around local opportunities for low-carbon, climate resilient development.

Multi-stakeholder forums or partnerships provide opportunities for collaboration among organizations with competing interests and policy preferences. Forums or partnerships can take a variety of forms, ranging from voluntary or loose networks to contractual arrangements in which participating organizations make time-bound, science-based mitigation commitments. In the absence of clear legal and regulatory frameworks governing cross-stakeholder interactions at the subnational level, transnational action networks often support lead authorities in local governments to fund and operate new local partnerships designed as collaborative governance experiments (Bulkeley 2019; Chu 2018). These initiatives promote solutions and learning, but it is often unclear how much policy feedback reaches and influences higher levels of government.

There are obvious concerns around giving too many actors potential veto opportunities over mitigation decision processes. Research and practice, however, have demonstrated that a strong polycentric approach to the pursuit of local climate mitigation solutions does not necessarily lead to deadlock (Ostrom 2012, 2010). Governance mechanisms that promote polycentric relations allow actors capable of working at different scales the opportunity to generate benefits relevant to those scales. Doing so is often the only viable approach in the absence of a strong national policy framework that prescribes collaborative governance roles relevant to different scales. Civil society actors have been influential in steering local policy and investment decisions away from powerful fossil fuel interests (Ciplet, Roberts, and Khan 2015). However, power utilities and other interest groups have the influence and means to push retrenchment of subnational clean energy policy implementation (Stokes 2020).

5.4.3 Incorporating Scientific and Citizen Participation in Hazard Mapping and Climate Risk Assessment

Collaborative governance functions that provide regular scientific input into local hazard mapping and risk assessments can help increase the legitimacy of proposed actions. Scientific data on forecasts of temperature trends (dry and wet bulb measures),



regional precipitation patterns, and other climate stressors (changes in geographic distribution of vector borne disease) might originate in the intergovernmental system, for instance, through extension services (see Kenya case in section 6). Local university, civil society organizations, and research agencies can be an alternative or complementary source of scientific expertise. Collaborative governance mechanisms that provide regular input can help subnational governments move beyond conventional participatory institutions (e.g., budget consultations) that might be dismissive of or hostile to climate action. More generally, building new adaptive capacities within the intergovernmental system can be supported by forging new connections among vulnerable populations, businesses, civil society organizations, researchers, and universities that have ties to other resources like transnational climate action networks (Ziervogel, Cowen, and Ziniades 2016).

Strengthening scientific inputs and community participation in risk mapping and risk assessment can support more inclusive planning and improve the effectiveness of disaster risk management and adaptation program designs. Participation in government is not always neutral—it can be susceptible to harmful bias depending on the composition of participants. If representation from marginalized groups is not sufficient, the preferences of wealthier constituents might lead to various forms of maladaptation. For instance, there is some emerging evidence that planning nature-based adaptation solutions, which in principle can yield both mitigation and climate resilience benefits, is driving land speculation that results in displacement and unintended vulnerability (Anguelovski et al. 2016; Anguelovski, Irazábal-Zurita, and Connolly 2019). This threat at the subnational level means it is important that the central government and legal institutions within the intergovernmental system monitor these functions and enforce high standards of accountability.

5.4.4 Community Leadership in Climate Adaptation and Disaster Management Decisions

Inclusive community leadership requires subnational governments to identify and nurture potential local leaders who represent local community interests and can speak to local needs. This often means going beyond the generic mandates of national climate and disaster laws to coordinate between subnational governments and community institutions, such as neighborhood associations or civil society organizations that represent highly vulnerable population groups. Given the well-established links between social inequality and vulnerability to climate change, such community leadership should aim to elevate poor women, children and adolescents, the disabled, sexual and gender minorities, and ethnic groups from populations historically excluded from governing authority.

As climate impacts become increasingly differentiated within and between regions, highly localized coordination and collaboration will only become more important to community-led disaster risk reduction strategies (see Bangladesh case in section 6, summarized in box 5.6). Adaptation interventions can be (and often are) designed using parameters set by national and regional actors, but they should be intentionally implemented locally in close consultation with local stakeholders (Mfitumukiza et al. 2019). Community leadership is characterized by local people and groups having individual and collective agency over how disaster risk and climate resilience decisions that affect them take place. Within adaptation practice, this is increasingly referred to as locally led adaptation (Soanes et al. 2020).

Box 5.6. Improving Local Coordination and Collaboration for Disaster Risk Reduction in Bangladesh

Bangladesh is highly vulnerable to disaster risks associated with climate change, such as stronger tropical cyclones and storms, sea level rise and storm surges, coastal flooding, and vector-borne diseases. Although the country has made considerable progress over the past two decades in developing national disaster management policies and strategies, along with technical improvements in weather forecasting and early warning systems, the benefits of these efforts have not always reached local communities. To help improve local coordination and collaboration, national Standing Orders on Disaster (SOD) have increasingly recognized the role of local governance structures and actions at the community level and the need to prioritize vulnerable groups for leadership positions. For instance, the 2019 SOD requires local government executive officers to work with youth volunteers (40 percent of whom must be women) to establish a first line of community defense and involvement in key functions, including early warning dissemination, evacuation, search and rescue, humanitarian assistance, and post-disaster rehabilitation. Progress on establishing more inclusive community-level structures, however, has not always been matched with the fiscal resources needed to increase protective infrastructure in vulnerable communities.

Transparent and accountable local decision processes may be associated with vulnerability reduction and better risk management (Hardoy, Pandiella, and Velásquez Barerro 2011). Governance functions that contribute to clear roles and responsibilities, backed by tangible resources for the most vulnerable and affected stakeholders, increase disaster preparedness and contribute to more equitable post-disaster recovery (UNDRR 2019).

06

Selected Cases of Administrative Decentralization for Climate Change Action

This section presents brief country cases to illustrate how some of the administrative functions reviewed in section 5 are used, often together, to act on climate change. Each case focuses on one climate challenge and the use of one or more administrative functions—regulatory, operational, information and analytics, and collaborative governance—in the context of a specific intergovernmental system.

It was not possible to identify "representative" examples, given the diverse universe of possibilities, and no primary research was conducted for this paper. Five cases—Indonesia, Argentina, China, Bangladesh, and Kenya—were chosen from secondary materials to cover varied challenges, represent multiple regions, and feature different intergovernmental system designs and decentralization frameworks.

Each of the five cases starts by identifying the climate change challenge being acted on and the administrative function(s) used to respond. They all follow a common structure:

- **Indication of climate challenges and administrative functions involved** (small table at the beginning of the case subsection)
- **Climate context and reform motivation** (indicate why a specific action was undertaken)
- **Basic intergovernmental system structure and challenges** (contextualize why certain actors were involved and why they needed to work with others)
- **Climate action, actors, and effects (explain what was** done by whom, how the action evolved, and the results generated)
- **Outstanding issues** (indicate what remains to be done to improve, build on, or replicate the specific action)

6.1 Indonesia – Slowing Carbon Emissions/Peatland Destruction Land-Use Conversion

Climate Change Challenge	Administrative Functions
Greenhouse Gas Mitigation	Regulatory, Operational, Information

6.1.1 Climate Context and Reform Motivation

Indonesia's tropical peatlands are one of the largest natural carbon sinks in the world, second only to Brazil's. Deforestation and peatland conversion to logging, oil palm, and other agricultural and economic development purposes have been driving up levels of carbon emissions in many parts of the country. Moreover, uncontrolled peatland draining and conversion have contributed to catastrophic forest fires, particularly during the dry season when average monthly temperatures are the highest.

Concentrated in the provinces of Papua, Riau, Central Kalimantan, West Kalimantan, South Sumatra, and East Irian Jaya, peatland areas in Indonesia are estimated to sequester 28.1 GtCO2 (Warren et al. 2017). Deep peat swamps are one of the most effective types of natural sinks for sequestering carbon dioxide per area, while also sheltering high levels of biodiversity and mitigating flood risks. The Global Peatlands Initiative estimates that draining and destruction of peatland globally over the past two decades has released carbon dioxide equivalent to 5 percent of the remaining global carbon budget for 2°C warming.11

Despite being an early project adopter under the Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) Program of the UN Framework Convention on Climate Change (UNFCCC), Indonesia has experienced two damaging forest fires since 2015. The World Bank estimated that these fires have cost the economy at least US$16.1 billion (IDR 221 trillion), with daily emissions exceeding 15.92 million tons of CO2, more than emissions of the entire U.S. economy (World Bank 2016). CO2 and other particulate matter from peatland fires cross borders, causing health impacts on vulnerable populations in neighboring countries. Widespread damage from the 2015 fires, along with the recognition that peatland sequestration of carbon dioxide is necessary for Indonesia to meet its NDCs under the Paris Agreement, motivated changes within the intergovernmental system.

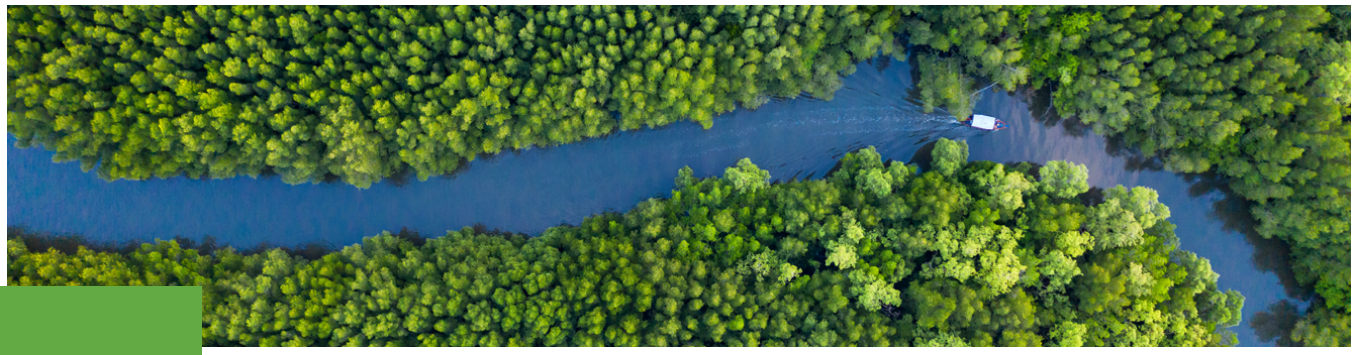
6.1.2 Basic Intergovernmental System Structure and Challenges

Indonesia is a unitary state with a multiple-tier system of subnational government. The regional level consists of provinces (34) with a second level of local government (514 cities and districts). Within the cities and regions are multiple administrative subdivisions, and at the lowest level are villages (many thousands). The system is fairly decentralized, with many public functions and a large share of national resources allocated to subnational governments. Local governments have the most responsibilities and expenditures, but provinces have some broader coordinating and regulatory functions, and dedicated funds are allocated to villages for use on local services. Subnational governments have significant roles in many climate-relevant functions, including land use, water and other infrastructure, and sanitation/solid waste management.

Problematic administrative gaps and redundancies, along with bureaucratic and political economy factors, have created complex challenges to protecting tropical peatland and restoring areas damaged by fires and forest land conversion. For instance, in 2011, a temporary moratorium on clearing forests and peatlands was adopted using a moratorium map controlled by the Ministry of Environment and Forestry (MoEF). While the MoEF was responsible for maintaining the map, subnational governments had autonomy to rezone forest land using a special "other purposes" category. Because provincial and district government zoning plans determined the forest area under protection, permitting for land conversion on mining and oil palm plantations continued.

Other gaps stemmed from incentives that created opportunities between the provincial and district levels to

11. For more information, see the Global Peatlands Initiative at https://www.globalpeatlands.org/.



create new districts in peatland areas. The 1999 Law on Forestry required a minimum of 30 percent of land to be forest cover, but when new districts are delimited, the ratio of forest cover can be much higher than the minimum. This allows district and provincial governments to issue permits to cut forests down for development (Myers et al. 2016). Other gaps in land-use regulations and planning between levels of government create opportunities for political logging, whereby local officials grant new land permits to private businesses in advance of elections (Burgess et al. 2012).

6.1.3 Climate Action, Actors, and Effects

Following the 2015 fires, the Government of Indonesia introduced ordinances to tighten the alignment of provincial and district land-use plans to slow down conversion of peatland into plantations. Regional governments also introduced new controls. For instance, the provincial government of Central Kalimantan abolished controlled burn policies of agricultural and forest land, matching the ambition behind the national regulations.

The central government created the National Peatland Restoration Agency (NPRA) to work with villages in target provinces. The NPRA had a target to rehabilitate and restore 2.6 million acres of peatland from 2016 to 2020, an unprecedented volume globally, but without an updated map of peatlands, the agency could not effectively focus its efforts. In response, the National Geospatial Information Agency initiated a competition to find the best approach to mapping peatland.

From 2016 to 2020, the NPRA successfully met 45 percent of the 2.6 million hectare peatland target set for the four-year period. The temporary 2011 moratorium on clearing forests and peatlands was made permanent in 2019, focused on halting the?? conversion of primary natural forests and peatlands for oil palm, pulpwood, and logging concessions.

With support from United Nations Environment Programme, the NPRA is working more closely with village-level governments in target districts to develop small-scale peat dams that support rewetting, reforestation, and revitalization.[12] There is also national funding to provide small grants for livelihood development through horticulture and fisheries. New conditional village development grants in specific regions also require local communities to participate in peatland restoration.

6.1.4 Outstanding Issues

Some drivers of peatland loss continue to operate in the intergovernmental system. For instance, there is commonly conflict between economic growth targets set at the central government level and carbon mitigation priorities (Myers et al. 2016). The current GDP growth target is 7 percent, while the GHG reduction target is 26 percent of 2005 levels by 2030. Although these targets might be compatible for some sectors, they lead to damaging tradeoffs and pressures in the forestry sector.

Another issue is that national and provincial regulations are not well understood by land users, which contributes to low compliance. In a recent comparative study, peatland users in Jambi and Central Kalimantan, Uda, Schouten, and Hein (2020) report varied explanations for the low compliance. These include unclear land titles, lack of accurate information on the groundwater table and deep peatland locations, and limited efforts to advance potentially productive traditional forms of peat management in national and regional policies. There is considerable need for remedial efforts on these fronts.

12. "UNEP Supports Project to Restore Peatlands in Indonesia," UN Environment Programme, August 10, 2020, https://www.unenvironment.org/news-and-stories/story/unep-supports-project-restore-peatlands-indonesia

6.2 Argentina – Promoting Solar Water Heaters in Municipal Building Regulations

Climate Change Challenge	Administrative Functions
Greenhouse Gas Mitigation	Regulatory, Collaborative Governance

6.2.1 Climate Context and Reform Motivation

The building sector in Argentina accounted for 17 percent of energy-related carbon dioxide emissions in 2016.[13] The use of natural gas to cook and to cool and heat buildings and water is the major driver of building emissions. Water heaters using motors powered by fossil fuel sources are a significant source of emissions, and they frequently burn out and are replaced before their expected service life because the power supply is unreliable. This impacts households and businesses operating out of both residential and commercial buildings, with utility prices a key concern for low-income households and firms in the manufacturing sectors.

The reform in this case was undertaken by a specific local government, Rosario municipality, which benefited from senior leadership who were highly motivated to act decisively on climate change (Hardoy and Ruete 2013). In addition, the constitution requires provincial governments to ensure municipal autonomy, and the province of Santa Fe was willing to let Rosario undertake this reform to deal with the problem at the municipal level and then to learn from it for broader application.

6.2.2 Basic Intergovernmental System Structure and Challenges

Argentina is a federal state with subnational government levels. Twenty-three provinces and the federal capital of Buenos Aires make up the intermediate tier, which is relatively autonomous in undertaking a wide range of public functions and generating considerable revenues. Provinces have their own constitutions and also have scope over the functions of lower-tier governments under their jurisdiction. There are 2,277 local governments with varied degrees of autonomy depending on provincial preferences and status (e.g., cities, municipalities, towns as defined by provinces). The Argentine constitution provides for municipalities to have a legislature, and they can pass laws pertaining to their constituents and collaborate with each other or with higher-level governments.

Although Argentina recognizes general energy efficiency in urban infrastructure and public housing as a priority in their second NDCs to the Paris Agreement, the country had no national energy building code for new or retrofitted buildings. Without any guidance, subnational governments were left to determine their own standards, and what municipalities could do depended on provincial government policies. There have been challenges with coordination, and capacity limitations have affected the extent, quality, and pace of municipal government efforts to reduce emissions from the building sector.

6.2.3 Climate Action, Actors, and Effects

In 2011, Rosario created a Sustainable Building and Energy Efficiency Program as a strategy to curb GHG emissions stemming from? future population growth and real estate development. As part of the program, the city issued public ordinance Nº 8784, requiring all new and retrofitted public buildings to use solar water heaters (SWHs) to heat at least 50 percent of their water.

Given a lack of expertise in the solar energy sector, the city spent a year collaborating with different organizations and academic institutions, such as Taller Ecologista, an environmental NGO, and the National Technology University in Rosario, to develop an installation and maintenance manual for SWHs. This collaboration was necessary because Rosario could not depend on higher levels of government for this purpose. Once the technical issues were identified and addressed, Rosario ratified the ordinance by passing decree Nº 2120 in 2012.

The ordinance detailed an implementation timeline and specified a need to coordinate with NGOs, academic institutions, and research centers, as well to create educational workshops to disseminate lessons learned from the experience to other NGOs, governments,

13. Climate Transparency, "Argentina," Brown to Green: The G20 Transition Towards a Net-Zero Emissions Economy, 2019, https://www.climate-transparency.org/wp-content/uploads/2019/11/B2G_2019_Argentina.pdf.

and relevant actors. Public ordinance No 8784 laid the foundation for developing a more comprehensive approach to renewable energy in the city's building sector outlined in Rosario's first Sustainable Building and Energy Efficiency Plan. As of 2018, there were over 30 SWH installations in public buildings in Rosario.

These projects, once installed, are administered by small and medium energy service companies, providing a source of income and economic activity to local businesses. Households in Rosario that adopted this technology have saved an estimated 80 percent of water heating costs (ICLEI and IRENA 2018). Given the success of the program, Rosario has offered technical courses on the ordinance to private solar companies to continue with SWH installations, as well as educational programs to other municipalities to replicate this regulatory experiment.

Rosario's initial efforts led to further intergovernmental cooperation between the municipal and provincial governments. The program's success also motivated the Municipal Bank of Rosario to work with the provincial government to create a new loan product to support small and medium-sized enterprises working on renewable energy and energy efficiency. Furthermore, four years after Rosario passed its ordinance, the provincial government of Santa Fe created a revolving credit line in 2016 to finance SWH systems. More recently, there have been some initial proposals around legislation to increase the number of SWHs in newly constructed government housing.

6.2.4 Outstanding Issues

The public ordinance requiring the use of SWHs to heat at least 50 percent of water in buildings still applies only to facilities owned by the municipal government. Although the local market for SWHs continues to grow, the design, construction, and retrofitting of many residential and commercial buildings still rely on water heaters with motors powered by fossil fuels. Stronger regulations and incentives are needed to increase adoption and broaden the impact of the reform.

6.3 China – Supporting New Energy Vehicles for Urban Logistics

Climate Change Challenge	Administrative Functions
Transition to Low-Carbon Local Economies	Regulatory, Operational, Information

6.3.1 Climate Context and Reform Motivation

China has among the most harmful levels of carbon dioxide and particulate matter pollution in its major cities. Given rapid growth in local and e-commerce-based consumption in cities, a large share of urban GHG emissions can be traced to combustion engines in freight and logistics operations vehicles. According to the Beijing Transport Institute, half of major vehicle emissions in Bejing derive from heavy internal combustion engine trucks, only 6 percent of the vehicle fleet.[14] Drastically increasing new energy vehicles (e.g., battery electric, plug-in hybrid, and hydrogen fuel cell) in urban freight and logistics is a shared national and local goal in the transition to low-carbon local and regional economies (Chen, Wu, and Zong 2020). Cleaning urban air pollution and expanding a major green industry are dual motivations tightly coupled in national and subnational policy.

6.3.2 Basic Intergovernmental System Structure and Challenges

China is a unitary state with a four-tier subnational government system: provincial (33), prefectural (334), county (2,851), and township (39,864), and a lower tier of residential and village committees. Each level has multiple units within them, many related to various sizes of urban and rural jurisdictions. China is one of the most decentralized countries in the world, with subnational governments responsible for providing most public services, but with considerable concurrency among levels. The revenue system is more centralized, with substantial revenue sharing, including some sources that

14. T. Fried and others, "The Road to Zero-Emission Cities Goes through Freight," *The City Fix*, September 15, 2020, https://thecityfix.com/blog/the-road-to-zero-emission-cities-goes-through-freight/.

accrue entirely to subnational governments. Although subnational governments have some expenditure decisions, budgeting and financial management systems exert some control and monitoring of behavior and performance. It is, in short, a complex system, but it offers considerable scope for subnational governments to play a major role in climate response.

Central government subsidies help local businesses and major logistics firms to deploy electric vehicles by subsidizing up to 50 percent of vehicle costs. These subsidies have created pricing parity for new energy vehicles but have not necessarily helped individuals and firms acquire these expensive cars, vans, and trucks. Rather, the subsidy accelerated the formation of new market segments, such as leasing companies, that use the funds to acquire vehicles and lease them to transportation companies and firms.

Beyond the incentive effect of national subsidies, China's system allows local governments to pass standards and regulations defined by credible targets, while national authorities also promote top-down experiments that try to leverage linkages between urban planning, environmental quality, and industrial policies (Chen et al. 2017). Provincial governments are also empowered to set targets for new energy vehicles to further incentivize local deployment.

Strategic investment planning capacities in China's major cities have improved, but a few key intergovernmental system challenges have to be addressed to significantly increase the number of electric freight and logistics vehicles and support the transition to low-carbon local economies. The main challenges include improving information technology to generate relevant data and developing local capacity and implementation strategies to translate ambitious targets into regional and local policy.

6.3.3 Climate Action, Actors, and Effects

Central, provincial, and local governments in China have each taken steps that work together to create interlocking policies and incentives to reduce air pollution and encourage the deployment of new energy vehicles for urban freight and logistics. National regulations apply to new energy vehicle manufacturing enterprises, while two major plans led by the State Council guide deployment: Energy Conservation and New Energy Vehicle Industry Development Plan (2012–2020) and the China New Energy Vehicle Industry Development Plan (2021–2035).

- Municipal governments in tier 1 cities have implemented measures to accelerate the deployment of more efficient energy vehicles in road freight logistics (Hunter et al. 2019). These measures include: Using mandates to increase infrastructure for low-carbon energy and technology vehicles (e.g., chargers and charging stations) and implementing vehicle registration restrictions for logistics vehicles using internal combustion engines
- Increasing fleet-wide fuel economy standards for urban logistics vehicles
- Piloting urban logistics planning using sensors and real-time tracking to increase control over freight movement, thereby improving energy efficiency in the movement of goods
- Using transport demand management to restrict the mobility of internal combustion logistics vehicles (e.g., banning polluting and allowing electric vehicles during specific times)

The deployment of new energy vehicles for urban logistics is further supported by the designation of National Pilot Zones for Ecological Conservation. The central government requires 80 percent of new or repaired public sector vehicles to be new energy vehicles. This designation unlocks additional funding from central and provincial governments to implement the national policy, reinforcing the important links between fiscal and administrative measures to address climate change.

The array of mandates and policies at both the local and national levels on the regulation of electric vehicle infrastructure, collaboration with suppliers, and data management generated important benefits. New energy vehicles in urban freight and logistics operations are rapidly expanding, accelerating the shift required to reduce urban emissions and improve environmental quality (Hunter et al. 2019). For instance, Shenzhen has been a pilot city for electric vehicles since 2009 and has become a leader in the country. From 2015 to 2018, the city's fleet of electric vehicles expanded from 300 to around 62,000, with electric light trucks and vans comprising almost 35 percent of the urban delivery vehicle fleet (Crow et al. 2019). The initial reforms have also led to additional measures: since 2018, logistics companies can only procure new energy vehicles in the light duty truck class.

6.3.4 Outstanding Issues

Although new energy delivery and light freight vehicles are part of a strategic national industry in China,

outstanding local issues require further attention. First, adjusting to the introduction or use of hard targets and restrictions and bans on certain delivery vehicles in urban areas (e.g., by fuel type or by size) takes time for logistics firms and can create new cost burdens that disrupt the flow of goods (Chen, Wu, and Zong 2020). Another issue involves improving supply and demand planning to further expand the distance reached by new energy vehicles from warehouses and other logistics hubs. This requires that the location of charging infrastructure be better matched to where logistics operators originate and terminate vehicle trips. These and other types of additional reforms to better coordinate urban planning would build on the gains from measures adopted thus far.

6.4 Bangladesh – Improving Collaboration for Disaster Risk Reduction and Response

Climate Change Challenge	Administrative Functions
Extreme Physical Risk	Collaborative Governance

6.4.1 Climate Context and Reform Motivation

Bangladesh is one of the most climate change vulnerable countries in the world. Key hazards associated with extreme physical risk include tropical cyclones and storms, sea level rise and storm surges, coastal flooding and saltwater intrusion, heat stress from high wet bulb temperatures, and vector-borne diseases. The country's physical exposure to extreme hazards reflects its geographic characteristics and high coastal population densities. Located on the shallow Bay of Bengal, which features high surface temperatures and a concave coast, Bangladesh's demographic and physical characteristics compound transboundary climate risks in both rural and urban areas. The impacts of extreme risk events hold the potential to cascade far beyond their immediate physical damages.

6.4.2 Basic Intergovernmental System Structure and Challenges

Bangladesh is a unitary state with a subnational government system comprised of administrative districts (64) with various urban and rural local governments within their boundaries. Local governments have responsibility for some functions, but largely those delegated by national authorities. There are some local revenue sources, but transfers dominate local funding. Urban governments are single tier and of two types: city corporations (11) and municipalities/*pourashavas* (324). Rural local governments have three tiers: district/*zila parishads* (64), subdistrict/upazila parishads (510), and villages/*union parishads* (5000+). The national government operates deconcentrated administrative units of central ministries and agencies at three lower levels: divisional (in city corporations), district, and subdistrict, reinforcing the prominence of the center.

Despite developing over the past two decades among the most advanced hydrometeorological forecasting operations and national cyclone early warning systems in the world, localities around the country have continued to experience lapses in evacuation behaviors and other risk management practices (Roy et al. 2015). Within the intergovernmental system, limited local coordination and ambiguity in disaster risk management roles have increased vulnerability to extreme physical risk events, such as storm surges during cyclones and coastal flooding from higher rates of precipitation.

6.4.3 Climate Action, Actors, and Effects

Community-led governance has been key in the country's shift from reactive to proactive local disaster management (Azad et al. 2019). National policy reform bolstered by national disaster management legislation has strengthened the community-driven disaster risk reduction model. For instance, the 2012 Disaster Management Act (DMA) created the legal basis for local governance structures for disaster risk management. These include City Corporation Disaster Management Committees, District Disaster Management Committees, *Upazila* Disaster Management Committees, *Pourashava* Disaster Management Committees, and Union Disaster Management Committees.

The 2012 DMA also recognized the Standing Orders on Disaster (SOD) as a key instrument with legal backing used to determine the liability, responsibility, and

duties of different actors within the intergovernmental system. In doing so, the DMA has helped integrate a coordination structure that stretches from the National Disaster Management Council down to village disaster committees, the lowest level of disaster management in the country.

The systematic incorporation of vulnerable populations into the SOD has contributed to structural improvements in community-led disaster risk reduction over the past decade. For instance, at the *upazila* level, the 2019 SOD features the following requirement of the executive officer: "establish 'first line defense' at the *upazila*, union and ward levels with local youth volunteers (at least 40% of them have to be women) to assist in early warning dissemination, evacuation, search and rescue, and humanitarian assistance and rehabilitation initiatives." This provision did not exist in the previous 2010 SODs and has opened additional space for deeper and more effective civic engagement.

The payoffs from developing such an expansive coordination structure spanning the National Disaster Management Council to the more than 2,000 village disaster committees have notably grown over time. Even as Bangladesh remains highly exposed to extreme climate impacts, the country's coordination structure has supported reductions in losses from recent historically intense cyclones and flooding events. Deaths from major cyclones have declined significantly. Major cyclones in 1991 (Gorky), 2007 (Sidr), and 2009 (Alia) killed more than 143,000 people, while more recent cyclones in 2017 (Mora), 2019 (Fani), and 2020 (Amphan) killed an estimated 45–50 people.

6.4.4 Outstanding Issues

Despite these improvements in community-led disaster risk management, the continuing shortfalls in funding for networked infrastructure and other physical risk mitigation assets mean that many communities remain highly vulnerable to climate-related hazards. Although inclusive participation in local disaster management governance has clearly improved, gaps in intergovernmental planning and budgeting slow down the delivery of protective infrastructure (Islam, Chu, and Smart 2020). Thus, despite progress on local coordination, there is considerable scope for additional measures and funding.

6.5 Kenya – Decentralizing Climate Information Services for Locally Led Adaptation

Climate Change Challenge	Administrative Functions
Slow Onset Environmental Change	Operational, Information, Collaborative Governance

6.5.1 Climate Context and Reform Motivation

Kenya is a highly agro-ecologically diverse country that is vulnerable to a range of slow onset environmental threats associated with climate change, such as longer droughts, higher flood frequency, and sea level rise. Given the diversity of physical and economic conditions in the country, ranging from farmers and pastoralists to urban-based production and consumption, the specific risks faced by local communities and economies vary considerably.

A new constitution adopted in 2010 created a substantial devolution. Major reforms have increased subnational authority and significantly modified accountability arrangements, increasing expectations that new subnational governments will take action on climate change. These institutional reforms have also generated pressure on the intergovernmental system to increase and improve the quality of climate information available to county governments as well as to integrate this information into local development plans, service delivery, and monitoring and evaluation.

Although the Kenya Meteorological Department (KMD) is the lead agency on decentralizing climate information service planning at the county level, an important impetus for reform was technical and coordination support provided by the Adaptation Consortium (ADA) and linked to funding through the County Climate Change Fund (CCCF).[15] The ADA is a multi-stakeholder collaboration focused on mainstreaming climate change

15. For more information, see https://www.adaconsortium.org.

considerations into county development planning. It is led by the National Drought Management Authority and its membership includes the National Treasury, National Climate Change Directorate, National Environment Management Authority, Ministry of Devolution and Arid and Semi-Arid Lands, and Council of Governors.

Another important driver of reform is the Climate Change Act (2016). By passing this legislation, the national government established itself as one of the most ambitious in the world in terms of actively promoting the decentralization of adaptation policy and planning.

6.5.2 Basic Intergovernmental System Structure and Challenges

Kenya is a unitary state with a single-tier system of 47 subnational governments at the county level. The 2010 constitution devolved development planning and major service delivery authority to the counties, along with selected revenue sources and substantial intergovernmental transfers. In addition to responsibility for major public works, infrastructure, and sanitation services relevant to climate change action, county governments have responsibility for controlling air pollution, disaster management, and the implementation of specific national government policies on natural resources and environmental conservation in their jurisdictions.

Even as county governments take on more responsibility for integrating climate risks into development planning, the intergovernmental system faces gaps in information technology and scientific data on slow onset environmental change that threatens agriculture and other major sectors. Kenya's Second National Communication to the UNFCCC recognized this challenge, in particular, how improved information flows across levels of government were critical to the integration of climate change considerations into county poverty reduction and development strategies.[16]

6.5.3 Climate Action, Actors, and Effects

The Kenya Meteorological Department, the agency responsible for climate information, is decentralizing climate information services by establishing county meteorological offices headed by county directors of meteorological services (CDM). The CDM reports upward to the Kenya Meteorological Department but is also responsible for delivering climate information services to inform the County Integrated Development Plan (CIDP) and decisions by single sector authorities.

The CDM additionally oversees the development and implementation of the County Climate Information Services Plan (CCISP). The CCISP is intended to establish systematic benchmarks and actions for tailoring national weather and climate information to help target vulnerable population groups and livelihoods, in particular, supporting local decisions for the CIDP (Isiolo County Climate Information Services Plan 2018). In Kitui county, for example, the CCISP outlines a set of geographically contextualized products, such as seasonal or onset/ cessation rainfall forecasts, to improve livelihood planning for climate hazards among smallholder farmers, pastoralists, and agro-pastoralists (Barrett, Ndegwa, and Maggio 2020).

Kenya's National Climate Action Plan (2018–2020) includes targets for the production of 24 CCISPs. Chaudhuri, Summerlin, and Ginoya (2020) report that the ADA is supporting local training to incorporate climate information into the CIDPs, with some counties mandating county and ward-level adaptation planning committees to demonstrate that they have used local climate information services to secure resources from the CCCF. Improvements have been reported in climate information systems and their incorporation into the CIDPs.

There is also emerging evidence of impact. An analysis of decentralized climate information services in Kitui county, for example, found positive returns over a 10-year period with a benefit-cost ratio of 14.56 (Barrett, Ndegwa, and Maggio 2020). Climate information users in Kitui households benefited from locally contextualized weather and climate information products, enabling them to shift to less climate-sensitive productive activities when forecasts indicated less rainfall.

6.5.4 Outstanding Issues

Outstanding climate information issues in Kenya include the need to continue rolling out and improving information systems and their effective use in more counties. There are also specific challenges, particularly related to tailoring top-down climate information to local preferences

16. Kenya, Government of, *Kenya: Second National Communication to the United Nations Framework Convention on Climate Change* (Nairobi: Ministry of the Environment, Natural Resources and Regional Development Authorities, 2015), https://unfccc.int/resource/docs/natc/kennc2.pdf.

and conditions. For instance, pastoralists in Isiolo county reported more interest in short-term seasonal change data rather than information covering longer-term periods of change that are critical to adaptation efforts (Fisher et al. 2018). Regional models used to make climate projections at the county level were also unable to clearly communicate changes in the frequency of more extreme hazard events in a format that was considered usable by county planning officers.

6.6 Selected Observations on the Cases

A number of basic observations can be drawn from the selective country experiences. None are particularly surprising; in fact, for the most part they reinforce the discussions in the previous sections. Nevertheless, these cases highlight considerations that can assist efforts to assess how subnational administrative functions might support climate change action in particular countries.

First, the priorities and motivations of different actors in the intergovernmental system to deal with climate concerns depend in part on the specific manifestations of climate change in their locations. National governments will have a wider perspective and be motivated to promote actions that respond to conditions broadly experienced and of national and international impact. Subnational governments most affected by specific climate change impacts will be particularly concerned about dealing with them.

Second, responsibility for action depends to a great extent on the institutional structure of the government system and provisions of the intergovernmental legal framework, which differed considerably across the cases. The path to action and the responsibilities and incentives best suited to pursue it will vary to reflect the number of government levels, the degree of their empowerment, and the relationships among them. A system must be well understood to determine options and responsibility for climate change responses and the possible benefits of system reform.

Third, many key climate change actions are (often necessarily) initiated and managed by the national government, but others emerge from the independent initiative of subnational governments. Subnational actors must respect national mandates and guidelines—with possible appropriate adaptation to reflect their own conditions. At the same time, successful actions that originate in subnational governments could be recognized, supported, and even promoted by higher levels, and there may be opportunities to adopt/adapt them in other subnational jurisdictions.

Fourth, effective climate change response generally requires concurrent measures on multiple fronts. Individual subnational administrative actions can help, but they often depend on other measures. Many operational actions, for example, must be supported by regulatory measures, and both require good data, which typically come from multiple sources and need to be adequately managed. Such linkages must be considered in developing an overall package of integrated measures to enhance the subnational government role in climate change. Most of the cases involved more than one type of administrative measure, and some also had a fiscal dimension.

Fifth, many administrative functions require mechanisms to coordinate action vertically across government levels and/or horizontally among neighboring jurisdictions. Although these exist in some countries, they are not necessarily systematically designed—they may simply have emerged in an ad hoc manner for certain purposes and in specific locations. More formalized mechanisms would offer principle-based procedures and guidelines to facilitate productive and fair collaboration. At the same time, subnational governments also need appropriate flexibility to work in partnership with higher-level and peer governments, as well as nongovernmental actors, to respond to climate change.

07

Looking Forward: Designing and Implementing Administrative Reforms for More Effective Subnational Government Engagement in Climate Change

The literature and case reviews point to a number of framing principles for considering how to approach climate action in intergovernmental systems. Several observations and lessons suggested by the cases were noted at the end of section 6. These centered on recognizing locational differences in climate priorities; variations in intergovernmental systems; the role of independent subnational innovations in climate response; the interdependence of elements of climate action (administrative and fiscal); and the value of appropriate collaboration among actors, governmental and nongovernmental. A few other notable points can also be drawn from the preceding sections.

First and most fundamentally, the national actors that shape climate change and decentralization policies could collaborate to develop and integrate their efforts in ways that generate mutual benefits. Many countries have national decarbonization and adaptation plans that do not reflect the intergovernmental system structure or ongoing decentralization reforms. More collaborative efforts could allow fuller assessment of the tradeoffs and opportunities, help improve working relationships among the relevant actors, and facilitate processes that pragmatically balance the roles that different levels of government could productively play in climate action.

Second, there is value in consulting and learning from subnational actors in developing national climate change policy. Overly centralized approaches to decarbonization and adaptation may insufficiently reflect local knowledge and fail to gain support from subnational authorities whose cooperation is required for effective action. Centrally dominated efforts may also not reflect the diversity of subnational conditions and

priorities and overlook constructive reforms already being adopted by subnational governments, such as renewable energy ordinances, low-cost information sharing, or floodplain mapping and early warning systems based on local knowledge.

Third, there is a need for more robust consideration of how to implement subnational climate change action. There is a tendency to follow normative principles and prioritize sound design, but the lack of an integrated conceptual framework and strong empirical evidence, as well as the complex climate change and intergovernmental system landscape covered in this paper, impedes generalization and the use of standardized approaches. This suggests a need for a more contextualized strategic approach, with careful attention to identifying entry points for implementation as well as to considering how the roles of different levels of government and other actors may evolve over time.

Fourth, experimentation is often warranted as part of an overall strategy, given the uncertainty surrounding climate change drivers, impacts, and effective solutions, as well as the effects of contextual variations across and within countries. Use of innovative initiatives can test new ideas and create a platform for developing and mainstreaming productive approaches and reforms. Devising and piloting remedial action may profit from partnerships with other governmental and nongovernmental actors engaged to tap into their comparative advantages.

Fifth, regular systematic assessment of remedial actions, experiments, and partnerships is essential. The evidence produced can be used to identify adjustments and allow climate response to evolve so as to improve and institutionalize good practice, including how different actors work together. This kind of learning approach requires constructive linkages and feedback channels within the intergovernmental system. It also has the potential to attain more ambitious and sustainable climate goals—local, national, and global—in the medium and longer term.

Collectively, these considerations reinforce the potential value of considering administrative decentralization and climate change policy jointly. Collaboration allows better assessment of shared understanding and points of disagreement regarding the roles that different levels of government could play in climate change action. The different perspectives and tensions involved will inevitably create challenges, but the process of resolving them can be productive in advancing both climate change and decentralization agendas if the relevant actors work together constructively. Such an approach could also help to inform the development of more effective donor support.

7.1 Framing Assessment of Administrative Decentralization for Climate Change Action

The previous discussion highlighted the complex landscape in which subnational climate change action must be crafted. Developing or enhancing administrative decentralization for climate change can start from different (although not necessarily mutually exclusive) perspectives. There are, however, certain basic considerations that need to be taken into account no matter which perspective(s) is (are) used.

The perspectives that may be used include:

- **How a national climate policy or action could engage subnational governments** productively, given the structure and capacity of the intergovernmental system and prospects for reform
- **How decentralization policies and reforms can be designed to enhance their relevance** for and potential efficacy in contributing to climate action
- **How proven instances of blending climate change and decentralization activities by a national or subnational government can be assessed** and how they might be used or adapted for application elsewhere, as appropriate

Assessing and pursuing reform from any of these perspectives requires:

- **Documenting priority climate change issues**—decarbonization or other GHG mitigation, transition to low-carbon economies, extreme physical disaster risks and slow-onset environmental change—experienced in a particular country or location (section 2.1)
- **Identifying possible remedial measures to alleviate priority issues** (section 2.2 outlines basic considerations, and tables 2.1 and 2.2 illustrate decarbonization, mitigation, and adaptation measures)

- **Understanding the legally defined, actual, and latent roles of subnational governments in potentially productive remedial actions, as well as the current and potential relationships these subnational governments have or could have with other actors** (general treatment in section 3 and more specifics regarding climate change in section 4)
- **Determining the challenges associated with the current arrangements and possibilities for, as well as the feasibility of, adopting the desired reforms** (section 4.3, with more detailed discussion of administrative decentralization in section 5 and illustrative cases in section 6)

Expertise in both climate change and decentralization and intergovernmental relations would be valuable on a team that is considering opportunities for enhancing subnational climate change policies and reforms.

7.2 Diagnosing Needs and Assessing Options for Subnational Administrative Action

The administrative measures that could be used for climate policy and action are potentially extensive. Many problems will require multiple remedial and preventive actions, so that even if a regulation is beneficial in principle, it may be ineffective if complementary operational or information functions—and perhaps including fiscal incentives—are not simultaneously adopted.

The institutional/intergovernmental landscapes in which these climate change issues play out and must be recognized were also shown to be diverse and complex. Various governmental and nongovernmental actors at one or more level(s) may be differentially or redundantly empowered to take specific administrative actions. There may also be established or potentially productive relationships (mandatory or voluntary) among actors that need to be considered.

Four basic questions are assessed to identify and begin to prioritize potential measures:

1. **Which aspect(s) of climate change action are the main priorities in a particular case?**

This assessment should be based on a review of the available data by climate change experts. Countries party to the Paris Agreement will already have NDCs, and most will have institutional arrangements for managing their climate change response. Subnational governments may build on national efforts, and larger, more capable regional and urban governments have their own mechanisms and defined needs. Priorities are driven by specific critical problems of public concern in a country or subnational jurisdiction, such as worsening pollution, episodic flooding, or environmental degradation that harms quality of life. Prioritization may also be influenced by a recent catastrophic climate-related event, the effects of which might have been less severe had proper precautions—better, more regular measurement of relevant indicators, sound regulations, provisions for construction of climate-resistant infrastructure, and so forth—been in place.

2. **Which types of policies and actions would be appropriate to deal with the priorities?**

Prescribing specific remedial options in a particular case is beyond the scope of this paper, but the types of policies and actions relevant to dealing with specific climate issues can be identified. Examples of policies and actions were presented in tables 2.1 and 2.2, with more specific treatment of administrative decentralization in section 5 and selected cases in section 6. This information and other issue-specific materials can guide the identification of alternatives.

3. **Which relevant policies and mechanisms are already in place?**

Once potential options are determined, the next step is to establish if/to what extent they or elements thereof are currently in place (including which actor(s) have responsibility) and how well they are functioning. This can suggest more specific reforms and gaps that need to be filled. This assessment also involves deciding which actors to involve, including subnational governments, and the need for collaboration with other governmental and nongovernmental partners. Table 3.1 maps intergovernmental system institutional structures and options and sections 4, 5, and 6 discuss or illustrate selected principles and practices specific to climate change action.

4. What factors need to be considered to operationally define and implement subnational administrative reforms that realistically support a sustainable climate response?

The previous questions identify administrative functions that—individually or in some combination—have the potential to alleviate priority climate issues. It may be tempting to pursue reform that seems relatively easy to design and adopt, such as climate friendly investment or procurement guidelines. Such reforms, however, depend on other measures, such as environmental standards and building codes. In addition, political, bureaucratic, and capacity challenges may constrain what is feasible. Understanding the extent and severity of such constraints enables analysts to identify pragmatic initial reforms and sustainable longer-term reform trajectories.

Table 7.1 provides a simple guide to help determine the and strategy for undertaking a particular type of climate-related administrative reform, as well as the scope of effort that will be needed, once priority needs are identified. It is linked to the four questions outlined above.

- Climate change priorities in a particular context (question 1) would be determined by climate experts before using this table.
- The main rows list illustrative types of functions under the administrative categories reviewed in section 5 (question 2). Only some of them will be potentially suitable to dealing with priority climate issues in specific contexts.
- The main columns list selected criteria to document and assess any measures related to options identified that are already in place and to identify the possible reforms and actors that might be involved (question 3), as well as to prompt analysts to assess the feasibility of reforms or new measures chosen for consideration (question 4).
- Once potentially suitable options are identified, more detailed function-specific diagnostics would be needed to make final decisions and design reforms.

Indicative considerations for each of the criteria in the main columns of table 7.1 include:

1. Status, Quality, and Performance of Existing Arrangements

- To what extent is there a legal and operational framework for the administrative function(s) of interest to deal with the specific problem identified? For example, are there well-defined systems and procedures for land use, building codes, and environmental standards?
- How can support for the development of such frameworks and systems be part of the World Bank's climate and decentralization initiatives?
- Are the framework and operating system consistent with the normative principles applied in the country context? For example, are land-use and other regulations consistent with sound principles and based on specific climate change mitigation and adaptation data and goals?
- Is there any evidence on the performance of the current arrangements?
- How can improving the scope and quality of such mechanisms be incorporated into World Bank support activities?

Table 7.1. Assessing Subnational Administrative Functions to Support Climate Action

1. Climate Change Priorities 2. Administrative Functions with Potential to Address Climate Priorities		3. Current Functions, Actors, Reform Areas, and Possible New Measures				4. Considerations to Assess Feasibility and Prioritize Actions			
	ASSESSMENT CRITERIA (to inform the process of selecting reforms and judging feasibility) **FUNCTIONS** (climate action options)	1. Status/Quality/Performance	2. Responsibility for Policy/ Implementation	3. Collaboration/ Partnerships	4. Enforcement Authority	5. Capacity	6. Complementary Reforms	7. Feasibility of Reforms	8. Overall Scope for Support
Which climate change actions are the main priorities?	**REGULATORY** • Zoning and Land Use • Energy Efficiency Standards • Emissions Standards								
	OPERATIONAL • Development Planning • Procurement • Budgeting/Public Financial Management								
	DATA • Emissions Inventory • Vulnerability Analysis • Performance								
	COLLABORATIVE GOVERNANCE • Intergovernmental Coordination • Multi-Actor Partnerships • Community Engagement								

2. Responsibility for Policy and Implementation:

- Is there clarity on the level of government and actors (governmental or nongovernmental) responsible for specific aspects of the function? Is assignment exclusive or shared?
- Is the official assignment appropriate (based on principles and context), or is there a misassignment (e.g., overly centralized or decentralized, assigned to a weakly accountable entity) or conflicting assignment (e.g., similar administrative powers assigned to multiple actors without guidance on boundaries for sharing)?
- How might assisting with the realignment of responsibilities and/or the alleviation of ambiguity and conflicting assignments be part of World Bank support efforts?

3. Collaboration/Partnership Arrangements

- If multiple actors are involved, are appropriate principles/mechanisms/procedures in place for the actors to work together? For example, if environmental regulations or resilient infrastructure development involve multiple government levels and/or nongovernmental actors, is there an appropriate governance mechanism to ensure productive collaboration?
- Are the existing arrangements working effectively, and have any performance issues been documented?
- How can World Bank support efforts help to improve the operation of existing mechanisms or provide assistance on developing new workable arrangements?

4. Enforcement Authority

- Is the entity (single or multi-actor) responsible for an administrative function sufficiently empowered to enforce regulatory mandates, to oversee procedural compliance, to monitor data collection, quality, and use, or to manage/play its/their role in collaborative governance mechanisms under their purview?
- What is known about the effectiveness of any current enforcement arrangements?
- How can assisting with the improvement or development of enforcement mechanisms be included in World Bank support?

5. Capacity

- Does the government entity (or entities) assigned a particular administrative function possess adequate capacity to meet its/their obligations?
- If not, do they have access to suitable training opportunities, technical support, and/or other actors and resources that can help them to execute their functions?
- How can capacity deficiencies be addressed in World Bank support through technical assistance and capacity building that institutionalize the requisite competence?

6. Complementary Reforms

- Does the administrative reform under consideration depend on other simultaneous or appropriately sequenced reforms? For example, climate-friendly environmental and land use regulations depend on enforcement authority and community outreach to inform businesses and residents and nurture their buy-in.
- Is financial support needed to secure compliance with administrative reforms? These may include intergovernmental transfers (conditional or performance-based as appropriate) and/or authority to levy fees and/or to borrow for climate-friendly investments (with necessary support to do so, such as subsidized interest rates or loan guarantees).
- How can World Bank support help to promote adoption of the interdependent reforms needed to enhance the role of subnational governments in climate change response?
- How can the World Bank assist with the prioritizing and sequencing of appropriate reforms intended to make subnational governments stronger players in climate response?

7. Feasibility of Reform

- How feasible is (are) the desired reform(s) in light of prevailing realities?

- Beyond capacity considerations covered under (5) above, are there political, bureaucratic, or other challenges that will need to be considered before potentially sensitive reforms, for example, those related to land use or decentralization of a particular function, can be pursued?

- How can potential obstacles be addressed through World Bank support, either by alleviating them or developing options for making progress that do not run into potentially insurmountable (at least in the short and medium term) constraints?

8. Overall Scope for Support

- Considering the above points collectively as appropriate can point to how the World Bank might engage with counterpart governments and specific actors to support reforms, though broader programs may involve multiple World Bank practices and government actors.

- Some initiatives may be undertaken at the subnational level if such engagement with appropriate World Bank practices and government actors is feasible.

These questions and criteria are selective and indicative rather than exhaustive or mandatory, as the intention is to help frame thinking on design interventions that operate at the intersection of administrative decentralization and climate policy. Productive negotiation among decentralization and climate policy stakeholders will be needed to define a workable approach in a particular case.

In developing reforms, strategic implementation almost invariably merits greater attention. Developing carbon reduction targets, for example, requires considering how to attain them—the actors and processes involved at various stages, the appropriate sequence of actions, the time frame over which they can be effectively and sustainably realized—and how to monitor progress and make necessary adjustments as the action is rolled out.

7.3 Concluding Observations

This paper reviewed the ways in which subnational governments can use administrative decentralization to take climate change action. It did not, however, offer the type of specific recommendations that those working in this field might have desired. Generalization and prescription are elusive due to the various factors discussed throughout the paper: differential impacts of climate change; diverse intergovernmental systems with varied levels and combinations of subnational powers; the broad scope of administrative functions and the lack of a unified underlying conceptual framework; the intrinsic uncertainty associated with climate change impacts, trajectories, and timelines; the lack of solid empirical evidence; and a range of constraints imposed by information gaps, political dynamics, and capacity deficiencies, among others.

What the paper does offer is a review of key issues and a basic analytical framework to assist in the assessment of possible subnational administrative measures to address climate change. It also makes

the case that subnational governments could play a stronger role in climate change action, both generally and with respect to administrative functions. There have been efforts to engage subnational governments, and many have taken independent actions, including a range of experiments and partnerships. Sound assessment, appropriate modification, and judicious adaptation and expansion of these efforts can be part of a broader intergovernmental effort to respond to climate change in a collaborative and integrated way that creates opportunities for the productive rebalancing of roles and relations between national and subnational actors. Such an approach can create momentum for reform and potentially support the pursuit of progressively more ambitious local, national, and global climate goals over time.

A related consideration is that national governments and development partners can nurture adoption of proven means of subnational climate action with dedicated support and incentives, an approach the World Bank already uses in many ways. This support would benefit from flexibility to adapt to the many variations noted above. Negotiated arrangements, for example, in which subnational governments agree to certain actions and partnerships benchmarked by performance standards, could provide a foundation on which to build progressively stronger efforts as subnational experience grows and subnational capacity improves. Such asymmetric processes tailor expectations and actions to particular situations but can still be tied to country commitments under the Paris Agreement.

Considerably more work is needed to advance assessments of the role of subnational administrative functions in addressing climate change and specific reform options in particular countries. There is much to gain by pursuing this agenda, but the territory is extensive and diverse and there is no universally applicable set of procedures or policies for how to proceed. Making further progress with the World Bank's agenda requires the Governance Practice to determine its priorities and consider how it can best work with other practices that are already taking the lead or working on climate change response. Once such decisions are made, more specific and detailed diagnostics, collaborative mechanisms, and policy approaches could be developed to guide future programming in this area.

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