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Pathways to Urban Transformation

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Pathways to Urban Transformation

The Five Pathways

Five pathways to urban transformation emerge throughout the *Second Urban Climate Change Research Network Assessment Report on Climate Change and Cities (ARC3.2)*. These pathways provide a foundational framework for the successful development and implementation of climate action in cities. Cities that are making progress in transformative climate change actions are following many or all of these pathways. The pathways can guide the way for hundreds of cities – large and small, low-, middle-, and high-income – throughout the world to play a significant role in climate change action. Cities that do not follow these pathways may have greater difficulty realizing their potential as centers for climate change solutions. The UCCRN ARC3.2 Pathways are:

- *Pathway 1 – Integrate Mitigation and Adaptation*: Actions that reduce greenhouse gas (GHG) emissions while increasing resilience are a win-win.
- *Pathway 2 – Coordinate Disaster Risk Reduction and Climate Change Adaptation*: Disaster risk reduction (DRR) and climate change adaptation (CCA) are the cornerstones of resilient cities.
- *Pathway 3 – Co-generate Risk Information*: Risk assessments and climate action plans co-generated with a full range of stakeholders and scientists are most effective.
- *Pathway 4 – Focus on Disadvantaged Populations*: Needs of disadvantaged and vulnerable citizens should be addressed in climate change planning and action.
- *Pathway 5 – Advance Governance, Finance, and Knowledge Networks*: Developing robust city institutions, advancing city creditworthiness, and participating in city research and action networks enable climate action.

1.1 Introduction

At the United Nations Framework Convention on Climate Change Conference of the Parties (COP21) held in Paris in December 2015, cities¹ were recognized as key actors in both mitigation and adaptation, which are now understood as encompassing low emissions development and resilience. The COP21 Paris Agreement, entered into force in November 2016, highlights the significant role that cities play in implementing national commitments: *“Agreeing to uphold and promote regional and international cooperation in order to mobilize stronger and more ambitious climate action by all Parties and non-Party stakeholders, including ... cities ...”* As is now widely acknowledged, cities can be the main implementers of climate resiliency, adaptation, and mitigation. The Second Urban Climate Change Research Network (UCCRN) Assessment Report on Climate Change and Cities (ARC3.2) addresses the critical question of under what circumstances this advantage can be realized. Cities will not be able to address the challenges and fulfill their climate change leadership potential without transformation.

ARC3.2 aims to provide the knowledge needed for cities to achieve transformation in order to fulfill their emerging role as prime actors in low emissions development and resilience. ARC3.2 synthesizes a large body of studies and city experiences and finds that transformation is essential if cities are to excel in their role as climate change leaders. As cities mitigate the causes of climate change and adapt to new climate conditions, profound changes will be required in urban energy, transportation, water resources, land use, ecosystems, growth patterns, consumption, and lifestyles. New systems for urban sustainability will need to emerge that encompass more cooperative and integrated urban-rural, peri-urban, and metropolitan regional linkages.

Cities are a prime source of greenhouse gas (GHG) emissions and thus collectively represent a significant opportunity to promote climate mitigation. In regard to resilience, climate change in cities encompasses a wide range of direct and indirect impacts, with more frequent extreme temperatures, exacerbated coastal and inland flooding, increases in vector-borne diseases, and heightened water shortages posing risks to infrastructure, resource availability, health, and ecosystems.

Although there is great potential for cities to respond to climate change with transformative solutions of global significance, early actions to date in cities have mostly been incremental. However, international urban climate change networks are gaining strength, city climate change programs are being funded by national governments and foundations, and individual cities are taking on responsibility for both reducing GHG emissions and building resilience. This leadership role of cities is likely to

expand and deepen as the implementation phase of global climate action, initiated in Paris in 2015 and entered into force as international law in November 2016, gets under way.

Climate change impacts have widely varying consequences on cities as diverse as New York, Mexico City, Lagos, Shanghai, and Indore. As cities develop their own individual responses to increasing climate risks, a strong knowledge base of cutting-edge science and case studies of effective actions in other cities can contribute to effective and efficient decision-making. Furthermore, urban planning and decision-making at the city level needs to be complemented by policy-making and actions at state, regional, and national levels as well.

For ARC3.2, the Urban Climate Change Research Network (UCCRN) has engaged with urban decision-makers and communities of practice² to synthesize the necessary pathways to transformation – both the mechanisms by which urban areas respond to risks and the links between urban mitigation and adaptation. Only through transformation can cities rise to the dual challenge of protecting their vulnerable populations and economic activities from increasing climate risks while taking actions to reduce GHG emissions, the root cause of climate change.

1.2 Urbanization, Transformation, and Sustainable Development

We now live on an urban-dominated planet (see Box 1.1). More than half of the world’s 7.3 billion people live in cities, and almost all of the projected population growth at least through the year 2050 is expected to take place as part of the urbanization process (UN Population Fund [UNPF], 2015). According to the UNPF, it is likely that two-thirds of the world’s population will live in cities by 2050 and that urbanization will be especially dramatic throughout Asia and Africa and in smaller urban areas (Seto et al., 2011). Not only does the majority of the world’s population live in cities, but also the large majority of the world’s wealth-generating capacity (likely 90% or more) takes place in cities (Seto et al., 2012). As a result, the prospects for global sustainability will be determined primarily by what happens in cities. As centerpoints for human settlement and economic activity, cities have become the focus of attention with respect to GHG emissions and climate risk exposure and vulnerability, and thus leading actors in climate adaptation and mitigation.

Urbanization can be defined as a set of system-level processes through which population and human activities are concentrated at sufficient densities at which a variety of scalar factors become present that in turn can promote further agglomeration effects. The most obvious manifestation of the urbanization process is the conversion of non-urban land to urban land uses. Urbanization not

1 Cities are defined here in the broad sense to be urban areas, including metropolitan, suburban, and peri-urban regions.

2 City decision-makers and communities of practice encompass a broad range of stakeholders that includes municipal governments, civil society groups, local organizations, international agencies, and donors.

Box 1.1 Demographics and Climate Change

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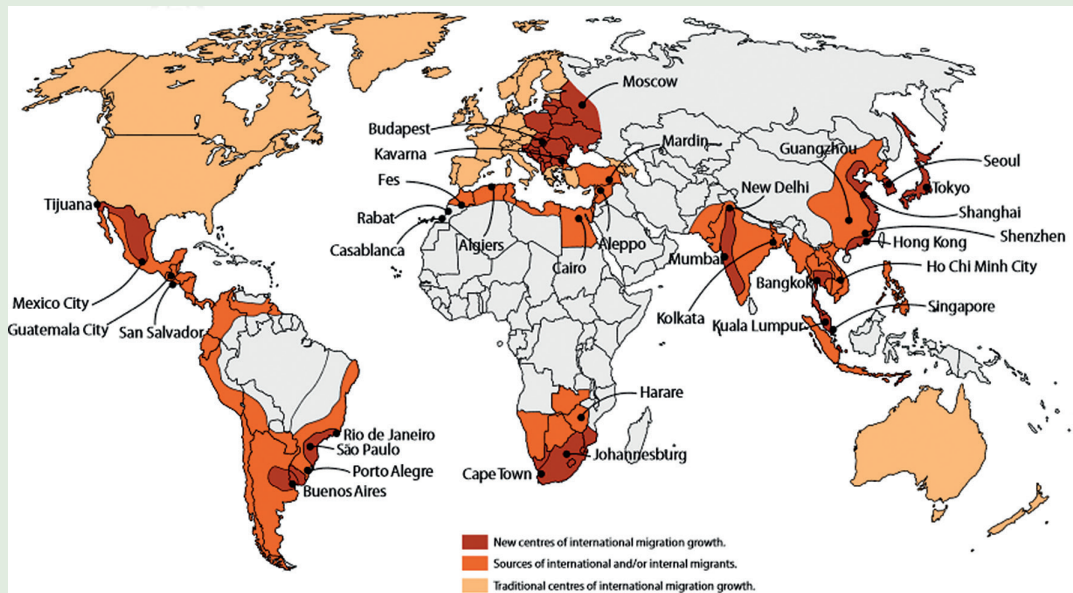
United Nations Population Fund, New York

A few years ago, the world population turned for the first time from majority rural to majority urban. With high proportions of city-dwellers in the Americas, Europe, and industrial countries of Asia and Oceania, this trend is seen as irreversible. Countries vary widely in the proportion of the population living in cities. Most Asian countries are predominately rural today, even while being home to some of the world's largest urban areas (UN Dept. of Economic and Social Affairs, Population Division, 2014, 2015).

These trends have important implications for climate change. Low-lying coastal zones are more likely to be disproportionately urban (McGranahan et al., 2007) thus implying that urban residents, more so than rural ones, will experience the untoward effects of hazards associated with seaward climate-related change (e.g., increased frequency or severity of coastal flooding). Cities dwellers are different from the general population in other ways as well. Cities tend to have somewhat younger age structures than the rest of the population, in part because cities receive migrants from other cities, towns, and rural areas and because migrants themselves tend to be young (Montgomery et al., 2012).

The relationship between migration and climate change, including internal migration to cities, is commonly understood as flight from climate impacts or, in extreme instances, migration driven by existential threats, as in the case of some small-island developing states. Yet the history of natural disasters shows that most displacement is relatively short term and local (Tacoli, 2009). Environmental drivers have always been a component of mobility, but the full calculus of migration includes social and economic factors as well. Given rural to urban migration, often toward coastal cities, significant amounts of internal migration may be increasing people's geographic exposure to climate hazards while at the same time improving and diversifying livelihoods. The net effect of urbanization driven by rural-urban migration on climate resilience is therefore highly contingent on circumstances, climate threats, and the protection factors in place.

City size is an often overlooked characteristic of development, with much attention being paid to mega-cities. In the developing world, only 12% of urban population lives in cities of 10 million persons or more, whereas about one-quarter of urbanites live in relatively small cities with populations of 100,000–500,000. Small cities tend to grow faster than large cities (Balk et al., 2009). Yet, small cities with far fewer resources may find this faster growth particularly challenging. Decentralization and the pressures of local governance further complicate or hamper the task of climate adaptation, where many interventions will be local. Even in terms of mitigation, secondary and tertiary cities may be at the mercy of



Box 1.1 Figure 1 *Global diversification of migration destinations.*

Source: IOM, 2015. Adapted from Skeldon, 2013

regulations designed for the biggest cities. City growth itself bears consideration: it may impact urban water availability well before the full effects of a warmer climate are realized in the second half of the 21st century (McDonald et al., 2011) (see Chapter 14, Urban Water Systems).

In terms of mitigation, the relationship between the demographic phenomenon of urbanization – or the increasing share of population that lives in urban areas – and GHG emissions is complex and is greatly dependent on a number of other factors. Urban areas are disproportionately the sources of emissions globally, and, in that sense, the trajectory of urbanization is correlated with the trajectory of emissions growth (O'Neill et al., 2010). However, much of this effect is driven by the concentration of wealth in cities; controlling for income, urban living is more energy efficient than rural living, meaning that the broad-scale shift of population from rural to urban provides the potential for a significant mitigation

benefit (Dodman, 2009a). Yet the link between urbanization and emissions also depends on income and wealth, including their distribution in society, as well as on technologies for energy use and urban form (Dodman, 2009b). Cities are also home to smaller households with more independent dwelling units overall; this is complicated because an increasing share of these households are elderly, which tends to lower emissions (O'Neill et al., 2010; Zagheni, 2011). Scenarios of population, economic factors, and technology – for instance the shared socioeconomic pathways (SSPs) (Hunter and O'Neill, 2014) – are useful in global and regional studies assessed by the Intergovernmental Panel on Climate Change (IPCC). Understanding trajectories of emissions and population change in cities is critical for identifying the best approaches to mitigation and adaptation.

For further coverage of this topic, see Box 6.4 in Chapter 6, Equity and Environmental Justice.

only transforms specific sites where cities are located and growing, it is a condition that also has created a web of global-scale resource supply, demand, and waste distribution chains resulting in impacts far beyond city borders. The metabolism of cities has impacts throughout the globe and is responsible for the transport into cities from nearby hinterlands and far-distant locations of primary resources such as energy and water, secondary resources including timber and building materials, and agricultural products.

Cities and their residents have the potential to play an important role in responding to climate change, but concerted transformative action is necessary to overcome the negative effects of the urbanization process. Given the clustering of economic activities, cities often become sites of increased per capita resource consumption in comparison to rural areas. Urban dwellers, particularly in low-income countries, may have relatively higher incomes than their rural counterparts so they tend to consume more. At the same time, density provides economies of scale and resource-use efficiencies so that more people are served with fewer inputs, albeit at higher aggregate consumption (Wenban-Smith, 2009). A case in point is GHG emissions: cities produce approximately 70% of CO₂ emissions (depending on measurement protocols) yet the per capita energy consumption of urban residents tends to be lower than that of rural residents in developed countries (UN-Habitat, 2011; Seto et al., 2014).

In regard to resilience, urbanization concentrates population, infrastructure, and economic activity thus potentially exacerbating vulnerability to extreme climate events. In addition, cities are defined by complex interdependent infrastructure systems and established social and financial networks. Understanding and integrating these circumstances into ongoing climate efforts presents a clear opportunity for enhanced resilience.

In ARC3.2, larger-scale mitigation and adaptation actions are presented within the context of transformation (see Box 1.2).

Transformations are defined as the conditions under which system-level changes take place when the integrated urban energy and risk-management regimes of a specific site, sector, or institution are fundamentally altered as one management regime is replaced by another regime. Transformation opportunities and contexts are explored explicitly in several chapters of ARC3.2 (see Chapter 3, Disasters and Risk; Chapter 4, Mitigation and Adaptation; Chapter 5, Urban Planning and Design; and Chapter 16, Governance and Policy).

1.2.1 Cities as Urban Social-Ecological Systems

In this volume, we understand cities to be complex social-ecological systems (SES), uniquely endowed with attributes and functions that enable them to be the first and leading responders to climate change challenges in both mitigation and adaptation (Redman et al., 2004). Urban systems are dynamically interactive at multiple spatial or temporal scales (see Figure 1.1). They consist of social and ecological components (broadly defined) that have their own internal processes; at the same time, these processes interact across the entire urban system in a variety of ways to produce overall urban system forms and dynamics. Drivers external to the urban system are fundamentally important and affect the social and ecological components and processes with different strengths or intensity. This conceptual approach to studying urban SES is scale-independent and can therefore be applied at multiple spatial or temporal scales (see Chapter 8, Urban Ecosystems).

The role of technology in the structure, metabolism, and management of cities is profound. The operation and potential failure of the technological systems of cities have important implications for the resilience of urban areas. Climate extremes in urban contexts reveal the potential for catastrophic collapse resulting from large-scale disturbances and cascading system failures. At the same time, the integration of social, ecological,

Box 1.2 Urban Climate Change Transformation

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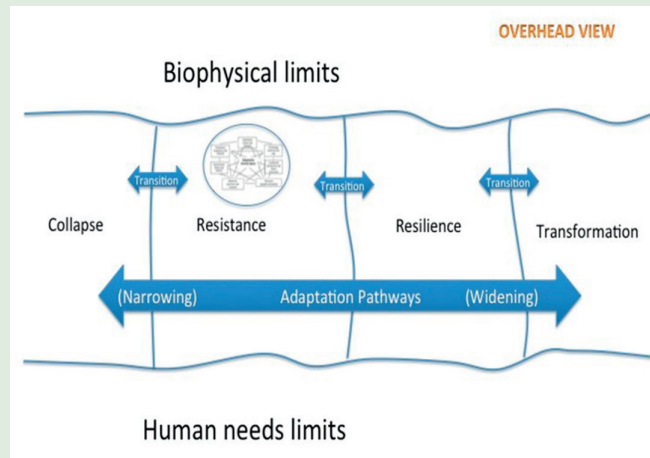
Transformation in the context of systems is found when a system, subsystem, or system components are no longer tenable and are replaced with a new system-level configuration. Expressed differently, this implies that the limits of resilience, adaptive capacity, and hence sustainability of the *status quo* are exceeded and incremental reforms are inadequate, with the result that systemic changes become inevitable and essential. Likewise, urban energy systems will undergo similar systemic change as forms of high-carbon development become untenable. The integration of larger-scale mitigation and adaptation actions are presented in the ARC3.2 within the context of transformation.

Transformations are defined as the conditions under which system-level changes (including value systems; regulatory, legislative, or bureaucratic regimes; financial institutions; and technological or biological systems) take place when the urban energy and risk-management regimes of a specific site, sector, or institution are fundamentally altered as one management regime is replaced by another new regime that integrates both mitigation and adaptation. Transformation opportunities and contexts are explored explicitly throughout this ARC3.2 volume.

Transformation opens new policy options once resilience and energy systems meet their limits. Transformation targets the root drivers of unmet sustainable development needs

where these constrain mitigation, adaptive capacity, and action (see examples in Marshall et al., 2012). Intentional transformation of one system or object may allow the maintenance of systems at other scales (e.g., relocation of households exposed to risk will be transformative for the households involved, for the places of origin, and for the destinations) and may require legislative change. At the same time, relocation may help maintain wider political and economic or social stability. Forced transformations may open greater scope for uncertainty in the behavior of surrounding systems. In comparison, transformation has been developed from a broad range of social science frames particularly focused on development theory and political ecology approaches (Welsh, 2014; Brown et al., 2013; Brown, 2014; Cote and Nightingale, 2011).

Transformations involve large, abrupt, and persistent changes in the structure and function of a physical or social system, such as changes in governance structures or policy objectives. They can open up the possibility of new rights being extended, of greater social and economic equality and greater political participation, and of sustainable development in response to a stressor or shock. Transformations provide abrupt redirecting to alternative development pathways for the system of interest. It may be that the system undergoing transformation is localized and discrete in sector terms, or it may be grand and all-encompassing. Thus, these shifts can be small and local or very widespread in their effects. A transformative state also can be one that is highly dynamic and potentially difficult to predict (Simon and Hayley, 2015; Solecki et al., 2016). As formulated in ARC3.2, urban climate change transformation integrates mitigation and resilience and leads to fundamental regime shift at both local and larger systems levels.



Box 1.2 Figure 1 Adaptation activity sphere, transitions, and pathway. Time in this diagram is not left to right. Adaptation pathways can move from a lower state to a higher state (i.e., from left to right) or from a higher state to a lower state (i.e., right to left). Time is referenced from the current to moments or eras in a future time.

Source: Solecki et al., 2017

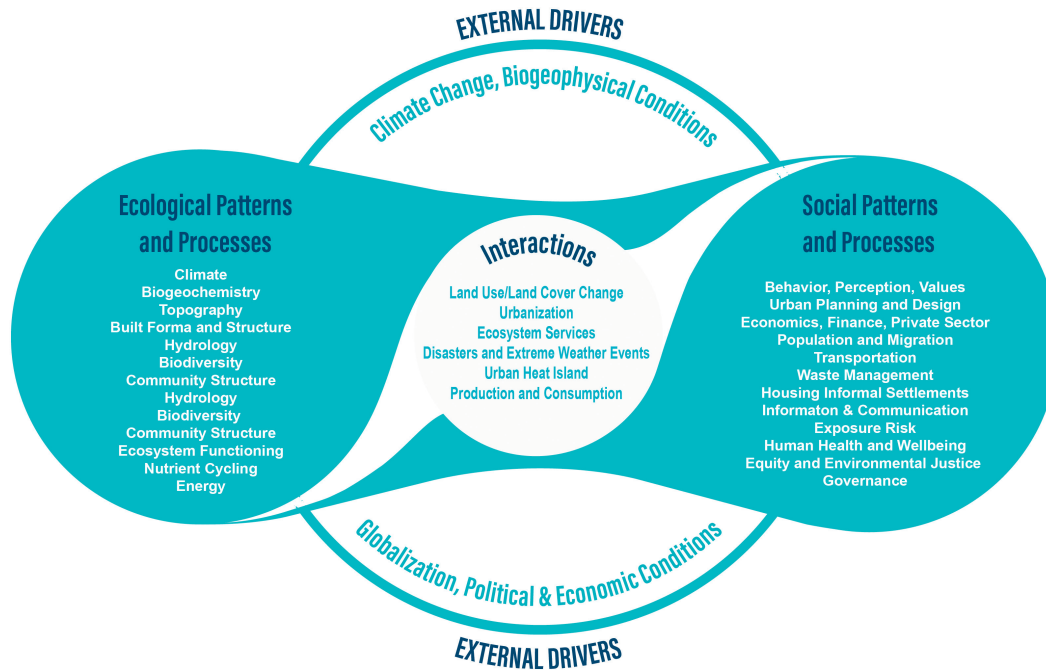


Figure 1.1 *The urban social-ecological system.*

Source: Adapted from Redman et al., 2004

and technological systems in cities provides transformative avenues leading to urban climate adaptation and mitigation.

The use of an urban systems approach is valuable for assessing climate risks and impacts, as well as adaptation and mitigation opportunities and challenges. Systems can operate in a variety of ways including simple linear and complex non-linear interactions and responses. Urban system sectors typically involve relatively well understood, linearly structured engineering systems but are embedded in complex societal and ecological systems with non-linear structures. The systems approach provides a framework for understanding the role and significance of stresses on the operation of urban sectors, metrics of resilience, and early-warning signals of potential system crises and pending system tipping points.

Finally, planning and governance are key dimensions of cities as SES (see Chapter 5, Urban Planning and Design, and Chapter 16, Governance and Policy). Urban climate change governance is the set of formal and informal rules, rule-making systems, and actor networks at all levels (from local to global), both in and outside of government, that are established to steer cities toward mitigating and adapting to climate change (Biermann et al., 2009). Urban climate change governance occurs within the broad context of the SES, with actors and institutions at a multitude of scales shaping the effectiveness of interventions.

1.2.2 Disaster Risk Reduction and Climate Resilience

In laying out concepts related to disaster risk reduction (DRR), ARC3.2 moves from the earlier linear impacts-centric framing of climate hazards, vulnerability, adaptive capacity, resilience, and impacts to an ongoing process-based decision-centric framing that explicitly includes the roles of stakeholders and institutions, governance, capacity building, and exposure reduction (see Figure 1.2) (see Chapter 3, Disasters and Risk). This framing explicitly incorporates elements of DRR and climate change adaptation and highlights operational, management, and governance opportunities for defining connections between the two. Resiliency presents an effective vehicle for highlighting these linkages because it can be applied to both the post-disaster context as well as to the longer-term transformations associated with climate change adaptation.

Often, city governments are the first level of connection to address resilience and DRR in urban areas; however, they often lack technical, knowledge-based, and financial capacities. Regional and national governments need to be engaged through legislation that expands city mandates on DRR and climate change.

Currently, many initiatives are assisting city governments in addressing their needs for building urban resilience and reducing disaster risks. The newly implemented “Ten Essentials”³ of the *Making Cities Resilient Campaign* of the United Nations Office

3 http://www.unisdr.org/files/26462_13.tenessentialchecklist.pdf

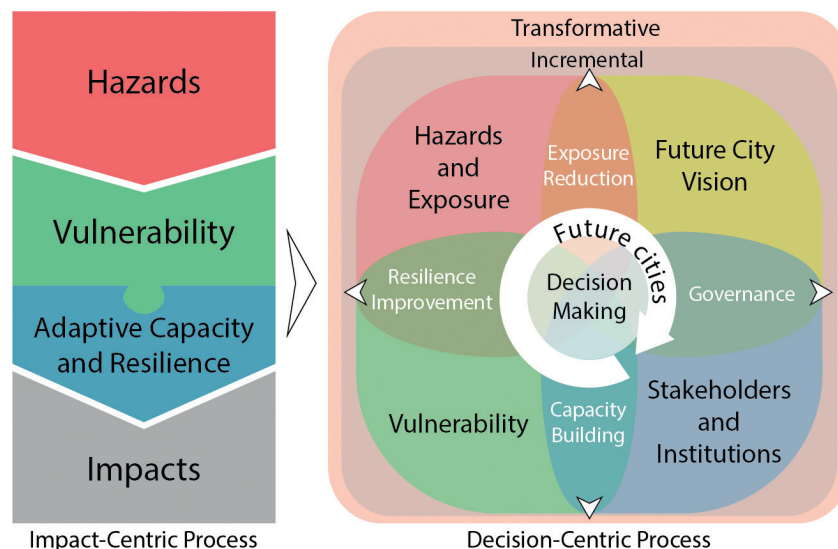


Figure 1.2 Shift from impact-centric to decision-centric process for disaster risk reduction and climate resilience.

Source: Xiaoming Wang and Ebru Gencer, 2014; adapted from Xiaoming Wang, 2014

for Disaster Risk Reduction (UNISDR) have provided city governments with practical tools and indicators to build their resilience (see Box 3.3). Currently, nearly 3,000 cities worldwide have joined the Making Cities Resilient Campaign and will be able to use these tools to advance their activities toward DRR and resilience building.

The United Nations Human Settlements Programme (UN-Habitat) City Resilience Profiling Programme (CRPP) is another initiative exploring and providing tools to measure resilience to multihazard impacts and is currently testing these tools in ten pilot cities (UN-Habitat, 2016). The Rockefeller Foundation's 100 Resilient Cities initiative is another program that focuses on building resilience through direct collaboration with city governments (Rockefeller Foundation, 2016) (see CAG 1.6).

1.2.3 Cities, Sustainability, and the Low-Carbon Urban Transition

Urban climate change transformation as presented in ARC3.2 requires the comprehensive integration of mitigation and adaptation. It brings profound changes in energy and land-use regimes, growth patterns, production and consumption, lifestyles, and worldviews (Denton et al., 2014). Some of these actions target the underlying drivers of GHG emissions and vulnerability, such as systems of production and consumption, and the social inequalities that give rise to the coexistence of sub-standard housing, illiteracy, and poverty alongside wealth-related consumptive patterns. As such, transformative climate change actions hold the potential to trigger a broader shift toward sustainable and resilient development pathways (Shaw et al., 2014; Burch et al., 2014).

Just as climate change responses in cities cannot proceed without understanding the larger context of sustainability,

sustainability goals cannot be met without explicit recognition of climate change and the role of cities. The year 2015 not only culminated in the Paris Agreement at the 21st Conference of the Parties for the United Nations Framework Convention on Climate Change (UNFCCC); it was also the year that the nations of the world adopted the Sustainable Development Goals (SDGs) (Sustainable Development Solutions Network [SDSN], 2013) (see Box 1.3). A worldwide campaign was successful in achieving a stand-alone urban sustainability goal, SDG11, to "Make cities and human settlements inclusive, safe, resilient and sustainable." SDG11 targets include:

By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels (SDSN TG09, 2013).

Climate change and sustainability were thus explicitly intertwined in the major policy actions of 2015.

A critical aspect of the movement to sustainability and transformation is the transition to low-carbon cities (see Chapter 12, Urban Energy). The connection between urbanization and GHG emissions is complex (Bulkeley et al., 2012; Bulkeley et al., 2014; Sachs and Tubiana, 2014). Cities present opportunities for resource-use efficiency across a large population. At the same time, rural to urban migration is associated with increased energy demand because citizens in cities are often wealthier and better able to access energy-intensive technologies. Researchers and practitioners are actively attempting to define mechanisms to promote technologies and governance structures that enhance opportunities to promote lower energy demand and uses in cities, a multifaceted social-technological transition.

Box 1.3 The Sustainable Development Goals and Urban Areas

The dynamism of cities is a major sustainable development opportunity (Second Urban Sustainable Development Goal Campaign Consultation on Targets and Indicators: *Bangalore Outcome Document* 12–14 January 2015). By getting urban development right, cities can create jobs and offer better livelihoods, increase economic growth, improve social inclusion, promote the decoupling of living standards and economic growth from environmental resource use, protect local and regional ecosystems, reduce both urban and rural poverty, and drastically reduce pollution. Sound sustainable urban and regional development will accelerate progress toward achieving the sustainable development goals (SDGs).

The Urban Climate Change Research Network (UCCRN) partnered with many city groups on the Urban Sustainable Development Goal Campaign (SDSN, TG09, 2013).

The global Urban SDG Campaign⁴ (urbansdg.org) supported by more than 400 cities, major urban networks, and institutions⁵ played a major role in encouraging the inclusion of SDG 11: “*Make Cities and Human Settlements inclusive, safe, resilient and sustainable.*”

Recognizing this, the United Nations included a stand-alone urban SDG as part of the set of 17 SDGs, passed by the General Assembly in September 2015. Targets included in the urban goal include:

Target 11.1: By 2030, ensure access for all to adequate, safe, and affordable housing and basic services, and upgrade slums.

Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Target 11.3: By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries

Target 11.4: Strengthen efforts to protect and safeguard the world’s cultural and natural heritage

Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Target 11.7: By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities

Target 11.a: Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

Target 11.b: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels

Target 11.c: Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials

Source: www.sustainabledevelopment.un.org

1.3 The Urban Climate Change Research Network

To inform effective city-level action on climate change, UCCRN (www.uccrn.org) was established in May 2007 at a side event held during the C40 Large Cities Climate Summit in New York. Beginning with an initial group of about 100 researchers in 60 cities, UCCRN was created to provide knowledge to the C40 cities and other urban decision-makers to enhance climate science-based policy-making on low emissions development and resilience. To this end, UCCRN has begun a global process for an ongoing city-focused climate change knowledge assessment and solutions program targeted to cities of all geographies, sizes, and income levels. It aims to provide a knowledge base for cities just beginning to assess climate change challenges as well as to those

who are leading response policies and measures. UCCRN has grown to include over 800 members worldwide and is based at the Columbia University Earth Institute in New York, with Regional Hubs in Paris, Rio de Janeiro, Durban, Shanghai, Philadelphia, and an Australian-Oceania Hub co-located in Canberra, Melbourne, and Sydney (see Box 1.4).

1.3.1 Role of ARC3 Process

Research on climate change drivers, impacts, and solutions has proliferated in cities in recent years. The need exists to consolidate and assess the existing knowledge to make it relevant and accessible for all cities. One goal of the UCCRN Assessment Report on Climate Change and Cities (ARC3) series is to complement the Intergovernmental Panel on Climate Change (IPCC) work on human settlements as well as other urban assessments.

⁴ Initiated in September 2013.

⁵ Including UN-Habitat, UCLG, ICLEI, C40, SDSN, Communitas, WIEGO, and SDI.

Whereas in many ways, the ARC3 Reports may be conceived as an “International Panel on Climate Change for cities,” there are significant differences with the IPCC. These include an interactive engagement with stakeholders throughout the assessment process, the inclusion of cutting-edge work that is developed by the cities themselves or by other expert groups outside of the peer-reviewed literature but is nonetheless internationally available, and a combined focus on mitigation and adaptation throughout the volume. ARC3.2 addresses mitigation and adaptation in each chapter, exploring synergies throughout.

ARC3.2 operates as an open process, focusing on stakeholder engagement through the co-creation of knowledge and an emphasis on accessible policy recommendations. It draws on both peer-reviewed and practitioner literature. Besides cities themselves, key stakeholders are global urban-focused multilateral institutions that are taking a growing interest in climate change and cities. The aim is for the ARC3 series to provide comprehensive knowledge assessments for its stakeholders’ benefit, to increase communication and collaboration (see Figure 1.3).

What distinguishes the ARC3 process is the comprehensive global scale at which urban climate change issues are examined and its potential to become the key ongoing assessment process for climate change and urban areas. Rooted in urban areas throughout the world, the UCCRN network of authors is able to provide in-depth understanding of the needs of decision-makers in cities and deliver the information they require. ARC3 expertise spans a broad spectrum of urbanization, climate change,

mitigation, adaptation, resilience, and transformation, and many authors have real-world experience working with urban policy-makers to implement mitigation and adaptation measures “on the ground.” Thus, the ARC3.2 report elaborates and expands on the coverage of both mitigation and adaptation provided by other institutional publications, providing practical information and lessons learned for urban policy-makers as they cope with the challenges that climate change poses to their cities.

1.3.2 First UCCRN Assessment Report on Climate Change and Cities (ARC3.1)

UCCRN’s first major publication was *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network (ARC3.1)* (ISBN-10: 1107004209), published by Cambridge University Press in 2011. The ARC3.1 represented a four-year effort by about 100 authors from dozens of cities around the world and was the first-ever global, interdisciplinary, cross-regional, science-based assessment to address climate risks, adaptation, mitigation, and policy mechanisms relevant to cities. The assessment articulated an urban climate risk framework, presented relevant climate science for cities, and derived policy implications for key urban sectors – water and sanitation, energy, transportation, public health – and system-wide issues such as land use and governance. To contextualize the knowledge, the ARC3.1 presented 46 Case Studies from a wide range of cities, providing lessons learned from mitigation and adaptation efforts in urban areas around the world.

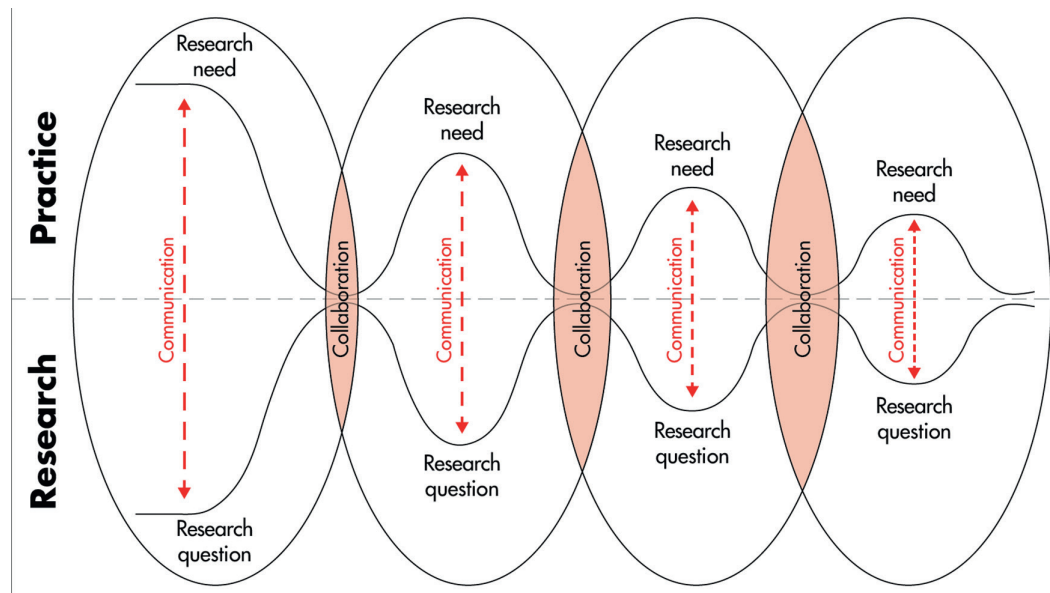


Figure 1.3 The evolution of a collaborative partnership between practitioners and researchers. Each large oval represents a problem common to both the practitioner community and research community. The dashed line down the center of the figure is the conceptual boundary between research and practice. While the problem may be common, the motivations and ways of framing and addressing it are often distinct for each community. As practitioners and researchers communicate more, their mutual understanding of each other’s professional language and culture grows, allowing those collaborative activities to become more complex and resulting in more integrated problem-solving. The net effect of the growth and evolution of these collaborative relationships is that the space shrinks between the research demand and the research supply, and the collaborative space grows. For greater detail, see Case Study 14.3 in Chapter 14, Urban Water Systems.

Source: Ferguson et al., 2014

During the writing phase, the ARC3.1 was presented to and discussed with a broad group of urban stakeholders – governmental, private-sector, and civil society institutions – in many cities and at high-level urban policy forums. On publication, UCCRN disseminated the ARC3.1 to developing country practitioners and scholars in Asia, Latin America, and Africa, and at urban climate change conferences, meetings, and workshops held in cities throughout the world. The ARC3.1 has been used by urban officials and networks to shape city mitigation and adaptation plans and in undergraduate and graduate-level courses to train the next generation of urban professionals.

The report received strong endorsements from leading mayors and other officials with direct responsibility for cities, including the mayors of Mexico City, São Paulo, and Toronto, the Governor of Lagos State, and senators from Indonesia. These endorsements reinforce the value that decision-makers place on urban-specific climate knowledge. Many urban stakeholders expressed demand for a second and broader international climate change and cities assessment report, which is presented in this volume, *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network (ARC3.2)*.

1.3.3 The Second UCCRN Assessment Report on Climate Change and Cities (ARC3.2)

Exciting new directions in regard to cities and climate change have emerged since the publication of the ARC3.1 in 2011. In the past five years, cities are increasingly taking on the role of implementers of climate change mitigation and adaptation policies and programs. A large amount of material about climate change and cities has been published since work was completed on the ARC3.1 in late 2010. Assessing this body of literature and new reports from a broad range of sources, including peer-reviewed literature as well as city and private-sector expert reports, is a key task of the ARC3.2. Lessons from implementation and updated climate science are incorporated to provide cutting-edge information.

The ARC3.2 has become essential as urban actors and scholars continue to create knowledge in the rapidly evolving “space” of urban climate change solutions, city government officials, national government institutions, global city networks, and international organizations. New knowledge is being created at an unprecedented pace due to the increasing scale of action by policymakers and the growing interest of urban scholars. ARC3.2 contributes to the creation of this multidisciplinary space by capturing the aggregate implications of the new research and practice-based policy learning on climate change and cities.

ARC3 stakeholders include urban practitioners, civil society groups, scholars, and city leadership groups. Following the publication of ARC3.1, UCCRN held several scoping sessions at urban climate change conferences around the world, to obtain feedback on the first ARC3 report and solicit suggestions on additional topics of interest for the ARC3.2 report. Scoping sessions were held at the World Delta Summit (Jakarta, 11/2011),

American Association of Geographers (AAG) Annual Meeting (New York, 2/2012), the Third ICLEI Resilient Cities World Congress (Bonn, 5/2012), C40 Large Cities Climate Summit during the Rio+20 Conference (Rio de Janeiro, 6/2012), the Sixth World Urban Forum (Naples, 9/2012), the European Climate Change Adaptation Conference (Hamburg, 3/2013), and the Fourth ICLEI Resilient Cities World Congress (Bonn, 6/2013).

UCCRN also distributed widely an Information Needs Assessment Survey (2013–2014), to draw on user experiences with the ARC3.1 and to tailor ARC3.2 to provide the greatest benefit to city stakeholders and decision-makers. The UCCRN received 68 responses to the survey from 58 cities in 31 countries. Responses were received from individuals working in local government, the private sector, NGOs, academia, and intergovernmental organizations. They included civil servants, elected officials, decision-makers, researchers, and technical, political, financial, and policy experts. Survey respondents were asked, among other questions, how helpful they found the ARC3.1 report, which topics were most relevant to their work, which Case Studies were most relevant, how often they used scientific assessments in their work, which climate-related resources they relied upon most, and how likely they were to obtain climate information or data in their field of work. The results of this survey were presented at the Seventh World Urban Forum in Medellín in 2014.

Stakeholder consultations have proceeded throughout the ARC3.2 writing process, which began with the ARC3.2 Kick-off Workshop held at the Columbia University Earth Institute in September 2013, continued at the ARC3.2 Authors Meeting held in London in September 2014, and culminated at the Climate Summit for Local Leaders hosted at Paris City Hall during COP21 held in Paris in December 2015.

Based on these interactions, ARC3.2 is structured to communicate to a range of groups important for urban decision-making. These include national institutions with responsibility for urban development policies and finance and city leaders and their technical staff who inform the decisions of urban sectors like transport, energy, water, solid waste, and health. There are also key policy units and associated personnel involved in urban decision-making for climate change, including chief sustainability officers, urban planners, and design professionals. Civil society groups, including non-governmental organizations, often play a major role in climate change mitigation and adaptation programs, particularly in low-income countries. In addition, private-sector organizations often provide the technical expertise to implement climate change response plans in regard to both mitigation and adaptation strategies.

The ARC3.2 has undergone three rounds of a rigorous independent peer-review process (see Appendix C). Each chapter of the report has been peer-reviewed by scholars who are subject experts, city decision-makers, and representatives of institutions that organize programs for cities. There were 89 reviewers involved in the review process across three rounds of

review. The chapters cite references from the peer-reviewed and internationally available literature.

The UCCRN presented the *ARC3.2 Summary for City Leaders* during the Climate Summit for Local Leaders during the COP21 in Paris. The full ARC3.2 was shared at the Habitat III Conference in Quito, Ecuador. Other launches will take place

in major cities on all continents. For latest launch information and other news about the Network, visit www.uccrn.org.

UCCRN is active in cities throughout the world and will distribute ARC3.2 to city practitioners and urban scholars from developing countries via its Regional Hubs, with support from international donors (see Box 1.4).

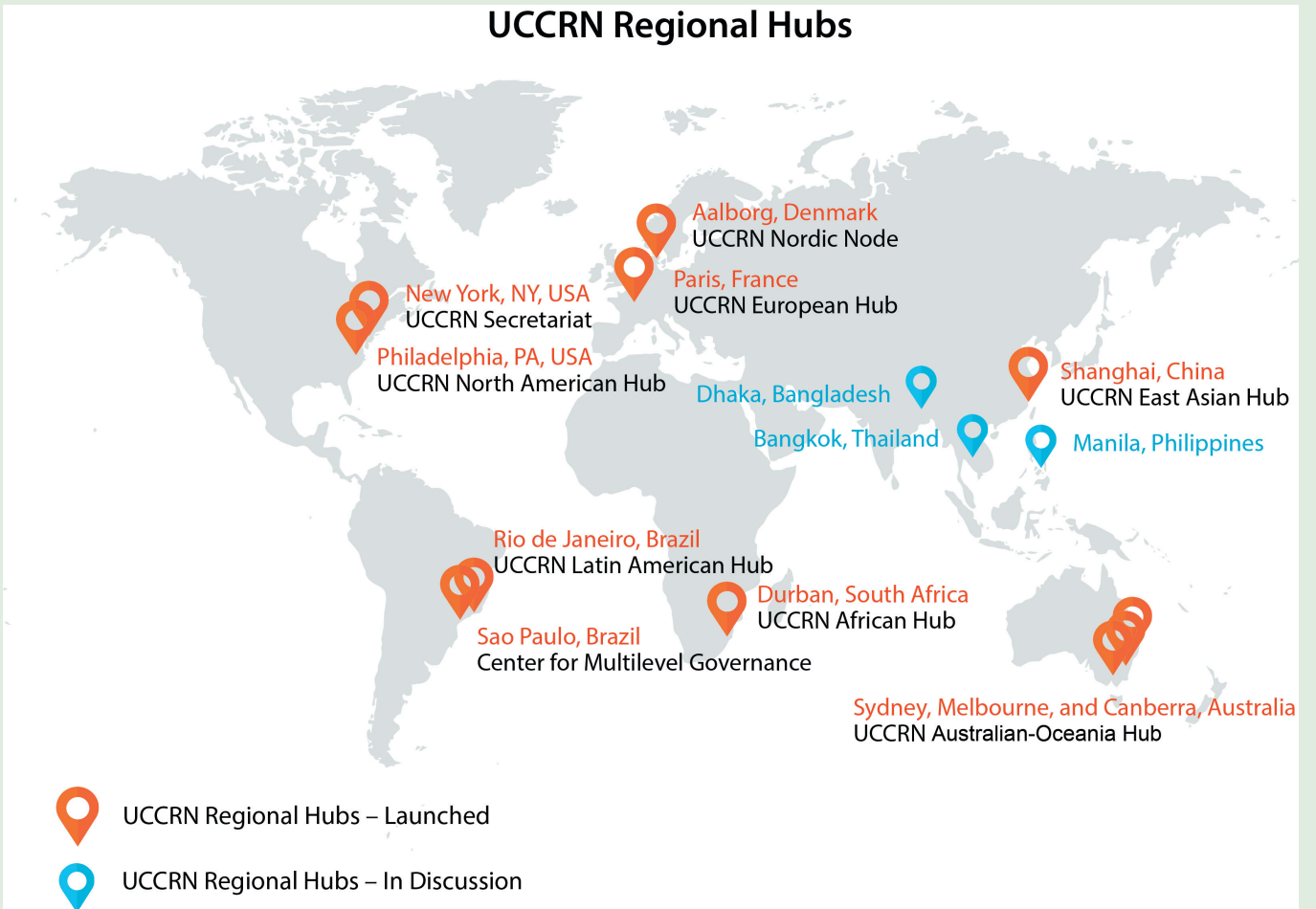
Box 1.4 UCCRN Regional Hubs

The UCCRN Regional Hubs in Europe, Latin America, Australia, Africa, and Asia will disseminate the ARC3.2 in low-, middle-, and high-income cities across the globe and spur ongoing dialogue between stakeholders and scientists. The Hubs promote enhanced opportunities for urban climate change adaptation and mitigation knowledge and information transfer, both within and across cities, by engaging in ongoing dialogue between scholars, experts, urban decision-makers, and stakeholders (see Annex 1 for more details).

The first UCCRN Regional Hub was launched in Paris in July 2015 as the European Hub, in partnership with the Centre National de la Recherche Scientifique (CNRS), University

Pierre et Marie Curie (UPMC), and l’Atelier International du Grand Paris (AIGP).

The UCCRN Latin American Hub was launched in Rio de Janeiro in October 2015, with Instituto Oswaldo Cruz at FIOCRUZ, Universidade Federal do Rio de Janeiro, and the City of Rio de Janeiro. The UCCRN announced an Australian-Oceania Hub at COP21 in December 2015, co-located at the University of New South Wales in Sydney, the University of Melbourne, and the University of Canberra. The UCCRN African Hub was established in Durban, South Africa in May 2016, in partnership with the Durban Research Action Partnership (D’RAP), the University of KwaZulu-Natal, and eThekweni Municipality. The



Box 1.4 Figure 1 Urban Climate Change Research Network (UCCRN) Regional Hubs.

UCCRN East Asian Hub was launched in Shanghai in August 2016, with East China Normal University and the Shanghai Meteorological Service, and the UCCRN North American Hub was launched at Drexel University in Philadelphia in November 2016, to strengthen a North American network of scholars and stakeholders dedicated to climate change and cities.

A Nordic Node has also been established at Aalborg University in Denmark, and São Paulo State, in partnership with the University of São Paulo, is the home of the UCCRN Center for Multilevel Governance. UCCRN is in discussion to launch a Southeast Asian Hub at the Ateneo de Manila University and the Manila Observatory, and others in Dhaka and Bangkok.

In addition to hosting and organizing region-specific, climate change and cities activities and knowledge sharing, Regional

Hubs are also responsible for recruitment and outreach to local urban climate experts to expand the UCCRN network and access an increased diversity of knowledge; stakeholder engagement to connect climate change expertise with city leaders; production of locally focused research and down-scaled projections for the regions; fundraising to support research projects, coordination activities, staffing, and operational expenses; hosting regional and topical workshops for local scholars and stakeholders to facilitate the exchange of ideas around climate change and cities; promotion of the *Urban Climate Change Research Network Assessment Report on Climate Change and Cities (ARC3)* series of reports to targeted stakeholders and translation of reports and publications into regional languages; and liaising between the UCCRN Secretariat in New York and the region.

For more details on the UCCRN Regional Hubs, see Annex 1.

1.4 Structure of ARC3.2

The ARC3.2 is the primary product of UCCRN, with 16 chapters covering a range of topics. It builds on feedback from the readership of the ARC3.1 and a series of focus groups held at urban forums over the past five years that identified the key topics on which city decision-makers required information.

It is comprised of three main parts: the Summary for City Leaders (SCL); the ARC3.2; and the Case Study Docking Station (CSDS) (see Figure 1.4).

The purpose of the SCL is to make assessment results more accessible to urban decision-makers and other stakeholders and

to explicitly address their needs for a focus on solutions (see Summary for City Leaders). The SCL is brief and much more concise than the primary volume. It organizes information differently than the main volume, highlights details that are of interest to the user community, and is written in language that is familiar to them.

The CSDS is a web-based, searchable database that serves to inform both research and practice on climate change and cities. Annex 3 of this volume describes the methods and procedures for development of the CSDS database, including a set of data protocols that enable comparisons across a range of social, biophysical, and economic contexts. 117 Case Studies are included in the ARC3.2, some embedded within the chapters and the rest gathered in the CSDS Annex (see Figure 1.5 and Annex 5).

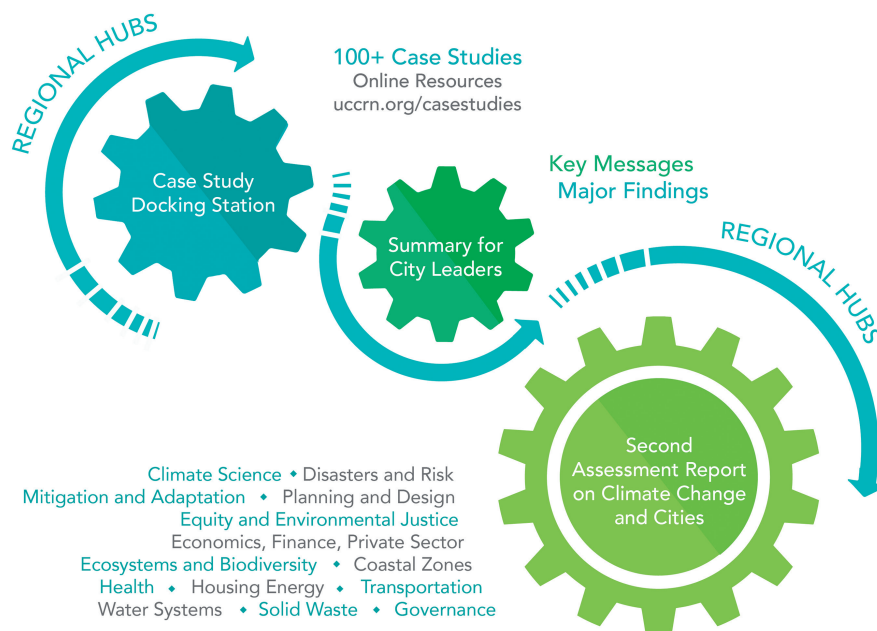


Figure 1.4 Components of the Second UCCRN Assessment Report on Climate Change and Cities (ARC3.2) and their interactions.

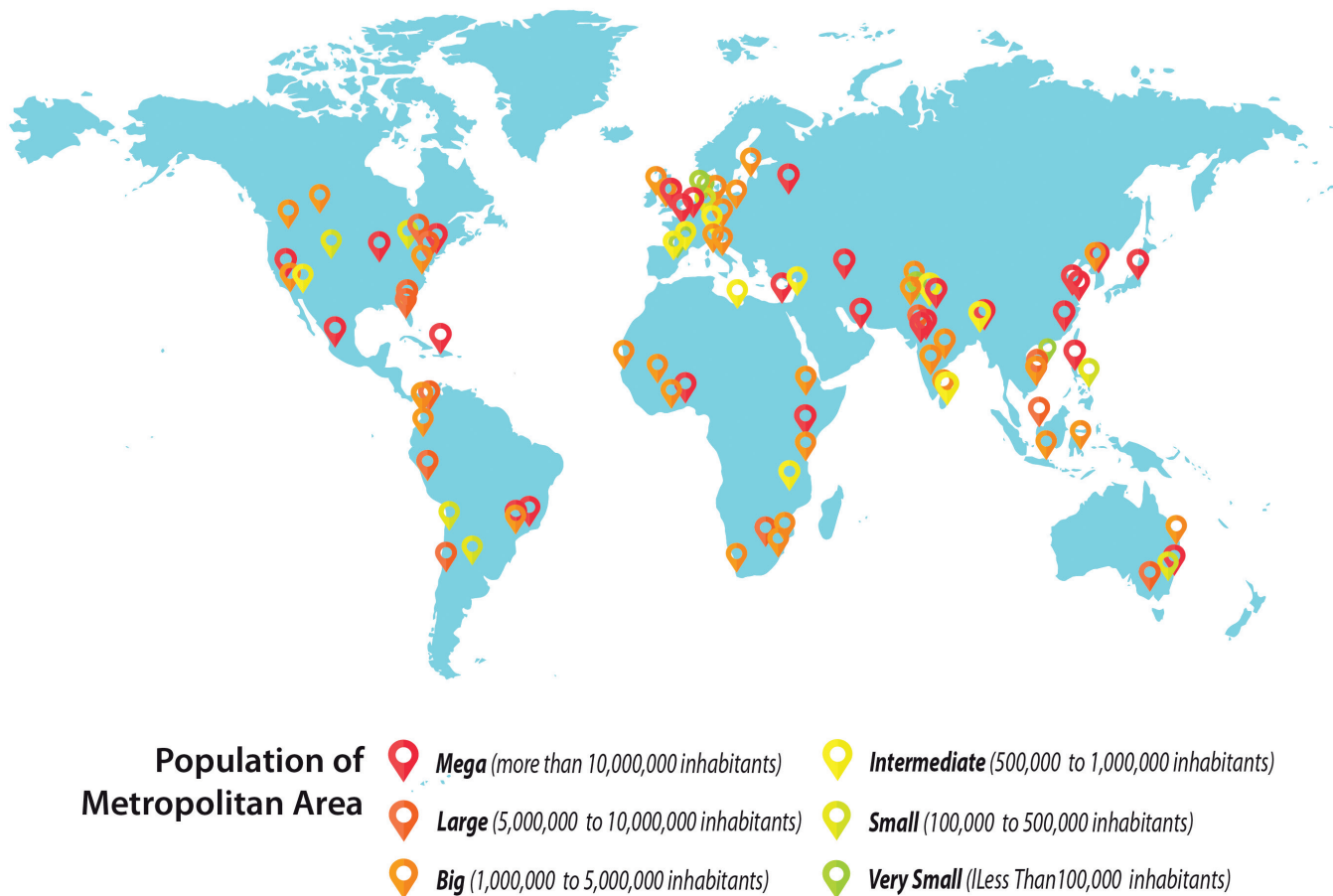


Figure 1.5 ARC3.2 Case Study Docking Station cities and the population of their metropolitan areas.

These Case Studies present empirical evidence on how cities are responding to climate change, across a diverse set of urban challenges and opportunities. The aims are to develop a mechanism by which to organize the Case Studies via a variety of metrics and sectoral and content elements and to engage a broad and diverse set of city examples for the ARC3.2.

Based on feedback from the stakeholder scoping sessions, the ARC3.2 presents the latest information on new topics that urban decision-makers see as crucial as they take on the challenges associated with adapting to the already-changing climate and mitigating GHG emissions, the root cause of climate change. The new topics covered in ARC3.2 include integration of climate mitigation and adaptation; urban planning and design; equity and environmental justice; economics, finance, and the private sector; urban ecosystems and biodiversity; coastal zones; housing and informal settlements; and urban solid waste. Other emerging topics covered are urban demographics (see Boxes 1.1 and 6.4); information and communications technology (see Box 7.2); and psychological, social, and behavioral challenges and opportunities for climate change decision-making (see Box 4.4). Topics covered in the ARC3.1 – including cities, disasters, and climate risk frameworks; urban climate science and modeling; urban energy; water and wastewater; transportation; human health; and governance – are updated in the ARC3.2 to reflect new research findings.

After the Summary for City Leaders, the main body of ARC3.2 is structured in four parts, along with introductory and concluding sections. The *Introduction* section describes Pathways to Urban Transformation and the role of UCCRN and ARC3 (Chapter 1), presents the latest research on Urban Climate Science (Chapter 2), and develops a new framework for the intersection of Climate Change, Disasters, and Risk (Chapter 3).

Part I presents the *Cross-Cutting Themes* of Integrating Mitigation and Adaptation: (Chapter 4); Urban Planning and Urban Design (Chapter 5); Equity and Environmental Justice (Chapter 6); and Economics, Finance, and the Private Sector (Chapter 7) (see Section 1.5).

Part II covers *Urban Ecosystems and Human Services*: Urban Ecosystems and Biodiversity (Chapter 8), Urban Areas in Coastal Zones (Chapter 9), Urban Health (Chapter 10), and Housing and Informal Settlements (Chapter 11).

Part III provides updates for the *Urban Infrastructure Systems* that were introduced in the ARC3.1, including Energy Transformation in Cities (Chapter 12) Urban Transportation (Chapter 13), and Urban Water Systems (Chapter 14), with the addition of a new chapter on Urban Solid Waste Management (Chapter 15).

Part IV, *Governance and Urban Futures*, describes the role of policy-making in effective climate change responses (Chapter 16).

The *Conclusions: Moving Forward* section presents the conclusions of the entire volume and the way forward for climate change and cities.

1.5 ARC3.2 Cross-Cutting Themes

Four cross-cutting themes are tracked throughout the volume: Integrating Mitigation and Adaptation (Chapter 4); Urban Planning and Design (Chapter 5); Equity and Environmental Justice (Chapter 6); and Economics, Finance, and the Private Sector (Chapter 7).

1.5.1 Integrating Mitigation and Adaptation

Urban planners and decision-makers need to integrate efforts to mitigate the causes of climate change (mitigation) and respond to changing climatic conditions (adaptation), for a global transition to a low-emissions economy and a resilient world (see Chapter 4). Actions that promote both goals provide win-win solutions. In some cases, however, decision-makers have to negotiate tradeoffs and minimize conflicts between competing objectives.

A better understanding of mitigation and adaptation synergies can reveal greater opportunities for urban areas. For example, strategies that reduce the urban heat island effect, improve air quality, increase resource efficiency in the built environment and energy systems, and enhance carbon storage related to land use and urban forestry are likely to contribute to GHG emissions reduction while improving a city's resilience. The selection of specific adaptation and mitigation measures should be made in the context of the current resources and technical means of the city, the needs of citizens, and the SDGs.

1.5.2 Urban Planning and Design

Urban planning and urban design have critical roles to play in the global response to climate change (see Chapter 5). Actions that simultaneously reduce GHG emissions and build resilience to climate risks should be prioritized at all urban scales – metropolitan region, city, district/neighborhood, block, and building. This needs to be done in ways that are responsive to and appropriate for city conditions.

Urban planning and urban design are emerging as important platforms for enabling more effective mitigation and adaptation responses to climate change challenges. Urban planning and design that integrates mitigation and adaptation can leverage the traditional influence and capabilities of practitioners and policy-makers, bringing together climate science, natural systems,

and compact urban form to configure dynamic, desirable, resilient, sustainable, and healthy communities.

1.5.3 Equity and Environmental Justice

Cities are characterized by the large diversity of socio-economic groups living in close proximity (see Chapter 6). Diversity is often accompanied by stratification based on class, caste, gender, profession, race, ethnicity, age, and ability. This gives rise to social categories that, in turn, affect the ability of individuals and groups to endure climate stresses and minimize climate risks. Such differences often lead to discrimination based on group membership. Poorer people and ethnic and racial minorities tend to live in more hazard-prone, vulnerable, and crowded parts of cities. These circumstances increase their susceptibility to the impacts of climate change and reduce their capacity to adapt to and withstand extreme events.

Countries and communities that have historically contributed least to global climate change might be impacted the most. The distribution of impacts between countries as well as within cities of documented natural disasters highlights the disproportionate impact of weather-related extreme events on the most vulnerable in society. This is illustrated by Bangkok's flood crisis in 2011, Typhoon Haiyan in the Philippines in 2013, the Chicago heat wave in 1992, and Hurricane Katrina in New Orleans in 2005.

Highly vulnerable people often share a set of similar and often interacting characteristics including minority status, race, ethnicity, gender, education, income, age, and health. These characteristics determine where people live, how sensitive they are, their assets, and how adaptive they are after one or several hazard occurrences. High exposure and sensitivity often coincide with low adaptive capacity, leading to higher risk and potentially serious impacts. These characteristics are exacerbated by existing poverty and inequality. They are further eroded over time through repeated coping and "risk accumulation processes" (the cumulative impact of relatively minor weather events is potentially significant to vulnerable groups), with indirect implications for chronic poverty. However, it is not just the most vulnerable who are impacted: regularly occurring events such as droughts and floods can also persistently act to undermine the resource base of better-off groups in society, ultimately leading to an increasing spread of those affected by conditions of poverty.

1.5.4 Economics, Finance, and the Private Sector

Because cities are the locus of large and rapid socioeconomic development around the world, economic factors will continue to shape urban responses to climate change (see Chapter 7). To exploit response opportunities, promote synergies between actions, and reduce conflicts, socioeconomic development must be integrated with climate change planning and policies.

Public sector finance can facilitate action, and public resources can be used to generate investment by the private sector. But private

sector contributions to mitigation and adaptation should extend beyond financial investment. They should also provide process and product innovation, capacity building, and institutional leadership.

Cities are where socioeconomic change occurs in most nations. With rapidly burgeoning populations, the influence of cities will only grow in the 21st century. This, coupled with the increasing threat of climate change, puts cities at risk of major social and economic disruptions absent sound plans for climate change mitigation and adaptation. These plans must take economics, financing, and the private sector into account.

Any single source of finance, including international public funding, will be inadequate to deliver the infrastructure needs of financing low-carbon development and climate risk management at the city level unless investment is undertaken to earn returns in addition to reducing the impacts of climate change. Cities therefore must tap their full spectrum of sources to raise money for climate action. In most countries, national or federal ministries of environment currently handle climate change activities. However, it is not clear how national climate change budgets – if any – will finance city initiatives. Therefore, city-based approaches to economic decision-making and finance are crucial to meet climate challenges. Public funding is especially effective if it helps to overcome key problems of access to finance (e.g., builds creditworthiness), supports the development of capacities at the city level to utilize diverse sources of funding and responsibly manage funds available at the city level.

The private sector has a strong motivation to make cities more climate resilient. For private efforts to be effective, however, the right regulatory framework has to be set, and the private and public sectors need to work in an integrated manner. A common vision, shared knowledge, and recognition of co-benefits are keys to successful partnerships.

1.6 UCCRN and Global City Networks

One aim of the ARC3 series of reports is to build the knowledge foundation for city networks, groups, and programs, such as the Cities Alliance Joint Work Programme (JWP) on Resilient Cities, C40 Cities Climate Leadership Group, the Durban Adaptation Charter (DAC), ICLEI—Local Governments for Sustainability, the International City/County Management Association (ICMA) CityLinks program, the Rockefeller Foundation’s 100 Resilient Cities Program, UNISDR’s Making Cities Resilient Campaign and the New Ten Essentials United Cities and Local Governments (UCLG), and UN-Habitat (see Chapter Annex 1.1, City Action Groups [CAGs]). ARC3 provides these and other groups with a comprehensive synthesis of current knowledge on the mechanisms by which urbanization and urban areas shape their own risks and the transformative links between urban mitigation and adaptation. One of the main findings of ARC3.2 is that cities should connect with national and international capacity-building networks because they can help to advance the strength and success of city-level climate planning and implementation.

The C40 Cities Climate Leadership Group, established in 2005, connects over 80 of the world’s megacities, representing more than 550 million people and one quarter of the global economy (see CAG 1.1). Created and led by cities, C40 is focused on tackling climate change and driving urban actions that reduce GHG emissions and climate risks while increasing the health, well-being, and economic opportunities of urban citizens. UCCRN is an advisor to C40 on climate science and climate risks.

UCCRN is part of the Cities Alliance Joint Work Programme (JWP) on Resilient Cities, which was launched at the COP21 Cities and Regions Day in Paris in December 2015 (see CAG 1.2). The JWP convenes a diverse consortium of international organizations to enhance work at the global and local levels to build more resilient cities. The JWP also collaborates with initiatives such as the Medellín Collaboration on Urban Resilience (MCUR), a cooperative effort between major organizations to build urban resilience, and the Lima Paris Action Agenda (LPAA) Cities and Sub-nationals Working group.

The Durban Adaptation Charter, signed in 2011 at the UNFCCC 17th Conference of the Parties, is an evolving international network of more than 1,000 elected urban and local officials drawn together for the purpose of taking action to adapt to climate change and build local resilience (see CAG 1.3). UCCRN and the DAC have signed a Memorandum of Understanding to incorporate the ARC3 reports as a key climate science knowledge base for DAC communications and policies.

ICLEI—Local Governments for Sustainability is a leading network of more than 1,500 cities, towns, and regions committed to building a sustainable future (ICLEI, 2015) (see CAG 1.4). By helping the ICLEI Network to make their cities and regions sustainable, low-carbon, resilient, biodiverse, resource-efficient, and healthy with a green economy and smart infrastructure, ICLEI impacts more than 25% of the global urban population. ICLEI’s mission is to build and serve a worldwide movement of city governments to achieve tangible improvements in global sustainability, with a specific focus on environmental conditions through cumulative local actions. UCCRN is a partner of ICLEI and launched the ARC3.2 Summary for City Leaders at the ICLEI Agora at COP21, during a joint session to promote the ICLEI-managed Transformative Actions Program (TAP).

UCCRN is a key science knowledge partner of the ICMA CityLinks Climate Adaptation Partnership Program, which allows cities to be paired with a Resource City to hone their technical and management skills and implement projects that will benefit their community (see CAG 1.5). UCCRN climate experts accompany Partner and Resource City delegates in a series of technical assistance exchange trips, to provide targeted climate science expertise and support.

The Rockefeller Foundation, as part of its 100 Resilient Cities program, is providing financial and logistical guidance for chief resilience officers in cities (see CAG 1.6). Selected cities also gain access to expertise from service providers and partners to develop and implement their own resilience strategies. They also

become part of a network of cities that exchange best practices and lessons learned.

The UCLG represents and defends the interests of municipal governments on the world stage, regardless of the size of the communities they serve (Urban Cities and Local Governments [UCLG], 2015) (see CAG 1.7). Headquartered in Barcelona, the organization's stated mission is "To be the united voice and world advocate of democratic local self-government, promoting its values, objectives and interests, through cooperation between municipal governments, and within the wider international community." The UCLG plays a major role in hosting and participating in international climate change negotiations on mitigation and adaptation in cities. They created a Local Government Climate Roadmap in 2007, organized UCLG World Council Meetings to address issues of climate change, and played a role in the 2013 World Mayor's Summit and the 2014 Climate Summit.

UN-Habitat, one of UCCRN's key partners, supports governments and local authorities, in line with the principle of subsidiarity,⁶ to respond positively to the opportunities and challenges of urbanization (see CAG 1.8). Its Climate Change and Cities Initiative (CCCI) helps cities in developing and low-income countries address climate challenges by providing technical assistance and expertise. UN-Habitat utilizes the ARC series of reports as a guide for CCCI city decision-makers at various levels.

Other city and climate initiatives include UNISDR's Making Cities Resilient Campaign and the New Ten Essentials (see Box 3.3) and the World Bank's City Creditworthiness Initiative (see Box 7.1).

1.7 Pathways to Urban Transformation

As is now widely recognized, cities can be the main implementers of climate resiliency, adaptation, mitigation, and sustainable development. However, the critical question that ARC3.2 addresses is under what circumstances this advantage can be realized. Cities may not be able to address the challenges and fulfill their climate change leadership potential without transformation that integrates mitigation and adaptation in virtually every decision, plan, and implementation.

ARC3.2 synthesizes a large body of studies and city experiences and finds that transformation is essential in order for cities to excel in their role as climate change leaders. As cities mitigate the causes of climate change and adapt to new climate conditions, profound changes will be required in urban energy, transportation, water use, land use, ecosystems, growth patterns, consumption, and lifestyles. New systems for urban sustainability will need to emerge that encompass more cooperative and integrated urban-rural, peri-urban, and metropolitan regional linkages.

A set of five pathways to urban transformation emerges throughout ARC3.2 (see Figure 1.6). These pathways provide

a foundational framework for the successful development and implementation of climate action. Cities that are making progress in transformative climate change actions are following many or all of these pathways. The five-fold pathway can guide the way for the hundreds of cities – large and small, low-, middle-, and high-income – throughout the world to play a significant role in climate change action. Cities that do not follow these pathways may have greater difficulty realizing their potential as centers for climate change solutions. The UCCRN ARC3.2 Pathways are:

Pathway 1 – Integrate Mitigation and Adaptation: *Actions that reduce GHG emissions while increasing resilience are a win-win.* Integrating mitigation and adaptation deserves the highest priority in urban planning, urban design, and urban architecture. A portfolio of approaches is available, including engineering solutions, ecosystem-based adaptation, energy policies, and social programs. Taking the local context of each city into account is necessary in order to choose integrated actions that result in the greatest benefits.

Pathway 2 – Coordinate Disaster Risk Reduction and Climate Change Adaptation: *Disaster Risk Reduction and climate change adaptation are the cornerstones of resilient cities.* Integrating these activities into urban development policies requires a new, systems-oriented, multi-timescale approach to risk assessments and planning that accounts for emerging conditions within specific, more vulnerable communities and sectors, as well as across entire metropolitan areas.

Pathway 3 – Co-generate Risk Information: *Risk assessments and climate action plans co-generated with the full range of stakeholders and scientists are most effective.* Processes



Figure 1.6 The five ARC3.2 Pathways to Urban Transformation.

⁶ **Subsidiarity** is defined as is an organizing principle that matters ought to be handled by the smallest, lowest or least centralized competent authority. Political decisions should be taken at a local level if possible, rather than by a central authority.

that are inclusive, transparent, participatory, multisectoral, multijurisdictional, and interdisciplinary are the most robust because they enhance relevance, flexibility, and legitimacy.

Pathway 4 – Focus on Disadvantaged Populations: Needs of the most disadvantaged and vulnerable citizens should be addressed in climate change planning and action. The urban poor, the elderly, women, minority, recent immigrants and otherwise marginal populations most often face the greatest risks due to climate change. Fostering greater equity and justice within climate action increases a city’s capacity to respond to climate change and improves human well-being, social capital, and related opportunities for sustainable social and economic development.

Pathway 5 – Advance Governance, Finance, and Knowledge Networks: Developing robust city institutions, advancing city creditworthiness, and participating in city research and action networks enable climate action. Access to both municipal and outside financial resources is necessary to fund climate change solutions. Sound urban climate governance requires longer planning horizons and effective implementation mechanisms and coordination. Connecting with national and international capacity-building networks helps to advance the strength and success of city-level climate planning and implementation.

A final word on timing: Cities need to start immediately to develop and implement climate action. The world is entering into the greatest period of urbanization in human history, as well as a period of rapidly changing climate. Initiating planning and implementation now will help avoid locking in counterproductive long-lived investments and infrastructure systems and will ensure that cities achieve the transformation necessary to fulfill their leadership role on climate change and sustainable development.

Annex 1.1 City Action Groups (CAGs)

CAG 1.1 C40 Cities Climate Leadership Group

Kathryn Vines

C40 Climate Leadership Group

Today, a number of leading mayors are forging a path to low-carbon development and are already achieving economic growth by investing in sustainable city climate solutions. Since the publication of the *First Assessment Report of the Urban Climate Change Research Network (ARC3.1)* in 2011, C40 Cities Climate Leadership Group cities have continued to take bold actions to reduce GHG emissions and climate risks across multiple sectors. As of 2016, C40 cities have together taken more than 10,000 climate actions, nearly doubling the number of actions in just two years, according to C40’s landmark report *Climate Action in Megacities 3.0 (CAM 3.0)*.

Officials from 98% of C40 cities report that climate change presents risks to their city. Because of this, cities understand the

need to exchange best practices and prioritize management of climate risks to ensure their climate resilience. As part of its commitment to assist cities to reduce their climate risk, C40 has developed the City Climate Hazard Taxonomy. It aims to establish a clear and concise lexicon of the climate hazards that cities face today and to document how those hazards may change in the future – a language for cities to speak when discussing climate change adaptation.

Collaboration through Networks Results in Greater Climate Action

C40 research also shows that, by 2050, cities could cut annual greenhouse gas (GHG) emissions by 13 GtCO₂e over what national policies are currently on track to achieve, the equivalent of cutting annual global coal use by more than half. By helping member cities create, share, and measure the impact of climate action, C40 accelerates results and helps to transmit the successful solutions around the world. C40 currently runs 16 networks across such initiative areas as Energy, Finance and Economic Development, Transportation, and Adaptation and Water. Every month, these networks bring member cities together to exchange ideas, solutions, and lessons learned and to collaborate on joint projects to combat common challenges.

These cities are actively advancing major climate actions that will reduce GHG emissions and reduce vulnerability to climate hazards. Data collected by C40 and its member cities show that these collaborations have led to significant results. As a result of taking part in C40 networks, 91 cities have taken 10,000 actions to combat climate change. These include the establishment of a climate change bureau in Ho Chi Minh City through the support of the Connecting Delta Cities Network and the City of Rotterdam and the launch of a Building Energy Challenge in London, working through the Private Building Efficiency Network, whereby 60 companies and 1,000 locations have committed to reduce energy usage. As signatories to the 2015 C40 Clean Bus Declaration of Intent developed by the Low Emission Vehicle Network, Buenos Aires and Rio de Janeiro have set new clean bus targets. Buenos Aires has committed to incorporate 100 bi-articulated buses with electric technology by 2020, and Rio has committed to convert 20% of its bus fleet to clean technologies by 2020.

Another key initiative area where C40 is accelerating local climate action is by helping cities gain access to finance and capital markets. A number of C40 cities do not have a credit rating or access to international capital and therefore cannot make the climate investments that simultaneously can drive economic growth and development and deliver significant health co-benefits. The C40 Creditworthiness program, with support and guidance from international experts, is helping cities break through these barriers and realize their full potential to build a low-carbon and climate-resilient future.

City Action Networks Beyond COP21

In December 2015, C40 mayors assembled in Paris for COP21 to demonstrate city leadership and innovation in the fight against

climate change. Limiting global temperature rise to 2°C will require actions by countries, but cities are playing a crucial role in spearheading the way. Collectively, C40 cities have committed to reduce emissions by 1 gigaton by 2020, and they are on course to deliver even more while also taking necessary steps to boost climate resilience.

In June 2016, the Compact of Mayors and the Covenant of Mayors were merged into a new initiative, the Global Covenant of Mayors for Climate and Energy. Through this initiative, C40 and partners ICLEI—Local Governments for Sustainability, United Cities and Local Governments (UCLG), and the United Nations Special Envoy for Cities and Climate Change, with support from UN-Habitat, expect to see cities making even greater commitments. The Global Covenant of Mayors is the world's largest coalition of city leaders addressing climate change by pledging to reduce their GHG emissions, tracking their progress, and preparing for the impacts of climate change.

The Global Covenant of Mayors will drive more aggressive city climate actions and reaffirm existing targets while capturing the significance of these efforts through a consistent, transparent public reporting of cities' GHG data. Through the Covenant, cities are:

- Showing national governments the extent of actions that cities are already undertaking so that it might be incorporated into national-level strategies or further supported through more enabling policy environments and resourcing approaches
- Encouraging increased capital flows into cities to support local action
- Demonstrating the commitment of city governments to contribute positively to more ambitious, transparent, and credible national climate targets by voluntarily agreeing to meet standards similar to those followed by national governments
- Establishing a consistent and transparent accountability framework that can be used by national governments, private investors, or the public to ensure that cities can be held responsible for their commitments

The Global Covenant of Mayors has the potential to make cities' role as partners to nations truly evident – now and in the years to come.

CAG 1.2 Cities Alliance Joint Work Programme on Resilient Cities

Laura Kavanaugh

ICLEI—Local Governments for Sustainability, Bonn

Julie Greenwalt

Cities Alliance, Brussels

The Cities Alliance Joint Work Programme is a partnership supporting cities to become more resilient with a focus on slums, informality and the working urban poor.

Members of the Joint Work Program include C40 Cities Climate Leadership Group, the French Alliance for Cities and Territorial Development (PFVT), GIZ, Global Facility for Disaster Reduction and Recovery (GFDRR), ICLEI—Local Governments for Sustainability, the Inter-American Development Bank (IDB), 100 Resilient Cities, Slum Dwellers International (SDI), The Ecological Sequestration Trust (TEST), United Nations Environment Programme (UNEP), UN-Habitat, the United Nations Office for Disaster Risk Reduction (UNISDR), Women in Informal Employment: Globalizing and Organizing (WIEGO), the World Bank, and the World Resources Institute (WRI).

UCCRN is a Knowledge Partner of the JWP, along with Overseas Development Institute and the International Institute for Environment and Development.

Observers: AECOM, ARUP, The Organization for Economic Cooperation and Development (OECD), Rockefeller Foundation, Swiss State Secretariat for Economic Affairs (SECO).

Activities: Cities Alliance established a Joint Work Programme (JWP) that brings together members and partners to support city resilience with an emphasis on the challenges of slums, informality and the working urban poor. The partnership aims to (1) facilitate the flow of knowledge and resources to enhance city resilience, supporting the emerging Post-2015 framework, climate change and Habitat III processes and (2) promote local resilience strategies through inclusive, long-term, urban planning processes.

Launched at COP21 in December 2015, the JWP is a new type of partnership with a unique constellation of institutions: slum dweller networks, informal workers, city networks working on resilience and climate change, combined with development partners, foundations, and multilateral partners such as the World Bank. The JWP is also unusual in that it combines support for global knowledge, financing, tools, and dialogue, and connects them with on-the-ground technical assistance and implementation. While many other resilience organizations focus on one or more of these aspects, the Cities Alliance JWP bring them all together to support growth trajectories increasingly characterized by equity, inclusion, and environmental sustainability.

The JWP together with the Medellín Collaboration on Urban Resilience has supported the creation of a *Local Governments' Pocket Guide to Resilience* and the *online platform resilience tools.org* which aims to offer an overview of the global resources available for local governments to assess, measure, monitor, and improve city-level resilience.

During 2016, the JWP has supported the development of several joint initiatives among the members. One aims to connect local governments with funders and implementation partners to increase access to finance for transformative local resilience projects. Another will provide technical assistance for cities in Asia, Africa, and Latin America to set meaningful GHG emissions targets and develop energy management plans, incorporating informal settlements, in the context of broader climate

change action plan. A third seeks to improve resilience at the household level by undertaking urban resilience audits of informal settlements and incorporating that information into city-wide resilience strategies. Through these and other activities, the JWP is leveraging global partnerships and international agreements to realize more sustainable, resilient, and inclusive cities and communities.

CAG 1.3 Durban Adaptation Charter

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eThekweni Municipality, Durban

Climate change is already affecting millions of people around the globe through extreme and unseasonable weather events. These impacts are likely to have a disproportionately greater impact upon nations from the Global South that have limited resources and infrastructure to adequately protect themselves and insufficient means to recover. Local governments, in particular, are most challenged because they are responsible for responding to climate impacts at ground level. It is at the local level where livelihoods are lost, water security and food security are impacted, and infrastructure is destroyed. Although local governments will suffer the full impacts of climate change, they are also most equipped to take rapid action now to prepare for and adapt to the impacts of climate change.

The Durban Adaptation Charter (DAC) commits local governments to local climate actions in their jurisdiction that will assist their communities to respond to and cope with climate change risks and thereby reduce vulnerability. By signing the DAC, they commit to *inter alia*:

1. Providing key information on all local government development planning;
2. Ensuring that adaptation strategies are aligned with mitigation strategies;
3. Promoting the use of adaptation that recognizes the needs of vulnerable communities and ensures sustainable local economic development;
4. Prioritizing the role of functioning ecosystems as core municipal green infrastructure;
5. Seeking innovative funding mechanisms.

The DAC was launched at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP17) held in the City of Durban (eThekweni Municipality), South Africa, in December 2011. The South African government, through the South African Local Government Association (SALGA), South African Cities Network (SACN), eThekweni Municipality, and the Department of Environmental Affairs partnered with ICLEI—Local Governments for Sustainability in hosting the *Durban Local Government Convention: Adapting to a Changing Climate – Towards COP17/CMP7 and Beyond*.

The momentous signing of the DAC by 114 signatories representing 950 local government organizations from 27 countries builds on the recognition of local governments as important government stakeholders in the Cancun Agreement.

CAG 1.4 ICLEI—Local Governments for Sustainability

Yunus Arikan

ICLEI—Local Governments for Sustainability, Bonn

ICLEI—Local Governments for Sustainability is the leading global network of more than 1,500 cities, towns, and regions committed to building a sustainable future. By helping the ICLEI Network to make their cities and regions sustainable, low-carbon, resilient, biodiverse, resource-efficient, and healthy, with a green economy and smart infrastructure, ICLEI impacts more than 25% of the global urban population.

ICLEI Vision

ICLEI envisions a world of sustainable cities that confront the realities of urbanization, adapt to economic and demographic trends and prepare for the impacts of climate change and other urban challenges. This is why ICLEI unites local and regional governments in creating positive change through collective learning, exchange, and capacity building.

Assets and Achievements

For the past 25 years, ICLEI has maintained that local action is at the center of global change. Its multidisciplinary network continues to develop and apply practical strategies, tools and methodologies that bring about tangible local progress worldwide.

The growing ICLEI Network works collaboratively across the world, leveraging local assets to address pressing urban challenges.

Approach

The ICLEI Network takes an integrated approach to sustainable development, and our 10 Urban Agendas are an expression of our integrated approach. ICLEI forges strategic partnerships with business and financial institutions to strengthen its results and bring about global change with a coalition of able partners. ICLEI also works to ensure that strong policy environments support local action through our national and global advocacy advancements.

CAG 1.5 ICMA CityLinks Climate Adaptation Partnership Program

UCCRN has partnered with the International City/County Management Association (ICMA) CityLinks Program, via its Climate Adaptation Partnership Program (CAPP).

Through the CityLinks Climate Adaptation Partnership Program, local governments in developing countries can apply to become the partner city of a “resource city” that will aid in the development and implementation of a climate adaptation project, with technical assistance provided by municipal and climate experts. CityLinks pairs international partner cities with resource cities that face and have begun to address similar adaptation challenges. International partner city staff have the opportunity to further hone their technical and management skills and implement a project that will benefit their community. They observe solutions and best practices developed in the resource city.

To provide additional targeted technical support to the CityLinks partnerships, ICMA draws on expertise from the Urban Climate Change Research Network. The academic experts are selected UCCRN scholars that are based regionally or locally. They join the city representatives on technical exchanges to provide tailored climate science expertise and assistance, combining a science-based approach with practical application to assist the municipality in preparing for future climate impacts.

City-to-City partnerships last 9–12 months and include two technical assistance trips to the international partner city and one trip to the resource city. The technical exchange trips consist of site tours; visits to universities, environmental agencies, and organizations enacting climate projects in the area; meetings with key stakeholders; and working sessions. During the trips, a work plan is developed for a 9–12 month period that focuses on specific climate-related objectives, delineates the partnership goals, and defines concrete action items for the subsequent technical exchanges and periods in-between the exchange visits. Following the work planning trip, a team of two or three individuals from the international partner city travel to the resource community to gain hands-on experience and observe the implementation of technical solutions. At the conclusion of this trip, next steps are planned for a final return trip of the resource community back to the international partner city to complete the work plan objectives.

CityLinks teams work closely together over the period to develop strategic recommendations that are the basis of an implementation plan informed by local science data, city staff, community stakeholders, and leading global practices in urban adaptation.

The 2015 CAPP pairings included Portmore, Jamaica and Townsville, Australia; Shimla, India and Boulder, Colorado; La Ceiba, Honduras and Somerville, Massachusetts, USA; and Semarang, Indonesia and Gold Coast, Australia.

About CityLinks

The CityLinks model was designed by ICMA as a way to enable municipal officials in developing and decentralizing countries to draw on the resources of their U.S. counterparts to find sustainable solutions tailored to the real needs of their cities. It was formalized in collaboration with the U.S. Agency for International Development (USAID) in 1997 with the launch of a funded program, known at the time as Resource Cities. Based on the success of Resource Cities, USAID awarded ICMA a new

program with the CityLinks name in 2003 and a five-year City-to-City Partnerships cooperative agreement – now known as CityLinks – in 2011.

Source: http://icma.org/en/cl/about/what_is_citylinks

CAG 1.6 Rockefeller Foundation 100 Resilient Cities Program

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Several years ago, the Rockefeller Foundation decided to address the issues of climate change in ways that targeted a gap in foundation sector funding. It decided to focus on adaptation and go one step further – explore not just how to adapt to the impacts of climate change, but how to build resilience to climate change. In other words, the organization’s members set out to find ways to help people, communities, and systems bounce back from and perhaps even thrive in the face of both long-term stresses and sudden shocks. In an innovative approach, they applied this to urban contexts at a time when few were yet talking about “urban resilience.”

An initiative called Asian Cities Climate Change Resilience Network was the foundation for a more widespread effort launched in the Rockefeller Foundation’s centenary year, a program called “100 Resilient Cities (100RC).” The 100RC is dedicated to helping cities around the world become more resilient to the physical, social, and economic challenges that are an increasing part of the 21st century.

With an interdisciplinary team that interacts with their growing network of cities, 100RC supports the adoption and incorporation of a view of resilience that is tackling what the cities themselves see as shocks and stresses – from earthquakes, fires and floods to high unemployment, overburdened transportation systems, and chronic food or water shortages. The 100RC is drawing on the expertise of municipal employees, academics, non-profit organizations, and businesses that are, in turn, working with their networks of colleagues to solve day-to-day problems and long-term challenges. With the world’s burgeoning population increasing most rapidly by far in urban areas, 100RC is providing a laboratory for experimentation and learning

The 100 successful cities that were selected over three competitive rounds receive resources along four pathways. First, they receive financial and logistical guidance for establishing an innovative new position in city government, a Chief Resilience Officer who leads the city’s resilience efforts. Second, if they do not have a resilience strategy yet, they can gain access to expertise to develop their own robust plan. Third, they gain access to service providers and partners from the private, public, and non-governmental organization sectors who can help them develop and implement resilience strategies. And, finally, they become part of a network of member cities exchanging learning

and advice. This effort was launched and is currently funded by the Rockefeller Foundation and is managed as a sponsored project by Rockefeller Philanthropy Advisors (RPA), an independent 501(c)(3) nonprofit organization that provides governance and operational infrastructure to its sponsored projects.

CAG 1.7 United Cities and Local Governments

The United Cities and Local Governments (UCLG) represents and defends the interests of local governments on the world stage, regardless of the size of the communities they serve. Headquartered in Barcelona, the organization’s stated mission is to be the united voice and world advocate of democratic local self-government, promoting its values, objectives, and interests through cooperation between local governments and within the wider international community.

UCLG’s work program focuses on:

- Increasing the role and influence of local government and its representative organizations in global governance;
- Becoming the main source of support for democratic, effective, innovative local government;
- Ensuring an effective and democratic global organization.

The UCLG supports international cooperation between cities and their associations and facilitates programs, networks, and partnerships to build the capacities of local governments. The organization promotes the role of women in local decision-making and is a gateway to relevant information on local government across the world.

Source: <http://www.uclg.org/en/organisation/about#sthash.SGvKEUnT.dpuf>

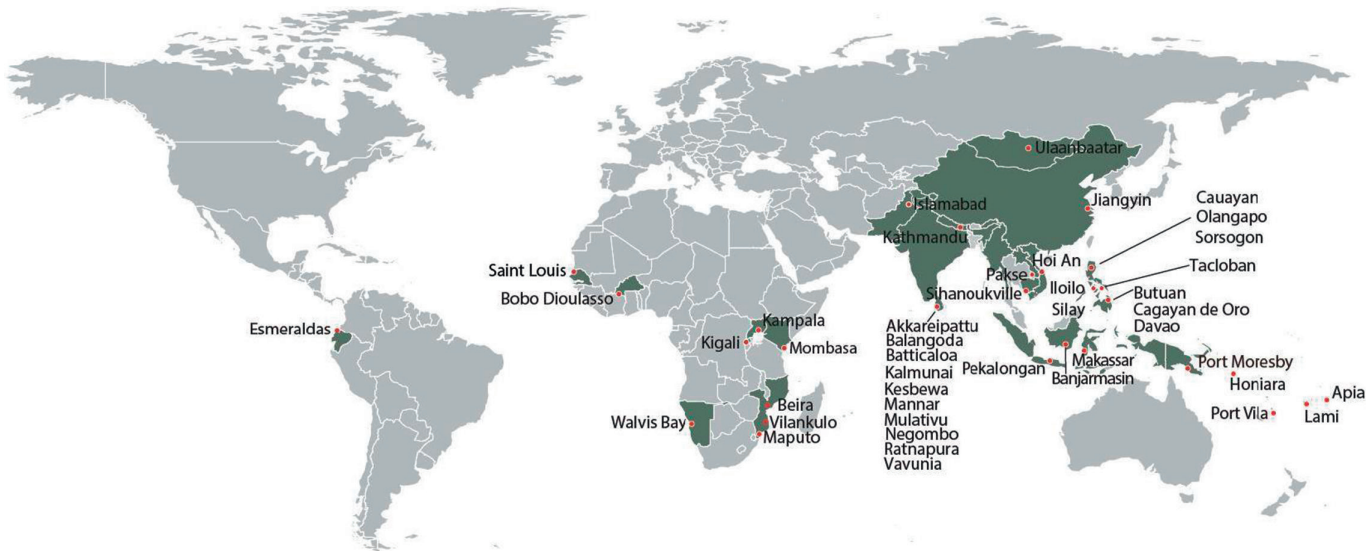
CAG 1.8 UN-Habitat Cities and Climate Change Initiative (CCCI)

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UN-Habitat supports governments and local authorities, in concert with the principle of subsidiarity⁷, to respond positively to the opportunities and challenges of urbanization. UN-Habitat provides advice and technical assistance on transforming cities and other human settlements into inclusive centers of vibrant economic growth, social progress, and environmental safety. Climate change and urbanization are two of the defining global trends of the 21st century. In response to this important linkage, UN-Habitat has brought together its multiple climate change activities under the flagship Cities and Climate Change Initiative (CCCI).

The CCCI is helping cities in developing and low-income countries to address climate challenges, with emphasis on a sound assessment of vulnerabilities and risks, urban planning, good governance, and practical initiatives for municipalities and their citizens. Launched in 2008 in just four cities, CCCI has expanded until, to date, it has assisted more than 45 cities in 23 countries. CCCI has been generously supported by the governments of Norway and Sweden and by the Cities Alliance.



CAG 1.8 Figure 1 Cities and countries in which the UN-Habitat Cities and Climate Change Initiative (CCCI) is active.

⁷ **Subsidiarity** is a principle wherein political decisions and other matters are handled at a local level, by the smallest competent authority, rather than by a central authority.

UN-Habitat CCCI works at neighborhood and city-wide scales. The entry point for climate action varies from city to city according to its capacities, resources, vulnerabilities, and opportunities.

Neighborhood projects are effective ways to address climate change at a human scale. UN-Habitat helps local governments to become more responsive to climate change challenges and engage local partners to support climate projects. It develops and implements projects with local communities and businesses, including urban farming, ecosystem-based adaptation, and local energy and mobility solutions. CCCI has supported several pilot activities to demonstrate good practices that merited upscaling. In Bobo Dioulasso (Burkina Faso), Kathmandu (Nepal), and Kesbewa (Sri Lanka), CCCI supported different types of urban agriculture pilots, such as greenways in Bobo Dioulasso. In Kathmandu, the garden rooftop pilot is now being upscaled city-wide, based on an agreement between the City and Ministry of Urban Development. In Maputo, attention focused on environmental zoning in the ecologically fragile Costa da Sol neighborhood, where mangrove forests that served as a buffer to extreme weather events were under intense pressure from urban development. In coastal Saint Louis (Senegal) following a vulnerability assessment, UN-Habitat succeeded in mobilizing co-funding from the government of Japan to help relocate those low-income families that were most exposed to storm surge and extreme weather events.

Cities around the world are beginning to address climate change. Some partner cities have committed to carrying out greenhouse gas (GHG) inventories and to monitoring, reporting, and reducing GHG emissions within their constituencies, whether in established districts or via planned low-carbon city extensions. UN-Habitat brings cities together to learn, share among peers, and enhance the effectiveness of city-led climate actions and to contribute to global research and capacity building. A complementary set of tools has been developed to support cities in raising awareness of the impacts of climate change and undertaking mitigation and adaptation activities. Sorsogon is one of the cities in the Philippines that is most exposed to sea level rise and storm surge from tropical cyclones. An intensive participatory assessment of the city's vulnerability was conducted and used to update the city's statutory plans and to open policy discussion. The city climate strategy focuses on climate change-resilient housing and basic infrastructure, livelihood adaptation plans, environmental management, and disaster risk reduction (DRR), and it is currently being implemented step-by-step to increase urban resilience.

Metropolitan areas are being reshaped continuously as urbanization advances. For Kampala Capital City Authority (Uganda), a CCCI-led vulnerability assessment identified neighborhoods at risk, the urban development dynamics, and institutional framework, and examined opportunities for addressing climate change. Working with the city, CCCI then proposed an integrated approach to dealing with flood management, acknowledging the linkages among floods, development, and poverty. The integrated management strategy is beginning to inform the metropolitan government's flood policy and related investments.

National governments, in their efforts to shape market conditions and coordinate development efforts, increasingly recognize the need for climate change to be included in national urban policies. Through vertical integration, urban issues and local authorities as front-line actors are being included in national-level climate policies, mitigation strategies, and adaptation plans. UN-Habitat has helped several national governments to address urban issues in their climate change policies. Substantive inputs, generally provided by CCCI through regional offices, are backstopped by a policy note on "Addressing Urban Issues in National Climate Change Policies."

Global institutions and processes are slowly but surely recognizing the nexus of cities and climate change as a critical piece of the puzzle to address the sustainable development challenges of the 21st century. Shaping global frameworks and mechanisms that support nations to address climate change in a multilevel effort together with their cities is part of UN-Habitat's work, as well as providing a forum for discussing and shaping the New Urban Agenda at the third UN conference on housing and sustainable urban development (Habitat III) in 2016, in Quito, Ecuador. Another important milestone is the set of goals emerging from the Post 2015 process and the work undertaken to identify means to implement the Sustainable Development Goals (SDGs) in an urban world.

Chapter 1 Pathways to Urban Transformation

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