

# ***Global Research and Action Agenda on Cities and Climate Change Science***

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Cities have the potential to be major catalysts of change in implementing recent international agreements such as the Paris Agreement, the 2030 Sustainable Development Agenda, the New Urban Agenda and the Sendai Framework for Disaster Risk Reduction. Actions to address climate change through adaptation and mitigation at the city level will make crucial contributions to the national efforts aimed at fulfilling international commitments. **The role of cities in addressing climate change is especially important within the context of urban population expansion, which is expected to result in 68% of the world's population living in cities by 2050 (UN DESA 2018).**

**This document aims to serve and support national governments, local and municipal authorities, researchers and scientists, planning and design communities, private sector enterprises, international organisations (including international corporations and development banks) and civil society including indigenous peoples, in developing blueprints and action plans for new evidence-based research and knowledge that supports effective climate action in cities. This document signposts key issues that will require research to help guide effective policy development for climate action in cities.**

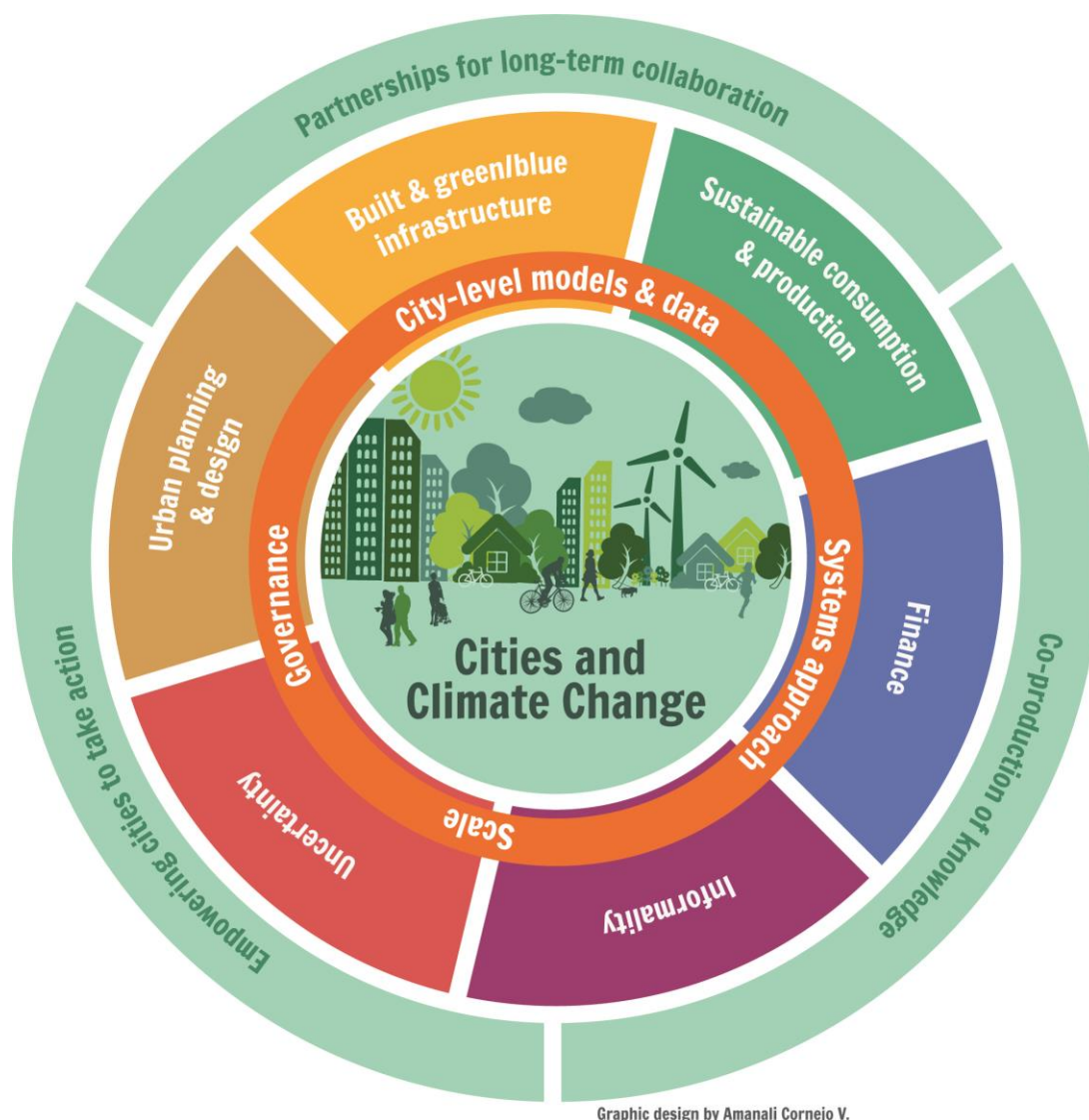
## **Laying the foundation**

At the 43<sup>rd</sup> Session of the IPCC in Nairobi, the IPCC recognised the key role of cities in the global response to climate change and proposed that the seventh assessment cycle include a Special Report on Climate Change and Cities.

To stimulate knowledge exchange, evidence-based reports, and peer-reviewed publications on cities and climate change, at its 44th Session in Bangkok, the IPCC approved a proposal for a co-sponsored International Conference on Climate Change and Cities (renamed and branded Cities and Climate Change Science Conference - CitiesIPCC for communication purposes). The Conference was held in Edmonton, Canada, from the 5–7th March 2018. The goals of the Conference were to assess the current state of academic, policy and practice-based knowledge on cities and climate change, and to identify key gaps to inspire research and the development of knowledge in critical areas.

More than 700 academics, leaders, innovators, and influencers attended this landmark conference. Participants provided insights that informed and shaped this *Global Research and Action Agenda on Cities and Climate Change Science* (for a more detailed version of this agenda, see Annex B). The Scientific Steering Committee, with support from the co-sponsoring organisations, compiled and synthesised input from conference plenaries, parallel sessions, posters, commissioned papers, and discussions to produce this Research and Action Agenda. Experience from cities with diverse and distinct characteristics, including size (small, medium, large and mega cities), growth patterns (rapidly expanding, sprawling, and stagnating), geography (coastal, dryland, highland, etc.) and contexts (Global North, Global South, high income, high inequality, etc.) were represented at the Conference. The Research and Action Agenda is meant to be applicable across these variations, however it is clear that some aspects may be more relevant for certain cities and countries.

The *Global Research and Action Agenda on Cities and Climate Change Science* is organised into three sections: 1. crosscutting issues and knowledge gaps; 2. key topical research areas; and 3. suggested approaches to implement the Research and Action Agenda. The structure of the Research and Action Agenda is illustrated in Figure 1.



**Figure 1. Pathways for climate adaptation and mitigation in cities**

This figure presents the structure of the *Global Research and Action Agenda on Cities and Climate Change Science*. The inner circle (orange) presents key crosscutting issues and knowledge gaps for a step-change of knowledge generation on cities and climate change. The middle circle (multi-coloured) presents six topical research areas where more evidence is needed to inform action. The external circle (green) presents three suggested approaches that may facilitate implementation of this Research and Action Agenda.

## 1. Crosscutting issues and knowledge gaps

The Conference highlighted a range of broad, crosscutting issues that underpin efforts to respond to climate change in cities, such as the capacity of local institutions, the interconnectivity of different sectors, the impacts of scale and data availability. For each of

these foundational issues, there are knowledge gaps related to methodology and understanding, which would benefit from better uptake of existing science and knowledge, new research and new perspectives.

## **1.1. Systems approach**

A systems approach recognises the interaction and interdependent nature of cities within their regions and countries. Cities are open, complex, self-organising, adaptive, and evolving formations that are embedded in broader social, ecological, economic, technical, institutional, and governance structures. A systems approach allows various (possibly conflicting) issues to be addressed simultaneously, can help to create more balanced solutions, for example, by combining a climate change perspective (both adaptation and mitigation) with human, ecological, biodiversity and economic development, avoiding unsustainable development scenarios, while meeting the needs of the disadvantaged. Traditionally, much urban research and action has taken place in various silos (either adaptation or mitigation; limited to specific sectors; academic disciplines, ministries or other policy-making units). As a result, many systemic opportunities and risks have been overlooked. In order to identify synergies and trade-offs between adaptation and mitigation options within the full range of human and natural systems, further knowledge is needed on how to apply a more holistic systems approach to:

- Capture, integrate, model and weave together diverse forms of knowledge and data from a wide range of sources and perspectives;
- Investigate interactions, inter-dependencies and resource flows between natural, built, and social systems, and between urban areas and the rural hinterlands;
- Develop and apply new measures of valuation, bringing together quantitative, relational, distributional, behavioural, and economic values (for a more detailed definition of these term, see (Pascual et al. 2017) to help assess the many complex synergies, trade-offs, co-benefits and potential maladaptation between interventions that respond to both climatic and non-climatic hazards.
- Develop action-oriented research that focuses on multiple impacts, assesses how uncertainty can be reduced, provides options for transformative climate action plans and highlights co-benefits for achieving the SDGs and other global agendas.

## **1.2. Governance and institutions**

The governance of climate change in a city is multi-faceted. For example, while the legal and regulatory frameworks for climate change response may be established by formal institutions, climate change governance may also take place through interventions designed and implemented by non-state actors, including businesses, non-governmental organisations and communities. Informal institutions and their associated social practices, norms, and path-dependencies also structure the scope and nature of action on climate change in cities. Governance for climate change in cities is further complicated by limitations in human capacity, financing tools, urban planning and the application gap between policy, innovation, research and technology. Enabling policies and investments that foster capacity for cities to respond to climate change are critical. Given this multi-sector and multi-actor context, this Agenda proposes several areas where further knowledge is needed, namely:

- Understand the operational pathways and institutional structures for governance that can effectively support climate action in different urban contexts, and that are inclusive of diverse priorities and voices in planning and decision making;
- Identify different forms of governance that can best support climate action across a highly uneven institutional and financial landscape;
- Transformative climate change responses that can address urban inequalities and ensure inclusive modes of governance.

### **1.3. Scale**

All aspects of climate change risk, impact, vulnerability and response options are influenced by issues of scale and scale interaction. The role of spatial (including differing levels of governance) and temporal scale can have profound implications. The short-term benefits of implemented climate strategies might not extend through to the medium and long-term. Similarly, actions (and the effectiveness of those actions) at the local scale (city/neighbourhood) are influenced by decisions made at other scales (such as provincial/state, national, global). Increasing knowledge on the interplay of scale in the context of climate change would allow more informed decisions to be made in urban areas, neighbourhoods, municipal jurisdictions and metropolitan regions. Specific attention needs to be paid to the following:

- Knowledge and data that is comparable across spatial scales and regions while remaining meaningful at the local scale;
- Increasing our understanding of the interplay between policies and actions taken at different scales, and how this affects the ability to take effective and coordinated climate action at the city scale;
- Collaboration between urban stakeholders and researchers to produce knowledge, data, and information that is responsive to the temporal scales relevant to cities.

### **1.4. Observation, data, modelling, and scenarios at the city level**

To fully understand how cities impact, and are impacted by, climate change, it is important to have observations, models, and scenarios at relevant spatial and temporal scales. Critical knowledge gaps exist related to downscaling climate projections to the most local levels, as well as improving confidence in future local projections. Information that is spatially and temporally relevant to city level actors could be advanced through the following:

- Creating an international and open-access observational framework for collecting key climate and socio-economic metrics at the city scale;
- Improving modelling capabilities to produce higher resolution data, predict near term climate futures, and to produce models that may be customised to specific cities;
- Developing future climate scenarios using transdisciplinary approaches that integrate sociological, economic, climatic and ecological features that are applicable at the city scale (and that are informed by a range of expertise including indigenous knowledge and local knowledge);
- Determining the effect of, and the dynamics between, adaptation alternatives for coastal cities.

## **2. Key Topical Knowledge Gaps**

This section presents key topical research areas where more evidence-based knowledge would support practitioners and decision-makers in addressing specific city-level challenges arising from climate change.

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**Topical areas**      **Further research and action is needed on the following**

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*Informality*

- Explore how inhabitants of both informal settlements<sup>1</sup> and slums are particularly vulnerable to the effects of climate change
- Understand the extent and nature of challenges and opportunities posed by informality, and provide evidence for policy interventions on informality that simultaneously respond to climate change and vice versa
- Investigate the relationship between climate change and the informal economy to better understand how to increase adaptive capacity of informal sectors and how to scale up low-carbon solutions from and for the informal sector

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*Urban Planning and Design*

- Develop more rigorous understanding and characterisation of the connections between urban planning, design, and infrastructure and climate change mitigation and adaptation
- Understand how urban micro-climates integrate into urban planning and design to simultaneously improve urban environmental outcomes, reduce risk and address the need to adapt to, and mitigate, climate change
- Explore the role of urban and spatial planning in reducing vulnerability and in adaptation to climate change for both formal and informal settlements
- Document and quantify the impacts of climate change on human health, and map the full range of health co-benefits of adaptation and mitigation to support future urban planning

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*Built and Blue / Green Infrastructure<sup>2</sup>*

- Explore low-carbon and environmentally-friendly infrastructure options that go beyond traditionally dominant grey infrastructure for transformational climate solutions in developed and rapidly developing urban areas
- Understand the co-benefits of blue/green infrastructure and ecosystem-based adaptation, and how mitigation projects could support decision-making in terms of future infrastructure priorities
- Develop more granular and location specific understanding of carbon lock-in risks and opportunities for mitigation and adaptation to inform planning and policies for building and upgrading infrastructure

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*Sustainable Consumption and Production*

- Understand the full life-cycle implications of various urban economic structures, modes and patterns of production, and their associated carbon lock-in effects, including regional, national and global relocation of manufacturing processes
  - Advance the development of pathways for social changes that enable people to participate in the life of cities in ways that are less resource intensive and enhance well-being
  - Improve current methodological innovations in greenhouse-gas emissions calculations by exploring the role of urban consumption
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<sup>1</sup> A term given to settlements or residential areas that by at least one criterion fall outside official rules and regulations. Most informal settlements have poor housing (with widespread use of temporary materials) and are developed on land that is occupied illegally with high levels of overcrowding. In most such settlements, provision for safe water, sanitation, drainage, paved roads, and basic services is inadequate or lacking (IPCC 2014a).

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## Finance

- Develop frameworks and tools to integrate climate considerations into fiscal and financial decision-making at the city scale
- Explore how public budgets can be strategically used, including to crowd in private investment, to address the shortfall in sustainable urban infrastructure investment
- Understand the role of public finance where projected returns are too low or perceived risks are too high to attract private finance at scale
- Find opportunities and alternatives for including low-income and other marginalised urban residents in fiscal and financial decision-making
- Explore insurance options which could empower cities to better address disaster risk

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## Uncertainty

- Evaluate the ‘fit-for-purpose’ attributes of models and provide guidelines for simplified approaches that would strengthen the evaluation of the confidence in projections and the associated uncertainties
  - Develop tools that assess uncertainty considerations in different city contexts to strengthen decision-making in uncertain situations
  - Develop methodologies to identify sources of uncertainty, and explore and understand the full range of uncertainty and to reduce it, where possible
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### **3. Delivering on the Research and Action Agenda: Approaches to strengthen the science, practice and policy interface**

Building from the knowledge shared by the science, practice and policy communities at the Conference, three possible avenues are presented here to support the implementation of this *Global Research and Action Agenda on Cities and Climate Change Science*.

#### ***3.1 Knowledge co-design and co-production***

The co-design, co-production and sharing of knowledge and information by the research, practice and policy communities in an integrated manner will enhance the value of such knowledge in informing city-level climate action. Co-design and co-production will be improved if the operational modalities of the three communities are adapted to support such cross-sector interactions. To this end the following approaches should be considered:

- Facilitate the co-design of tools for knowledge sharing and assessment, and scoping of new priorities for further research and knowledge generation by different initiatives and institutions (such as think tanks, science and city networks, and local research organisations).
- Synthesise and widely disseminate existing knowledge to allow actors to share lessons learned and support the use of best practices to inform policy and action.
- Include indigenous people and local communities, practitioners, city networks, policy-makers and researchers from social and natural sciences and the humanities to enhance the co-production of knowledge and weaving together of expertise at the city scale.
- Examine how climate action is facilitated by— and what the effective conditions are for—evidence-based policy that integrates diverse perspectives through co-design and co-production.

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<sup>2</sup> Green Infrastructure refers to interventions to preserve the functionality of existing green landscapes (including parks, forests, wetlands, or green belts), and to transform the built environment through phytoremediation and water management techniques and by introducing productive landscapes (IPCC 2014b). This can be termed blue infrastructure if aquatic ecosystems are concerned (European Environment Agency 2017).

### **3.2 Empowering cities to take action**

For national governments to implement the Paris Agreement, cities need to be empowered both financially and politically to develop ambitious climate targets and take transformational climate action. Some aspects to consider when working to empower cities to take action can be found below and can be adapted and developed to suit local contexts:

- Effective collaboration between national, sub-national, municipal and local government in addressing climate change would be facilitated through harmonising efforts to address the various global agendas.
- Accurate and scientifically robust monitoring and evaluation frameworks developed for and by cities would support them in showcasing the impacts of action.

### **3.3 Fostering long-term science-policy-practice collaborations**

As researchers, urban practitioners and policy-makers often operate at different time and spatial scales, and use different vocabularies, it is important to distil the information already available to meet the immediate knowledge needs of cities, and to have a constructive, open, long-term and iterative dialogue to match current and future knowledge needs, to respond to challenges faced by cities. Building relationships that can withstand the different cycles (funding, electoral, project and publication) within which the communities operate, and that would incorporate continuous feedback and flow of information between communities, would allow for progress in addressing climate change and could be cultivated using the following approaches:

- Fostering mutual understanding, respect and effective communication across silos within and between communities to advance the co-production and co-generation of knowledge and empowering cities to take action.
- Building city-to-city partnerships to encourage the exchange of knowledge across cities and to develop capacity.
- Providing opportunities for researchers to work in municipal and local governments, and opportunities for practitioners and decision-makers to invest time in research projects.

## **Catalysing collaboration and knowledge production**

Building on existing knowledge and action, the Conference and this *Global Research and Action Agenda on Cities and Climate Change Science* are two steps in a journey towards generating greater knowledge in support of practice and decision-making to address climate change challenges and opportunities in urban areas. The following are examples of forward-thinking initiatives that have recently emerged to continue this journey. (1) *The Science we Need for the Cities we Want*, signed by most of the Conference's organising partners and the Urban Climate Change Research Network (UCCRN) at the end of the Conference, and now signed by 23 organisations<sup>3</sup>; (2) *the Edmonton Declaration*, which calls on cities to support evidence-based decision-making and action to address climate change in cities; (3) a national gathering of science, policy and practice in Mexico City (organised by the National Autonomous University of Mexico-UNAM) to discuss the outcomes of the Conference in the Mexican context; (4) The Conference partners, led by ICLEI, together with the UNFCCC, are working towards an annual gathering of UNFCCC members, city and research partners around cities and climate; (5) Innovate4Cities initiative from the Global Covenant of Mayors, to work with cities to further develop this Research and Action Agenda to align specifically with their needs.

The Conference and this subsequent Research and Action Agenda have showcased not only the importance cities play in terms of climate impact and opportunities to address it, but the breadth of knowledge needed to support decision-makers and urban practitioners to tackle these challenges. The Scientific Steering Committee and Organising Partners are inviting their constituencies, the IPCC

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<sup>3</sup> As of 3 Aug 2018

member countries, and other science, practice and policy organisations and communities to implement and further develop the knowledge generation avenues proposed in this Research and Action Agenda. Continued collaborative participation in this journey can support effective, evidence-based climate action in cities.

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