

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



Cities and Climate Change

Abridged Version

Crosscutting

Urban

Action

Integrate

Communicate



### **Organising Partners**

Cities Alliance, City of Edmonton, C40 Cities Leadership Group, Future Earth, ICLEI-Local Governments for Sustainability, Intergovernmental Panel on Climate Change (IPCC), Sustainable Development Solutions Network (SDSN), United Cities and Local Governments (UCLG), United Nations Environment Programme, United Nations Human Settlements Programme (UN-Habitat), and the World Climate Research Programme (WCRP).

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

Abridged Version

2019

**Cities Alliance**  
Cities Without Slums



**futurearth**  
Research. Innovation. Sustainability.

**UN HABITAT**  
FOR A BETTER URBAN FUTURE

**I.C.L.E.I**  
Local Governments  
for Sustainability



**ipcc**  
INTERGOVERNMENTAL PANEL ON  
climate change



**Edmonton**

**WCRP**  
World Climate Research Programme



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

### **Abridged version**

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### **Author list**

Anne-Hélène Prieur-Richard, Brenna Walsh, Marlies Craig, Megan L. Melamed, M’Lisa Colbert, Minal Pathak, Sarah Connors, Xuemei Bai, Aliyu Barau, Harriet Bulkeley, Helen Cleugh, Maurie Cohen, Sarah Colenbrander, David Dodman, Shobhakar Dhakal, Richard Dawson, Jessica Espey, Julie Greenwalt, Priya Kurian, Boram Lee, Lykke Leonardsen, Valerie Masson-Delmotte, Debashish Munshi, Andrew Okem, Gian C. Delgado Ramos, Roberto Sanchez Rodriguez, Debra Roberts, Cynthia Rosenzweig, Seth Schultz, Karen Seto, William Solecki, Maryke van Staden, and Diana Ürge-Vorsatz.

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### **Contact information**

All enquiries regarding this report should be directed to the World Climate Research Programme:  
[wcrp@wmo.int](mailto:wcrp@wmo.int)

### **Images**

Cities and climate change (cover), modified from Figure 1: Amanali Cornejo V.

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Report design and layout: Narelle van der Wel



## Foreword

The main goal of the Intergovernmental Panel on Climate Change's (IPCC) co-sponsored international Cities and Climate Change Science Conference (March 2018, Edmonton, Canada) and the related CitiesIPCC campaign (initiated by the organisations who partnered with the IPCC in hosting the conference) was to engage the scientific community, practitioners and policymakers in discussing the next frontier of research focused on the science of cities and climate change.

We, the conference Scientific Steering Committee (SSC) and Organizing Committee (OC), are proud to present this Research and Action Agenda on Cities and Climate Change Science. It aims to inspire climate change research and collaborative scientific efforts resulting in reference reports and peer-reviewed publications that will inform the IPCC's sixth assessment cycle (2015-2022) and the Special Report on Cities planned for the seventh assessment cycle. Drawing on a synthesis of the conference outcomes, as well as the parallel deliberation of experts from the SSC and OC, this agenda presents the key findings as relates to: six topical research areas; key cross-cutting issues and knowledge gaps; and approaches to facilitate the implementation of the Research and Action Agenda on Cities and Climate Change Science. A report back on the conference and the Research and Action Agenda was presented to the IPCC during its 48th plenary session on 1st October 1st 2018, in Incheon Korea.

We invite the science, policy and practice communities to collectively address climate change in cities by implementing and building on this Research and Action Agenda, integrating perspectives of their constituencies, and tailoring the findings from our continuing efforts to understand the climate change challenges and opportunities in different cities.

**Scientific Steering Committee (SSC) and Organizing Committee (OC)  
Cities and Climate Change Science Conference  
(March 2018, Edmonton, Canada)**

*SSC Co-chairs: Shobhakar Dhakal, Seth Schultz, Diana Ürge-Vorsatz. SSC Members: Xuemei Bai, Aliyu Barau, Helen Cleugh, Richard Dawson, Gian Carlo Delgado, David Dodman, Lykke Leonardson, Valérie Masson-Delmotte, Debra Roberts, Roberto Sanchez, Cynthia Rosenzweig, Karen Seto, William Solecki, Maryke van Staden, Megan Melamed.*

*OC Co-chairs: Sarah Cicchini, Emmanuelle Pinault, Julie Greenwalt. OC Members: Anne-Helene Prieur-Richard, Yunus Arikan, Mxolisi Shongwe, Sarah Connors, Bard Rama, Minal Pathak, Jessica Epsey, Natalene Poisson, Pierre Boileau, Marcus Mayr, Boram Lee.*





## Message from his worship Mayor Don Iveson

Our city has been a gathering place for thousands of years of civilization, a place where diverse groups have come together to trade, share ideas and learn from one another. Edmonton was honoured to host the inaugural Cities and Climate Change Science Conference as a continuation of this legacy, bringing together local leaders, global organizations and scientific experts to explore the challenges of climate change.

This was a conference of many firsts – the first time the scientific community focused its attention on the role of cities in combating climate change, the first time cities and city networks gathered with technical experts to align climate efforts, and the first concrete example of the multi-level collaboration enshrined in the Paris Agreement.

Cities are where innovation and progress happen. As hotbeds of research and collaboration, they are uniquely positioned to tackle the ever-evolving challenges of climate change. The conversations and presentations at the conference were essential to the development of the Research and Action Agenda on Cities and Climate Change Science that identifies the knowledge required and approaches to delivering on the research needed to help keep the City of Edmonton, as well as communities around the world, focused on our efforts to address climate change.

Municipalities must commit to a new kind of partnership with the scientific community – a partnership based on data, research and innovation – to guide investment and policy decisions. One of the most important outcomes from the Conference was the Edmonton Declaration – a city focused document that reaffirms the importance of science-based policy and decision making. It recognizes that powerful change is possible through the unified and consistent efforts of government, businesses and the scientific community. In response, the City of Edmonton launched a Research Grant Program in 2019. Submissions in this first year were tailored to key knowledge gaps identified in the Research and Action Agenda.

The results of this work will advance Edmonton's understanding of risks, challenges and potential solutions as efforts to engage citizens and address climate change mitigation and adaptation continues. The resulting material will be shared and we are encouraging other jurisdictions to join the grant program and pursue opportunities to generate and disseminate the knowledge cities need.

I would like to extend a resounding thank you to the Conference Organizing Committee and Scientific Steering Committee, conference sponsors and supporters from the scientific, practitioners and policymaking communities who helped to make this inaugural event a resounding success. The work we do today will have an enduring impact on the future of cities – and the world.

A handwritten signature in black ink, appearing to read "Don Iveson". The signature is fluid and cursive, with a large, sweeping initial "D".

Don Iveson, Mayor



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

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 43rd 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 (UN Habitat, 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.

## 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;





**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. Graphic design by Amanali Cornejo V.

- 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 understand fully 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.



## Topical areas

Further research and action are 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 understand better how to increase adaptive capacity of informal sectors and how to scale up low-carbon solutions from and for the informal sector
- 

### 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 improve urban environmental outcomes simultaneously, 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
- 

### 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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## Topical areas

Further research and action are needed on the following

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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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### 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 used strategically, 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 address disaster risk better
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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
- 



### 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.

#### 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 develop this Research and Action Agenda further 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 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.

## Acknowledgments

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## Notes

1. 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).
2. 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. As of 3 Aug 2018.

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**The Global Research and Action Agenda on Cities and Climate Change Science showcases the breadth of knowledge needed to support decision-makers and urban practitioners to tackle these challenges. Building on existing knowledge and action, the Agenda aims to generate greater knowledge in support of practice and decision-making to address climate change in urban areas.**

**This is the primary outcome of the Cities and Climate Change Science Conference (City of Edmonton, Canada, 5-7 March 2018), reported to the 48th Plenary session of the Intergovernmental Panel on Climate Change (Incheon, Korea, October 2018).**

