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PROGRESS REPORT

International Conference on Climate Change and Cities

(Prepared by the Co-Chairs of the Scientific Steering Committee)

(Submitted by the Secretary of the IPCC)

PROGRESS REPORT

International Conference on Climate Change and Cities Shaw Conference Centre, Edmonton, Canada, 5-7th March 2018

Introduction

Recognising the important role of cities in the global climate change response, the Intergovernmental Panel on Climate Change (IPCC) at its 43rd Session (Nairobi, Kenya, 11 – 13 April 2016), decided under the **Decision IPCC/XLIII-6. Sixth Assessment Cycle (AR6) Products. Special Reports:**

Special Reports:

- i. To recommend, within the AR6 scoping processes, a stronger integration of the assessment on the impacts of climate change on cities and their unique adaptation and mitigation opportunities and make more robust the consideration of cities in the treatment of regional issues and in chapters that are focused on human settlements, urban areas and the like, including through the enhanced engagement of urban practitioners.
- ii. That the Seventh Assessment Cycle (AR7) report will include a Special Report on climate change and cities.
- iii. To consider working with academia, urban practitioners, and relevant scientific bodies and agencies, to organise an international scientific conference on climate change and cities early in the AR6 cycle, in order to stimulate scientific reports and peer reviewed publications on this subject.

At its 44th Session (Bangkok, Thailand, 17 – 20 October 2016), the IPCC approved the proposal for an International Conference on Climate Change and Cities, co-sponsored by Cities Alliance, C-40 Cities Leadership Group, Future Earth, International Council for Local Environmental Initiatives (ICLEI)-Local Governments for Sustainability, Sustainable Development Solutions Network (SDSN), United Cities and Local Governments (UCLG), United Nations Human Settlements Programme (UN-Habitat), United Nations Environment Programme, and the World Climate Research Programme (WCRP). The International Conference on Climate Change and Cities, which was co-sponsored¹ by the IPCC and the nine partners specified above was hosted by the City of Edmonton, Canada from March 5th- 7th 2018.

Conference objectives

The overall objectives of the 2018 International Scientific Conference on Climate Change and Cities (**which for communication and branding purposes was later renamed Cities and Climate Change Science conference and tagged with the short title CitiesIPCC**) were to: (1) identify key research and knowledge gaps with regard to cities and climate change; (2) inspire global and regional research that will lead to peer-reviewed publications and scientific reports; and (3) stimulate research in Cities and Climate Change over the AR6 cycle.

The specific aims of the conference were to:

- i. Take stock of the scientific literature, data and other sources of knowledge that have emerged around cities and climate change since the close of the Fifth Assessment Report (AR5) (i.e. March-October 2013²) and build on ongoing work as part of the AR6 cycle.

¹ IPCC co-sponsorship does not imply IPCC endorsement or approval of this report, or any recommendations or conclusions contained herein. This report, and the *Global Research and Action Agenda on Cities and Climate Change Science* and supporting material which can be found within this report has been prepared for consideration by the IPCC at its 48th Plenary. This material has not been subjected to formal IPCC review process, or peer review.

² AR5 cut-off dates for literature to be considered: WG I: 15 March 2013; WG II: 31 August 2013 and WG III: 3 October 2013

- ii. Identify key gaps in the scientific literature, in keeping with the emphasis that arises from the scoping of the AR6 and its three Special Reports, and international, regional and national policy and implementation imperatives that emerge from 21st Session of the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), the Sustainable Development Goals (SDGs) and the New Urban Agenda.
- iii. Identify key research and knowledge gaps, with the aim of stimulating new research, the findings of which to be assessed in AR7's Special Report on Climate Change and Cities³.
- iv. Develop novel assessment frameworks that take into account the systemic linkages, synergies and trade-offs between urban systems and climate change, especially action at the local scale.
- v. Identify the research gaps in terms of policy and implementation in order to facilitate the consideration of such areas in anticipation of the Special Report on Climate Change and Cities.
- vi. Bring together key urban and climate change stakeholders⁴ to identify priorities for scientific and policy research during the AR6 cycle and to stimulate the co-design and co-production of actionable knowledge.
- vii. Building on established United Nations, member state and research network initiatives help define appropriate global, regional and local monitoring systems and data architectures, including quality control, to facilitate scientific research and to help inform evidence-based policy development on climate change and cities.
- viii. Establish a partnership-based platform to systematically accumulate, assess, analyse and disseminate information on science-policy-practice linkages that enable an upscaling and mainstreaming of urban climate actions at all scales.

Conference Overview

High level committees

The Conference was organised by two central committees, the Scientific Steering Committee and the Organising Committee.

The Scientific Steering Committee (SSC) was composed of experts from the engineering, physical, natural and social sciences and humanities, as well as the urban community. The SSC was charged with guiding the organization of the conference through developing the scientific strategy and vision to achieve the conference objectives. The SSC was also in charge of developing the conference programme and the selection of participants. SSC members were nominated in their personal capacity and their contribution was considered voluntary, although their involvement in major international organisations was taken into account, as well as their capacity to represent the main constituencies of the conference partners (IPCC, Scientific Community, Urban Community). The SSC held bi-weekly meetings, hosted by Future Earth and chaired by the SSC's three co-chairs, Dr Prof Diana Ürge-Vorsatz, Seth Schultz and Dr Prof Shobhakar Dhakal. For further details on the mandate of the Scientific Steering Committee, see their Terms of Reference in Annex D. For details on the selection process for SSC members, refer to Annex D.

Each partner organisation (C40, Cities Alliance, Future Earth, ICLEI, IPCC, SDSN, WCRP, UCLG, UN Environment, UN-Habitat) had a seat in the Organizing Committee (OC). The IPCC was represented by one member of each Working Group's Technical Support Unit (TSU) as well as one member of the IPCC Secretariat. After the selection of the host city, a representative from the City of Edmonton also joined the Organizing Committee. The OC held 20 bi-weekly meetings chaired by the OC's 3 co-chairs Emmanuelle Pinault (C40), Julie Greenwalt (Cities Alliance) and Sarah Cicchini (City of Edmonton).

³ Decision IPCC/XLIII-6 # 6 "AR7 cycle will include a Special Report on climate change and cities."

⁴ This includes UN member states, representatives of city and regional governments, UN and international organisations, representatives of the scientific community, universities and think tanks, urban and climate practitioners; organisations of the urban poor, development partners and donor institutions

The work of the Organising Committee consisted of overseeing the preparation of the conference in terms of planning, budgeting, communication and logistics. It worked in close collaboration with the team from Edmonton, the host city. The Organising Committee was also responsible for coordination and costs associated with planning and delivering the conference including registration, conference website, international marketing, communication, travel sponsorship and support and reporting on conference proceedings, mobilization and accommodation. For further details on the mandate of the Organising Committee, see their Terms of Reference in Annex D.

Conference structure

The call for conference proposals ran from 9 August - 16 October 2017. During this period, SSC members and OC partners held ten webinars reviewing the goals and requirements for submission, with a focus on the needs of different stakeholder groups (academic, urban practice and policy) to clarify any outstanding questions from those wishing to present at the conference. The SSC received 210 session proposals and 804 proposals of abstracts for oral or poster presentation. The full list of sessions and abstracts proposals were distributed between 97 individuals for review. This list of reviewers comprised of SSC members, volunteers from partner organisations and external experts in the field who were recommended by SSC and OC members. Using the review inputs as a basis, the proposals were evaluated by the SSC at a two-day workshop which was held on 7-8 November 2017 in Paris. Extending invitations to participants to attend the conference was coordinated by Cities Alliance, Future Earth and City of Edmonton.

More than 700 participants from 64 countries attended the conference, 49% of participants were women, and 51% men; 46% represented academia/research communities, 20% were policy makers, 21% were urban practitioners and 14% were categorised as other. The host country and city invited local delegates, including local and national Canadian authorities, indigenous representatives and 50 students from the University of Alberta who had an active role in taking minutes for and providing summaries of the parallel sessions. Including all special invitees from the host country and city, 75% of the delegates were from the Global North and 25% from the Global South⁵. When the invitations to Canadian delegates made by the host city and the 50 student volunteers from the University of Alberta were excluded, the Global North vs. Global South ratio was 68% and 32% respectively. All geographic World Meteorological Organization (WMO) Regions were represented at the conference. Participation included representation of Least Developed Countries (Bangladesh, Ethiopia, Malawi, Nepal, Uganda and the United Republic of Tanzania), Land locked Developing Countries (Zimbabwe) and Small Island Developing States (Jamaica, Papua New Guinea, St. Lucia, and Trinidad and Tobago). For full list of conference participants, see Annex E.

During the Conference, seven plenary sessions, 55 parallel sessions and 76 posters were presented. Three official press conferences were held during the conference. In total 39 reporters attended the Conference and 69 interviews were arranged during and about the conference. More than 90 articles were written in the lead up to, during and directly following the Conference. Twitter and Facebook were the primary social media platforms to promote the Conference. Each of the seven plenary sessions were livestreamed on Facebook, and more than 700 individuals watched

⁵ Among the co-sponsoring organizations there was no one straightforward or uncontested way to refer to the division among countries. The IPCC is guided by Statistical Annex to the World Economic Situation and Prospects 2015 Report, an Annex issued by the Department of Economic and Social Affairs of the United Nations Secretariat (UN/DESA), and is based on information obtained from the Statistics Division and the Population Division of UN/DESA, the UN Conference on Trade and Development (UNCTAD), the five regional UN economic commissions, and furthermore from the UN World Tourism Organization (UNWTO), the International Monetary Fund (IMF), the World Bank and the Organization for Economic Cooperation and Development (OECD), see IPCC-XLII, INF. 16. However, other co-sponsoring organizations use different approaches to classification (e.g., based on a subjective level of development (developed countries and developing countries) or level of income (low- and middle-income countries and high income countries), which have limitations to illustrate the strong division among societies globally. The SSC found using the terms Global North and Global South better reflects cultural, social, economic, political and environmental dimensions that distinguish societies and are also commonly used in the urban research communities

these streams. Conference material received over 6300 views on Facebook live, and the Conference was referenced over 4300 times on Twitter⁶. The Conference website (www.citiesipcc.org) was the main communications product for participants with session information, travel information and supporting documentation. The site remains active.

Following the Conference, a short survey was sent to conference participants to assess their satisfaction with the Conference, and to determine if it met their expectations. The OC received responses from 55 conference participants to this survey. Overall, responses were positive with the majority of respondents expressing satisfaction with the conference and subsequent opportunities to strengthen collaboration. Responses are summarised in Tables 1 and 2, below.

Table 1. Overall participant satisfaction

	Very Dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
Overall quality of the conference	0%	5.66%	0%	22.64%	71.70%
Overall quality of the programme	0%	1.89%	7.55%	39.62%	50.94%
Relevance of the programme to your professional practice	1.89%	3.77%	3.77%	39.62%	50.94%

Table 2. Has conference achieved its goal to strengthen collaboration between the science, policy and practice communities?

	Disagree	Slightly agree	Strongly agree
Did the conference achieve its aims to build bridges between the science-policy-practice communities?	3.77%	52.83%	43.40%
Did you meet colleagues you are not used to meeting in your day to day work or during professional conferences?	1.89%	18.87%	79.25%
Do the discussions you participated in allow the identification of knowledge gaps in the field of cities and climate change?	5.66%	35.85%	58.49%
Will this conference and the discussions you had in Edmonton change the way you do your day-to-day work?	15.09%	43.40%	41.51%

Many comments from participants clustered around a small number of topics, which are highlighted here. Conference participants enjoyed the opportunity to hear from a wide range of voices and actively participate and give feedback in both parallel and plenary sessions. However, it was noted that the Global South, especially those working in Global South institutes could have been better represented. Respondents appreciated the open dialogue between more established professionals and academics and early career participants. The session *Youth Voices and Climate Change Knowledge: Empowering Youth in Conversations on Climate Impact and Vulnerabilities* was a conference highlight for several of the participants who provided feedback via the survey, and several participants mentioned that they would now try to find ways to bring youth, and other under-represented communities into the discussion around cities and climate change.

⁶ Statistics were taken up to March 14th, one week following the close of the Conference.

Budget

Table 3 shows the breakdown of the global conference budget. The City of Edmonton had a separate budget which included the responsibilities of the host city: venue, catering, receptions, etc. as well as a contribution to the sponsored travel of Global South participants, the total amount of which is also provided below. Please note that all amounts are listed in US Dollars. In-kind contributions of staff time by OC organisations are not accounted below. Other in-kind support from the organizing partners included presentations, webinars and discussions as well as side events on the Conference at COP23 and the World Urban Forum 2018. For further details on how the budget was distributed, see Annex C.

Table 3. Global and host city budget figures for the Conference

	Global Budget	City of Edmonton, Government and Private Sector Sponsors
Category		
Scientific Steering Committee	\$ 79, 200.00	-
Website design/maintenance	\$ 20, 000.00	-
Events management	\$ 35, 000.00	\$ 991, 395.73
Communications & outreach	\$ 92, 000.00	-
Sponsored travel	\$ 306, 462.43	\$ 105, 591.67
Total Spent	\$ 532 463.43	\$ 1,096,987.40

Conference outcomes

The primary outcome of the Cities and Climate Change Science conference is the *Global Research and Action Agenda on Cities and Climate Change Science*, which can be found in Annex A. The agenda is a synthesis of the most important topics that emerged from the Conference. It attempts to summarise these and highlight gaps in knowledge and research. It is important to acknowledge that the Research and Action Agenda could not capture every aspect discussed or presented, but it aims to represent the detail of the Conference to the best extent possible. For elaboration on the points made in this Research and Action Agenda, please see the extended version of the *Global Research and Action Agenda on Cities and Climate Change Science* in Annex B. For details on the process by which the information in this agenda was collected, see Annex F. For information on the full summary of input from conference participants to the research agenda, see Annex G.

In the months following the Conference - based on outcomes of and discussions which took place during the Conference - several initiatives, which were informed and catalysed by the Conference and its outcomes have begun. These initiatives have been organised by SSC members, OC partner organisations and by other organisations to further the discussions between the research, urban practice and policy communities on cities and climate change science. For a list of these initiatives, see Annex H.

In parallel to the preparation of this post conference report, a conference proceeding is being prepared by UN-Habitat. This proceeding will include important detailed information generated as a result of the conference, which includes summaries of parallel sessions and inputs from parallel sessions to the Research and Action Agenda, summaries for the four thematic plenary sessions as well as the SSC led plenary session, conference posters, the papers commissioned in advance of the conference by the SSC. This information was provided by conference participants with the knowledge that it would be published as part of the conference proceedings. Additionally, it will include the full list of conference participants, and specify all sources of funding and other support. The content of the proceedings will be a representative record of conference discussions. However, IPCC co-sponsorship does not imply IPCC endorsement or approval of the proceedings, or any

recommendations or conclusions contained therein. Additionally, the papers presented at the conference nor the proceedings have not been subjected to formal IPCC review process, or peer review, and the proceedings will clearly indicate the two previous points.

Recommendations for the consideration of the IPCC Panel

The level of engagement of conference participants from the pre-conference session on 4 March through to the closing plenary on 7 March 2018, was extremely encouraging. Building on conference discussions, inputs to the *Global Research and Action Agenda on Cities and Climate Change Science*, presentations from parallel and plenary sessions, and questions posed throughout the conference, the SSC and OC propose that the following recommendations be taken note of at the 48th Plenary session of the IPCC.

That the Panel:

- Consider holding an expert meeting after the completion of the AR6 Reports, in the lead-up to the AR7 cycle, with a focus on city-level local modelling to engage the scientific community on advancements in this emerging area, to provide recommendations for the AR7 cycle, including its Special Report on Climate Change and Cities. Additional expert meetings, which focus on other issues of cities and climate change could follow, in advance of the AR7 cycle.
- Consider increasing the frequency of dialogue between intergovernmental bodies on the topic of Cities and Climate Change Science.
- Consider the inclusion of a city focus at IPCC outreach events and encourage the engagement of national and regional level organisations addressing climate change in cities and urban areas in these events. An example of this could be an outreach event on the Special Report Global Warming of 1.5 °C for local government organisations and city networks.
- Consider Cities as a crosscutting topic for future assessment cycles, noting the overwhelming support of Conference participants for the Panel's increased focus on Cities during the AR6 cycle.
- Consider giving strong support to city and urban issues in the scoping of the AR6 Synthesis Report, highlighting the new knowledge found across all Working Groups and Special reports in the Sixth Assessment cycle.
- Encourage national IPCC Focal Points to circulate drafts of forthcoming and future IPCC draft reports to city networks and local government organisations for review.

Concluding remarks

This conference was successful in bringing together stakeholders from the research, practice and policy communities to assess knowledge and identify current research gaps in cities and climate change science. The SSC and OC would like to take this opportunity to thank the IPCC for their leadership in bringing these actors together to discuss cities and climate change science.

As mentioned previously, in the months following the conference, several initiatives informed and catalysed by the Conference have begun, initiated by SSC members, OC organisations and other organisations to further strengthen the work at the interface of science, practice and policy on cities and climate change (for a list of these initiatives, see Annex H). These initiatives highlight the importance of bringing a variety of actors together and fostering dialogue, collaboration and exchange of knowledge around a specific issue to accelerate knowledge co-generation.

Moving forward, we are hopeful that the research, urban practice and policy communities will build further fruitful collaborations that will address some of the gaps in knowledge and research identified in the *Global Research and Action Agenda on Cities and Climate Change Science*, producing new knowledge and generating additional peer reviewed literature for consideration during the AR6 and AR7 cycles, and particularly the *Special Report on Cities and Climate Change*.

Annex A

Global Research and Action Agenda on Cities and Climate Change Science

Authored by: 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, Diana Ürge-Vorsatz

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. 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.

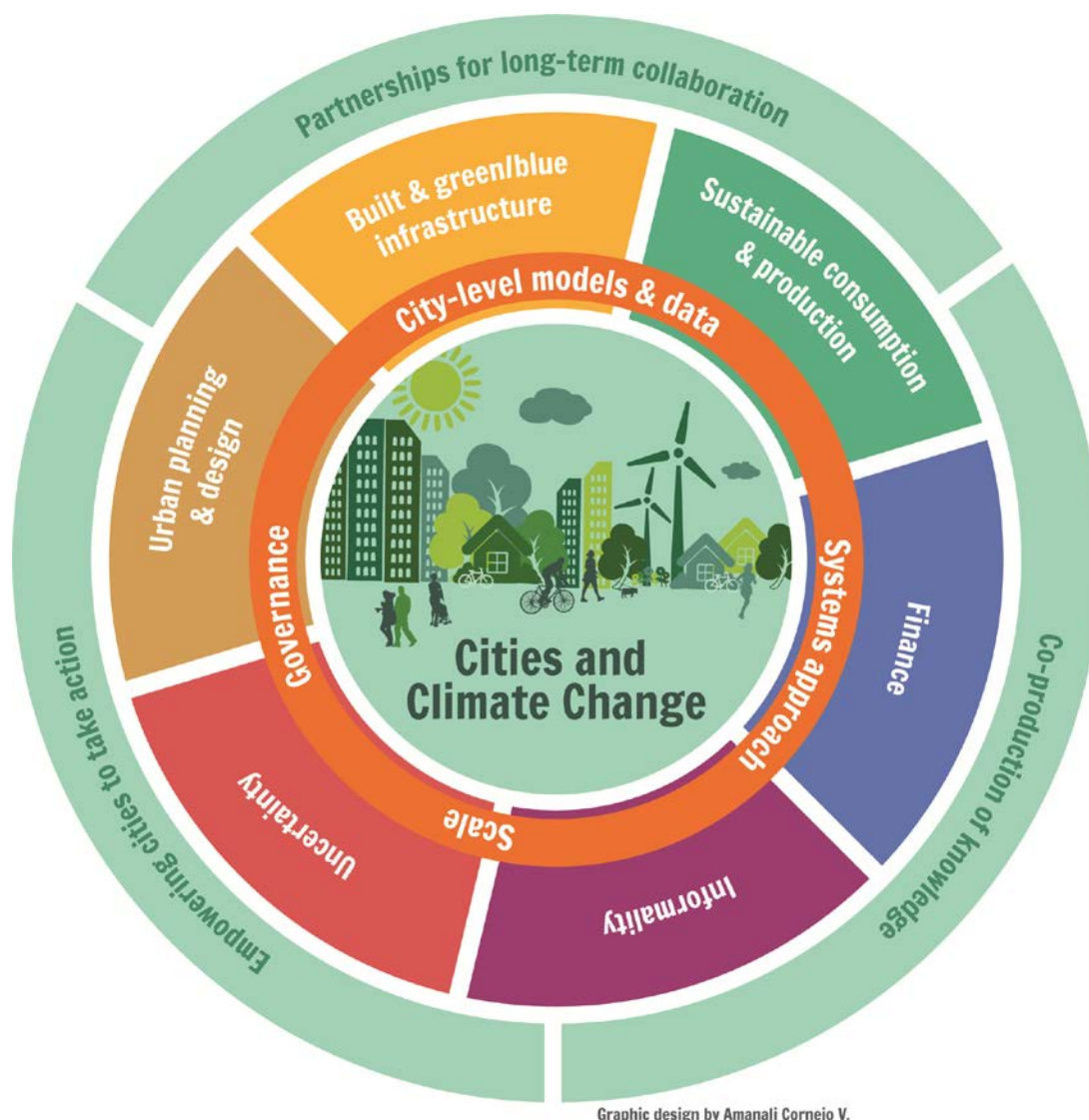


Figure 1. Pathways for climate adaptation and mitigation in cities

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.

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

Informality

- Explore how inhabitants of both informal settlements⁷ 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

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

Built and Blue / Green Infrastructure⁸

- 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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⁷ 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).

⁸ 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).

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

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

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.

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 organisations⁹; (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

⁹ As of 3 Aug 2018

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 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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Annex B

Extended version: *Global Research and Action Agenda on Cities and Climate Change Science*

Cities have the potential to be major catalysts of change in the implementation of 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).**

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, and the production of evidence-based reports and peer-reviewed publications on cities and climate change, at its 44th Session in Bangkok the IPCC approved a proposal for the co-sponsored International Conference on Climate Change and Cities (renamed and branded Cities and Climate Change Science Conference - CitiesIPCC for communication purposes), which was subsequently held in Edmonton, Canada, from the 5–7th March 2018. The aim of the conference was 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.

The Conference was co-sponsored by multiple international groups, Cities Alliance, C40, Future Earth, ICLEI-Local Governments for Sustainability, 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). Conference participants represented 64 countries and all six continents, 32% of which were from the Global South and 49% of which were women. Science, policy and practice communities were all present, distributed as 46% academia/research, 21% urban practitioner, 20% policy and 13% other. Private sector and civil society organisations were under-represented in general.

More than 700 academics, leaders, innovators and influencers attended this landmark conference providing insights that informed and shaped this co-produced *Global Research and Action Agenda on Cities and Climate Change Science*. The breadth of information presented at the Conference spoke to the significant amount of work that has already been achieved by the scientific, urban practice and policy communities to address climate change in cities. The high level of interest in attending the conference and subsequent constructive debate and discussion during the conference highlighted the strong willingness for collaboration between these communities. Furthermore, the diversity of conference participants ensured a strong move towards more balanced and robust collaboration, which will help to catalyse evidence-based research, funding and knowledge sharing, and to prepare the groundwork for the Special Report on Climate Change and Cities, which will be produced during the IPCC's Seventh Assessment Cycle.

To build the *Global Research and Action Agenda on Cities and Climate Change Science*, the SSC (see full list Annex D), with support from co-sponsoring organisations, compiled and synthesised input from all conference plenaries, parallel sessions, posters, pre-conference commissioned papers, and discussions during the conference, regarding knowledge gaps and key

recommendations.¹⁰ This information was synthesised to shape this Research and Action Agenda by the SSC, with contributions from co-sponsoring organisations and external experts (see authors list, Annex A), who represented diverse disciplines, perspectives, and areas of expertise. Examples used throughout this agenda were discussed at the Conference and are meant to be illustrative. In no way are they meant to be prescriptive or representative of all examples or best practices in the field.

The Conference and the resulting Research and Action Agenda can be considered steps in a longer journey to explore the opportunities offered by evidence-based knowledge in helping address challenges associated with climate change in urban areas. Experience from cities with diverse and distinct characteristics including size (small, medium, large and mega cities), growth patterns (rapidly expanding, sprawling, or 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. Note that the agenda enriched and expanded on the six research priorities identified by Bai et al. (2018) in the course of preparation for the Conference.

This document aims to serve and support national governments, local and municipal authorities[1], researchers and scientists, the planning and design communities, private sector enterprises, international organisations (including international cooperation and development banks) and civil society including indigenous peoples, in developing blueprints and action plans for developing new evidence-based research and knowledge that supports effective climate action strategies in cities. This document signposts key issues that will require research to help guide effective policy development for climate action in cities.

This ambitious agenda attempts to be holistic, inclusive, responsive and solution oriented. It seeks to enable co-design and co-production of knowledge, to encourage system-based approaches, and to highlight the importance of urban processes in facilitating a global climate change response.

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.

¹⁰ A compilation table of some of the major points, knowledge gaps and recommendations, and their links to the sections of this document will be included in the full report to IPCC.

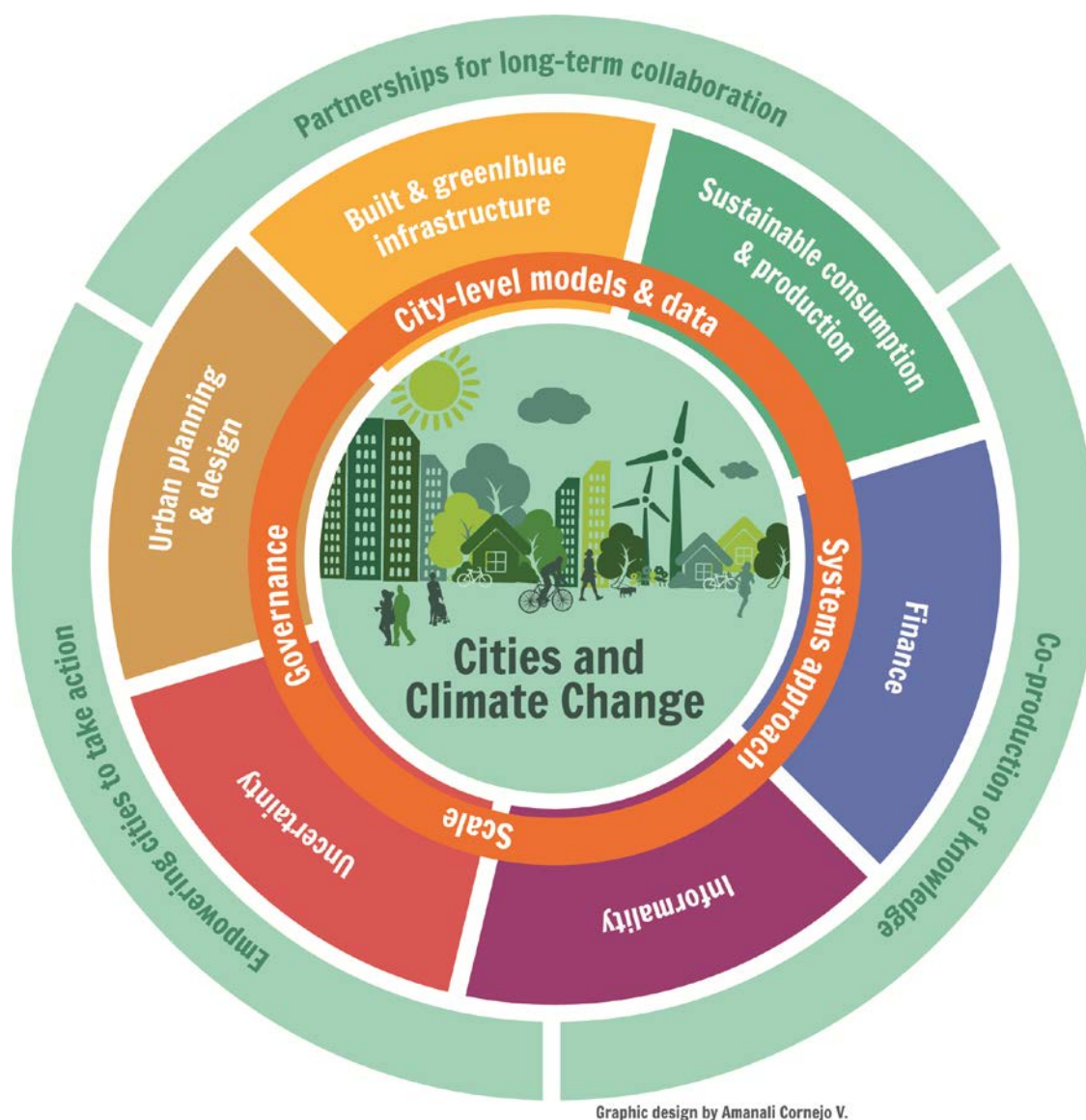


Figure 1. Pathways for climate adaptation and mitigation in cities

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 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 that would benefit from better uptake of existing science and knowledge, new research and new perspectives.

1.1. Systems Approach

Taking a systems approach to explore solutions for cities is particularly important for climate change mitigation and adaptation strategies. 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 governing 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 factors, 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, or limited to specific sectors, academic disciplines or policy-making units). As a result, many systemic opportunities and risks have been overlooked. Research identifying synergies and trade-offs between adaptation and mitigation in urban areas in different regions could create valuable precedents for urban areas seeking to create climate change agendas.

Knowledge is needed on how to use a holistic approach to capture and weave together or integrate diverse forms of knowledge and data from a wide range of sources and perspectives. Climate change is an extremely crosscutting societal issue. It influences and is influenced by such a vast range of factors, that it cannot be addressed with silo-style analysis. However, approaches to capture and integrate such diverse data sources as climate metrics, qualitative socio-economic data, informal knowledge (local, indigenous, traditional, feminist, social, political, community, etc.), collective intelligence, Big Data and experiential evidence on nature-based solutions, among others, are only beginning to be explored. Methods for protecting and promoting indigenous practices that have been used for generations when faced with environmental change and those which contribute to adaptation, also need to be included. Generating knowledge on societal transformation requires various facets of the problem to be integrated and considered simultaneously. More analysis is needed to improve knowledge in these research areas, which could lead to a step change in building options for climate action in cities and understanding implications of actions.

Systems knowledge is needed on important interactions, inter-dependencies and resource flows between natural, built and social systems, and between urban areas and the rural hinterlands. Oftentimes, mitigation and adaptation actions can compound each other. The potential co-benefits and synergies, as well as trade-offs, cancellation and carbon lock-in[3] effects of such actions, are increasingly recognised (Ürge-Vorsatz et al. 2018). With a systems approach, urban scale mitigation and adaptation are positioned in a broader spatial context, considering the flow of resources, energy and waste in and out of cities, and the associated environmental, economic and social impacts of cities on hinterlands, and *vice versa* (Delgado-Ramos and Guibrunet 2017). However, the complex interplay between urban systems (social, economic, political, geographical etc.) and between urban and peri-urban areas, as well as the broader regional effects, have not been described or explicitly mapped. Therefore, the impacts of various interventions cannot be predicted accurately. Future research using a systems approach offers a new way to understand complex causes and effects within and outside city limits when planning and implementing climate change adaptation and mitigation measures.

New methods need to be developed to incorporate integrative measures of valuation, bringing together quantitative, relational, distributional, behavioural and economic values¹¹ to assess synergies, trade-offs and co-benefits and potential maladaptation between interventions the respond to climatic and non-climatic hazards. A core challenge facing decision-makers is identifying and prioritising climate change interventions in specific contexts. Calculating costs, co-benefits and trade-offs is often difficult, because many components have no clear monetary value. The total and true 'value' of an action or intervention could be derived by, for example, assessing reduced mortality and morbidity, reduced energy consumption, protected biodiversity or infrastructure, the various benefits of nature-based solutions, socio-cultural well-

¹¹ For a more detailed definition of these terms, see (Pascual et al. 2017).

being, cleaner air, etc. (e.g., Hallegatte et al. 2013; Masson et al. 2014; Lemonsu et al. 2015)). New systems-based valuation approaches need to provide and compare valuation of adaptation and mitigation actions, between various systems and regions, and within specific national contexts. Research in this direction could strengthen contributions to climate change action in urban areas.

Advancements in action-oriented research are needed, focusing on multiple impacts, assessing how uncertainty can be reduced, providing options for transformative climate action plans, and highlighting co-benefits for achieving the SDGs and other global agendas, within the context of rapid urbanisation. Rapidly growing and developing urban areas stand to reap long-term rewards from investing early in a systems approach when designing mitigation and adaptation strategies. Within a broader development framework, synergies and co-benefits of systems-based solutions for urban areas can help achieve many SDGs. Research is needed on how different SDGs and their targets interact and interface with other global agendas, in terms of possible co-benefits and trade-offs. Integrating and comparing targets pertaining to cities under different SDGs could allow for the development of possible optimal solutions to meet mitigation and adaptation targets within other global agendas (Sanchez Rodriguez et al. 2018). Further research using a systems approach is also needed that identifies maladaptive and mal-mitigative pathways and demonstrates possible alternatives. Considering climate change within a systems approach can also help avert compounded and aggregated risks of climate and non-climate hazards in cities. A systems approach is key in delivering the climate change agenda as well as the UN's New Urban Agenda, the SDGs (Bai et al. 2016) and the Sendai Framework for Disaster Risk Reduction.

1.2. Governance and Institutions

City governance of climate change is multilevel, multi-actor and multi-faceted. It is organised through formal and informal institutions operating across scales (from local and municipal authorities to national governments) as well as through networks and partnerships that operate within and between cities. While formal institutions can establish the legal and regulatory frameworks within which responses to climate change operate, governing climate change in cities also takes place through an array of interventions designed and implemented by non-state actors, including businesses, non-governmental organisations and communities. These actors are increasingly experimenting with ways to address this challenge in the context of their wider goals for sustainable development and social and environmental justice.

It is important to investigate the differential distribution of power among diverse actors, and how this shapes their capacity to act in response to climate change. Informal institutions, and their associated social practices, norms and path-dependencies, also structure the scope and nature of action on climate change in cities (see section 2.1 on Informality). Governance for climate change in cities is further complicated by limitations in human capacity, financing tools, urban planning and the application gap between policy and innovation, research and technology. Enabling policies and investments that foster capacity for cities to respond to climate change are critical.

There is a need to develop knowledge to understand the operational pathways and institutional structures for governance that effectively supports climate action in different urban contexts and that is inclusive of diverse priorities and voices in planning and decision-making. There will be no 'one size fits all' model of urban climate governance, rather a diversity of approaches is likely to apply in different contexts. Governance models will require the inclusion of diverse interests and voices in planning, decision-making, action and monitoring. They will also require recognition of the significance of path dependencies^[2] which emerge from prior policy-making on issues as diverse as infrastructure, design and resource management. Additionally, generating knowledge on these path dependencies can demonstrate the constraints on climate resilient and equitable urban transformation, and on potential areas of vulnerability and risk.

Knowledge is needed on different forms of governance, including multilevel governance, that can best support climate action across a highly uneven institutional landscape. Existing evidence points to the importance of building governance capacity. Different institutions and actors have highly uneven access to the knowledge, resources and power required to engage with the

climate change challenge. Cities in the Global South experience a significant deficit in governance capacity compared to those in the Global North, with small and mid-size cities having even more asymmetrical governance capacities compared to large cities or capital cities in the same country. Multilevel governance arrangements for political and financial decision-making, long-term continuity and inter-municipal collaborations, as well as joint efforts between research institutions, decision-makers, practitioners and transnational city networks, are all potentially key factors. More evidence is needed to understand the impacts and effectiveness of different forms of governance, to solve tensions and reduce trade-offs, negotiate business practice and information use and create enabling conditions for effective city-based action.

Deeper understanding is needed of how transformative climate change responses can address urban inequalities and ensure inclusive modes of governance. Knowledge generation could shed light on how the capacity to act on climate change is distributed and on how political-economic structures, struggles and conflicts shape climate responses of public and private actors. It could also further understanding, and promote incorporation of the diverse perspectives of those often excluded from decision-making processes (including women, indigenous peoples, youth, minorities, economically or otherwise disadvantaged groups and people with disabilities). Addressing adaptation and mitigation at the urban scale raises significant questions of inclusiveness in these processes for current inhabitants and future generations, and thus on desirable urban futures.

1.3. Scale

All aspects of climate change risk, impact, vulnerability and response options are influenced by scale and scale interactions. The role of spatial (including different levels of governance) and temporal scale can have profound implications. The benefits of climate strategies implemented in the short-term might be different in the medium and long-term contexts. One of the major challenges is that actions and effectiveness of those actions at the local (city/neighbourhood) scale are influenced by decisions made at other scales (e.g., provincial/state, national, global). For example, national governments may set policies for transportation and economic development that influence investments in cities. Knowledge generation on the interplay of scale in the context of climate change would allow for more informed decision-making processes for urban areas and entities including neighbourhoods, municipal jurisdictions and metropolitan regions.

To inform integrated action, new knowledge and data are needed that are comparable across spatial scales and regions while remaining meaningful at the local scale. For instance, local weather or air pollution data are not easily translated into, or integrated with, long term and large-scale climate or emissions data (see also section 1.4 on data, modelling and scenarios). Local city or neighbourhood scale data can not necessarily be extrapolated to another region, context or spatial scale. Similarly, global and regional means tend to hide extreme local variability. This can hamper local and national planning, large-scale modelling and global assessments, and therefore data comparable across spatial scales could facilitate action.

New knowledge is needed to increase 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. There is a need to develop further knowledge on the implications of multi-scale issues and decisions on effects of climate change at the urban scale. Currently, information on impacts of the changing climate tend to be available only in broad terms, with no clear consideration of scale. Expanding our knowledge on the interactions of decisions at multiple scales and the direct implication of these interactions for cities could allow local authorities to be responsive or proactive to decisions being made at other scales and informing better policies at the national level. In terms of vulnerability to hazard, for example, individuals may experience a hazard (e.g., flood or drought) as a threat to their health and livelihood, which in turn will depend on the specific individual and community capacities to respond (access to resources, basic services and information, relational capacities, etc.). The same hazard may exert a strain on essential services and management structures at the subnational level, impact the national budget at the country level, and lead to migration and conflict at the regional level.

Further collaboration between urban stakeholders and researchers to produce knowledge, data and information that is responsive to the temporal scales relevant to cities. Various climate change patterns and events, natural systems, human systems, global agendas, national administrations, funding cycles, research agendas, municipal action plans, industrial systems and so forth, each operate on different time scales. This makes the planning, implementation, financing, monitoring and evaluation of adaptation and mitigation activities difficult. It is desirable that cities act in the most efficient and integrated manner possible, and therefore there is a need to develop new ways for cities and climate change science to work together with innovative, flexible and iterative processes to develop and implement solutions at the local level.

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. The need for more urban scale observations has been well argued in the urban climate literature (see, for example, (Grimmond et al. 2010; NRC 2012; Henderson-Sellers et al. 2012). Critical knowledge gaps exist relating to downscaling climate projections to the most local levels, as well as on how to improve confidence in future local projections (also see Section 2.6 on Uncertainty), with particular dearth of data in the Global South. Providing information that is spatially and temporally relevant to city-level actors requires the development of a new observation framework, advances in climate modelling and evaluation, and the development of scenarios at the city scale.

There is a need for an international and open-access observational framework for collecting key climate and socio-economic metrics at the city scale. Currently, both climate and socio-economic data remain scarce at the city and neighbourhood scales, particularly in the Global South. Climate-related metrics (such as emission factors and activity data, air quality, temperature, precipitation, soil moisture), socio-economic metrics (such as demography, income, informality, economics, architecture, health, mobility, consumption budgets), city-relevant data (such as state of infrastructure and services) and biophysical data (such as ecosystem services, geological and hydrological) often have insufficient resolution to be useful at the local level. This represents an important obstacle in improving and expanding knowledge generation. Future research efforts could consider creating an international city-scale observation framework capable of providing data on key metrics, which could be useful for informing the implementation, evaluation and adjustment of mitigation and adaptation strategies in urban areas.

Improving modelling capabilities is key to producing higher resolution data, predicting near term climate futures, and producing models that are customisable to specific cities. Key challenges for achieving the above-mentioned improvements are the required advances in modelling methods, increased computing power, data collection and storage needs. These advances can build on the substantial progress made over recent decades by the urban climate research community into developing micro- to neighbourhood-scale models and comprehensive evaluation research programmes documenting impediments to improved model performance (Best and Grimmond 2015).

Suggested advancements include better spatial and temporal resolution, and integration of local geography. The current suite of global climate models produces outputs at spatial resolutions that are not fully applicable to cities. This suggests a need for improved downscaling methods. Cities across the world also vary greatly in terms of specific geographical features, requiring models to be parameterised to include specific geomorphologies.

Societal actors also request information on the effects of climate change at the city scale in the near term, whereas climate projections focus on the mid- or long-term. Modelling methods to develop near term climate information would be strengthened by a stronger emphasis on the specific needs at the city scale.

Future climate scenarios need to incorporate transdisciplinary approaches that integrate sociological, economic, climatic and ecological features applicable at the city scale (and that are informed by a range of expertise including indigenous knowledge and local knowledge), is crucial for scientific advancement. Scenarios often rely on many assumptions related to social

factors such as urbanisation, demography, economics and innovation. For example, at the global scale, the Shared Socio-Economic Pathways were developed to encompass a plausible range of qualitative narratives regarding demographics, urbanisation, human development, economy and lifestyle, policies and institutions, technology, environment and natural resources (O'Neill et al. 2014). Further research is needed focusing on new modelling methods that allow for assumptions and starting parameters to be scalable, based on actual local data. This would reduce the uncertainty in future scenarios and would make outputs more relevant and reliable in informing local city action, especially if climate and socio-climate metrics were to be monitored and modelled continuously at the city scale.

Research is needed on the effect of, and the dynamics between, adaptation alternatives for coastal cities. Complex and dynamic feedback systems can result in seemingly intuitive infrastructure solutions resulting in maladaptation. The complexity of coastal systems and islands impedes the development of wave impact and flood modelling and other relevant models and scenario simulations for coastal cities. Increasing understanding of these aspects could lead to better adaptation strategies. The impacts of sea level rise and other effects are distributed unequally across cities' populations, often concentrated in regions with existing social vulnerability. Co-producing models that integrate indigenous knowledge, local knowledge, marine, terrestrial and social research will therefore be essential for mapping the challenges faced in coastal cities due to climate change.

2. Key topical knowledge gaps

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

2.1. Informality

The way in which informal settlements^[4] and the informal economy operate, and the ways in which governments respond to these, have significant implications for adaptation and mitigation. Informal settlements are urban settlements or neighbourhoods that have developed outside formal systems regarding land ownership, land tenure and a range of regulations related to planning and land use, built structures, health and safety. Informal settlements do not always occupy land illegally, but rather informality may arise from subsequent sub-divisions or sublets, which do not meet formal standards. Climate change often affects the inhabitants of informal settlements most severely – the poorest, most vulnerable and marginalised populations in the city, generally with low per capita carbon footprints. Furthermore, differences in the capacity to mitigate carbon emissions and risks while adapting to both rapid and slow onset events (e.g., floods and droughts) depend on differences in socioeconomic status, which in turn can be exacerbated by growing levels of social inequality. More research is needed to understand informality in the context of climate change given the scale of the issue. The population living in informal settlements globally was estimated to be between 881 million and one billion in t2014 (UN Habitat 2017). A possible tripling in the informal population is foreseen (see <http://mirror.unhabitat.org/content.asp?typeid=19&catid=10&cid=928>) in the coming years given the high rate of informality in Africa and Asia and that 90% of the urban population growth up to 2050 is expected to happen in these two continents (UN DESA 2014).

Further understanding and research is needed on how inhabitants of both informal settlements and slums are particularly vulnerable to the effects of climate change. Informal settlements are frequently located on land that is exposed to climate-related hazards (particularly riverine flooding and sea-level rise). This coupled with poor infrastructure, poverty and the limited adaptive capacity of most households, can create significant risks. Research could explore how informal settlements can be upgraded in ways that contribute to lower carbon and climate resilient lifestyles, at an affordable cost, particularly through retaining central locations that minimise energy use for travel, but also through the types of building materials employed. Decades of urban research studies document a progressive transformation of informal settlements into formal urban structure

(Fernandes 2011). Research on these processes within the contexts of climate change could incorporate low carbon emission and resilience[5] strategies into this transition.

Research is needed to understand the extent and nature of the challenges posed by, and to provide evidence for policy interventions on informality that simultaneously respond to climate change and vice versa. Informality is, and will remain, one of the defining features of many cities. In many countries around the world, especially in the Global South, most of the urban population lives in informal settlements and most of the workforce operates in the informal economy (Mitlin et al. 2018). This presents significant challenges in responding to climate change, as most of the approaches to mitigation and adaptation assume the existence of formal legal and planning mechanisms to create economic, social and behavioural change. At the same time, the characteristics of resourcefulness and flexibility that are demonstrated in informal settlements and economies hold the potential for rapid transformation to lower-carbon and more resilient human settlements. Developing knowledge on experiences from informal settlements and economies would also contribute to inclusivity and more efficient adaptation strategies.

Further research could investigate the relationship between climate change and the informal economy to understand how to increase adaptive capacity of informal sectors and how to scale-up low-carbon and climate resilient solutions from and for the informal sector. People whose livelihoods rely on the informal economy can be more vulnerable to climatic changes – for instance higher temperatures and extreme events – due to the lack of a regulatory framework and reliance on casual and intermittent employment. Developing knowledge and strategies for increasing adaptive capacity of informal businesses would reduce vulnerability. While some areas of the informal economy need low-carbon solutions to sustainably scale up business (such as sustainable energy to replace generators or reliance on biofuels), there are other sectors where current activity is already low-carbon in nature (e.g. waste pickers) and could be scaled-up to citywide level as part of a broader low-carbon strategy. For example, around the world, informal recycling businesses showcase positive environmental outcomes, which can be starting points for more expansive recycling initiatives (Delgado-Ramos and Guibrunet 2017; Botello-Álvarez et al. 2018). These activities could become more efficient through city-level adaptation and mitigation programmes and be integrated as an aspect of a citywide low-carbon transition.

2.2. Urban Planning and Design

Multi-dimensional urban planning is a crucial tool for addressing climate change adaptation and mitigation in cities, bringing together energy and transport sectors, inclusion of blue and green spaces and biodiversity, economic development as well as incorporating social and cultural contexts. Urban planning which integrates mitigation and adaptation should be inclusive of various kinds and sizes of settlements, and address the existing urban core, while remaining coherent with planning for the future city. The following research needs, and knowledge gaps can build on the significant and mature body of research from the urban climate research community. This research, and associated data and information, are important in linking urban scale climate science to the challenge of planning more sustainable cities.

Further development of more rigorous understanding and characterisation of the connections between urban planning, design and infrastructure and climate change mitigation and adaptation action is needed. While there is ample evidence, for instance, that urban form, density, mobility, land use and planning have strong implications on GHG emissions, there is little robust quantitative evidence and information on this relationship. Among others, models are needed that are better able to characterise the impact of urban form on emissions. Tools adapted to different contexts that can help urban planners understand the impact of different urban design options on emissions and implications for adaptation to climate change are also needed. Global mitigation scenarios need to incorporate urban planning better in mitigation options. Whereas different urban form for cities with similar climate, development status, wealth and population can result in an order of magnitude difference in per capita emissions, the implications of these choices for the urban areas to be built for the remaining billions of future urban dwellers have not been quantified. Further research in this direction will represent a valuable contribution.

It will be increasingly important for both researchers and decision-makers to 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. From enhancing ventilation, increasing vegetation cover, maximising green and ecological infrastructure, to using strategic shading, understanding the configuration of the micro-climate of an urban district is increasingly important for both researchers and decision-makers to develop responses to guide urban planning to address climate mitigation and adaptation challenges. In addition, the vast majority of our current understanding of heat risk in cities comes from studies in the United States, Europe and Australia, but cities in the Global South are unique in their climates, vulnerabilities and exposures. Foundational and actionable research on the best ways to define heat waves (e.g., determining relevant indices or variables), what thresholds are considered dangerous in different cities and how heat interacts with the built environment (e.g., corrugated metal roofs in slums) would provide important insight for adaptation and mitigation needs in the context of specific cities. The complexity of understanding and managing a city's micro-climate, both in urban areas in the Global South and Global North, calls for further research and the development of new methodologies for urban planning for mitigating of and adapting to climate change.

It will be important to explore the role of urban and spatial planning in reducing vulnerability and enhancing adaptation to climate change for both formal and informal settlements. Urban form and structure play a prominent role in shaping vulnerability, but informal settlements are often not considered in planning strategies. Encouraging research on how planning approaches can become inclusive of informal settlements for climate change adaptation would make a key contribution to reduce negative impacts of current and future urban growth. Further research is also needed to assess underlying causes of social vulnerability to climate change, particularly in small- and medium-sized urban areas in the Global South. The implications of exploring urban planning in reducing vulnerability could contribute many positive impacts, especially in towns and cities with high levels of informality, where planning and action cannot take place because of a lack of knowledge around risk awareness, threshold identification, forecast products and actionable guidance from the planning community. Accounting for predicted future population growth and land consumption while considering vulnerability and risk, could compliment vulnerability assessments of urban areas further enhancing the capacity of the planning community to address risks associated with climate change.

In planning for future urban expansion, there is a need to document and quantify the impacts of climate change on human health, and to map the full range of health co-benefits of adaptation and mitigation. Climate change presents complex threats for human health, both direct and mediated by natural and human systems. In cities, these threats are often amplified by high population density and vulnerability, systemic interdependencies, and by risk of flooding and inundation in coastal and low-lying areas. Urban planning and design can help address these threats especially where buildings, transport and infrastructures are yet to be built, or where informal and vulnerable areas are earmarked for upgrading or retrofitting. Health co-benefits of climate action can be immediately relevant and a potentially powerful motivator for investing in climate action. To support transformative change, there is an urgent need for detailed local information on the impacts of climate change on human health and potential co-benefits (for instance improved air quality, resilience to temperature extremes, reduced rate of death, injury or propagation of communicable disease due to climate disasters, avoiding system breakdowns with their downstream effects on food, water and energy security) which can be considered in future urban planning.

2.3. Built and Blue and Green Infrastructure

Infrastructure provides critical services such as shelter, mobility, thermal comfort, communication, illumination, sanitation and protection, which are essential for urban living. Closing the infrastructure deficit in the Global South is an essential component to providing critical urban services, reducing vulnerability and supporting adaptation to climate change within the context of sustainable development. However, if current levels of growth in building infrastructure alone are sustained in

the Global South, this could release 226 gigatons of carbon dioxide by 2050; more than double the amount used to build existing global infrastructure (Bai et al. 2018). Further research is needed to determine how infrastructure can be developed differently to prevent negative infrastructure carbon lock-in.

Further exploration is needed on low-carbon and environmentally-friendly infrastructure options that go beyond traditionally dominant grey infrastructure[6] for transformational climate solutions in developed and rapidly developing urban areas. Urban development remains dominated by grey infrastructure – buildings, roads and associated infrastructure. The way urban areas are designed, planned and maintained significantly affects urban emission levels (Seto et al. 2014). While there have been promising technological developments, more research is needed on low-carbon construction techniques, affordable low-carbon building materials, carbon storage in infrastructure, bioclimatic designed infrastructure, novel mobility paradigms and more environmentally-friendly planning and design, including blue/green infrastructure[7]. With the potential to reduce energy needs, high-carbon materials consumption and urban heat island effect and to increase urban resilience, these options could make a significant impact on rates of future global emissions. These effects also need to be better captured in emission scenarios.

Further research is needed to 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 to address climate change in cities. Blue/green infrastructure such as open spaces, parks, indigenous biodiversity and bodies of water have a wide array of economic, social and environmental benefits, including, greatly improving urban form, and enhancing the effectiveness and/or reducing demand on other infrastructure sectors. Further research is needed on how to maximise their potential to improve the health and wellbeing of urban residents (Chu et al. 2004; Bowen and Lynch 2017) mitigate climate change through carbon sequestration (Liu et al. 2016; Pennino et al. 2016; Zuñiga-Teran 2017; Chenoweth et al. 2018; Bartesaghi Koc et al. 2017) and passively modulate the urban micro-climate. It will also be necessary to understand how blue/green infrastructure itself is vulnerable to future climate change, including increases in temperature, changes in precipitation patterns and more frequent and intense weather events (e.g., ice storms, hurricanes), with the goal of enhancing resilience and reducing maintenance costs of the blue/green infrastructure solutions. Study and development of innovative financial solutions for incorporating blue/green infrastructure is also crucial for cities, especially those that make these solutions affordable for cities in the Global South. Research on the cultural value of these ecosystem services is also key to a better understanding of their utilisation by urban inhabitants, particularly in the Global South, and will imply close collaboration with social sciences and humanities.

Research and knowledge which provides a more granular and location specific understanding of the carbon lock-in risks and opportunities for mitigation and adaptation to inform planning and policies for building and upgrading infrastructure is needed. Current and future patterns of urban growth will determine emissions, vulnerabilities and potentially constrain adaptation options for decades, sometimes centuries. Urban planning that integrates research and data, incorporating the carbon lock-in potential of infrastructure development, is essential for a low-carbon and climate-resilient urban future. Whereas conceptual research and knowledge have advanced, there is extremely limited literature on how these translate into concrete policy responses, and how positive carbon lock-ins can be maximised (Seto et al. 2016) (Ürge-Vorsatz et al. 2018).

2.4. Sustainable Consumption and Production

Cities are centres of economic, social and cultural change. As such they are well positioned to test interesting opportunities in production and consumption typologies and patterns that can greatly encourage the diffusion of low-carbon lifestyles, enable climate resilience, and could facilitate overall improvements in quality of life. In supporting these goals, a progressive transition towards more efficacious and sustainable production and consumption patterns is of specific relevance. Expanding knowledge on these patterns will focus on different aspects in the Global North and Global South, but both are relevant and crucial for supporting urgent climate action.

Further research is desirable on the implications of diverse types of urban economic structures, modes and patterns of production, and their associated lock-in effects, including regional, national and global relocation of manufacturing processes. In the Global North, three key aspects are identified: greater incentives and regulations for cleaner production (by supporting low-carbon and sustainable value chains based in circular economies and sustainable product design as well as on technological innovation and know-how), sustainable and resilient logistic systems that are anchored in visions of materially sufficient lifestyles, and preparedness to invest in new systems for sustainable provisioning. In the Global South, although the above is desirable, most of the short and mid-term opportunities are to be found in updating obsolete means of production and increasing production capabilities with cleaner technologies. In the mid- and long-term, opportunities for Global South cities lie in moving their main economic structure towards low-carbon, sustainable and more knowledge-intensive options. This transition is of high importance as this is where most future population growth is expected. These cities represent a major opportunity to avoid repeating the high consumption and emission developmental pathways and subsequent high carbon lock-in of industrialised countries, and to be at the forefront of innovation. In any Global South transition, North-South and South-South cooperation seems to be crucial.

Research is required to better understand potential pathways for social change that promote lifestyles and cultures which are less resource intensive and that increase adaptive capacity and well-being. It is through consumption that people navigate their way in the world, create identity, express status and symbolically communicate with others. Yet these activities inflict a heavy burden often have in terms of energy and materials utilisation. High consumption patterns are particularly salient in the lives of urban populations, and especially prominent in the Global North, and need to be considered in meaningful climate-response programmes. Further studies could explore how diverse ways of organising community life – both the physical form and social relations – affect consumption as measured by GHG emissions, influence adaptive capacity and destabilise the long-standing connection between fossil fuels and urban development while ensuring urban liveability. Another aspect of this research would be to understand better the role of incentives, privileging investments, technological innovations, law, taxation, education and urban governance in influencing decisions made by people and communities, which orient choices towards reduced carbon and energy use, and towards more sustainable consumption. Research focusing on the transfer and adoption of consumption patterns in the Global North to cities in the Global South is also relevant for climate change agendas.

Current methodological innovations in greenhouse gas emissions calculations could be improved by exploring the role of urban consumption. Current methodological approaches often disregard energy embodied in consumer goods and services produced outside city limits. Alternative accounting systems, so-called consumption-based emission inventories, *de facto* assign responsibility for greenhouse gas emissions to consumers and suggest that true emissions attributable to cities are two or three times higher than supposed. This methodological innovation can be explored and applied further and improved as appropriate. Such inventories and related techniques like environmentally extended multi-regional input-output modelling have the potential to expand the circle of relevant actors, redefine the responsibility of citizen consumers, challenge energy and environmental analysis, and place demands on different components of the urban economy.

2.5. Finance

Implementing the Paris Agreement will require both a shift in the way that existing streams of finance are allocated, and a substantial increase in the total quantity of urban infrastructure investment. Mature cities will need to refurbish or replace existing infrastructures, and fast-growing cities will need to shift towards lower-carbon, more climate-resilient development pathways. Further research is needed for alternative financing opportunities and mechanisms to support urban climate change agendas.

Research is needed to inform the development of frameworks and tools that enable the integration of climate considerations into fiscal and financial decision-making at the city scale. If governments steer investment towards sustainable options through carbon pricing, green

public procurement and accounting systems that capture physical, liability and transition risks, there are large opportunities for climate change mitigation and adaptation within cities. Policy frameworks and spatial plans can also methodically direct investment towards low-carbon, climate-resilient modes of urban development, while urban infrastructure strategies can be used to develop a clear pipeline of climate-compatible projects.

Further research is needed to explore how public budgets can be strategically used, including to crowd in private investment, to address the shortfall in sustainable urban infrastructure investment. Bankability and creditworthiness are prerequisites for private investors, who require either a sufficient return on investment based on project income flows or low-risk government debt repayments. Governments and development agencies play a role in structuring and packaging urban infrastructure projects, using domestic and international public finance strategically to attract investment and lower the cost of capital (Floater et al. 2017). Cities could benefit from targeted research on how to strengthen the coherence and effectiveness of demand-side institutions (the project implementers) and the effectiveness of project preparation facilities.

Research is particularly needed on the role of public finance where projected returns are too low or perceived risks are too high to attract private finance at scale. In informal settlements, for example, low per capita incomes mean lower tax revenues and less ability to pay user fees and charges at a level that provides a sufficient profit margin for investors (Mitlin et al. 2018). Historically, only a small proportion of international climate finance has been disbursed to local governments or local civil society. However, the Green Climate Fund and Adaptation Fund (among others) are experimenting with “direct access” modalities and “fit-for-purpose” accreditation and approval processes to support more small projects managed by local entities. This could build adaptive capacity in urban areas both instrumentally (by financing new infrastructure) and transformatively (by strengthening delivery capabilities and local accountabilities) (Colenbrander et al. 2018). There is a need for further research on how municipal authorities and local civil society organisations could most efficiently access, use and scale these financial opportunities.

Research is desirable on how to include low-income and other marginalised urban residents in fiscal and financial decision-making. There is a specific need for climate-relevant investment in informal settlements, which typically have severe infrastructure deficits that increase residents’ exposure and sensitivity to risk. In many cases, residents in informal settlements and workers in informal economies are already making significant innovations and contributions towards greener urban development (Brown and McGranahan 2016). Further research on alternatives and opportunities to involve these communities in planning, financing and delivering climate investments can increase their influence over decision-making and build their delivery capabilities. This can help redress the exclusion and inequality that contribute to climate vulnerability and injustice (Bulkeley et al. 2014). These participatory processes can also enhance the cost-effectiveness and transparency of infrastructure investment, so that scarce resources are used most efficiently (Cabannes and Lipietz 2018).

Research on insurance options could empower cities to better address disaster risk. Many urban areas will continue to have some exposure to climate hazards, even if resilience is mainstreamed into planning and investment. The insurance industry can play a key role in supporting cities to better prepare for and recover from disasters, both by incentivising better risk management through premiums and by sharing good practice in risk assessment and mitigation (Oberlack and Eisenack 2014). Research is needed to enhance the sophistication of risk modelling and to inform the optimal design of insurance instruments to share risk equitably (including with people living and working in the informal sector).

2.6. Uncertainty

The term uncertainty [8] can have very different meanings within and outside of the scientific community. For researchers, uncertainty relates to how accurately something is known or how unknown something is. This is sometimes shown by providing a range associated with a specific value; highlighting the degree to which this value could vary. Understanding uncertainty is an integral part of science and decision-making.

To avoid misunderstanding outside the scientific community, it is important to communicate clearly and transparently the level of confidence associated with findings, avoiding scientific jargon (e.g., likelihood scales) for probabilistic estimates, and instead report the chances in lay terms (e.g., 95% chance of something). It is important to understand how different societal actors define and assess uncertainty when developing climate change mitigation and adaptation strategies across the science, policy and practice communities.

Further research is needed to evaluate the ‘fit-for-purpose’ attributes of models and to provide guidelines for simplified approaches that would strengthen the evaluation of the confidence in projections and the associated uncertainties. Examples of such uncertainties include whether the sets of projections used in city scale models encompass the full range of relevant drivers (e.g., land use and aerosols at the regional scale, and greenhouse gases at the global scale), whether the methodologies encompass the full range of plausible climate variations on the near and long term, whether they include low probability, high risk, poorly known events (e.g., compound extreme events), and whether non-linear behaviours and risks of thresholds and abrupt shifts are accounted for. Developing simplified approaches that can be adapted to different city contexts, and that are informed by exhaustive assessments of sources of uncertainties and limits of complex modelling approaches is needed to account for the full spectrum of uncertainty to inform decision making.

Further research should be conducted on tools that assess uncertainty considerations in different city contexts to strengthen decision-making in uncertain situations. New decision-making tools for risk assessment and adaptation planning include iterative risk management, real option analysis and robust decision-making approaches. Recent studies highlight barriers to using these decision-making tools in the Global South, despite their strong potential especially in situations of rapid urbanisation. Further research on adaptation/mitigation approaches requires: information on the future, usually informed by modelling scenarios; context-specific criteria to define robustness (e.g., performance over a wide range of plausible scenarios, and understanding of trade-offs associated with alternative options); and an iterative process that characterises uncertainty in the context of a specific decision, thus providing understanding of the key assumptions underlying alternative options.

Research is needed to develop methodologies to identify sources of uncertainty, to explore and understand the full range of uncertainty, and to reduce it, where possible. Uncertainty regarding projected future climate conditions, levels of risk and vulnerability, and effectiveness of adaptation and mitigation efforts, needs to be integrated into all aspects of urban climate action. The concept of deep uncertainty^[9] has recently emerged in decision-making contexts but it has not yet been fully defined within IPCC assessment reports. Recent literature developments have used the deep uncertainty framing in relation with water management linked to drought and/or flood, risk management associated with ecosystems (e.g., forests, wildfires) and climate surprises (e.g., compound extreme events or abrupt change) and coastal management in relationship with sea level rise and storm surges. However, further research is needed on methodologies to fully account for uncertainties and report them, using a standard approach, so that knowledge from individual case studies can be assessed homogeneously. Characterisation of uncertainty in risk evaluation and risk management approaches would also be key to conduct.

3. Delivering on the Research and Action Agenda: Approaches to strengthen the science, practice and policy interface

This section focuses on options to support the implementation of the *Global Research and Action Agenda on Cities and Climate Change Science*. As illustrated in the previous two sections, there are still many knowledge, research and data gaps to be filled to advance climate action in cities. In this regard, the Conference represented a significant opportunity to bring together knowledge from the science, practice and policy communities, and provided a key step forward in understanding knowledge gaps. The conference also highlighted the large benefit of working together in building evidence-based knowledge for climate action in cities. To strengthen the collaborations of these communities on cities and climate change science, engagement is

encouraged at the global, national and local level. This section provides possible avenues – but by no means an exhaustive list – that are available to enhance such collaboration.

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 greatly improved for both Global North and Global South cities if the operational modalities of the three communities are adapted to support such cross-sector interactions.

Co-designed tools are needed for knowledge sharing, assessment, and for scoping of new priorities for knowledge generation and research by different initiatives and institutions within the science, urban practice and policy communities at the city scale. Different initiatives and institutions could help facilitate the co-design of such tools within these three communities, and with local urban communities and civil society organisations. For example, public-private partnerships in the form of city think tanks could focus on co-designing key research questions and assisting cities with limited resources in their work towards evidence-based solutions. City and scientific networks, such as C40, ICLEI, UCLG, Future Earth, SDSN and WCRP, could also facilitate, champion and provide opportunities for co-design exercises. However, it is essential to ensure that different local communities and actors are kept informed of outcomes of these processes and have opportunities to provide input on how these processes could be guided and improved to meet broader needs. Local research centres or universities, for example, could also be empowered to play this kind of facilitation role.

Ensure existing and future knowledge is synthesised and widely disseminated to support best practices. Global assessments of climate change and cities can help inform and enable the integration of social, ecological and technological systems in urban areas and provide guidance on transformational opportunities for urban climate adaptation and mitigation. Integrating adaptation and mitigation can help advance city responses beyond limited siloed approaches, which in turn can minimise unanticipated conflict and avoid carbon lock-in (Ürge-Vorsatz et al. 2018). A global scale urban assessment structure would facilitate collaboration and decision-making for the urban research, practice and policy communities. Tailoring assessments to multiple sets of societal actors and their interests, would ensure that the knowledge provided is salient, credible, legitimate and inclusive (Cash et al. 2003). Such assessments may be characterised by the following: involvement of societal actors to co-generate goals, an urban systems approach, integration of adaptation and mitigation, promotion of science-practice-policy partnerships that can then disseminate knowledge at the regional and local levels, and linkages to ongoing, benchmarked processes such as *The Second Assessment Report on Climate Change and Cities* (ARC3.2) to provide input to the IPCC assessment cycles (Rosenzweig et al. 2011, 2018).

The co-production knowledge at the city scale can be enhanced through the inclusion of local communities and indigenous peoples, practitioners, city networks, policy-makers and researchers from social and natural sciences and the humanities. Urban practitioners, decision-makers and community members often possess knowledge on their city, which has not yet been incorporated into peer-reviewed literature or assessment. Insights from different knowledge holders, including but not restricted to, local and indigenous groups, women, youth, those living in informal settlements and other marginalised and vulnerable populations could also be brought to the forefront. The participation of a variety of actors representing diverse perspectives (including but not limited to those mentioned above) as knowledge is generated will add value, for instance in local and international meetings, to establish a dialogue, challenge *status quo*, stimulate action and share innovative ideas. More frequent international events and conferences which convene academic, urban practice and policy communities, and which are actively inclusive of other urban actors and research awards calling for active collaboration could be two approaches to encourage co-design and co-production.

Further research is needed examining how climate action is facilitated by- and what are the effective conditions for- evidence-based policy that integrates diverse perspectives through co-design and co-production. There are multiple cases within the contexts of different cities where the research, urban practice and policy communities and other urban stakeholders are working together under different institutional frameworks to co-design and co-produce evidence-based policy for cities to address climate change. However, a thorough assessment of the impact of evidence-based climate policies that have been implemented has not been performed. This global assessment could then highlight co-designed and co-produced policies which have led to most effective mitigation and adaptation and which allow for key co-benefits and synergies between mitigation and adaptation measures, and conditions in which these policies were developed. This could provide important insight for cities beginning to develop or looking to adapt (existing) evidence-based policy to address climate change.

3.2. Empowering Cities to Take Action

For national governments to implement the Paris Agreement, cities will 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 governments to respond to climate change, would be facilitated by harmonising efforts that aim to address various global agendas, such as the Paris Agreement, the 2030 Sustainable Development Agenda, the New Urban Agenda and the Sendai Framework for Disaster Risk Reduction.

Transformation could be accelerated if municipal and local authorities could directly provide knowledge co-produced by diverse city actors to inform national climate change policies. Strategies to identify and address barriers within multilevel governance (which may differ significantly between nations), and strategies to build capacity for different cities could be co-developed, tested and adapted, with experiences shared between cities. One element that may facilitate this process could be transparent assessments of the costs of climate action and inaction in cities, to illustrate monetary incentives for action from multiple levels of government on climate change adaptation and mitigation.

Accurate and scientifically robust monitoring and evaluation frameworks developed for and by cities would support them in showcasing the impacts of action. Systems that measure direct and indirect impacts of climate change action and inaction at the city level could empower municipal and local authorities by providing information for evidence-based decision-making. Some municipal and local authorities are developing innovative and transparent methods to monitor, evaluate and display different climate indicators/measures to provide accountability to its citizens with respect to their commitments to address climate change. These systems may be also developed, or supported, by city networks to facilitate sharing between member cities.

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, iterative long-term dialogue to match current and future knowledge needs, to respond specific city-level challenges arising from climate change. In the context of some cities, little initiative has been taken to build long term relationships between the science, urban practice and policy communities (for a variety of reasons, including the lack of opportunities or capacity), while in other cities, collaborations are long-standing. However, relationships that could withstand the different cycles (funding, electoral, project and publication) within which the communities operate, and that would incorporate continued feedback and flow of information between communities, would allow for progress in addressing climate change.

Fostering mutual understanding, through advancing co-production and co-generation of knowledge and further empowering cities to take action. Climate change action has tended to

occur in silos, not only within the three communities, but also in the sectors and fields within them (e.g.; natural, social sciences and humanities). A first step towards fruitful and holistic collaboration would be to raise awareness of the personal competencies required to work across silos. Such competencies might include for example the ability to understand and navigate differences in organisational culture, ethical and normative issues, the ability to translate between different knowledge schemes, the necessary self-awareness to recognise gaps in capacity and the willingness to develop lacking capacities actively, by involving different perspectives. The recognition of the different level of detail needed and the different priorities of the three communities (e.g., different information needs of high level government officials looking to create new policy and practitioners implementing solutions on the ground) by all collaborating actors would facilitate dialogue. Identifying common ground on issues relating to mitigation and adaptation, and on how science and policy needs can best be aligned, would allow for cross community benefits to emerge on an ongoing basis.

City-to-city partnerships could encourage exchange of knowledge across cities and develop capacity in cities. City-to-city partnerships or ‘twinning’ refers to two cities in different countries/regions entering into a broad-based partnership, to promote the exchange of ideas, people and trade across the two geographies. Moving forward, formalised twinning arrangements between cities could be considered to foster accountability between city partners, to ensure more formalised modes of exchange, and to provide defined mechanisms through which smaller cities or those with less capacity can receive technical support to respond to the challenges of climate change, including climate adaptation and mitigation. These partnerships could encompass local and municipal authorities as well as city-level academic institutions. Under such an agreement, the mayor or highest level elected officials could sign a partnership agreement while the deans/presidents of their lead academic and research institutions, could commit to work with their municipal and local authorities, and with each other, to contribute to evidence-based responses to climate change.

Close interactions between cities and the scientific community can be fostered by providing opportunities for researchers to work in municipal and local authorities, and opportunities for practitioners and decision-makers to invest time in research projects. This could be facilitated by grants and fellowships for PhD or master students from both social and natural sciences and humanities to conduct research in local and municipal authorities’ offices or to work as part of collaborative research projects. Another approach could be a chief scientist or a scientific advisory panel supporting a city on climate change issues (Bai et al. 2018). This would help the research community better understand city opportunities, challenges and constraints (e.g., timelines, priorities). Another option would be to have urban practitioners and decision-makers take a larger role in research projects or in the development of climate centres in research institutes to ensure they are better aligned with city challenges. Establishing living laboratories[10] could also facilitate this and increase understanding between disciplines and departments. These approaches would facilitate a deeper understanding of the processes in cities and the development of solutions based on scientific evidence.

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 organising partners as well as Urban Climate Change Research Network (UCCRN) at the end of the Conference, and now signed by 24 organisations,¹²; (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

¹² As of 3 Aug 2018

City (organised by the National Autonomous University of Mexico-UNAM) to discuss the outcomes of the Conference in the Mexican context; (4) Conference partners, especially ICLEI, together with the UNFCCC, 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 further develop this Research and Action Agenda with cities.

The Conference and this subsequent Research and Action Agenda have showcased not only the important role 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. Together, continued collaborative participation in this journey can support effective, evidence-based climate action in cities.

Glossary

- [1] Municipal authorities This term includes local and municipal governments.
- [2] Path dependencies The generic situation where decisions, events, or outcomes at one point in time constrain adaptation, mitigation, or other actions or options at a later point in time.
- [3] Carbon lock-in Where the inertia of technologies, institutions and behaviours individually and interactively inhibit innovation and competitiveness of low-carbon alternatives.
- [4] Informal settlements 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)
- [5] Resilience The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation
- [6] Grey infrastructure Human-made, constructed infrastructure (European Environment Agency 2017)
- [7] Green infrastructure 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 2014a) This could be termed blue infrastructure if aquatic ecosystems are concerned (European Environment Agency 2017)

- [8] Uncertainty A state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour. Uncertainty can therefore be represented by quantitative measures (e.g., a probability density function) or by qualitative statements (e.g., reflecting the judgment of a team of experts) (Moss and Schneider 2000; Manning et al. 2004; Mastrandrea et al. 2010)
- [9] Deep uncertainty The concept of deep uncertainty has emerged to refer to situations where decision-making is needed while there is no conceptual understanding of the key drivers of change; when there is no agreement on the probability distribution of key variables affecting the changing system; when there is no agreement on the desirability of alternative outcomes. The term deep uncertainty is particularly complex and in need of further specification. (Lempert et al. 2003) have defined deep uncertainty as “the condition in which analysts do not know or the parties to a decision cannot agree upon (1) the appropriate models to describe interactions among a system's variables, (2) the probability distributions to represent uncertainty about key parameters in the models and/or (3) how to value the desirability of alternative outcomes.”
- [10] Living laboratories Living laboratories are structures often operating in a territorial context, such as within a city or agglomeration, which seek to enhance collaboration between researchers and the end users or beneficiaries of research efforts, engaging community in every stage of development from concept to prototyping.

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Annex C

Detailed conference budget

The Conference global budget is detailed below, in table C1. both by item and contributions of each partner organisation. The details on the budget of the Host City can be found in table C2. Funds were provided by the City of Edmonton, government and private sector sponsorship.

Table C1. Detailed global conference budget

	Item	Expensed by	Amount Spent
Scientific Steering Committee			
	Pre-conference meeting room and catering	Cities Alliance	\$ 500.00
	Co-Chair pre-conference travel for meetings	Cities Alliance	\$ 6, 200.00
	SSC in-person meeting	C40 Cities	\$ 20, 000.00
	Commissioned background papers	UN Habitat	\$ 10, 000.00
	Production of conference report, International Institute for Sustainable Development	IPCC	\$ 36,200.00
	Total Scientific Steering Committee Spending		\$ 79, 000.00
Website			
	Design and maintenance	Cities Alliance	\$ 9, 500.00
		Edmonton	\$ 11, 500.00
	Total Website Spending		\$ 20, 00.00
Event Management			
	Online and on-site registration	Edmonton	\$ 20, 500.00
	Events manager	C40 Cities	\$ 15, 000.00
	Total Event Management Spending		\$ 35, 000.00
Communications and outreach			
	Global Communication and Media Agency	C40 Cities	\$ 80,000.00
	OC Video Production	Sustainable Development Solutions	\$ 6, 000.00

		Network	
		C40 Cities	\$ 6, 000.00
	Total Communication and outreach Spending		\$ 92, 000.00
Sponsored Travel			
	Airfare, lodging and additional expenses	IPCC	\$ 203, 800.00
	Airfare, lodging and additional expenses	UN-Habitat	\$ 30, 000.00
	Airfare, lodging and additional expenses	Cities Alliance	\$ 40, 183.62
	Airfare, lodging and additional expenses	C40 Cities	\$ 25, 154.00
	Airfare	DG Clima, European Commission	\$ 35, 500.00
	Airfare	German government	\$ 21, 716.43
	Airfare	Future Earth	\$ 3, 500.00
	Airfare	World Climate Research Programme	\$ 3, 500.00
	Airfare	Louis Berger	\$ 20, 000.00
	Airfare	International Development Research Centre	\$ 28, 600.00
	Airfare, lodging and/or additional expenses	International Council for Local Environmental Initiatives	\$ 9, 051.00
	Total Sponsored Travel Spending		\$ 306, 462.43
Total Spending			\$ 532, 463.43

Table C2. Detailed conference budget for the host city

Item	Spent
Event management & registration	\$ 109,949.68
Pre-conference cities IPCC meetings in Edmonton (venue, hospitality, accommodation, transportation)	\$ 7,088.30
Venue rental, audio-visuals and technical support & equipment	\$ 303,110.82
Hospitality	\$ 324,397.04
Programme support, event dressing, branding and marketing, conference and exhibition support	\$ 190,847.24
Travel support for developing countries	\$ 105,591.67
On ground transportation and site tours	\$ 56,002.65
Total Project Expenditures	\$ 1,096,987.40

Annex D

High level committees

The Cities and Climate Change Science Conference was organised and delivered by two central committees, the Scientific Steering Committee and the Organising Committee. Their terms of reference, and member list for each committee as well as the selection process for SSC members can be found below. The Co-Chairs from each committee had regularly teleconferences and this acted as a *de facto* management group; however, the terms of references below maintain the reference to the original idea of a Management Group, which ultimately was not required.

Scientific Steering Committee (SSC) Terms of Reference

6 February 2017

1. Composition and Procedures of the Scientific Steering Committee (SSC)

- a. Scientific Steering Committee and Organising Committee and Management Group to carry their work in very close collaboration, with most teleconferences and meetings to be held together to ensure efficiency and complementarity. SSC has ultimate decision-making power with regards to the conference.
- b. Members nominated in their personal capacity although their involvement in major international organisation will be taken into account including their capacity to represent the main constituencies of the conference partners (IPCC, Scientific Community, Urban Community)
- c. Three Co-Chairs (IPCC, Scientific Community, Urban Community)
- d. Around twelve people in total (nominations from all conference partners)
- e. Balance in terms of disciplines and geography, and as much as possible in terms of gender.
- f. Ex Officio members:
- g. Representative of the Organising Committee
- h. Representative of the two scientific organisations in support of the SSC, Future Earth and WCRP
- i. Two IPCC Working Group Bureau representatives
- j. No overlap of people with the Organising Committee
- k. 75% or greater of members required for quorum
- l. Monthly teleconferences/meetings from Q1 2017 to Q2 2018, under the understanding that most of the work will be carried by email and teleconferences and we may need to increase the rate of teleconferences as we are getting closer to the conference.

2. Mandate of the Scientific Steering Committee (SSC)

- a. The Organising and Scientific Steering Committees will be working closely with each other. Many of the mandates below, especially achievement of the conference objectives and production of conference outcomes will be delivered jointly by the Organising and Scientific Steering Committees, although the decisions will be taken by the Scientific Steering Committee. As a result, we anticipate that most of their meetings (or teleconferences) will be jointly organised to ensure a better understanding of the two committees and more efficient implementation of the decisions.
- b. Develop the strategy and vision to achieve the conference objectives
- c. Develop the content/programme of the conference

- d. Develop the preparatory scientific activities needed to achieve the conference objectives; organisation of the call for sessions/abstracts
- e. Develop scientific conference programme(s) including reviewing proposals for plenary topics, symposia, round table discussions, keynote speeches, etc., and the review and selection of contributions (e.g. abstracts, white papers, posters, keynote speakers). This item includes the selection of conference participants based on the conference programme
- f. Selection of conference participants
- g. Develop the strategy to produce (by the Scientific Steering Committee or by the broader community) the conference outcomes, especially synthesis paper on cities and climate change knowledge, gaps in knowledge, user needs
- h. Engage and mobilise (as participants and preparatory contributors) the international and regional scientific and knowledge provider organisations and more broadly the multi-disciplinary (physical, natural, social, humanities) scientific community
- i. Oversee the scientific-based content of the conference-related communications
- j. Report backs to the IPCC at IPCC Panel Sessions and produce a report after the conference to report on the process and achievements. Delivery of a Conference Report to the IPCC Panel at its 48th Session, currently scheduled for September 2018

Conference Scientific Steering Committee (SSC) Selection Process

The Scientific Steering Committee was formed after a call for nominations, which took place during February 2017. The nomination and selection processes are detailed below.

Scientific Steering Committee (SSC) Call for Nominations and Selection Criteria

8 February 2017

The 2018 Cities and Climate Change Science Conference co-sponsored by the IPCC, promises to be a pivotal event in developing the global understanding of cities and climate change.

In order to prepare for this important event, the organisers are looking for members to be part of the SSC, whose key mandate will be to develop the scientific strategy and vision to achieve the conference objectives, namely

- identify key research and knowledge gaps with regard to cities and climate change;
- inspire global and regional research that will lead to peer-reviewed publications and scientific reports; and
- stimulate research in Cities and Climate Change over the AR6 cycle to provide appropriate knowledge for the AR7.

This mandate will be starting as soon as early March 2017 and will be carried forward until the reporting phase of the conference to be held in March 2018. The terms of reference for the SSC is found above.

We are looking for 12-15 members to be part of the SSC, based on the following selection criteria:

- Outstanding scientific contribution in one or many of the following key areas of expertise (a Ph.D. in one of those areas would be preferred, but candidates without a Ph.D. and additional work experience in one of those fields might be considered):
 - Physical sciences
 - Natural sciences
 - Urban planning
 - Architecture and design
 - Social sciences (including economy and political science)
 - Humanities (including law)

- Expertise in synthesis work and agenda setting is highly desired
- Experience in working with stakeholders from the urban community (e.g. local authorities, NGOs in the field of cities, private sector) is highly desired
- Experience in working with developing countries and/or IPCC/UNFCCC processes is highly desired.

Candidates will be selected to have balance in region, area of expertise, and gender.

Interested individuals should submit their candidatures by sending a short CV (300 words), key relevant publications, and a short motivation letter via this Google form - available as a pdf for candidates who cannot access google (see attached) by the 17th of February. Should interested candidates wish to send a more detailed CV, they would be able to do so at the following email address: citiesipcc.SSC@futureearth.org. Only successful candidates will be contacted by the 3rd of March.

Scientific Steering Committee Members

Co-Chairs

Dr Prof Shobhakar Dhakal, Associate Professor, Asian Institute of Technology, Thailand

Seth Schultz, Director of Science and Innovation, C40 Climate Leadership Group, USA

Dr Prof Diana Ürge-Vorsatz, Professor, Central European University, Hungary; Vice-chair IPCC Working Group III

Members

Prof Xuemei Bai, Professor, Australian National University, Australia

Dr Aliyu Barau, Department Head and Lecturer, Department of Urban and Regional Planning, Bayero University, Kano, Nigeria

Dr Helen Cleugh, Director, CSIRO Climate Science Center, Australia

Prof Richard Dawson, Professor, School of Engineering, Newcastle University, UK

Dr Gian Carlos Delgado Ramos, Principal Investigator, Interdisciplinary Research Center on Sciences and Humanities, National Autonomous University of Mexico, Mexico

Dr David Dodman, Director, Human Settlements International Institute for Environmental Development (IIED), UK

Lykke Leonardson, Program Director, Resilience and Sustainable City Solutions, City of Copenhagen, Denmark

Prof Valérie Masson-Delmotte, Lead Scientist, Laboratoire des sciences du climat et de l'environnement, France ; Co-chair IPCC Working Group I

Dr Megan Melamed, Executive Officer, International Global Atmospheric Chemistry (IGAC), USA

Dr Debra Roberts, Head of Sustainable and Resilient City Initiatives Unit, eThekweni Municipality, Durban, South Africa; Co-chair IPCC Working Group II

Prof Roberto Sanchez-Rodriguez, Researcher, Department of Urban and Environmental Studies, El Colegio de la Frontera Norte, Mexico; Vice-chair IPCC Working Group III

Dr Cynthia Rosenzweig, Senior Research Scientist, NASA Goddard Institute for Space Studies, USA

Prof Karen Seto, Professor, School of Forestry and Environmental Studies, Yale University, USA

Prof William Solecki, Professor, CUNY Institute for Sustainable Cities, USA

Organising Committee (OC) Terms of Reference

2 May 2017

1. Composition and Procedures of the Organizing Committee
 - 1.1. Three Co-Chairs, including one from the Host City.
 - 1.2. A maximum of fifteen people
 - 1.3. Gender and regional balance to be considered
 - 1.4. No overlap of people with the Scientific Steering Committee, but potential overlap of organizations
 - 1.5. A representative from each of the Conference organizations, including the IPCC Secretariat and at least one Working Group Technical Support Unit
 - 1.6. 75% or greater of members required for quorum
 - 1.7. At least bi-monthly phone calls/meetings from Q2 2017 to Q2 2018
 - 1.8. Organizing Committee members may appoint alternatives from their organization
 - 1.9. The Scientific Steering Committee and Organizing Committee will work closely together through the following means: naming an official liaison between the two committees, who will attend both committees and be in charge of reporting back to one and another and ensure an excellent coordination between the two; back-to-back meetings/teleconferences, sharing of meeting minutes, calls between co-chairs, report back to each other's calls and meetings.
 - 1.10. The Organizing Committee will liaise with the Management Group on fiduciary and budgeting matters.

2. Mandate of the Organizing Committee

Following on the decisions of the Scientific Steering Committee:

- 2.1. Planning: Develop a work plan for the conference and monitor regularly its implementation including all necessary promotional events and pre-meetings.
- 2.2. Budget: Approve the Conference's budget and fundraising strategy presented by the Management Group.
- 2.3. Communication: Develop and disseminate all communications related to the conference
 - 2.3.1. Content and updates for the website
 - 2.3.2. Press releases and announcements
 - 2.3.3. Materials needed for the conference based on the decisions of the SSC
 - 2.3.4. Develop and implement an international media and outreach plan of the Conference
 - 2.3.5. Dissemination of the outcomes and reports following the conference
- 2.4. Logistics: work closely with the Host city on all logistical aspects of the Conference
 - 2.4.1. Organise the work of the Conference to support the Host City to deliver on their obligations, as specified in the Request for Proposal dated on January 11, 2017 and subsequent Memorandum of Understanding
- 2.5. Content: take responsibility for the invitations to speakers, guests, meeting participants and the agenda for the conference.

Organising Committee Members

Co-Chairs

Cities Alliance - Julie Greenwalt

City of Edmonton - Sarah Cicchini

C40 Cities Climate Leadership Group - Emmanuelle Pinault

Members

Future Earth – Jean-Patrick-Toussaint/Anne-Hélène Prieur-Richard

ICLEI-Local Governments for Sustainability - Yunus Arian

IPCC Secretariat - Mxolisi Shongwe

IPCC Working Group I - Sarah Connors

IPCC Working Group II- Bard Rama

IPCC Working Group III - Minal Pathak

Sustainable Development Solutions Network (SDSN) - Jessica Espey

United Cities for Local Governments (UCLG) - Natalène Poisson

UN Environment - Pierre Boileau

UN-Habitat - Marcus Mayr

World Climate Resource Programme - Boram Lee

Annex E

List of conference participants

The Conference welcomed 701 invited participants. Unfortunately, due to VISA restrictions, there was a number of invited participants from the Global South who were unable to attend as they were not able to secure VISAs. The regional distribution of conference participants is summarised in table E1, and the full list of conference participants follows in table E2. We note that there were also 16 participants who did not indicate a nationality upon registration, and therefore are not represented in Table E1. The nationalities indicated below are those provided by conference participants at the time of registration.

Table E1. Number of conference participants from different regions

Africa	44
Asia	72
South America	33
North America, Central America and the Caribbean	362
South West Pacific	20
Europe	154

Table E2. List of conference participants

FIRST NAME	LAST NAME	NATIONALITY	GS/GN	FIRST NAME	LAST NAME	NATIONALITY	GS/GN
Deborah	(Matejicka) Elliott	Canada	GN	Lykke	Leonardsen	Denmark	GN
Ernest Mensah	Abraham	Ghana	GS	Lynden	Leonce	UK	GN
William	Adams	Canada	GN	Thomas	Lewis	USA	GN
Anthea	Adjei Tawiah	Ghana	GS	Hannah	Liddy	USA	GN
Rimjhim	Aggarwal	USA	GN	Eric	Lindquist	USA	GN
Sohail	Ahmad	India	GS	Thomas	Lippiatt	Canada	GN
Samuel Olumide	Akande	Nigeria	GS	Leroy	Littlebear	Canada	GN
Hashem	Akbari	Canada	GN	Wilton	Littlechild	Canada	GN
Hina	Alam	India	GS	Tom	Logan	New Zealand	GN
Jaume	Albertí	Spain	GN	Darrell	Loranger	Canada	GN
Florian	Albrecht	Germany	GN	Hina	Lotia	Pakistan	GS
Jacqueline	Alderton	Canada	GN	Peter	Love	Canada	GN
Ali	Alizadeh	Iran	GS	Natalie	Loveless	Canada	GN
Jennifer	Allan	Canada	GN	Amy	Luers	USA	GN
Justis	Allard	Canada	GN	MaryElizabeth	Luka	Canada	GN
Adrianna	Amalio	Canada	GN	Shuaib	Lwasa	Uganda	GS
Pauline Mercy	Amondi	Kenya	GS	Laura	Lynes	Canada	GN
Shaye	Anderson	Canada	GN	Jonathan	Lynn	UK	GN
Walter	Andreeff	Canada	GN	Kevin	Ma	Canada	GN
Vada	Antonakis	Canada	GN	Leslie	Mabon	UK	GN

Fernando	Aragon-Durand	Mexico	GS	Renato	Macciotta	Italy	GN
Ron	Arcand	Canada	GN	Laura	Macedo	Brazil	GS
Mark	Archibald	Canada	GN	Martha	Macedo de Lima Barata	Brazil	GS
Verónica	Arias	Spain	GN	Caitlin	Macnab	Canada	GN
Yunus	Arikan	Turkey	GN	Cheyenne	Maddox	USA	GN
Astrid	Arnslett	Norway	GN	Darshini	Mahadevia	India	GS
Kabir	Arora	India	GS	Nafisa	Mahbub	Canada	GN
Mohit	Arora	India	GS	Kelly Leilani	Main	USA	GN
Jose Miguel	Arriaza Hinojosa	Chile	GS	Maria-Ines	Maita	Canada	GN
Julie	Arrighi	USA	GN	David	Major	USA	GN
Eric	Ast	USA	GN	Sebastien	Malo	Canada	GN
Francis	Asunccion	Canada	GN	Tonya	Malo	Canada	GN
Adam	Auer	Canada	GN	Felipe	Mandarino	Brazil	GS
Kenshi	Baba	Japan	GN	Shingirai	Mandizadza	Zimbabwe	GS
Simeran	Bachra	Canada	GN	Trevion	Manning	Jamaica	GS
Carl	Backstrand	Sweden	GN	Claire	Markgraf	USA	GN
Xuemei	Bai	Australia	GN	Samuel	Martin	Canada	GN
Rose	Bailey	UK	GN	María Amparo	Martínez Arroyo	Mexico	GS
Thomas	Bailey	UK	GN	Susan	Mason	USA	GN
Alexander	Baklanov	United Nations		Valéry	Masson	France	
Osman	Balaban	Turkey	GN	Valerie	Masson-Delmotte	France	GN
Catherine	Bale	UK	GN	Mmoto	Masubelele	South Africa	GS
Kelly	Bamford	Canada	GN	Érika	Mata	Spain	GN
Aliyu	Barau	Nigeria	GS	Robin	Matthews	UK	GN
Fabiana	Barbi Seleguim	Brazil	GS	Maija	Mattinen-Yuryev	Finland	GN
Karen	Barkley	Canada	GN	Ana	Mauad	Brazil	GS
Kaitlin	Barr	Canada	GN	Ian	Mauro	Canada	GN
Silvio	Barros	Brazil	GS	Shedrack	Maximilian	Tanzania	GS
Bernhard	Barth	Germany	GN	Marcus	Mayr	United Nations	
Judit	Bartholy	Hungary	GN	Alice	McClure	South Africa	GS
Chris	Bataille	Canada	GN	Darren	McCrank	Canada	GN
Heike	Bauer	Germany	GN	Shannon	McDaniel	Belgium	GN
Elisabeth	Beaubien	Canada	GN	Dan	McDougall	Canada	GN
Lan Marie Nguyen	Berg	Norway	GN	David	McGown	Canada	GN
Rob	Bernhardt	Canada	GN	Becky	McKee	Canada	GN
Paolo	Bertoldi	Italy	GN	Scott	McKeen	Canada	GN
Courtney	Bettin	Canada	GN	Catherine	McKenna	Canada	GN
Anthony Gad	Bigio	Italy	GN	Timon	McPhearson	USA	GN
Sierra	Bilton	Canada	GN	Sarah	McPike	Canada	GN
Anna	Bishop	Canada	GN	Ian	McVey	Canada	GN
Hilda	Blanco	USA	GN	Megan	Meaney	Canada	GN
Kristy	Bland	Canada	GN	Guenter	Meinert	Germany	GN
Nathalie	Bleau	Canada	GN	Megan L.	Melamed	USA	GN
Kambal	Bloxhan	Canada	GN	Fabrizio	Melgarejo	Peru	GS

				Sebastian Manuel Malpartida			
Eva A.	Bogdan	Canada	GN	Mike	Mellross	Canada	GN
Alyssa	Bohart	Canada	GN	Kavya	Michael	India	GS
Pierre	Boileau	Canada	GN	David	Miller	Canada	GN
Nicole	Bonnett	Canada	GN	Masoumeh	Mirsafa	Iran	GS
Craig	Bonneville	Canada	GN	Carrie	Mitchell	Canada	GN
Alex	Boston	Canada	GN	Logan	Mitchell	USA	GN
Buffy	Boudjikianian	Canada	GN	Lois	Mitchell	Canada	GN
Thijs	Bouman	Netherlands	GN	Semu	Moges	Ethiopia	GS
Thomas E.	Bowman	USA	GN	Banafsheh	Mohammadi	Iran	GS
Dana	Boyer	USA	GN	Asad	Mohammed	Trinidad and Tobago	GS
Aspasia	Brasileiro Alcântara Camargo de	Brazil	GS	Azadeh	Mokheri	Iran	GS
Geneviève	Bretagne	France	GN	Luisa	Molina	USA	GN
Allison	Bridges	USA	GN	Hayley	Moller	USA	GN
David	Bristow	Canada	GN	Jade	Monaghan	Canada	GN
Derik	Broekhoff	USA	GN	Paula	Monroy	Mexico	GS
Danielle	Bronson	Canada	GN	Franco	Montalto	USA	GN
Mark	Brostrom	Canada	GN	Sourayan	Mookerjea	Canada	GN
Halina	Brown	USA	GN	Rosa	Morales	Peru	GS
Brianna	Bruni-Bossio	Canada	GN	Timothy	Morrison	Canada	GN
Harriet	Bulkeley	UK	GN	Omar	Mosleh	Canada	GN
Yakubu	Bununu	Nigeria	GS	Gareth John	Moss	Ireland	GN
Harley	Burland	Canada	GN	Tereza	Moura	Brazil	GS
Laura	Cabral	Canada	GN	Michail	Mouzourakis	Greece	GN
Eduardo	Calvo Buendia	Peru	GS	Sophie	Muller	Canada	GN
Ines	Camilloni	Argentina	GS	Muhammad	Mumtaz	Pakistan	GS
Carolyn	Campbell	Canada	GN	Jeremy	Murphy	Canada	GN
Andres	Canavera	Colombia	GS	Issah Justice	Musah Surugu	Ghana	GS
Maruxa	Cardama	Belgium	GN	Tero	Mustonen	Finland	GN
Alexander	Carius	Germany	GN	Gifti	Nadi	USA	GN
Jeremy	Carter	UK	GN	Catherine	Nangini	Canada	GN
Tim	Cartmell	Canada	GN	Roy	Neehall	Canada	GN
Anton	Cartwright	South Africa	GS	Heather	Nelson	Canada	GN
Fabrice	Casciani	France	GN	Mani	Nepal	Nepal	GS
Sander	Chan	Netherlands	GN	Edward	Ng	UK	GN
Chris	Chang-Yen Phillips	Canada	GN	Charlene	Nielsen	Canada	GN
Pacteau	Chantal	France	GN	Dan	Nielsen	Canada	GN
Gu	Chaolin	China	GS	Alex	Nnamonu	Canada	GN
Matthew	Chapman	Canada	GN	Kate	Noble	Australia	GN
Souran	Chatterjee	India	GS	Barbara	Norman	Australia	GN
Ryan	Chavez	USA	GN	Georgina	Numbasa	Papua New Guinea	GS

Neelam	Chawla	Canada	GN	Abu Sadat Md Marjan	Nur	Bangladesh	GS
Meian	Chen	China	GS	Valentine	Ochanda	Kenya	GS
Marc	Chiappero	France	GN	Stephanie	Odayen	Canada	GN
Annapurna	Chintaluri	India	GS	Edna	Odhiambo	Kenya	GS
Dumisani	Chirambo	Malawi	GS	Liam	O'Doherty	Canada	GN
Carlos	Chiu	Peru	GS	Sean	O'Donoghue	South Africa	GS
Titash	Choudhury	India	GS	David	Oehmen	Switzerland	GN
Winston	Chow	Singapore	GN	Mark	Ojal	Kenya	GS
Eric	Chu	USA	GN	Natalia	Okutoi	Kenya	GS
Zaneta	Chui	Canada	GN	Paola	Ometto	Brazil	GS
Julia	Chung	Canada	GN	Camilo	Ordenez Barona	Colombia	GS
Sarah	Cicchini	Canada	GN	Lyndal	Osborne	Canada	GN
Amelia	Clarke	Canada	GN	Katie	O'Shea	USA	GN
Karen	Clarke-Whistler	Canada	GN	Juan	Osorio	Colombia	GS
Helen	Cleugh	Australia	GN	Holly	Palen	Canada	GN
Marieke	Cloutier	Canada	GN	Sean	Pander	Canada	GN
Adrienne	Cloutier	Canada	GN	Lumari	Pardo-Rodriguez	USA	GN
William	Cobbett	UK	GN	Jyoti	Parikh	India	GS
Linda	Cochrane	Canada	GN	Brad	Parker	NO DATA	
Marshall	Cohen	USA	GN	Charles	Parker	NO DATA	
Maurie	Cohen	USA	GN	Brenda	Parlee	Canada	GN
M'Lisa	Colbert	Canada	GN	Alberto	Pascual	Panama	GS
Sarah	Colenbrander	Australia	GN	Lorena	Pasquini	UK	GN
Marcus	Collier	Ireland	GN	Madhumita	Patel	India	GS
Sarah	Connors	France	GN	Sheela Bharat	Patel	India	GS
María	Cortés Puch	Spain	GN	Minal	Pathak	India	GS
Jacob	Corvidae	USA	GN	Joanne	Pawluk	Canada	GN
Peter	Cox	Ireland	GN	Benoit	Pellerin	Canada	GN
Marlies	Craig	South Africa	GS	Mark	Pelling	UK	GN
Steve	Craik	Canada	GN	Rylie	Pelton	USA	GN
Drury	Crawley	USA	GN	Eduardo	Pérez	Canada	GN
Roger	Cremades	Spain	GN	Ekaterina	Perfilyeva	Russia	GN
Elena	Crete	USA	GN	Adriaan	Perrels	Netherlands	GN
Felix	Creutzig	Germany	GN	Clare	Peters	Canada	GN
Edoardo	Croci	Italy	GN	Katie	Peterson	Canada	GN
Palmira	Cuellar-Ramirez	Mexico	GS	Shannon	Phillips	Canada	GN
Bruce	Currie-Alder	Canada	GN	Ramon	Pichs-Madruga	Cuba	GS
Thomas	Dallessio	USA	GN	Emmanuelle	Pinault	France	GN
Brent	Dancey	Canada	GN	Laszlo	Pinter	Canada	GN
Gaddafi	Danmaliki	Nigeria	GS	Hans	Poertner	Germany	GN
Aniruddha	Dasgupta	India	GS	Audrey	Poitras	Canada	GN
Debra	Davidson	Canada	GN	Cecilia	Polacow Herzog	Brazil	GS
Amy	Davison	UK	GN	Diego	Ponce de Leon Barido	Mexico	GS
Richard	Dawson	UK	GN	Rita	Pongracz	Hungary	GN

Thomas	Day	UK	GN	Lavinia	Poruschi	Australia	GN
Cecile	De Munck	France	GN	Joanne	Potter	USA	GN
Phil	DeCola	USA	GN	Prajal	Pradhan	Nepal	GS
Filiep	Decorte	Belgium	GN	Emily	Prestwood	UK	GN
Margaret	Deignan	UK	GN	Anne-Hélène	Prieur-Richard	France	GN
Sabrina	Dekker	Canada	GN	Dawn	Pritchard	Canada	GN
Gian Carlo	Delgado Ramos	Mexico	GS	Jose Antonio	Puppim de Oliveira	Brazil	GS
Stefan	Denig	Germany	GN	Sara	Radelet	USA	GN
Shobhakar	Dhakal	Nepal	GS	Melissa	Radu	Canada	GN
Jose	Di Bella	Mexico	GS	Homa	Rahmat	Iran	GS
Giovanni	Di Lullo	Canada	GN	Indrika	Rajapaksha	Sri Lanka	GS
Emily	Dietrich	Canada	GN	Bardhyl	Rama	Germany	GN
Kathleen	Diga	Canada	GN	Anu	Ramaswami	USA	GN
Andy	Diwangkari	Indonesia	GS	Trude	Rauken	Norway	GN
Saliha	Dobardzic	Bosnia and Herzegovina	GN	Jeffrey	Raven	USA	GN
Nancy	Dodds	Canada	GN	Ilona	Rayan	USA	GN
David	Dodman	UK	GN	Gleb	Raygorodetsky	Canada	GN
Jago	Dodson	Australia	GN	Marlo	Raynolds	Canada	GN
Felix	Döhler	Germany	GN	Diana	Reckien	Germany	GN
Chelsea	Donelon	Canada	GN	Daniel	Rees	Norway	GN
Benedicte	Dousset	USA	GN	William	Rees	Canada	GN
Michael	Doust	UK	GN	Chao	Ren	China	GS
Joanne	Douwes	South Africa	GS	Gregory	Reppucci	USA	GN
Delali B.K.	Dovie	Ghana	GS	Maya	Reshef	Canada	GN
David	Draper	Canada	GN	Aromar	Revi	India	GS
Martine	Dubuc	Canada	GN	Garrett	Richards	Canada	GN
Linda	Duncan	Canada	GN	Randy	Ries	NO DATA	
Brian	Dupuis	Canada	GN	Gale	Rigobert	Saint Lucia	GS
Luiza Rodrigues	Dutra	Brazil	GS	Jan	Riise	Sweden	GN
Selene	Dykes	Canada	GN	Keith	Ripley	USA	GN
Matt	Dykstra	Canada	GN	Michael	Rivest	Canada	GN
Jon	Dziadyk	Canada	GN	Debra	Roberts	South Africa	GS
Kristie	Ebi	USA	GN	Pedro Lomando Restum Macedo	Rocha	Brazil	GS
Amanda	Eichel	USA	GN	Maria Fernanda	Rodrigues Campos Lemos	Brazil	GS
Katrin	Eisenbeiss	Germany	GN	Sofia Valez	Rodriguez	Colombia	GS
Karim	Elgendy	UK	GN	Aura Azalea	Rodriguez Villamil	Mexico	GS
Thomas	Elmqvist	Sweden	GN	Patricia	Romero-Lankao	USA	GN
Jean Pierre	Elong Mbassi	Cameroon	GS	Mike	Roppelt	NO DATA	
George	Enei	Canada	GN	Cynthia	Rosenzweig	USA	GN
Evyatar	Erell	Israel	GN	Lauren	Ross	USA	GN
Moe S.	Esfahlani	Germany	GN	Paul	Ross	Canada	GN

Jessica	Espey	UK	GN	Sheena	Rossiter	Canada	GN
Jennifer	Ewing-Thiel	USA	GN	Amanda	Rosychuk	Canada	GN
Samuel	Ezebunandu	Nigeria	GS	Ashley	Roszko	Canada	GN
Aaron	Fairbrother	Canada	GN	Joyashree	Roy	India	GS
Andrew	Fang	USA	GN	Steve	Rumley	Canada	GN
Ira Damayanti	Fasa	Indonesia	GS	Adam	Rysanek	Canada	GN
Liam	Fee	Ireland	GN	Saeideh	Sadeghi Afjeh	Iran	GS
Christian	Felske	Germany	GN	Rasikh	Sagitov	Russia	GN
Mark	Fenwick	NO DATA		Emilia	Saiz	Spain	GN
Maria Josefina	Figueroa	Venezuela	GS	Alejandra	Salas	Spain	GN
Andres	Filella	Canada	GN	Julie	Salter-Keane	Canada	GN
Amethyst	First Rider	Canada	GN	Mogamat Igshaan	Samuels	South Africa	GS
Laura	Florez	Colombia	GS	Leon	Sanderson	NO DATA	
Sarah	Flynn	Canada	GN	Edgar Roberto	Sandoval Garcia	Mexico	GS
Henry Abanda	Fonbeyin	Cameroon	GS	Michelle	Sanfilippo	Canada	GN
Silvia Graciela	Fontan	Argentina	GS	Andréa	Santos	Brazil	GS
Bill	Fortier	Canada	GN	Caterina	Sarfatti	Italy	GN
Kansie	Fox	Canada	GN	Kwadwo Ohene	Sarfoh	Ghana	GS
Niki	Frantzeskaki	Greece	GN	Jim	Saunderson	Canada	GN
John	Freeman	Canada	GN	Bob	Savage	Canada	GN
Sandra	Gagnon	Canada	GN	Nathan	Schaffer	Canada	GN
Hana	Galal	Germany	GN	Marvin Wayne	Schmyr	Canada	GN
David Felipe González	Galindo	Colombia	GS	Alison	Schneider	Canada	GN
Kalum	Galle	Canada	GN	Sven	Scholtysik	Germany	GN
Snigdha	Garg	India	GS	Seth	Schultz	USA	GN
Matthias	Garschagen	Germany	GN	Jessica	Seddon	USA	GN
Matt	Gemmel	Canada	GN	Julia	Seixas	Portugal	GN
Ebru	Gencer	USA	GN	Guilherme	Selegium	NO DATA	
Mehrmaz	Ghojeh	UK	GN	Mahendra	Sethi	India	GS
VJ	Gibbins	Canada	GN	Karen	Seto	USA	GN
Nancy	Giguere	Canada	GN	Alessandra	Sgobbi	Italy	GN
Alexandra	Gillam	Canada	GN	Keshav Sheetal	Shah	USA	GN
Suhanee	Giroti	India	GS	Heather	Shewchuk	Canada	GN
Priyanka	Girsti	Canada	GN	Malcolm	Shield	Canada	GN
Bruce	Gladue	Canada	GN	Wan-yu	Shih	NO DATA	
Terry	Godwaldt	Canada	GN	Adrian	Shirt	NO DATA	
Tasha	Goldberg	USA	GN	Marvin	Shmyr	Canada	GN
Mitch	Goldenberg	Canada	GN	Mxolisi	Shongwe	Swaziland	GS
Tirso	Gonzales	Canada	GN	Sharon	Shuya	Canada	GN
Stacia	Gordey	Canada	GN	Kevin	Sieck	Germany	GN
David	Gordon	Canada	GN	Graham	Simpkins	UK	GN
Andy	Gouldson	UK	GN	Roop	Singh	USA	GN
Stelios	Grafakos	Greece	GN	Jim	Skea	UK	GN
Carrie	Grassi	USA	GN	Karin	Smith Fargey	Canada	GN

Melodie	Green	Canada	GN	Ranon	Soans	Canada	GN
Debra	Greenspan	USA	GN	Lisa	Sobchyshyn	Canada	GN
Julie	Greenwalt	USA	GN	Amarjeet	Sohi	Canada	GN
Joan	Greer	Canada	GN	Youba	Sokona	Switzerland	GN
David	Grimes	NO DATA		William	Solecki	USA	GN
Francesco	Guarino	Italy	GN	Sajad	Soleymani Yazdi	Iran	GS
Manisha	Gulati	India	GS	Lei	Song	China	GS
Ankit	Gupta	India	GS	Heidi	Sørensen	Norway	GN
Kevin	Gurney	USA	GN	Stephen	Stanley	Canada	GN
Caroline	Hachem-Vermette	Canada	GN	Linda	Steg	Netherlands	GN
Dylan	Hall	Canada	GN	Fee	Stehle	Germany	GN
Rafiq	Hamdi	Belgium	GN	Perry	Stein	Canada	GN
David	Hameršak	Slovenia	GN	Michael	Steinhoff	USA	GN
Johannes	Hamhaber	Germany	GN	Daniel	Strain	Canada	GN
John	Hanson	Canada	GN	Charles	Stubblefield	USA	GN
Sinda	Haouès-Jouve	France	GN	Andrew	Sudmant	Canada	GN
Masayuki	Hara	Japan	GN	Katherine	Sugar	UK	GN
Wolfgang	Haupt	Germany	GN	Lorraine	Sugar	Canada	GN
Josephine	Head	UK	GN	Robert	Summers	Canada	GN
Clare	Healy	UK	GN	Wenyuan	Sun	China	GS
Jen	Heemann	Brazil	GS	Cliff	Supernault	Canada	GN
Ben	Henderson	Canada	GN	Scott	Sutherland	Canada	GN
Yuill	Herbert	Canada	GN	Leila	Taheriazad	Iran	GS
Annel	Hernandez	USA	GN	Kelly	Tai	Canada	GN
Maria del Rosario Silva	Hernández	Colombia	GS	Alireza	Talaei	Iran	GS
Dayna	Herr	Canada	GN	Kiyoto	Tanabe	Japan	GN
David	Hetherington	UK	GN	Nigel	Tapper	Australia	GN
Thomas	Heyd	Canada	GN	Oksana	Tarasova	Russia	GN
Julia	Hidalgo	Spain	GN	Anna	Taylor	UK	GN
Tiffany	Hodgson	United Nations		Kevin	Taylor	USA	GN
Sarah	Hoffman	Canada	GN	Emma	Terämä	Finland	GN
Derek	Hollman	Canada	GN	Sarah	Thacker	Canada	GN
Charlene	Holmes	Canada	GN	Pakamas	Thinphanga	Thailand	GS
Hans	Hooyberghs	Belgium	GN	Charlotte	Thomasson	Canada	GN
MD. Zakir	Hossain	Bangladesh	GS	Jeremy	Thompson	Canada	GN
Candice	Howarth	UK	GN	Zhan	Tian	China	GS
Alexandra	Hryciw	Canada	GN	Amos	Tindyebwa	Uganda	GS
Angel	Hsu	USA	GN	Aisa	Tobing	Indonesia	GS
Kevin	Hsu	USA	GN	Nicola	Tollin	Italy	GN
Ross	Hunter	UK	GN	Chandra	Tomaras	Canada	GN
Margaret	Hurwitz	USA	GN	Kangkang	Tong	China	GS
Lucy	Hutyra	USA	GN	Rachel	Touchie	Canada	GN
Rachel	Huxley	UK	GN	Jean-Patrick	Toussaint	Canada	GN
Victor	Indasi	Kenya	GS	Lieutenant Governor	Travor	Canada	GN

Kendra	Isaac	Canada	GN	Krista	Tremblett	Canada	GN
Mohammad Nurul	Islam (Nazem)	Bangladesh	GS	Alexei	Trundle	Australia	GN
Taja	Islamovič	Slovenia	GN	Nobumitsu	Tsunematsu	Japan	GN
Don	Iveson	Canada	GN	Andreas	Tveteraas	Norway	GN
Jason	Jabbour	Canada	GN	Kari	Tyler	Canada	GN
David	Jackson	UK	GN	Sandra	Ukaigwe	Nigeria	GS
Meryl	Jagarnath	South Africa	GS	Namrata	Upadhyay	India	GS
Garima	Jain	India	GS	Asha	Upadhyay	India	GS
Swati	Janu	India	GS	Naz Sohni	Uppal	Canada	GN
Ryan	Janzen	Canada	GN	Diana	Ürge-Vorsatz	Germany	GN
Nathalie	Jean-Baptiste	Mexico	GS	Michael	Uwemedimo	UK	GN
Chris	Jennings	Canada	GN	Stephany	Uy-Tan	Philippines	GS
Ghiloufi	Jihene	Tunisia	GS	Lesley	Vaage	Canada	GN
Lin "Judy"	Jingtong	China	GS	Pouya	Vahmani	USA	GN
Joseph	Jobin	Canada	GN	Hans	van Ammers	Netherlands	GN
Shelley	Joderin	NO DATA		Gino	Van Begin	Belgium	GN
Craig	Johnson	Canada	GN	Wouter	van Bolhuis	Netherlands	GN
Scott	Johnson	NO DATA		Saleem	Van Groenou	USA	GN
Doug	Jones	Canada	GN	Elsona	van Huyssteen	South Africa	GS
Kirti	Joshi	Nepal	GS	Karl	Van Orsdol	USA	GN
Alexandra	Jurgilevich	Belarus	GS	Maryke	van Staden	South Africa	GS
David	Kahane	Canada	GN	Ernita	van Wyk	South Africa	GS
Miho	Kamei	Japan	GN	Henry David	Venema	Canada	GN
Manikarnika	Kanjilal	India	GS	Nicolaas	Veraart	USA	GN
Monicah	Karangi	Kenya	GS	Philip J	Vergragt	Netherlands	GN
Sydney	Karbonik	Canada	GN	Marc	Vermette	Canada	GN
Carrie	Karsgaard	Canada	GN	May Celine Thelma	Vicente	Philippines	GS
Raymond	Kasei	Ghana	GS	Vincent	Viguié	France	GN
Jesse	Keenan	USA	GN	Maria Virginia	Vilariño	Argentina	GS
Ramin	Keivani	UK	GN	David	Viner	UK	GN
Josh	Kelly	Canada	GN	Felix	Vogel	Germany	GN
Ryan	Kelly	Canada	GN	Carmen	Vogt	Germany	GN
Dave	Kendal	Australia	GN	Konstantin	von Gunten	Switzerland	GN
Christopher	Kennedy	Canada	GN	James	Voogt	Canada	GN
Martin	Kennedy	Canada	GN	Sebastien	Wagner	Canada	GN
Anne	Kerr	UK	GN	Brenna	Walsh	Canada	GN
Myrna	Khan	Canada	GN	Claire	Walsh	UK	GN
Martin	Kholmatov	Canada	GN	Michael	Walters	Canada	GN
Radhika	Khosla	UK	GN	Yali	Wang	China	GS
Grant	Kidd	Canada	GN	Grant	Wang	Canada	GN
Julia	Kilpatrick	Canada	GN	Bettina	Wanschura	Austria	GN
Jinmi	Kim	South Korea	GN	Mark	Watts	UK	GN
Patrick	Kinney	USA	GN	Joseph	Weasel Child	Canada	GN
Christel	Kjenner	Canada	GN	Bob	Weber	Canada	GN

Gary	Klassen	Canada	GN	Christopher	Wellise	USA	GN
Johannes	Klein	Germany	GN	Jason	West	USA	GN
Jonathan	Koehn	USA	GN	Michael	Westphal	USA	GN
Danielle	Koleyak	Canada	GN	Hege	Westskog	Norway	GN
Sheila	Kong Mukwele	Cameroon	GS	Julie	Whipple	USA	GN
Kweku	Koranteng	Ghana	GS	Andrea	Wiebe	Canada	GN
Meinolf	Kossmann	Germany	GN	Lindsay	Wiginton	Canada	GN
Kaelin	Koufogiannakis	Canada	GN	Sheena	Wilson	Canada	GN
Alex	Kovac	USA	GN	Osnat	Wine	Canada	GN
Marley	Kozak	Canada	GN	Steve	Winkelman	USA	GN
Juergen	Kropp	Germany	GN	Irene	Wolfstone	Canada	GN
Thelma	Krug	Brazil	GS	Roel	Woudstra	Netherlands	GN
Lee	Kruszewski	Canada	GN	Fred	Wrona	Canada	GN
Tevfik	Kuloglu	Turkey	GN	Jinhan	Xie	China	GS
Mayank	Kumar	India	GS	Kun	Xu	China	GS
Priya	Kurian	New Zealand	GN	Penlope	Yaguma	Uganda	GS
Pascale	Ladouceur	Canada	GN	Geng	Yong	China	GS
Wendy	Lam	Canada	GN	Steve	Young	Canada	GN
Crystal	Lameman	Canada	GN	Kevina Nuraini	Yusuf	Indonesia	GS
Nadean	Langlois	Canada	GN	Alexandra	Zabjlk	Canada	GN
Bin	Lau	Canada	GN	Panmao	Zhai	China	GS
Kevin Ka-Lun	Lau	China	GS	Huiwen	Zhang	China	GS
Louise	Lauritzen	Denmark	GN	Tong	Zhu	China	GS
Allan	Lavell	UK	GN	Cynthia	Zutter	Canada	GN
Thi Phuong Linh	Le	Vietnam	GS	Maja	Zuvela-Aloise	Croatia	GN
Stephen	Leahy	Canada	GN				
Derek	Leahy	Canada	GN				
Emma	Lecavalier	Canada	GN				
Boram	Lee	Switzerland	GN				
Hoesung	Lee	South Korea	GN				
Jaemee	Lee	South Korea	GN				
Martin	Lehmann	Denmark	GN				
Benjamin	Leibowicz	USA	GN				
Jennifer	Lenhart	USA	GN				

Annex F

Process for collecting information for *Global Research and Action Agenda on Cities and Climate Change Science*

Information for the Research and Action Agenda was compiled from all sources of official conference inputs, which include plenary and parallel sessions, posters, and the five papers which were commissioned by the SSC in advance of the Conference. A team comprised of representatives from partner organisations, two members of the SSC, and led by Future Earth was charged with compiling all conference inputs and supporting the SSC in the writing of the *Global Research and Action Agenda on Cities and Climate Change Science*.

In advance of the Conference, poster presenters were asked to fill in a form to input the SSC on research gaps and recommendations coming from their work to be presented at the Conference. A similar form was given to parallel session conveners in advance of their session, with the expectation that research gaps and recommendations would be identified from their previous work and emerge from discussions during the Conference session. A compilation team supporting the SSC extracted research gaps and recommendations from the Conference commissioned papers.

At the Conference, several mechanisms were used to record information. Student volunteers from the University of Alberta took detailed minutes for each parallel session, to support the session conveners in preparing their responses on research gaps and recommendations emerging from their session. At least one representative from the compilation team also attended each parallel session take minutes and to record research gaps and recommendations. A member of the compilation team took detailed minutes of each of the four thematic plenary sessions as well as the SSC led plenary and worked with a member of the SSC to fill in the same form provided to session conveners to identify research gaps and recommendations which emerged from the presentations and subsequent discussions. A member of the compilation team also recorded all questions, and research gaps which were provided as feedback by conference participants during the SSC led plenary session.

The compilation team held two working sessions with the SSC, organising committee and IPCC Co-Chairs and Working Group Co-Chairs after the first day of the Conference and midway through the final day of the Conference. Before these sessions, the compilation team compiled all key research gaps and recommendations which had been collected to date and mediated a discussion to assess whether this was an accurate representation of the inputs to the research agenda which had been presented at the conference up to that point.

Directly after the Conference, the SSC held a two-day workshop to begin analysing and reviewing conference inputs. The OC participated and provided input during the first day of the workshop. After two days of discussion, the SSC and compilation team developed a draft outline for the *Global Research and Action Agenda of Cities and Climate Change Science*. Writing teams were then established for each section of the research agenda. Several gaps in expertise were recognised (on indigenous knowledge, governance, finance and consumption and production) and conference participants with such expertise were invited to join the writing team.

Writing of each section was led by the writing team lead, and the full draft was reviewed periodically by the SSC and compilation team. A meeting was held from 5 - 8 June 2018 to finalise the first draft of the *Global research and Action Agenda on Cities and Climate Change*. Following this meeting, the draft was shared with all conference participants to engage them in a consultation process.

The goal of this consultation was to ensure that information shared, the discussions, and the different perspectives present at the Conference are well represented in the synthetic document. Participants were asked to provide comments related to information shared or discussed at the Conference which addressed the following three questions, and given two weeks to provide these comments to the SSC and compilation team:

- (1) Broad key research areas or topics missing. Please note that a detailed table of all recommendations coming out of the conference, will be presented as an annex to this document. This document is the synthesis of this detailed information.
- (2) Inaccuracies or important addition for the overall understanding.
- (3) Text difficult to understand.

During the consultation process, 234 comments were received from 49 conference participants. Participant comments were considered in the final revision of the Research and Action Agenda, before its submission to the IPCC. Following this consultation process, the draft was shared with SSC and OC members for final approval for the *Global Research and Action Agenda on Cities and Climate Change Science* to be shared with the IPCC.

The SSC and OC organisations will be informally tracking several indicators of success of the Conference and Research and Action Agenda. Some of these indicators include:

- A surge of knowledge production and peer reviewed literature capturing knowledge co-design and co-production timely for the AR7 Special Report on Cities and Climate Change,
- A broader network of stakeholders involved as observer organisations to the IPCC.

All information relevant to the building of the Global Research and Action Agenda on Cities and Climate Change Science, from conference submissions through to the results of participant consultation will be permanently held on the Durban Branch of the WG II TSU's website and passed on to the AR7 Bureau to be used as a resource, if needed, in preparation for writing the *Special Report on Cities and Climate Change*. Figure F1. summarises the reference material available which was generated as a result of the Conference.

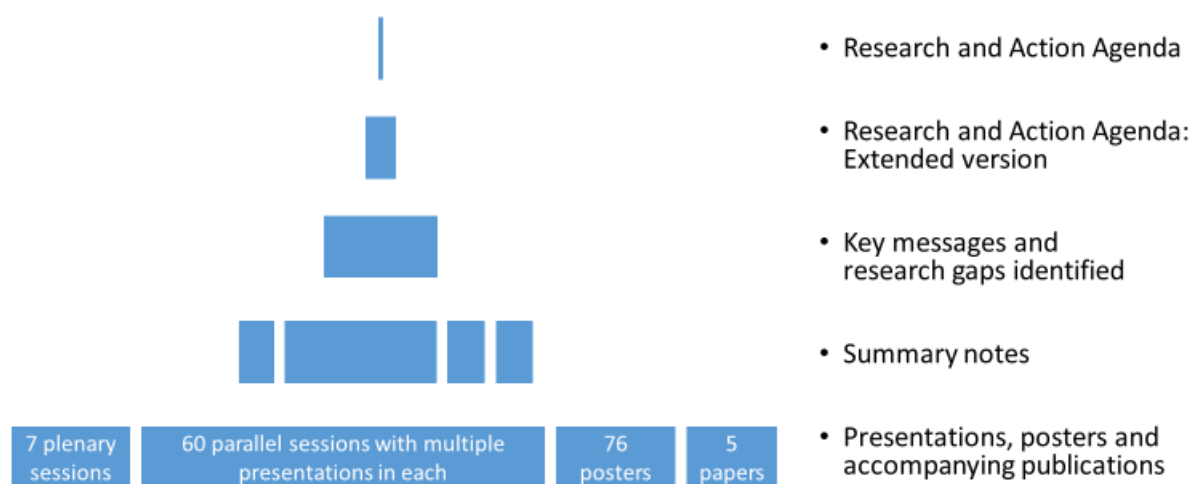


Figure F1. Reference material available from Cities and Climate Change Science conference

Annex G

Summary of participant inputs to the *Global Research and Action Agenda on Cities and Climate Change Science*

As mentioned above, inputs from all conference sessions, posters, commissioned papers and discussions were recorded and informed and shaped the Research and Action Agenda. These inputs were used to define the priority areas to form the outline. Once the outline of the Research and Action Agenda was identified, all inputs were summarised and binned under the appropriate section. The 358 individual research gaps and approaches for action which were identified and are categorised under the section headings found in the agenda, the accompanying excel file has been submitted to the IPCC Secretariat for reference along with this report. Through the process of writing the document, the outline of the draft changed slightly, however, the breakdown of the key messages found in this table, was developed through consultation that took place throughout the writing process.

Annex H

Initiatives informed and catalysed by the Conference

In the months following the Conference, several initiatives have started, which were informed and catalysed by the Conference process which have been initiated by SSC members, OC and other organisations to further the discussions between the research, urban practice and policy communities on cities and climate change science. Below is an illustrative list including some of these initiatives

- “The Science we need for the Cities we Want: Working together to implement the *Global Research and Action Agenda on Cities and Climate Change*”, a joint partner statement initiated on the final day of the Conference. This statement has been signed by 24 organisations, including most of conference organising committee partners.
- The Edmonton Declaration, which originated from discussions at the Mayoral Summit held Edmonton 4 March 2018, and officially launched in May 2018. This declaration is a call to local governments to support evidence-based decision-making and action to address climate change in cities. This has now been signed by 17 local governments.
- A follow up conference, discussing the outcomes of the Conference in the Mexican context hosted by the National Autonomous University of Mexico (UNAM) 5-6 June 2018
- ICLEI together with the UNFCCC working towards an annual gathering of UNFCCC members, city and research partners around the topic of cities and climate change
- The Innovate4Cities initiative hosted by the Global Covenant of Mayors to further develop this Research and Action Agenda further with greater alignment with cities’ needs.

Annex I

International Institute for Sustainable Development Conference Report

The International Institute for Sustainable Development Reporting Service attended the Conference, and prepared a conference bulletin, summarizing the events of the three-day conference. The bulletin can be found at the following link:

<https://citiesipcc.org/wp-content/uploads/2018/04/enbplus172num42e.pdf>

Annex J

International Conference on Climate Change and Cities conference programme

The programme of the International Conference on Climate Change and Cities conference can be found below. This programme includes the pre-conference session, held on 4 March 2018 and extends through to the end of 7 March 2018. Participants were also invited to register for local site visits, coordinated by the City of Edmonton which took place 8 March 2018.



SUNDAY, 4 MARCH

13:00-	Pre-Conference Session:
17:30	A Village of Hope [SEPARATE REGISTRATION REQUIRED]
17:30-	Edmonton Opening Reception: <i>Collect your registration package early and take the opportunity to sample refreshments and interact with tradeshow exhibitors</i> [HALL A]
20:00	
17:30	Poster Set-up · 1.5 HRS [HALL B]

MONDAY, 5 MARCH

07:30	Breakfast · 60 MIN [HALL D]
08:30-	Opening Plenary
10:00	[HALL D]
10:00	Refreshment Break · 30 MIN [HALL D FOYER]
10:30-	Theme 1 Plenary
12:00	[HALL D]
12:00	Lunch · 60 MIN [HALL D]
12:00	Poster Set-up · 60 MIN [HALL B]
13:00-	Parallel Sessions Theme 1
14:30	Cities and the Global Agendas: SDGs, Paris Agreement, New Urban Agenda, Sendai Framework and Convention on Biological Diversity [SALON 5]
	Embedding Practitioner Evidence into the IPCC Process [SALON 6]
	iDoc Workshop: Speculating on future energy systems [SALON 8]
	Financing Climate Risk at the City-level: Promoting dialogue between public and private actors [SALON 9]
	Inclusion and Informality [SALON 10]
	Co-benefits for Emerging Economies: Practical experiences and policy imperatives [SALON 11]
	Application of Multiple Knowledge Systems for Evidenced-Based Decision Making: Opportunities and challenges for ensuring resilient communities [SALON 12]
14:30	Refreshment Break · 15 MIN [SALON LEVEL]

14:45-	Parallel Sessions Theme 1 + 2
16:15	Environmental Justice and Urban Climate Change: How can we ensure an equitable future? [SALON 5]
	We Are Still In: The political and practical potential of non-state actor collaboration [SALON 6]
	Big Data: Understanding risks and resilience in cities [SALON 8]
	Delivering Air Quality Health, and Climate Co-Benefits [SALON 9]
	The Role of City Networks in Supporting Policy-Practitioner-Academia Interactions [SALON 10]
	Mapping the Greenhouse Gas Data Landscape [SALON 11]
	Urban Climate Information to Support Decision Making: From local to global [SALON 12]
16:15	Refreshment Break · 15 MIN [HALL D FOYER]
16:30-	Theme 2 Plenary
18:00	[HALL D]

TUESDAY, 6 MARCH

08:00	Breakfast & Posters · 60 MIN [HALL B]
09:00-	Theme 3 Plenary
10:30	[HALL D]
10:30	Refreshment Break · 30 MIN [SALON LEVEL]
11:00-	Parallel Sessions Theme 2
12:30	Research Priorities and Multisectoral Collaborations Needed to Support the Most Vulnerable People in Cities [SALON 10]
	Climate Risks and Vulnerabilities in Coastal Communities [SALON 6]
	Guide for Integrated Urban Weather, Environment and Climate Services (IUWECS): How it can best meet the needs of researchers and stakeholders [SALON 8]
	How Data Aggregation Can Support Subnational Actors in Framing Climate Policy [SALON 9]
	Human Health Impacts of Climate Change [SALON 5]
	Mainstreaming Urban Governance and FEW Systems Towards Climatic Risk Reduction [SALON 11]
	Climate Response Actions in Cities: Enabling resilience building [SALON 12]

WEDNESDAY, 7 MARCH		
12:30	Lunch & Posters - 60 MIN [HALL B]	15:00 Refreshment Break - 30 MIN [SALON LEVEL]
13:30-15:00	Parallel Sessions Theme 3 Promise of Green Infrastructure to Combat Climate Change in Cities [1] [SALON 8] Smart Cities and Their Promise for Addressing Climate Change in Cities [SALON 6] Interactions of Climate Mitigation and Adaptation in Cities: Synergies and trade-offs [SALON 5] Transforming the Built Environment: Research and experience [SALON 9] Climate Change and Equity in the Context of SDGs [SALON 10] Urban Heat Island Effect and Climate Change in Cities [SALON 11] Climate Change and the End of Consumer Society [SALON 12]	15:30-16:30 SSC/OC Led Parallel Sessions Enhancing Data and Data Infrastructure for Urban Community [SALON 5] Finance [SALON 6] Future Research Agenda [SALON 8] Developing Novel Assessment Frameworks [SALON 9] Developing Partnership Based Platform for Better Information [SALON 10] Transforming Cities for 1.5 Degree World [SALON 11] Climate Change and Informality in Cities [SALON 12]
15:00	Refreshment Break - 15 MIN [SALON LEVEL]	16:30 Refreshment Break - 30 MIN [HALL D]
15:15-16:45	Parallel Sessions Theme 3 + 4 Infrastructure Transitions and Urban Form [SALON 5] Promise of Green Infrastructure and Nature-Based Solutions to Combat Climate Change [SALON 8] Energy Systems and Buildings [SALON 6] Climate Change and SDG interactions in Cities: How much transformation is needed? [SALON 9] Governing Climate Change in Complex Urban Settings: Resilience through social innovation [SALON 10] Urban Mobility and Climate Change in Cities [SALON 11] Strengthening and Accelerating Effective Climate Action in Cities [SALON 12]	17:00-18:00 Closing Plenary [HALL D] 18:00-19:30 Closing Reception [HALL D FOYER]
16:45	Refreshment Break - 15 MIN [HALL B]	
17:00-18:00	SSC Led Plenary [HALL D]	
18:00-20:30	Edmonton Gala Reception <i>Enjoy excellent food, company and entertainment. This social highlight of the conference will be celebrated in Rogers Place in the heart of downtown and home to Edmonton's National Hockey League Team. [ROGERS PLACE]</i> <i>For those attending the conference, this event is included in your registration and bus shuttles will be available.</i>	
WEDNESDAY, 7 MARCH		
08:00	Breakfast & Posters - 60 MIN [HALL B]	
09:00-10:30	Theme 4 Plenary [HALL D]	
10:30	Refreshment Break - 30 MIN [SALON LEVEL]	
11:00-12:30	Parallel Sessions Theme 4 Urban and Rural [SALON 5] Informal Settlements and Economies: Means for transformative climate action [SALON 11] The Importance of Monitoring and Reporting (M&R) for the Aggregated Impact of Local Climate Action and the Assessment of Covenant of Mayors Initiative [SALON 8] From Science to Action - Making estimates for multiple benefits of urban climate action accessible for decision makers [SALON 9] Climate Adaptation Finance: Urban perspectives [SALON 10] What Does the Transition to a 1.5 °C City Look Like? [SALON 12]	
12:30	Lunch & Posters - 60 MIN [HALL B]	
13:30-15:00	Parallel Sessions Theme 4 Challenges and Opportunities for Locking-In Positive Climate Responses in Cities [SALON 5] Youth Voices and Climate Change Knowledge: Empowering youth in conversations on climate impact and vulnerabilities [SALON 10] Initiating Climate Awareness in Urban Planning Practices Through Participatory Action Research [SALON 8] Climate Change Adaptation in Cities: Insights on actors, institutions and agendas [SALON 9] Supporting National Determined Contributions (NDCs) Implementation in Urban Areas and Vertical Integration of Climate Actions [SALON 6] Cities and the Challenge of 1.5 °C: Assessing modes mechanisms and manifestations of coordination in global urban climate governance [SALON 11] Raising and Steering Finance for Climate Action in Cities [SALON 12]	
THURSDAY, 8 MARCH		
Edmonton Sustainable Site Tours [AS PER REGISTRATION INSTRUCTIONS]		



Figure J1. Cities and Climate Change Science conference programme

Annex K

Conference closing plenary statement from IPCC Vice chairs Youba Sokona and Thelma Krug

During the closing plenary of the Cities and Climate Change Science Conference, IPCC Vice-Chairs Youba Sokona and Thelma Krug gave closing remarks, to share an IPCC perspective after their active participation through the three days of the conference. The transcript of their closing remarks, which were jointly delivered is presented below.

“Good afternoon to all:

The Vice-Chairs of the IPCC have been invited by the organisers to reflect on the three days of this Conference here in Edmonton. Unfortunately, our colleague Ko Barrett could not be physically here with us, but she is kept aware of our discussions at this extraordinary Conference. It is not our intention to cover all the wealth of detail, discussions, research gaps, but to highlight some elements from the IPCC perspective. We have limited time and even if we had more time, we would not be able to make justice to all the invaluable contributions that resulted from this Conference.

The conference brought together the three communities of the IPCC stakeholders, namely the Research community, the Policy Community, and the Practice Community.

Let us first start by recalling the role of IPCC – “to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human induced climate change its potential impacts and options for adaptation and mitigation.” In doing so:

- *Assurance of the quality of all cited literature is crucial*
- *Priority should be given to peer-reviewed scientific, technical and socio-economic literature if available*
- *Other sources such as reports from governments, industry, research institutions, international and other organizations, etc. are important source of knowledge to be assessed.*

As you know, all the products of the IPCC are based on the scientific literature available globally and so, it is essential to advance research in climate science to ensure that science can, indeed, better inform the decision-making process at various levels. We are particularly impressed with the amount of climate-related knowledge already available on cities and climate change, but as we have heard along these 3 days, there is still a lot yet to be done. Let us single out some of the issues that we found particularly relevant to address here:

- *One recurrent issue in the IPCC assessment reports relates to observation, data, including GHG emissions data, in particular in developing countries, information, data availability and accessibility, coverage, quality, and so on. The limitation in data restricts the scope of the research that, in turn, affects the assessment reports.*
- *Limited or non-existence of literature covering various situations in particular in developing countries. This is consistent with AR5, WG II when noting that the literature available for assessing climate change impacts, adaptation, and vulnerability more than doubled between 2005 and 2010, which allowed for a more robust assessment that informs policymaking. Besides expanding the diversity of topics and regions covered by the literature, as well as the geographic distribution of authors contributing to the knowledge base for climate change assessments, the contribution of developing countries in research and literature authorship still represents a small fraction of the total. This unequal distribution presents a challenge to the production of a comprehensive and balanced global assessment. Here is the case of enhancing our knowledge on the various aspects of the so called “Informal sector”, with greater vulnerability of specific groups such as the poor, marginalised, and fragile people. Also, more and more in the global North, a pocket of such group exists and is increasing.*

- *Consistent with the identified knowledge gaps in the IPCC AR5, the issue of understanding climate interactions in the complex various situations requires special attention. This has been covered by the key topics discussed during the various sessions as well as reflected in the future research questions. It is important to highlight the need to engage more social scientists, balancing disruptive technological options with behavioural approaches, as reflected in the outline of AR6. This brings opportunities to the research community to provide, in due course, great contribution to the AR6.*
- *In addition, our understanding of policies and governance systems are still limited and fragmented and will benefit from additional research as well as compilation of case studies and best practices.*

So, it is our hope that this conference has been a wonderful platform for the three communities to have a productive and stimulating dialogue that will lead to the joint production of knowledge to advance, among others, in the potential urban responses to climate change for increased and ambitious actions. It became obvious from this Conference, that more interaction among the three communities is urgently needed not only at international level but also at regional and national levels. This will inform the IPCC focus on regional issues, which became more prominent since AR4.

We would like to thank the Government of Canada, the authorities in Edmonton, the sponsors, and the Scientific Steering Committee, for the hard work and extraordinary preparation they have jointly done for this Conference. Finally, we salute the partnership between IPCC and the three communities here represented.”