Urban Issues and Climate - Initial Ideas

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Urbanization, a global phenomenon, will accelerate especially in developing countries, resulting in a rapid increase in the number of megacities and large urban complexes, many of them along coastal areas. Such a trend causes transformation in the geosphere, biosphere, atmosphere and hydrosphere, which affect the environment over both short and long timescales.

Coastal cities represent a broad and highly dynamic interface between Earth Components (atmosphere, land, ocean, etc.) and societal factors. They have direct and indirect impacts on the atmospheric composition, climate, hydrology and ecology, however current models are inadequate in simulating these with confidence. Coastal cities embrace many challenges in the advancement of knowledge about physical, chemical, ecological, social and environmental change in their interrelationship.

The RCP8.5 scenario by late century (with unchanged current greenhouse gas emission trends) shows that the bulk of the world's population living in large urban agglomerations will be exposed to a minimum 2.5°C temperature rise. Some cities in high latitudes experience a mean 3.5°C rise, or greater than 5°C when combined with urban heat island effects. Temperature increases of 6°C to 8°C in the Arctic and temperature rise in Antarctica would contribute to sea level rise that would impact coastal cities across the world[1]. A projected future implies permanent alternation of environmental process and associated societal systems.

The urban dweller has become especially vulnerable to the impacts of natural disasters, including weather and climate extreme events and their environmental consequences – particularly with the anticipation of changes in frequency, intensity, geographic range and duration of such events as a result of projected changes in climate[2]. The scale and nature of these changes and impacts require further study.

There has never been a bigger need for informed and science-based climate service in support of safe, healthy and resilient cities against weather and climate induced disasters; spanning urban weather, climate, water and all environmental factors. The high number of stakeholders in coastal cities result in increasing opportunities, complexity and pressure; necessitating innovative and forward-thinking research agendas.

We recognise a shared need for WCRP and the World Weather Research Programme (WWRP) to together address urban climate science, comprising and based on a breadth of past and existing efforts by various entities at national, regional and global scales. The key would be to identify the "climate voice" in the existing effort, to overcome contemporary gaps and shortcomings of the understanding, and to improve accuracy and reduced uncertainties in the prediction and projection in all spatial and temporal scales that are utilized for immediate response to long term planning in cities; with minimum of sectorial fragmentation.

Seeking a clear direction for such an initiative, a series of questions have been identified so far:

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[1] IPCC AR5 WGII, 2014

[2] Special Report on Managing the Risk of Extreme Events and Disasters to Advance Climate Change Adaptation 2012.

Do we have sufficient long-term city-specific data streams to understand processes and trends, and produce projections for urban climate?

> If not, which sector(s) is(are) the most prepared with sustained interdisciplinary data steams shared by all stakeholders?
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> What are the gaps (both technical and sectorial) that can be closed in near terms?
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> And which areas/datasets are in need of immediate actions by concerned communities?

Does existing city-specific downscaling from global/regional climate models provide sound scientific foundation for city planning?

> Do all climate models currently consulted for urban planning, provide scientifically ascertained advice with acceptable uncertainties?
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> Do existing climate model efforts provide the motivation and basis for the development of trans-disciplinary information for urban users?

Has the ongoing effort toward integrated earth system modelling, for seamless weather-climate-impacts forecasting, been directly applied to urban climate studies?

Are the relevant parts of WCRP effort connected to / linked with ongoing/existing analyses and assessment for urban climate?

> Which components of WCRP activities could be potentially the direct input to / lead the development of actionable information for urban climate assessment and planning?