

Future Earth Urban Platform

Initial Design Report

11/1/2015



Urbanization and Global
Environmental Change

FUTURE EARTH URBAN PLATFORM (FEUP) INITIAL DESIGN REPORT

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ACRONYMS

ACCEV - Adapting Cities to Climate Extremes and Variability
ICO – International Coordinating Office
IHDP – International Human Dimensions Programme on Global Environmental Change
FEUP – Future Earth Urban Platform
FEUP WG – Future Earth Urban Platform Working Group
SSC – Science and Solutions Committee
UGEC – Urbanization and Global Environmental Change Project
UIS – Urban Information System
USSC – Urban Science and Synthesis Center

Initially drafted and edited by: Corrie Griffith (UGEC EO), Patricia Romero Lankao (Urban Futures, NCAR, UGEC SSC), David Simon (UGEC SSC, Mistra Urban Futures and RHUL) and Mark Watkins (UGEC IPO). Additional inputs from the FEUP core group, comprising representatives of the major constituencies participating in the process:

Future Earth Urban Platform Working Group Members

Core Group Members leading the FEUP WG:

Xuemei Bai—Australian National University (Future Earth Science Committee)
Thomas Elmqvist—Stockholm Resilience Centre (Future Earth Interim Global Secretariat – Sweden and DIVERSITAS)
Corrie Griffith—UGEC International Project Office
Timon McPhearson—Tishman Environment and Design Center, The New School (DIVERSITAS and US National Science Foundation Urban Sustainability Research Coordination Network)
Marcus Moench—Institute for Social and Environmental Transition (ISET)
Jon Padgham—System for Analysis, Research and Training (START)
Debra Roberts—eThekweni Municipality (Future Earth Engagement Committee)
David Simon—Royal Holloway, University of London & Mistra Urban Futures (UGEC Scientific Steering Committee)
Patricia Romero Lankao—Urban Futures, National Center for Atmospheric Research (UGEC Scientific Steering Committee)

Other members:

Diane Archer—International Institute for Environmental and Development (IIED)
Mary Barth—National Center for Atmospheric Research (NCAR)
Eugenie Birch – Penn Institute for Global Research and World Urban Campaign, SDG
Christopher Boone—Arizona State University
Bharat Dahiya—Chulalongkorn University
James Goldstein—COMMUNITAS Coalition & Tellus Institute
Nancy Grimm—Arizona State University
Kevin Gurney—Arizona State University
Jose Lobo—Arizona State University
Andrés Luque-Ayala—Durham University
David Maddox—The Nature of Cities

Megan Melamed—International Global Atmospheric Chemistry (IGAC) Project
Maik Netzband—Ruhr University, Bochum
Chantal Pacteau—National Center for National Research (CNRS – Paris)
John Robinson—University of British Columbia
Andrew Rudd—UN-Habitat
William Solecki—Hunter College, City University of New York
Joshua Sperling— National Center for Atmospheric Research (NCAR)
Mark Watkins—UGEC Project

Target Audience(s) of the Report

This Initial Design Report is intended for a variety of audiences. The initial audience is the FEUP Working Group itself. This initial drafting combines the motivations, goals and ideas of the many voices which have been involved in the scoping process and which now defines the FEUP and, thus, a shared understanding around which the FEUP Working Group is organized.

Secondly, this document is intended to inform the Future Earth Science and Engagement Committees and supporting staff of the FEUP activities and aspirations. This document reflects a strong community of academics and non-academics worldwide working on urbanization and global environmental change issues that is enthusiastic about the aims and objectives of the FEUP. Given that the process, which has led to the platform's concept and design, is financially supported by and in accordance with the spirit of Future Earth, *the implicit message herein is the need for prioritization and further support of the FEUP by Future Earth as it continues to develop and strengthen its research and organizational architecture.*

Third, this document is a starting point by which to communicate the FEUP and engage with the wider Future Earth community and beyond. The FEUP Working Group is mandated to reach out to wider communities of urban research and practice globally, nationally and locally in this development stage as part of its co-design strategy. Throughout this process, it is expected and hoped that this document and its ideas will evolve as new communities are engaged and provide input and feedback into future iterations of this report, ultimately strengthening the design and future direction of the FEUP. The name 'Future Earth Urban Platform' could change, however, the concept should remain clear and consistent, as per the original grant mandate - FEUP has been designed as the urban framework within Future Earth.

BACKGROUND

Established as an **International Human Dimensions Programme on Global Environmental Change (IHDP)** core project in 2006, the **Urbanization and Global Environmental Change (UGEC) Project** has since worked to better our understanding of the regional and global implications of urbanization and the complex dynamic systems of urban areas that affect and are affected by global environmental change. Specifically, the project fosters the development of innovative conceptual and methodological frameworks for UGEC research, which is organized by four broad themes: 1) Processes within the urban system that contribute to global environmental change; 2) Pathways through which specific global environmental changes affect urban systems; 3) The resulting interactions and responses within the urban system, once these pathways and points of interaction are identified; and 4) Consequences of the interactions within the urban system on global environmental change, or feedback processes.

UGEC is nearing a decade of operations - in 2017 - and is currently engaged in synthesis activities. These activities will not only offer an assessment of the research produced over this timeframe, but also will be forward-thinking - identifying gaps in knowledge and future research foci.

First Scoping Workshop

As part of this synthesis process and transition into the new global urban research initiative, UGEC organized an initial Scoping Meeting of leaders from allied communities to explore potential directions for urban themes within the new research framework of [Future Earth](#). This meeting, held in February 2014 in London, UK, brought together representatives of different disciplinary backgrounds and inter- and non-governmental organizations to begin a conversation on the gaps and future needs for urban research as well as the necessary components for the design of a new urban interdisciplinary initiative. The results of this workshop include a draft working paper outlining the rationale, key components, characteristics of success, and programmatic objectives of a possible urban initiative within Future Earth. This document is available for download (<http://bit.ly/1axvBm5>) and contains the participants' names and constituencies they represent. This output formed the basis for a grant application to the Future Earth Interim Secretariat to fund more systematic preparation of an urban platform within Future Earth.

Second Scoping Workshop

In July 2014, the UGEC Project and the Stockholm Resilience Centre were awarded a grant under the title of 'Livable Urban Futures' by Future Earth to continue efforts already underway towards defining critical pathways for co-produced interdisciplinary and transdisciplinary urban research, and to explore the next phase of urban research within Future Earth. In parallel, the development of an urban platform was proposed by several Future Earth Science and Engagement Committee members, which was endorsed as one of the priority activities at the third meeting of the Future Earth Science Committee and Engagement Committee in Buenos Aires, Argentina (December 2014).

To further develop this process, a workshop was held on March 12-13, 2015 at the National Center for Atmospheric Research in Boulder, Colorado, USA. The workshop participants are known here forward as the **Future Earth Urban Platform (FEUP) Working Group**. This group is charged with leading the transition of the urban agenda within the global research initiative Future Earth through: A) the establishment of initial urban research activities; and B) the design of an urban platform for facilitating interdisciplinary research coordination and co-design with urban stakeholders and practitioners.

FUTURE EARTH URBAN PLATFORM (FEUP)

Vision: To support a sustained source of knowledge from integrative, interdisciplinary and trans-disciplinary research across natural and social sciences, engineering and humanities, practitioners and decision-makers that enables the transitioning towards sustainable urban futures where cities are more livable, equitable and resilient.

Mission: To create broad-based sustainable networks for research, innovation and learning that champion co-designed and co-produced urban research-toward-action that: a) recognizes urbanization as a transformation process that is driving and driven by interlinked and interacting social, economic and environmental processes across all scales; b) understands cities as complex, evolving social-ecological systems; and, c) identifies and contributes to transitions towards sustainable and livable urban futures worldwide in an era of profound social and environmental change.

Agreements and Objectives of Future Earth Urban Platform Working Group

This **FEUP Working Group (FEUP WG)** is comprised of diverse researchers and practitioners in order to establish a FEUP that will expand on and integrate with existing communities and further develop future urban research collaborations, initiatives, and networks, globally.

Key agreements of the Working Group include:

- We are committed to working towards a single unified Urban Platform as part of Future Earth
- We are the Future Earth Urban Platform Working Group (FEUP WG)
- We will work towards agreement between all members prior to any public communication or commitment regarding the FEUP
- We will keep each other informed in a timely fashion of activities that relate to our objectives

Key objectives of the Working Group include:

- To establish the scientific foundation, mission and objectives of the FEUP
- To define critical pathway(s) for co-designed and co-produced (i.e., interdisciplinary and transdisciplinary) urban research within the Future Earth framework
- To fulfill the self-imposed co-design mandate for the duration of the funding cycle, through 2015, by engaging in dialogues with our scientific communities and communities of practice toward further developing the FEUP, its objectives and structure

The following have been identified as a) leaders with respect to their involvement with urban research and/or policy and practice; b) organizations that are in the beginning stages of including urban-GEC interactions work into their portfolios, and thus advantageous to include in our activities; and/or c) inter-/non-governmental organizations including organizations with regional foci (the list is not meant to be exhaustive; yet representative of those we foresee having direct engagement:

- Asia-Pacific Network for Global Change Research (APN)
- Asian Cities Climate Change Resilience Network (ACCCRN)
- C40 Cities Climate Leadership Group (C40)
- European Initiative on Smart Cities | SETIS - European Commission

- Evidence and Learning from Latin American Cities (ELLA)
- ICLEI Local Governments for Sustainability (ICLEI)
- Inter-American Institute for Global Change Research (IAI)
- International Finance Corporation (IFC)
- Institute for Social and Environmental Transition-International (ISET)
- Global Change System for Analysis, Research, and Training (START)
- Living with Environmental Change (LWEC)
- Red Cross/Red Crescent Climate Centre
- Rockefeller Foundation 100 Resilient Cities initiative
- Slum and Shack Dwellers International (SDI)
- UN-HABITAT
- World Bank Low-Carbon Liveable Cities Initiative

Aims and Objectives of the Future Earth Urban Platform

Short-term (3-5 years)

- To create networks and mobilize resources at all scales that can catalyze or facilitate more effective mechanisms for the exchange of ideas, knowledge and critical insights into effective solutions and principles of good practice for urbanization and urban areas in multiple contexts.
- To launch 3-5 initial core research projects that address the FEUP vision and mission.
- To strongly encourage interdisciplinary, innovative and integrative research, and research on urban and socio-environmental challenges that works across the natural, engineering and applied sciences, the descriptive and critical social sciences and the humanities.
- To actively promote co-design, co-produce and co-deliver locally appropriate new knowledge that can be translated into solutions by actively engaging urban planners, managers, non-governmental organizations, urban populations, the private sector and other stakeholder communities in the design and execution of the research process.

Long-term (until 2035)

- To co-develop solutions-oriented transition pathways and implementation and evaluation processes for intentional transformational change.
- To support progress toward achieving locally appropriate targets and indicators consistent with the Urban Sustainable Development Goal (SDG 11) and other relevant SDG targets and indicators.
- To engage in local, national and global processes and fora to improve connections between research outcomes and policy and practice, and to help capacitate stakeholder communities (e.g., with respect to SDG 11 progress) through appropriate protocols among relevant stakeholder groups.
- To explore opportunities for urban futures that simultaneously improve environmental and human wellbeing.
- To enlist alternative powers (e.g., the arts) to explore, question and disrupt our deepest understandings of the relationships between humanity and the world.

Guiding Research Themes

Research under the FEUP is divided into three initial research themes, each having research questions, with room for additional foci as momentum builds. Together, the themes constitute a broad umbrella that requires collaboration not only across a range of research disciplines and areas, but also with urban stakeholders and communities of practice. They respond to the three overarching research themes of Future Earth and were established through a series of deliberative efforts (e.g., the First and Second Scoping Workshops). They provide a foundation for developing research questions and anchoring research in different regions across the globe that supports the Future Earth priority to, “build healthy, resilient and productive cities by identifying and shaping innovations that combine better urban environments and lives with declining resource footprints, and provide efficient services and infrastructures that are robust to disasters” ([2014 Strategic Research Agenda, P.6](#)).

Urban areas are understood not as networks of islands but as integral parts of wider systems at various scales, in all of which sustainability transitions are essential. The Future Earth themes function as an umbrella for the development of the FEUP’s initial research activities and other projects that emerge within the international communities of urban research and practice.

Theme 1: Dynamic Urban Planet: What pathways does urbanization take at different scales (space, place, time, biophysical and socioeconomic conditions, and culture)? How does urbanization interact with environmental circumstances? How can we best understand the complex interplay within coupled socio-technical-natural systems and processes? What are the risks and tipping points in key environmental components such as biodiversity, climate, carbon, air quality and hydrology?

Theme 2: Global Urban Development: How does global environmental change affect (positively and negatively) urban populations, livelihoods, well-being, economic activities, ecosystems, infrastructures, culture and other things of urban value? For example, how vulnerable or adaptable are urban areas, actors and economic activities to current temperatures and to a future 3-4°C warmer world?

Theme 3: Urban Options for and Limits to a Transformation towards Sustainability: What are the limits, barriers and opportunities to transition to different – more sustainable and resilient – futures? For example, when and how do urbanization processes and urban socio-ecological and technological systems “lock-in” such that future emission trajectories are difficult to alter; and what are the opportunities for altering urbanization trajectories towards more sustainable development pathways? What lifestyles, worldviews, ethics and approaches to sustainable, economically successful and livable cities in the world are compatible with transitions to global sustainability? How can we best engage the critical social sciences, humanities, physical sciences and engineering in sustainable transitions? How can we use the Future Earth focal challenge on urban (see: 2014 Strategic Research Agenda, P.6) as a foundation for developing research questions and anchoring research in different regions across the globe?

FEUP Organizational Structure and Functioning

The following outlines only the potential structure and functioning of the FEUP, intended to afford it the highest level of success given the current structure of governance of Future Earth and its globally distributed Secretariats. It is important to note that the latter is still evolving and, thus, so might the FEUP over time as explained on page 3 above.

In addition, Future Earth is in the process of establishing a number of Knowledge and Action Networks (KANs) including an Urban KAN. Document 22.3.1, Framing Future Earth Knowledge-Action Networks states that the KANs “...will explore a different model of operation – how to adopt a more dynamic network structure to harness the existing global expertise in the three research themes (dynamic planet, global development and transformations) relevant to the Future Earth Vision as a whole” (pg. 3). As the KAN concept evolves, guided by input from the core projects and FTI/Cluster Activities commissioned to facilitate the transition into Future Earth, the Future Earth Urban Platform (FEUP) initiative is well-positioned to inform and participate in these developments. A number of steps need to be taken at the Urban KAN level and the following can be informed by the FEUP:

- Finalize the concept document for KANs, taking into account the current FEUP and the outcomes of previous scoping workshops to inform the Urban KAN;
- Establish a funding strategy, and;
- Explore with the Future Earth global/regional hubs and key research organizations the possibility of establishing Urban Science and Solutions Centers in different geographical regions and start FEUP activities relevant to the Urban KAN. It is important, however, with such a distributed structure, that overall effectiveness is not reduced, that regional overlaps/duplications are minimized and that the emphasis falls on appropriateness/sensitivity to regional differences and specificities.

Urban Science and Solutions Centers

We envision the structure of the FEUP could be centered on **Urban Science and Solutions Centers (USSCs)** in pilot locations that already have existing urban institutes, research programs and centers. These would be a constellation of centers or hubs spread throughout the globe, but mainly centered on regions where urbanization is most prevalent. These USSCs will link to both global and regional Future Earth hubs, but should not be confined to those locations.

A strong relationship with the Future Earth education component is paramount. These USSCs will be focused on, but not limited to, the following goals and activities:

- Enabling regional and international collaboration and synthesis, and strengthening linkages between stakeholders in the Global North and South
- Creating incentives for engagement in solutions- or user-based research
- Facilitating transdisciplinary and trans-academic research into sustainable global futures, based on principles of co-production and co-creation

Functions:

- Housing the initial urban activities and future projects that would exist under the FEUP
- Functioning as centers of education and engagement for early-career scholars, particularly from low- and lower-middle income countries located in the respective region (e.g., include giving opportunities, support, and space to PhD students/Postdocs to design projects and work with more senior scholars and regional stakeholders, with an emphasis on both cutting-edge science and practical, real world experience)
- Acting as an ‘extension’-type service for local and regional decision-makers, stakeholders, scholars, researchers, and planning entities, with a focus on:

- Co-design and co-production of regional/local focused projects
- Capacity building and outreach to local and regional groups in the form of workshops, conferences, symposiums, and training sessions
- Providing space for visiting scholars and practitioners to engage with stakeholders at a local/regional level

USSC Staff and Personnel

USSC Regional Director (one per USSC)

Full Time / remunerated

Located at regional USSC (one per site)

Support Staff / Local Science and Solutions Committee (see below for description)

International Coordination Office

The **International Coordination Office (ICO)** for FEUP could be located at one or two of the five Future Earth Global Secretariats (Montreal, Stockholm, Tokyo, Boulder or Paris), at one of the Future Earth regional hubs (Kyoto, Norwich, or in the Middle East, Africa, India, SE Asia, etc.), at existing urban institutes, research programs or centers, or at the Julie Ann Wrigley Global Institute of Sustainability at Arizona State University (current International Project Office of the UGEC project).

The ICO will be focused on but not limited to, the following activities:

- Acting as a central node for all USSCs
- Coordinating a broad **Urban Information System (UIS)**, with a strong emphasis on a culture of data sharing and open access that counterbalances a trend towards the commodification of data. Key attributes of this UIS include:
 - Inter-operability among USSCs, research projects, cities and countries in terms of shared data, models, tools and visualization outputs
 - Open access to information and assistance in the interpretation of data by the FEUP, USSCs and associated staff
 - Information and ideas that are accessible to, and usable by, actors from local communities (including policy makers, practitioners, non-governmental and community-based organizations, private-sector entities and members of the public)

International Coordination Office Staff and Personnel

Executive Director

Full time position / remunerated

Located at FEUP International Coordination Office

Science/Research Officer

Full time position / remunerated

Located at FEUP International Coordination Office

Communications Director

Full Time Position / remunerated

Located at FEUP International Coordination Office / corresponding Future Earth Global Secretariat

Other:

Platform Coordinators

Data and Informatics Director

Support Staff

Science and Solutions Committee

This **Science and Solutions Committee (SSC)** could be made of 14-16 individuals, with one half championing the Science/Research Component, and the other focusing on the Stakeholder Engagement Component. The committee will have two co-chairs, each acting as subcommittee heads. While these subcommittees will have separate tasks and foci, they will function together as one integrated committee and will give regular input to each other.

The SSC will have a specified term of commitment and will require participation in in-person meetings (yearly or biennial) and will take part in regular teleconferences (monthly or bimonthly). Special attention will be paid to the composition of the committee and the commitment ability of the committee member, with an emphasis placed on diversity of nationality, gender, race, academic/professional background and regional location.

Role of the Future Earth Global Secretariat

The Future Earth Global Secretariat will have a key role to play in the construction and expansion of the FEUP by helping to develop and actualize the initial organizational framework. As the Future Earth Global Secretariat will already be established well before the FEUP, it will be an invaluable resource in this process. Initially, the Future Earth Secretariat should take the following roles:

- Coordinate and/or locate the initial USSCs at Future Earth regional hubs (Kyoto, Norwich, etc.), at any existing urban institutes, research programs and centers, at Future Earth Secretariats or the location of the UGEC IPO at Arizona State University, Tempe, Arizona, USA
- Consider geographical locations with stronger urbanization and GEC pressures including rapidly urbanizing regions and those in the Global South in the development of new regional hubs
- Act as a liaison with other global efforts within and outside Future Earth that might benefit from partnership with the FEUP
- Coordinate the USSCs' education component, which would add to Future Earth's own education component
- Provide initial support in communications, research development, engagement to the FEUP ICO and USSCs as they are established
- Develop co-funded positions that would support the local Future Earth regional hubs and respective activities as well as the work of the USSCs
- Identify funding mechanisms to support the start-up and continuation of the FEUP ICO.

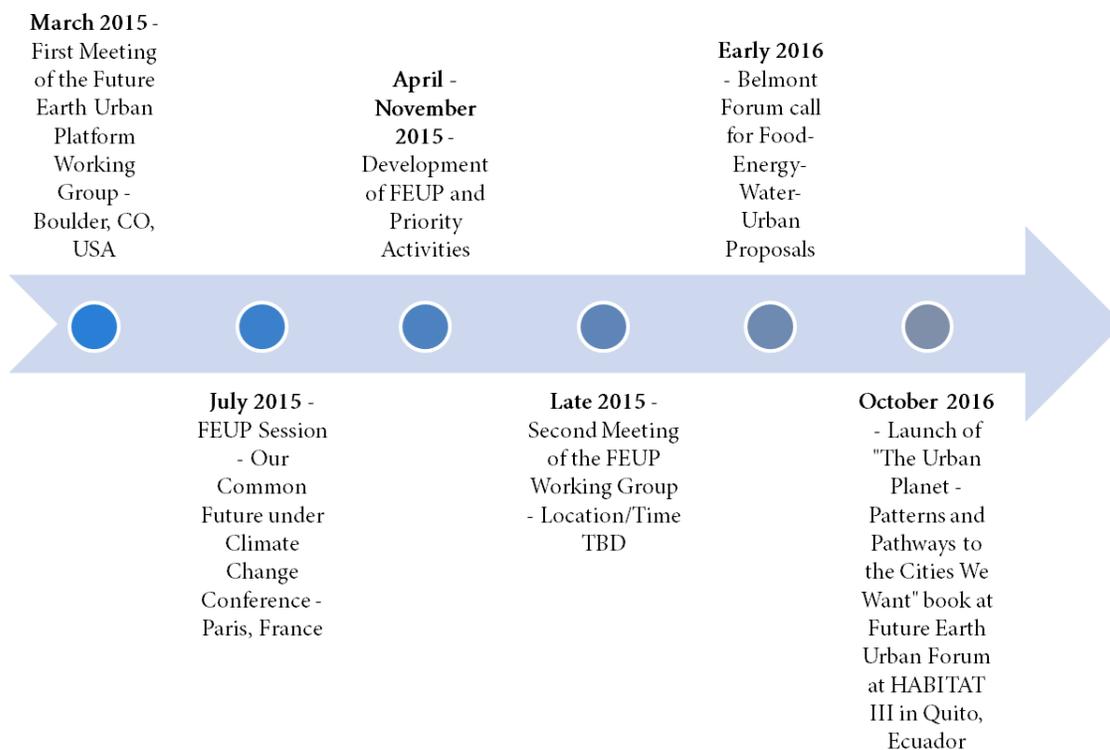
Funding

The initial FEUP will require startup capital to fund key infrastructure, such as the FEUP ICO and USSCs as well as staff and personnel at both locations. The Belmont Forum could be the funding source for key infrastructure of the FEUP, while USSCs could be funded by regional funding sources. Flagship activities could seek funding from other sources, such as development banks, national research council calls and foundations.

As the platform matures, funding could be sought to develop a mechanism for funding new activities and projects under the FEUP. The FEUP could also work on leveraging existing projects to expand the FEUP network. The FEUP should accept not only monetary funding, but also time and data as resources.

Timeline of FEUP Activities (2015-2016)

The following timeline outlines activities, which will build the urban network (meetings and workshops, held over this time will address this in greater detail) and aid in future iterations of this Initial Design Report, all in coordination with the Future Earth SC/EC/and Global Secretariats.



FEUP INITIAL RESEARCH ACTIVITIES

Introduction

The design of initial urban research activities is an integral component of the broader urban transition into Future Earth. These activities are concrete research actions, which can be linked to and also provide substantive clarity and recognition to the FEUP. These projects are outcomes of the Second Scoping Workshop held March 12-13, 2015 at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, USA. They have been developed collaboratively by workshop participants (FEUP Working Group) with the goal of closing identified gaps in urban and global environmental change research, and in the spirit of Future Earth principles such as North/South collaboration, co-design and interdisciplinarity.

These initial activities are examples of what we believe the FEUP can offer in terms of large-scale, integrative global research efforts. We encourage and welcome wide participation in these projects as

well as the development of other urban projects within the FEUP, so as to be as inclusive as possible of our large, diverse urban research networks.

The following provides brief summaries of each of the proposed urban activities identifying their rationale, goals and methodologies. Throughout 2015 the activity working groups, along with the FEUP Core Working Group, are tasked with: a) fine-tuning the ideas herein towards fully-developed proposals; b) identifying funding mechanisms and soliciting those sources; and, c) further engaging relevant urban communities and stakeholders, regions and disciplines in the design of these and other activities.

Adapting Cities to Climate Extremes and Variability (ACCEV)

Working Group: *Nancy Grimm, Timon McPhearson, Patricia Romero-Lankao, Corrie Griffith, David Iwaniec, Chantal Pacteau, Joshua Sperling, William Solecki*

This activity proposes to build a network of cities conducting research, synthesizing knowledge, co-educating and co-producing potential solutions to understand whether and how cities can cope, adapt or transform in the face of such climate extremes as floods and heat to ensure livable urban futures.

Given that that more than half of humanity lives in urban areas and climate change is expected to have far-reaching impacts that will affect livability and sustainability, the likelihood of increases in the frequency and magnitude of extreme events, such as floods, heat waves and coastal storm surges is quite high. In turn, such events may lead to the crossing of thresholds of particular concern to urban populations.

Local decision makers need information about, for example, what magnitudes and durations of heat waves will result in accelerated rates of human morbidity and mortality, or what levels of coastal sea surges will threaten housing, livelihoods or transportation infrastructure. The type and potential impacts of extreme events will vary as a function of the characteristics of cities, regional urbanization patterns, and biophysical, institutional and societal contexts.

The methodological framework for collaborative knowledge production will entail a combination of methods and tools for bi-directional design and production of knowledge, e.g., data visualization, modeling, participatory GIS, scenario development and design studios. Using a systems-based approach which recognizes the tight interconnectivity and feedback between social, ecological, and technical/built infrastructure systems (SETS), we will examine how relationships, feedbacks, and trade-offs among interacting systems help to create opportunities or barriers to sustainable urban futures thereby uncovering levers for change and openings for innovation that can work synergistically within urban systems.

Two overarching questions guide this effort:

- How do key socio-ecological dimensions of selected urbanized and urbanizing cities interact to create vulnerability—or adaptiveness—to extreme events?
- How can cities be redirected along more flexible and adaptive pathways to more resilient and sustainable futures, even in the face of extreme events of unknown future magnitude and frequency?

Alternative Urban Futures within Planetary Boundaries

Working Group: *James Goldstein, Jose Lobo, Andrés Luque-Ayala, Diane Archer, Eugenie Birch, Christopher Boone, Bharat Dahiya, Nancy Grimm, David Maddox, Marcus Moench, Chantal Pacteau, Patricia Romero-Lankao, Joshua Sperling, & David Simon*

This activity is aimed at the identification and definition of alternative urban futures and the participatory examination of the impact of these futures in both the environmental health of the planet as well as the possibilities for achieving a more inclusive and just society.

This research is predicated on the notion that we need to re-think human wellbeing underpinned by a better understanding of key societal issues such as productivity levels, wealth creation capacity, poverty reduction goals and income increasing objectives. This necessitates an examination of the required policies and governance models, values and lifestyles likely to advance a shift in dominant societal values and social practices toward an emphasis on quality-of-life, social solidarity, and an ecological ethos.

This research is driven by a set of practical questions, to be answered in a co-produced manner between academics, government, civil society organizations and members of the public. These include:

- How do we imagine our urban future and how can we envision alternatives that are more sustainable and socially just?
- What do we have to transform in order to achieve this future?
- What are the planetary (environmental) implications of this imagined future?
- What are its social, equity, justice, cultural, biophysical and political implications?
- What are the values that underpin the production of alternative urban futures? Is this future scalable and can we propose this future to other communities?

This project will be comparative at a multiplicity of scales (e.g., cities, regions, neighborhoods), whilst allowing for local specificity and historical considerations. It will employ a scenario approach to explore alternative urban development pathways for a diverse set of four to five partner cities in the Global North and South. The scenarios, both quantitative (scenario-based methodologies, data analytics) and qualitative (narratives, voices and visions), would be co-developed by the researchers and a team of local practitioners, planners, policymakers, civil society and other stakeholders. The scenarios will reflect an understanding of urban regions as complex systems with connections to rural and other regions, drivers and feedback loops.

Dynamic Urban Regions

Working Group: *Xuemei Bai, Eduardo Brondizio, Bharat Dahiya, Thomas Elmqvist, Timon McPhearson, Maik Netzband, Jose Lobo, David Maddox, Jon Padgham, Debra Roberts, & Patricia Romero Lankao*

This activity will conduct in-depth, place-based, comparative research building upon on-going, but independent research in several highly dynamic regions, aiming to understand: a) the drivers of urban growth; b) the role of actors/agencies/policies/external processes (such as foreign investment) in urban growth; c) the interlinkages (tradeoffs and synergies) between different processes and between urban and rural areas; d) the impacts (social, economic, environmental and human wellbeing) of rapid urbanization and associated processes, and e) leverage points for interventions and actionable options.

Rapid worldwide urbanization is one of the most transformative global phenomena of our generation, with far-reaching economic, political and environmental implications. Urbanization is a global trend that varies across time and space; several regions are currently experiencing relatively more rapid change, such as Yangtze River Delta in China, Amazon region in Brazil, Mekong River region, Sub-Saharan Africa and the Delhi-Mumbai corridor in India. Some other urban regions are going through rapid transition and transformation where cities are shrinking rather than growing.

These highly dynamic urban regions represent very different processes under different socio-economic conditions, e.g., with some regions being affluent and rapidly growing (Eastern Asia) and others less affluent and rapidly growing (parts of Africa), often confronting highly deficient infrastructure. However, all of these regions are facing multiple and intertwined drivers and are thus in high need for knowledge to guide practices, and with many opportunities for intervention to realize transition and transformation towards alternative future trajectories. In these regions, urbanization is closely linked to almost all of the eight grand challenges identified by Future Earth, and therefore can be used as an entry (leverage?) point to address these challenges.

Specifically, this research will analyze how urbanization is influencing the food-water-environment-human wellbeing nexus; to identify the locally embedded leverage points and actionable options for a more sustainable urbanization; and how different cultural, institutional and governance arrangements, visions and aspirations influence the choices across several contrasting regional contexts. This will require large amounts of information on the multi-dimensional aspects of urbanization including remote sensing, historical, socioeconomic, institutional and environmental data, which can be supplemented by information generated by original surveys and interviews. It will require multiple partners within and beyond the selected regions, including academic institutions, decision makers and practitioners. The research will be co-designed and co-produced with the stakeholders within the region, solution oriented and with strong policy linkages.

Urbanization and Air Quality

Working Group: *Mary Barth, Corrie Griffith, Megan Melamed, Patricia Romero-Lankao, Joshua Sperling*

In 2012, the Organization for Economic Cooperation and Development (OECD) projected that by 2050 air pollution would become the top environmental cause of mortality worldwide. However, in 2014, 38 years earlier than projected, the World Health Organization reported that in 2012 around 7 million people died as a result of exposure to air pollution, making it the world's largest single environmental risk. In response, the United Nations Environment Assembly in 2014 made improving air quality a top priority for sustainable development, recognizing that clean air is fundamental to protect human health, and has simultaneous benefits for the climate, ecosystem services, biodiversity and food security. Yet, the connection between urbanization and air quality remains largely unacknowledged amongst social scientists, engineers, urban planners, physical scientists and policy makers.

Physical scientists have studied air pollution extensively at the city and regional level, but with no systematic connection to the mechanisms by which urban growth, institutional settings, culture, lifestyles and infrastructures condition emissions and air pollution. Social scientists have examined dimensions of urbanization (e.g., demographic); intra-urban differences in risk and vulnerability; and the governance, cultural and institutional factors shaping the effectiveness of mitigation and adaptation

policies. Yet, they haven't made explicit linkages to the spatial and temporal distribution of urban and regional air pollutants.

These two communities would benefit from an interdisciplinary approach that brings together the physical and social sciences for understanding both social drivers of emissions and patterns of exposure, sensitivities and capacities to mitigate and adapt to air pollution, by studying atmospheric chemistry while incorporating the social, technological, institutional and ecological factors that influence human exposure and vulnerabilities to air pollution at the urban level. This would result in a better understanding of emissions and their social and environmental drivers, and the urban atmosphere, epidemiology and toxicology of air pollutants. It would lead to the development of better modeling techniques and methods to understand the physical and social processes that lead air pollutants from the source of emissions to the sensitive populations (e.g., children) that breathe these pollutants.

This activity seeks to synthesize the state of knowledge of urbanization and air quality from both the physical and social science perspectives while setting forth future interdisciplinary and transdisciplinary research directions incorporating both physical and social sciences frameworks that would ultimately lead to more effective and informed actions that reduce exposure and vulnerabilities to air pollution in urban areas.