Urban Planet

Global urbanization promises better services, stronger economies, and more connections; it also carries risks and unforeseeable consequences. To deepen our understanding of this complex process and its importance for global sustainability, we need to build interdisciplinary knowledge around a systems approach.

Urban Planet takes an integrative look at our urban environment, bringing together scholars from a diverse range of disciplines: from sociology and political science to evolutionary biology, geography, economics, and engineering. It includes the perspectives of often neglected voices: architects, journalists, artists, and activists. The book provides a much needed cross-scale perspective, connecting challenges and solutions on a local scale with drivers and policy frameworks on a regional and global scale. The authors argue that to overcome the major challenges we are facing, we must embark on a large-scale reinvention of how we live together, grounded in inclusiveness and sustainability. This title is also available Open Access from www.cambridge .org/core.

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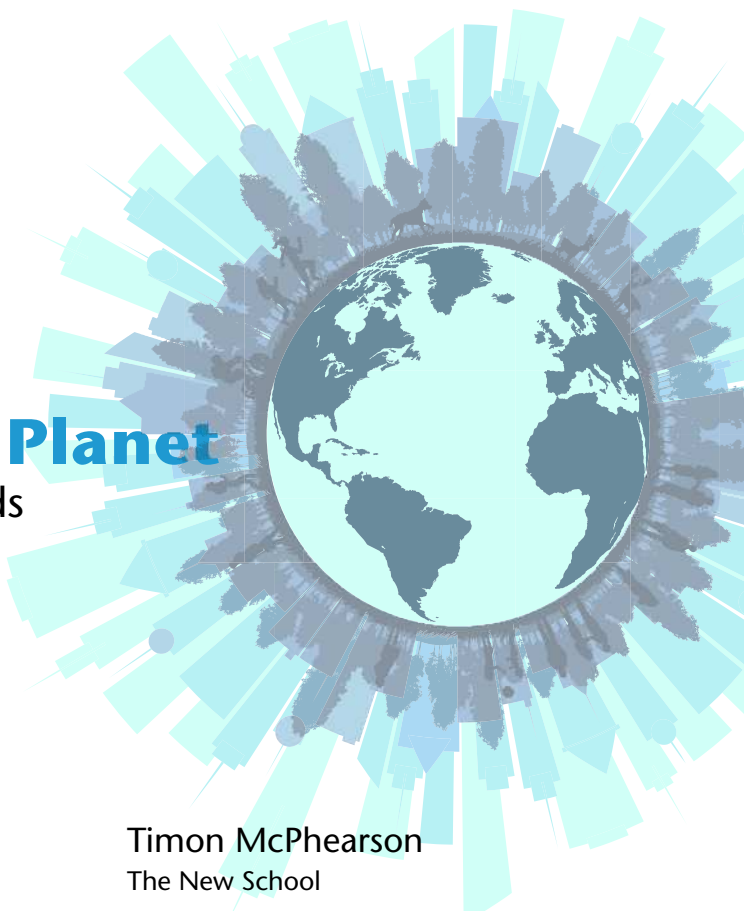

The Urban Planet

Knowledge Towards Sustainable Cities

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Preface

The Urban Planet is the result of a collaborative project within Future Earth (www.futureearth.org). It emphasizes the need for a new knowledge generation agenda, given the urgency of understanding the sustainability challenges and options for a rapidly urbanizing planet. Our urban future will determine the viability and vitality of the human endeavor towards global sustainability. This centrality of cities to the sustainability of people, planet, and prosperity points to the need for continuous investments in an expanded and flexible urban science and practical knowledge generation that is forged out of innovative interdisciplinary and multisectoral understandings of the complex systems that both drive and derive from the prevalence of urban ways of being. Greater understanding of urbanization processes and the multiscale interactions and feedbacks with the earth system is required for addressing the complex issues related to urbanization and sustainability, and for aiding in the solutions. This book aims, therefore, not only to provide a synthesis of existing knowledge across the different disciplines, but also to showcase new ways of producing and integrating knowledge, extending the frontier of urban research, and providing new directions in research and practice that will help us achieve the cities we want now and in the future.

In addition to academic scholars, this book gathers important urban stakeholders from a diverse range of disciplines to jointly show ways of coproducing knowledge. These urban stakeholders are critical, because ours is a book that aspires to make a difference in the real world of city building, city renovation, and city invention. To do so, the ideas of academics and thought leaders are paralleled by voices on the front lines of urban development and change – by stakeholders such as journalists, artists, designers, architects, landscape architects, activists, youth, and urban practitioners from city governments to civil society – whose perspectives are typically left out of academic books. The fourth part of *The Urban Planet* comprises contributions by 39 such diverse stakeholders, from the perspective of where the urban "rubber hits the road."

The *Urban Planet* thus draws from diverse authors and intellectual traditions to engage the emerging science and practice of cities, and evolving ideas about global urbanism. This large-scale undertaking (with over 100 contributors) represents a diverse range of disciplines as well as important urban stakeholders. This new generation of scholars will be responsible for producing the evolving analysis, knowledge, and methods necessary to spark the innovation that will be required to make cities the most efficient, equitable, and sustainable places to live. Much of what happens, both in cities and across the global urban system, will result from the actions of citizens and political decision-makers. But

knowledge gaps and poorly understood urban design – its patterns, processes, and risks – in our urban planet will inevitably lead to poor decisions. Solid knowledge and knowledge-driven practice will be key to the future of life on Earth.

As editors and authors, we put considerable effort into addressing the scale issues and heterogeneity in urban issues (for example, differences in geography, biophysical conditions, size, growth rate, socioeconomic conditions, and demography). This is to avoid the usual generalizations that flow from the typically small selection of northern hemisphere and Global North cities included in similar volumes. Furthermore, we have tried to apply a knowledge coproduction mode of operation. The selection and assembly of the chapter-author teams intentionally include disciplinary, regional, and gender diversity for more holistic perspectives on the respective chapter topics. This is likewise true of the authors of the provocations, who represent many communities of practice from around the world in both the Global North and South.

We believe that integrating knowledge from science and practice – or, more abstract research ideas with lived experience – will be critical to building better cities. Decision-makers at various levels of government require knowledge that is both grounded in science and data, and also consistent with proven practice on the ground, at street and neighborhood levels. This belief led us to include both perspectives – academic, practitioner, and the many gradations between – in this volume as a single book, perspectives that are typically sequestered into separate forums.

But, as in real life, integrating diverse, even radically different, perspectives and points of view is challenging. Much of this process has evolved organically during the production of the book, allowing us to follow needs and address emerging issues in novel collaborations of authors. Indeed, we examined various approaches to integrating academic and practitioner perspectives: having practitioner responses interrogate academic chapters; interspersing academic and practitioner contributions; and gathering each point of view in their own section. In the end, we chose the latter path, and pursued three academic sections around major themes (Parts I, II, and III), and a section called "Provocations from Practice" (Part IV). We found that this arrangement best honored the unique contributions of each.

We can also see how different the perspective often are. There is still much work to be done to integrate research and practice into integrated urban knowledge. This book continues a march in that direction. While there are many profound differences among the chapters and sections, all share a common interest: discovering and sharing ideas that can help produce future cities that are better for both people and nature.

The Urban Planet

Structured in four major sections comprising 18 diverse academic chapters and 36 provocations written by nonacademic knowledge holders and practitioners, the book tracks the surge of urbanization globally. We pose this question: What new thinking is required to radically shift the urban trajectory onto a more sustainable path, a mandate for urbanism that international policy-makers provided when they endorsed the 2030 Agenda in 2015 (UN 2015) and the New Urban Agenda in 2016 (UN-Habitat 2016)? Taken together, the book's contents speak to the new multilateral demand that cities be given greater prominence in development. They also reflect the complexity and range of city realities and highlight the multiple, even competing, concerns of what we may frame as existing or contemporary urban science.

The book's four parts are I) Dynamic Urban Planet; II) Global Urban Sustainable Development; III) Urban Transformations to Sustainability – corresponding to the three crosscutting themes that underpin the research framework of Future Earth; and IV) Provocations from Practice.

Part I: Dynamic Urban Planet

In the first part, we seek to define the continuum of urbanity since there is a surprising lack of common understanding among scientific disciplines on what characterizes or defines an urban area or urbanization, making comparative and composite assessments of urban change difficult. This part of the book presents leading views, models, and new data from a diverse set of disciplines to advance our understanding of the urban, including the fundamental complexity of urban systems and how these intersect and interact with politics, justice, health, climate risks, and economics. The current framework of cities as social-technological systems is too narrow and should be complemented with the view of cities as complex social-ecological-technological systems that has recently advanced within urban ecology and social-ecological systems perspectives. This advance is critical given that the continuum of urbanity includes many characteristics and processes other than the particular density of people or land area covered by human-made structures. Furthermore, the conventional view of the urban-rural dichotomy is vastly outdated and needs to be challenged and replaced.

The first three chapters of the book deal with the different pathways of global urbanization; how they relate to different social, economic, historical, and geographical contexts, as well as different drivers and impacts; and the multifaceted dynamics of growing and shrinking urban areas. Different types of urban-rural interactions and urban teleconnections are introduced and

discussed. An important dimension is the shift from cities as social-technological systems to complex social-ecological-technological systems.

Chapter 3 focuses on urban metabolism and challenges in the Anthropocene. Chapter 4, on dynamics of risk and vulnerability, examines existing and forward-looking approaches to risk, vulnerability, and resilience – for example, in coastal, mountain, and desert cities as well as in rapidly growing, affluent, and shrinking cities. It discusses vulnerability and resilience at multiple scales (for example, from the city to the neighborhood), and it examines infrastructural resilience and its relationship to vulnerability as well as the significance of governance and politics in shaping urban risk.

Chapter 5, on urbanization and health, outlines the current major threats to urban health and well-being worldwide, for example, an aging population, the epidemiological shift from infectious to noncommunicable diseases, and climate change, which is changing both disease patterns and quality of life in cities. For coping with urban health challenges, a transdisciplinary systems approach is taken, which conceptualizes urban health disorders as emergent properties of urban systems. Among the lessons learned are that changing urban environments can have a broader and more cost-effective impact than changing individual behavior. As a result of health determinants being highly interconnected, a health-in-all-policies approach promises sustainable and equitable urban development outcomes.

Finally, Chapter 6 covers urbanization and macroeconomy and demonstrates that aggregate economic growth and productivity are closely correlated with urbanization levels. Yet, while urbanization and productivity regularly rise in tandem, not all cities are equally productive. The chapter explores explanations of why urban poverty and intra-urban inequalities continue to persist and even intensify despite increased per capita productivity. The chapter concludes with an outlook on future challenges and opportunities. Rising inequalities and pressures from global market economies are expected to increasingly affect cities, threatening economic and social opportunity. However, moving towards a green economy could have tangible and considerable positive effects on the environment, productivity, and economic growth. International collaboration also represents an opportunity to hold local and national governments accountable for their actions. Ultimately, proactive local governments are needed to reduce local constraints to productivity, as well as strong social programs and distributive mechanisms to create opportunities for all citizens.

Part II: Global Urban Sustainable Development

Although widely sloganized and even abused by greenwashing, sustainability as an aspirational and perhaps normative concept remains remarkably durable.

Ironically, perhaps, it is even experiencing something of a resurgence rather than being eclipsed by "resilience" as many had anticipated. This is explicable in at least three ways, namely that sustainability is broader and has resilience as one of its characteristics; that similar analytical ambiguities and operational weaknesses identified with respect to sustainability also apply to resilience; and that any such concept is open to contestation, discipline- or context-specific interpretation, and weakening through popularization.

The urban represents one crucial arena in which such debates are manifested, and the catalytic and often contradictory roles of towns and cities as fulcra of population concentration, resource-intensive production, mobility, consumption, and both waste and opportunity generation – albeit in different combinations in different contexts – are now almost universally recognized. A key stimulus in this regard has been the explosion of research, political debate, and commitment to climate change mitigation, adaptation, and resilience. This has been further sharpened by increasing evidence of the devastating impact of increasingly severe and frequent extreme events on urban areas, both the highly vulnerable and the supposedly well protected and resilient.

All too often, however, debates over how to promote urban sustainability and resilience in progressive terms remain trapped in narratives that assume or imply that this is possible within cities in isolation from their hinterlands. Yet precisely because urban areas are not islands but integral parts of their natural, economic, and political regions, urban sustainability must be conceived and pursued as part of national and broader societal sustainability efforts.

The six chapters in this part examine ongoing conceptual (re)formulations and more practical initiatives to achieve urban sustainability by harnessing new information sources, technologies, and tools; creating and exploiting opportunities in international initiatives like the Sustainable Development Goals (SDG) and New Urban Agenda; and by applying new approaches to engage key stakeholder groups, especially those normally marginalized by and from conventional urban planning, design, and management procedures in order to achieve greater traction, acceptability, and local appropriateness. Several connective threads weave throughout these chapters that are important to highlight, particularly as they offer key messages for urban sustainability research, policy, and practice.

The first major thread concerns equity and justice principles, and thus links to where Part I ended. For example, Chapter 7 begins by pointing out that the "social" sphere of the traditional three-pronged approach of sustainability discourse has been, to date, heavily underemphasized within both research and practice, while resilience efforts are often critiqued for lacking critical examination of underlying power structures or conditions that maintain the status quo. That is, inequality and corruption may be highly resilient systems, but

they are clearly undesirable if the goal is to foster greater livability in the era of global urbanization. Inequality is further examined in light of the increasing trend of utilizing big data in the urban context. This brings to the forefront questions of what and how data are being collected or accessed, distributed, and used, by whom, and who is benefiting from these applications. As the use of crowd-sourced and remote sensing data and other technologies increase to support "smart" cities around the world, it is imperative that data-driven, or rather "data-informed," solutions support equitable and just urban areas.

Closely related to equity is the second thread – the importance of finding new and more appropriate (and democratic) methodologies and instruments for "the urban." Acknowledging that traditional or conventional (mainly Northern-derived and -centric) urban planning, development, and management approaches are often inadequate, the chapters emphasize the importance of nonexpert knowledge and participatory opportunities; citizen science or coproduction; and capitalizing on the innovation space that urban areas offer, such as the use of "living laboratories" that might help catalyze social innovations and lead to the transformation of more inclusive and effective urban governance structures. These approaches, which are in many ways complementary to one another and to novel and more democratic forms of generating and using big data, represent promising ways forward for the next generation of urban research and action.

The third collective message from the chapters is the continuing challenge of scale, that is, the inherent difficulty of reconciling the distinctiveness of specifically urban contexts with the need for integrated urban sustainability planning at the scale of functional/ecological urban regions, and also advancing sustainability through urbanization at the global scale (that is, ensuring that sustainability efforts in one location do not erode efforts or conditions in another). This tension is central to the book's premise of the need to situate urban sustainability within an understanding of "planetary urbanization." This is particularly evident in the two chapters that connect to the most recent UN-led sustainability developments, such as the new urban SDG, the New Urban Agenda, and Agenda 2030. What is clear is the need for holistic, localized indices and indicator sets for planning and management purposes, but this will also be crucial for the implementation of such global sustainability agendas.

The six chapters in Part II have been arranged to provide a logical flow of arguments and illustrative cases from the broad and contextual to the more specific. The first three are also global in scope, respectively addressing the evolution and use of the core concepts in different settings; the ongoing process via which urban sustainability and resilience indicators within the UN system have developed increasing sophistication and universal relevance over successive generations; and the unprecedented process of formulating and gaining

international political approval for the most ambitious global urban sustainability agenda within a broader sustainable development approach. The latter three chapters survey and illustrate three innovative and potentially complementary urban research approaches that emphasize substantive participation and coproduction.

Altogether this part seeks to showcase a diversity of perspectives, an evolution and "state of the art" in sustainability and resilience interpretations, and the actions that seek to improve urban areas worldwide. These new and, in some cases, unconventional approaches help to move agendas forward and open new potentials for our urbanizing planet, many of which are presented in Part III.

Part III: Urban Transformations to Sustainability

Governance shapes transformations towards urban sustainability and resilience. In Part III, we identify opportunities and challenges facing city officials and private and civil society actors in their efforts to develop governance solutions that support sustainable and resilient urban development. We introduce key urban governance terms and describe the governance factors shaping social and environmental change in urban areas. Chapter 13 describes policy actions seeking to mitigate or prevent environmental risks and impacts, and to adapt to environmental threats and disruptions. It analyzes the sectoral and jurisdictional actor-networks involved in designing and implementing actions, and the opportunities, barriers, and limits that multilevel governance poses to local climate and environmental policy. The remaining chapters throughout this part take a close look at the governance of environmental change and transformations through different forms of experimentation.

This part also examines the diversifying role of civil society organizations in fostering Europe's sustainability pathways in cities. First, civil society initiatives can pioneer new practices, eventually leading to radical changes in the ways of organizing urban life. Therefore, these initiatives can be an integral component of urban transformations and can fill the void left by a retreating welfare state, thereby safeguarding and servicing social needs but also backing up such a rollback of the welfare state. Finally, civil society organizations can function as a hidden innovator – contributing to sustainability but remaining disconnected from the wider society. While civil society organizations currently play a noteworthy role in decision-making around sustainability, some dangers also exist. Civil society initiatives can be used by neoliberal agendas to legitimize existing power structures and deepen social inequalities between and within communities, given their uneven capacities to self-sustain and self-organize.

Good Anthropocene futures are envisaged through the collection and use of "seeds," defined as initiatives that exist at least in prototype form but are not currently dominant in our world. These seeds are used to explore the potential for fostering radically different futures. The authors highlight the synergies and tensions between the underlying values reflected in the seeds, and also how these seeds can be used to think about an urban planet. They conclude by presenting new research directions suggested by this project.

The part ends by describing conceptual and theoretical tools that have emerged in the attempt to understand the role of collaboration in transitioning towards sustainable futures. The chapter explores experiments in collaboration that have shaped local politics and models of governance. It underscores the capacity of local governance actors to respond to identified sustainability challenges, the networks of interaction they form, and the scale of transformation that takes place over time. It questions whether collaborations among public and private actors can deliver on multiple priorities simultaneously, and seeks to analyze how experiments in collaboration may be reshaping urban politics more broadly, or just revealing new governance questions.

Part IV: Provocations from Practice

"Provocations from Practice" is a novel inclusion for an academic book, but it is key for addressing the breadth of knowledge that is actually required to build better cities. What do we mean by provocations? One of our core themes of the book is knowledge: What knowledge do we need for cities of the future that are more sustainable, livable, resilient, and just? Where will it come from? How can it be produced (or coproduced)? How will it be used (or misused)? These questions are starting points for provocations. The contributors inspire us to think about these issues in new or different ways from their point of view and/or practice. Further, they speak of urbanism and its knowledge as a lived reality, from practitioners of all sorts who build cities from the ground up: architects (Paul Downton, P.K. Das, Anna Dietszch), landscape architects (Andrew Grant, Diana Wiesner), artists (Lesley Lokko, Mary Miss), activists (Cecilia Herzog, Guillermina Ramirez, Gurbir Singh), civil society actors (Cristina Rumbaitis del Rio, Mary Rowe), government and elected officials (Troy Pickard, Debra Roberts), journalists (Mahim Maher, Andrew Revkin), specialists from NGOs (Robert McDonald, Kareem Buyana, Pengfei Xie, Lorena Zarate), young students (Kate Scherer, Umamah Masum), and others. They may comment specifically about the ideas included in the academic chapters or take us in new and/or otherwise missing directions. A key question of these provocations is this: What knowledge is needed to build cities at the street and neighborhood level?

And: What is missing from standard academic discussions of sustainability and livability? In these important senses, we have intended not to privilege the academic contributions as being more important, or more central, to the concept of sustainability. At 36 in total – from 39 authors in 31 cities on 6 continents – these provocations from practice offer key voices and ideas that are central to the struggle for urban sustainability.

Many pieces illustrate the fact that it is not only urban academic research that is flourishing. Cities around the world increasingly benefit from greater participation and activism by civil society, practitioners, and regular citizens. This activism has three key benefits. First, it facilitates the grounded practice of making better cities not just through knowledge, but *action:* the design of neighborhoods, infrastructure, and open spaces – that is, *places* – that are better for both people and nature (see Keitaro Ito, Cecilia Herzog, Anna Dietzsch, Rebecca Salminen Witt, Lorraine Amollo Ambole). Second, it demonstrates that justice, livability, and participation by urban citizens in decision-making and urban creation should be key drivers in any connection between academic knowledge and policy (see Robert McDonald, Diana Wiesner, Lorena Zarate, Anjali Mahendra and Victoria Beard, and P.K. Das). Indeed, what knowledge do cities themselves feel they need? What kind of cities to they want? Third, it unveils that there is a clear role for imagination to the creation of cities, not only in the forms of art but also in innovation (see Mary Miss, Paul Downton, Debra Roberts, Andrew Grant, Emma Arnold, and Todd Lester).

The overarching message of the provocations is the growing vibrancy of civil society and communities of practice around the world, which put people and nature at the center of movements to make cities that are better for both people and nature.

Final Words

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The Future Earth Urban Knowledge and Action Network was launched at the Habitat III conference in Quito, Ecuador, in October 2016. This network represents an integrative and transdisciplinary approach to engage researchers, policy-makers, and other stakeholders on urban issues at various levels, thus facilitating the knowledge coproduction needed to address urban challenges. We hope that this book may be the source of initiating lively debates, innovative partnerships, and a wealth of codesign, coproduction, and coimplementation initiatives within the new Future Earth Urban Knowledge and Action Network and other urban knowledge generation networks.

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References

UN 2015. Sustainable Development Goals. https://sustainabledevelopment.un.org/post2015/transformingourworld

UN 2016. The New Urban Agenda. United Nations Conference on Housing and Sustainable Urban Development (Habitat III) Quito, 17–20 October 2016 http://habitat3.org/the-new-urban-agenda