



## Chapter 7: Rethinking Urban Sustainability and Resilience

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This chapter provides a critical review of the evolution, framings, and disciplinary underpinnings of narratives and discourses around two core concepts in this field – namely urban sustainability and resilience – over the last few decades. It further assesses the recent contributions and limitations of these approaches both conceptually and operationally with respect to an urbanizing world. Both terms entered the lexicon in relation to profound societal challenges of our time and were only subsequently applied to more specific contexts, including urban areas. Therefore, our account starts by surveying this broad canvas in order to contextualize the more detailed assessment of urban sustainability and resilience debates that follows. Strategically, this discussion introduces Part 2 on account of both the central importance of these twin concepts and the need to understand some of the diverse ways that they now find expression in key current urban challenges.

### 7.1 The Evolution of Urbanization and Sustainability Thinking

Following *Silent Spring*, Rachel Carson's (1962) landmark study of the effects of excessive pesticide use on bird life and food webs in the United States, international concern for humans' impact on the environment and the unsustainability of resource-intensive, consumerist lifestyles increased steadily. This concern was spurred by a series of industrial and shipping accidents that caused major pollution disasters, as well as other disparate strands in the 1960s. Consequently, the United Nations convened its landmark Conference on the Human Environment in Stockholm in 1972, for which three other classic texts in the sustainability canon were published from rather different perspectives on the need to live within resource constraints and in harmony with ecological principles. These were the Club of Rome's *Limits to Growth* (Meadows et al. 1972), Barbara Ward and René Dubos' *Only One Earth* (1972), and *The Ecologist*

magazine's *A Blueprint for Survival* (1972). A key outcome of the Stockholm summit was the establishment of two specialist agencies, the United Nations Environment Programme (UNEP) and the UN Centre for Human Settlements (now the UN Human Settlements Programme, or UN-Habitat), to address environmental conservation and sustainability concerns in general and the complex challenges of urban development and sustainability, respectively.

Stockholm was also the first in what has become established as a regular series of global environmental sustainability summits, most notably the UN Conference on Environment and Development, or UNCED, in Rio de Janeiro in 1992; the World Summit on Sustainable Development, also called WSSD or "Rio+10" in Johannesburg in 2002; and the UN Conference on Sustainable Development, also called UNCSD or "Rio+20," held again in Rio in 2012. In parallel, the more specific annual UN Framework Convention on Climate Change (UNFCCC) Conferences of the Parties, and equivalent initiatives on other conventions and treaties have helped to focus attention and political negotiations, not always very successfully, on issues of sustainability. In addition, innumerable NGOs and other agencies operating at all spatial scales and from diverse philosophical and theoretical positions have emerged to create an immensely diverse ecosystem of environmentalisms, some of which advocate particular versions of sustainable development, while others argue for "deep" or other ecological environmentalism that is implicitly or explicitly anti-developmental (compare with Giddens 2011; Bond 2012; Middleton et al. 1993; Death 2010).

Essentially, therefore, sustainable development has become successfully mainstreamed, to the stage that world political and religious leaders across the spectrum profess at least rhetorical commitment to the objective at summits and in policy statements, even if their actions are less than fully aligned with or even directly contradictory to this aim. Having become a "sloganned" concept, for want of a better term – and with which all wish to be associated, since it is universally considered to be a good thing – sustainability has inevitably lost its original progressive (or even radical and subaltern) purchase in relation to poverty reduction, redistribution, and environmental justice, for instance. The Brundtland Report's popularization of sustainable development came in response to a concern about limits to economic growth and associated environmental problems (WCED 1987), but there has always been disagreement over interpretation of the concept, including the extent to which it could be both a goal and a process, and how the economic, social, and environmental dimensions could be reconciled (WCED 1987; Simon 1989). Even now, most official policies and programmes constitute examples of "weak" sustainable development, comprising modest reform or regulatory measures, accompanied by much "greenwashing" to ensure minimal change to business as usual.

“Strong” sustainable development initiatives involving more substantive changes to current practices and lifestyles are generally associated with radical or progressive NGOs, grassroots movements, and the like, although some private firms are perhaps emerging as strong pioneers now that the green economy is seen increasingly to make business sense (for example, Zorrilla 2002; Simon 2003; Weiss and Burke 2012).

Although it had earlier origins – and, indeed, one can usefully understand sustainability in the context of the longer perspective of urban history (Lumley and Armstrong 2004; Douglas 2013) – direct concern with applying sustainability principles to urban contexts gained rapid momentum after the UNCED summit in Rio in 1992. The specific instrument of urban sustainability intervention has been Local Agenda 21 (LA21), the urban component of Agenda 21, one of the two principal outcomes of the UNCED summit. Local Agenda 21 required local governments worldwide to formulate a sustainability plan for their towns and cities via a consultative process. The International Council for Local Environmental Initiatives (now known as ICLEI- Local Governments for Sustainability), an international NGO established in 1990, was commissioned to oversee implementation of LA21.

Inevitably, progress in urbanizing the sustainability agenda has varied greatly by world region and even within individual countries. Even in high-income countries, it initially proved quite challenging to gain the political will of elected councillors and to engage citizens beyond small, environmentally aware and already engaged minorities, while town planners and engineers grappled with the necessary revisions of planning and building codes and materials, infrastructural provision, and even funding models. Initially, at least, the geographical concentration of wealth; industry; energy-intensive, elite lifestyles; and emissions – and the vested interests they represent – in large urban areas were widely perceived to provide formidable obstacles to major change (for example, see Pugh 1996).

The international community also recognized that urban areas in low- and lower-middle income countries would be unable to implement LA21 unaided. Local resource and revenue constraints, a lack of perceived relevance, the immediate basic needs deficits that demanded priority attention, and the rural orientation of official development assistance programmes at the time represented a severe combination of constraints (see Pugh 2000). Consequently, ICLEI came to focus much of its attention on devising specific measures that would be appropriate and acceptable in such countries. The Human Settlements Programme of the London-based International Institute of Environment and Development, long headed by David Satterthwaite, has also played a consistent and invaluable role in engaged thinking, writing, and advocacy around urban sustainability challenges in the Global South, not least in influencing

policy within UN-Habitat (for examples, see Satterthwaite 1993, 1997; Parnell 2016; see also Chapter 9). Satterthwaite's (1997) paper remains important for clearly highlighting the fallacy that cities could become sustainable as urban islands, without sustainability in the wider territories and societies of which they form integral parts.

Programmes, organizations, and agendas developed under the banner of sustainability have grown steadily in number since the late twentieth century, and also across world regions and at multiple scales – from the level of the city or neighborhood to much broader global initiatives (Du Pisani 2007). UN-Habitat's twin series of biennial publications, *Global Report on Human Settlements*, and *State of the World's Cities* (and the latter's continental companion reports) reflect how that agency's thinking and programming on urban sustainability have evolved since the 1990s. Since its establishment in its current form in 2004, United Cities and Local Governments, the global association of subnational governments, has also played a prominent role in galvanizing urban sustainability actions, not least on climate change and the Urban Sustainable Development Goal, by its membership.

## 7.2 Urban Resilience: Evolution, Scope, Application, and Challenges

As with its counterpart term, “sustainability,” the application of the term “resilience” to socioecological systems gained prominence in relation to discussions of broader issues of conservation (Folke 2006); both have been relatively recently applied to urban systems. Originally developed for application in fields as diverse as mathematics, engineering, materials science, and psychology (Olsson et al. 2015), researchers later applied resilience to ecological systems theory via mathematical models of population ecology (Bodin and Wiman 2004). People later broadened the concept of resilience to include issues of human drivers and responses to ecological change, and eventually to the consideration of the adaptive management of coupled social-ecological systems. In contrast to sustainability, the idea of resilience places greater emphasis on issues of coupled system dynamics that can lead to nonlinear feedbacks and to slow, as well as abrupt, system changes. Resilience keeps at its core the acceptance and management of constant change, uncertainty, and “unknowability,” that is, the impossibility of achieving definite knowledge about system trajectories in complex social-ecological systems.

With the rapid acceleration of urban growth and its associated challenges, exacerbated by global environmental and climate change, resilience has become an increasingly visible term in discussions of urban planning and

policy (Meerow et al. 2016). Resilience has found favor among widely divergent groups of actors, in large part because of the fuzziness and malleability of the term that enables it to act as a “boundary object” (Brand and Jax 2007), representing different things to different sets of players. Yet the fuzziness of the term also generates challenges for operationalization of resilience planning, making it difficult to develop clear metrics and indicators of resilience that can be monitored over time. For instance, resilience, in the urban planning context, has been defined variously as a goal, as a desired outcome, and as a process, making progress difficult to grasp or measure.

Like sustainability, resilience is fundamentally a normative concept (Strunz 2012), although not always explicitly defined as such. Most discussions around urban sustainability implicitly assume resilience to be a desirable property, although this has been increasingly criticized by research that addresses problems such as urban inequity (such as Vale and Campanella 2005). In contrast to sustainability, the concept of resilience (and its counterpart, vulnerability) implies a greater emphasis on urban processes, including adaptive capacity to maintain dynamic equilibria and transformation to alternative desired social-ecological states. The goal of such planning has typically been geared towards achieving specific outcomes in response to global challenges, such as climate change (Romero-Lankao and Dodman 2011). Some critics (for example, Olsson et al. 2015) argue that a fundamental dissonance exists in the way resilience is framed in the natural sciences, as a desirable system property, and in the social sciences, where the resilience of certain sociocultural norms that perpetuate inequity and power imbalances may be inherently problematic, requiring transformation and system change rather than resilience and the perpetuation of the status quo.

In recent years, the importance of resilience planning in an era of increased uncertainty has also gained ground, leading some scholars to propose the idea of cities that accept concepts of disturbance and change as fundamental to urban planning (Ahern 2011). Planning for resilience in an era of change requires the effective incorporation of typical characteristics of twenty-first century urban centers, including challenges of social, ecological, and economic diversity; balancing modularity with teleconnected networks (Seto et al. 2012); and redundancy with efficiency. A city with a diverse economy and reduced socioeconomic inequities can be expected to rebound more quickly from disasters as compared to a city with a specialized, narrow economic base with strong economic and social hierarchies, for example (Campanella 2006).

Finally, the protection and restoration of urban ecosystems is a historically neglected component of resilience planning that is now gaining significant traction across the globe (McPhearson et al. 2015). Cities with functioning, diverse, interconnected, multifunctional ecosystems exhibit greater resilience

to natural disasters such as tornadoes and floods (Ahern 2011). Urban ecosystems thus provide cost-effective approaches to increasing the capacity of urban landscapes to deal with uncertainties and shocks that are typically more robust compared to anthropogenic, engineered solutions (Ernstson et al. 2010). Further, given their multifunctionality, urban ecosystems provide diverse services in cities, acting to increase human well-being. Urban green and blue spaces constitute public goods that increase the quality of the environment (including air and water) and, as commons, provide food, fodder, and fuel wood to many urban residents, particularly in cities of the Global South. Thus, urban ecosystems increase the resilience of residents to food shortages in times of crisis, providing common pool resources accessed by all, but in particular used by disadvantaged sections of society, such as practitioners of ecosystem-based livelihoods and urban migrant laborers (Colding and Barthel 2013; Nagendra 2016). Urban social movements, drawing on a wide base of urban cultural and social diversity, can be especially important in acting as a buffer against the problematic trends of privatization of urban green spaces witnessed in many cities. In this context, urban ecosystems connect the social and the ecological, providing an important motivation for social and community action that cuts across sociocultural and economic barriers, facilitates social entrepreneurship, and maintains feedback loops that contribute to the renewal of social capital in cities from Bogotá – where a gradient of ecological networks has been suggested as a way to connect wild habitats to built spaces (Andrade et al. 2013) – to Cape Town, where a proposed urban biosphere reserve has the potential to address ecological goals of biodiversity conservation as well as social goals of inclusion and poverty alleviation (Krasny et al. 2013).

### 7.3 Global Sustainability through Urbanization and Environmental Change

Whether or not it is an oxymoronic concept, as often claimed, sustainability pervades today's politics, research, and practice in efforts to meet human development goals without compromising the resources and environment that sustain the economic goods and services needed to support them (see Section 7.1). However, in reality, the three pillars that underpin traditional sustainability thought (economic, social, and environmental) are rarely approached together, resulting in fragmented research perspectives and policies. Efforts have tended to focus on economic and environmental dimensions, with less focus on the social; however, more holistic interpretations of sustainability are emerging that focus on urbanization and cities as key components of this process (see Bina 2013; Seto et al. 2012, Pickett et al. 2013; Steele et al. 2015).

“Ecosystem services,” “well-being,” and “low-carbon” are just some of the new ideas and concepts that have moved the sustainable development discourse forward (Bina 2013), increasingly in the urban context.

Moreover, the importance of a better understanding of urbanization processes, interactions, and feedbacks with other systems for global sustainability has become increasingly clear over the last decade. Urban environmental change research has expanded the place-based approach associated with traditional urban studies to address the temporal and spatial interactions that urbanization, a social-ecological process itself, has with other biophysical systems (Sánchez-Rodríguez et al. 2005; Seto et al. 2016). Knowledge and actions that deal with these interactions are critical for a modern agenda towards a more equitable and healthy world. Any hope of achieving global sustainability in holistic terms requires that we understand the connections between urban processes, natural resources, land change, human migration, financial flows, and technology transfers and innovation with environmental change in this broader context (Seto et al. 2012; Pincetl 2016).

The next section briefly reviews salient areas within urbanization and global environmental change (GEC) research and practice that have added to sustainability and resilience thinking over the last decade.

## 7.4 Urban Adaptation and Mitigation within Sustainability and Resilience

The connections between urbanization and GECs, including the more frequent consequences of climate-related disasters and greater climate uncertainty, have increased the need to climate-proof and adapt urban areas to potential risks (Richards and Bradbury 2007; Thornbush et al. 2013). Concerned parties have traditionally focused on the impacts in rural areas, since damage therein was often more extreme, causing concern over potential damage to natural resources and disruption of agricultural systems (Birkmann et al. 2010). However, attention to urban areas grew rapidly following numerous weather extremes and reports thereafter, highlighting existing gaps in our understanding of the unique urban challenges related to adaptation (Commission on Climate Change and Development 2009). These challenges are attributed to cities’ regional and global connectivity and their diverse characteristics, including their population size and density, stage within their respective development processes, and variances in hard and soft infrastructure. Particularly within low- and middle-income countries, where cities are often rapidly urbanizing, exposure to disease and other health problems became cause for deep concern and inquiry into urban coping capacity



in the context of nonexistent or substandard development infrastructure, such as weak water and sanitation systems; high concentrations of urban poverty, including slums and informal settlements; and weak social and political institutions (Birkmann et al. 2010).

In the last decade, as more frequent and often more severe occurrences of extreme events – including intense rains and flooding, hurricanes and storm surges, and heat waves – persisted, so did the emergence of urban adaptation responses, prompting research on multiscale responses within urban areas (that is, at the individual, neighborhood, community, or city levels) (Bicknell et al. 2009). A number of research advancements followed, including the identification and assessment of the diversity of actions and comprehensive adaptation strategies in cities across regions (Carmin et al. 2012), the urban governance and institutional capacities to pursue adaptation (Anguelovski and Carmin 2011; Aylett 2015), and more nuanced understandings of drivers of vulnerability and risk in various urban populations (Garschagen and Romero Lankao 2015). In the latter case, resilience theory has provided a lens or tool to approach climate change adaptation and to manage social-ecological systems (Garschagen 2011; Section 7.2). Today, “resilience” is often used in the same manner as “adaptation”; that is, building urban resilience often implies building urban adaptive capacity to stresses and shocks from climatic events. Efforts to create urban resilience “toolkits” through disciplinary integration have grown in recent years, along with attempts to codesign comprehensive city strategies with the involvement of multiple stakeholders (Solecki et al. 2011).

On the other side of the coin, mitigation actions, like adaptive actions, are often implemented locally in cities as part of national efforts to reduce GHG emissions. In aggregate, aggressive urban mitigation actions could have profound global impacts (Seto et al. 2014). Since the 1992 Kyoto Protocol and events thereafter, such as Rio+20 and the 2015 UNFCCC summit in Paris (COP 21) (see Section 7.1), many nations have committed to reducing their emissions footprints as part of broader sustainability efforts. This has translated given impetus to cities, where the majority of emissions occur and where the majority of efforts to curb them are undertaken. Many cities have created baseline GHG emissions inventories and sustainability portfolios that include consumption- and production-based efforts to reduce emissions. Some of these efforts include municipal and residential emissions reductions through improving energy efficiencies in built infrastructure, encouraging alternative modes of transportation, and increasing efficiencies in water treatment and distribution; promoting urban food production, composting and recycling, and reduction in water use; and integrating green infrastructure and tree planting into the urban landscape for carbon sequestration. These and myriad other efforts and innovations have been tailored to cities’ individual needs and



cultural, geographical, and economic characteristics (Seto et al. 2014; Simon 2016). “Low-carbon” cities are a new trend found in the discourse of mitigation that people are employing in urban environments worldwide. Such cities are increasingly being touted as having capabilities to transform sociotechnical and governance systems (Bulkeley et al. 2011) through the redesign and reconfiguration of energy infrastructures. Personnel at ICLEI, the World Bank, and the World Wildlife Fund in China, among others, for example, are pursuing a low-carbon agenda wherein “a low-carbon city recognizes its responsibility to act. It pursues a step-by-step approach towards carbon neutrality, urban resilience and energy security, supporting an active green economy and stable green infrastructure” (ICLEI 2016). Such actions represent what some refer to as the emergence of a low-carbon urban transition. However, both actual progress and the extent to which urban adaptation or resilience and carbon reduction efforts are integrated with broader development goals are unclear and remain in need of further research.

## 7.5 Integrating Adaptation, Mitigation, and Urban Development for an Equitable Future

Urban system complexity and dynamics across scales are not new to the understanding of urban sustainability, but approaches often continue to oversimplify the interactions of urban systems with other socioeconomic, geopolitical, and environmental processes. Urbanization and GEC research foster multidimensional perspectives that transcend the short term and cross spatial scales, but they would benefit from further disciplinary integration to build new theories and methods. Such knowledge, for example, would be useful for cities to better operationalize adaptation to and mitigation of the negative impacts of climate and other environmental change, and could strengthen the social dimension in the sustainability narrative (Sánchez-Rodríguez 2008).

As a term, sustainability has often been used to bridge mitigation and adaptation; it has been well documented that to achieve long-term urban sustainability, efforts to promote urban resilience to climate change that are inclusive of both adaptation and mitigation strategies must be bundled with broader development policies and plans (Leichenko 2011). Research continues to stress the importance of integrating the two often conceptually distinct strands of sustainability and mitigation/adaptation (Golubchikov 2011; Dodman 2009; Thornbush et al. 2013), as findings show that adaptation actions (such as greater use of air conditioning as urban temperatures rise) can sometimes have an inverse effect on mitigation (a proportional higher energy use and GHG emissions) – known as maladaptation.

The idea that integral components of long-term urban sustainability and global sustainability include justice and equity is emerging within urban responses to climate change. This shift arises from our recognition that, first, the responsibility for climate change is not equally distributed, meaning that some nations and cities are doing more with respect to mitigation and reducing emissions than others. Second, climate change does not affect all people equally or in the same ways, as some populations, and groups within populations, are more vulnerable due to historically rooted, political-economic relationships and processes that are not beneficial for all (Steele et al. 2015). Recent inquiry into the relationship between climate justice principles in urban policy development has found remarkable differences in both mitigation and adaptation policies in terms of distributional and procedural justice in cities of both the Global North and South (Bulkeley et al. 2012).

Further research into vulnerability, equity, and social justice could help frame policies with fair or just outcomes through a greater understanding of existing inequality or where/how future inequality might occur. Resilience theory that incorporates governance, institutional processes, and organizational structures could add to the understanding of the existing strengths and constraints of governments, institutions, and organizations in different sociocultural contexts, yielding more successful integration of concepts of resilience and transformation in sectoral policies, urban planning, and design (Garschagen 2011). Emerging eco-social justice perspectives are also broadening the sustainability agenda by increasing attention to the needed integration between environmental change, social change, human vulnerability or resilience, and biodiversity loss in the city (Steele et al. 2015).

Ultimately, the call to transform our cities and to push the “urbanization transition” along more sustainable trajectories is urgent, but challenging. To be successful, it requires understanding context and leverage points for change, which will require continued analysis of urbanization processes (including drivers, interactions, and outcomes) that occur at multiple scales (see Part III, “Urban Transformations to Sustainability”). Research approaches that frame urbanization as an opportunity for global sustainability, wherein principles of equity and justice are centralized, hold promise for achieving such transformations.

## **References**

- Ahern, J. (2011). From Fail-Safe to Safe-To-Fail: Sustainability and Resilience in the New Urban World. *Landscape and Urban Planning* 100(4): 341–43.
- Andrade, G.I., Remolina, F., and Wiesner, D. (2013). Assembling the Pieces: A Framework for the Integration of Multi-Functional Ecological Main Structure in the Emerging Urban Region of Bogotá, Colombia. *Urban Ecosystems* 16: 723–739.

- Angelovski, I., and Carmin, J. (2011). Something Borrowed, Everything New: Innovation and Institutionalization in Urban Climate Governance. *Current Opinion in Environmental Sustainability* 3: 169–175.
- Aylett, A. (2015) Institutionalizing the Urban Governance of Climate Change Adaptation: Results of an International Survey, *Urban Climate* 14(1) December: 4–16
- Bicknell, J., Dodman, D., and Satterthwaite, D. (eds.). (2009). *Adapting Cities to Climate Change: Understanding and Addressing the Development Challenges*. London: Earthscan.
- Bina, O. (2013). The Green Economy and Sustainable Development: An Uneasy Balance? *Environment and Planning C: Government and Policy* 31: 1023–1047.
- Birkmann, J., Garschagen, M., Kraas, F., and Quang, N. (2010). Adaptive Urban Governance: New Challenges for the Second Generation of Urban Adaptation Strategies to Climate Change. *Sustain Science* 5(2):185–206
- Bodin, P., and B. Wiman. (2004). Resilience and Other Stability Concepts in Ecology: Notes on Their Origin, Validity, and Usefulness. *ESS Bulletin* 2.2: 33–43.
- Bond, P. (2012) *Politics of Climate Justice: Paralysis Above, Movement Below*. Durban: UKZN Press.
- Brand, F.S., and Jax, K. (2007). Focusing the Meaning (s) of Resilience: Resilience as a Descriptive Concept and a Boundary Object. *Ecology and Society* 12: 23. [www.ecologyandsociety.org/vol12/iss1/art23/](http://www.ecologyandsociety.org/vol12/iss1/art23/)
- Bulkeley, H., Carmin, J., Castán Broto, V., Edwards, G.A.S., and Fuller, S. (2013). Climate Justice and Global Cities: Mapping the Emerging Discourses. *Global Environmental Change*, 23(5): 914–925. DOI: 10.1016/j.gloenvcha.2013.05.010.
- Bulkeley, H., Castán Broto, V., Hodson, M., and Marvin, S. (2011). *Cities and Low Carbon Transitions*. Abingdon, Oxon: Routledge.
- Campanella, T.J. (2006). Urban Resilience and the Recovery of New Orleans. *Journal of the American Planning Association* 72(2): 141–146.
- Carmin, J., Nadkarni, N., and Rhie, C. (2012). *Progress and Challenges in Urban Climate Adaptation Planning: Results of a Global Survey*. Cambridge, MA: DUSP/MIT.
- Carson, R. (1962). *Silent Spring*. New York: Houghton Mifflin [later also Penguin Modern Classic]
- Colding, J., and Barthel, S. (2013). The potential of ‘Urban Green Commons’ in the resilience building of cities. *Ecological Economics* 86:156–66.
- Commission on Climate Change and Development (2009). Governance Gaps in *Closing the Gaps: Disaster Risk Reduction and Adaptation to Climate Change in Developing Countries*, Commission on Climate Change and Development, Stockholm: Commission on Climate Change and Development, pp. 24–33.
- Death, C. (2010). *Governing Sustainable Development*. London and New York: Routledge.
- Dodman, D. (2009). Blaming Cities for Climate Change? An Analysis for Urban Green-House Gas Emissions Inventories. *Environment and Urbanization*, 21(1): 185–201.
- Douglas, I. (2013). *Cities: An Environmental History*. London and New York: I.B. Tauris.
- Du Pisani, J.A. (2007). Sustainable Development – Historical Roots of the Concept, *Environmental Sciences*, 3(2): 83–96, DOI:10.1080/15693430600688831

- Ernstson, H., van der Leeuw, S.E., Redman, C.L., Meffert, D.J., Davis, G., Alfsen, C., and Elmquist, T. (2010). Urban Transitions: On Urban Resilience and Human-Dominated Ecosystems *Ambio* 39(8): 531–545.
- The Ecologist, (1972). *A Blueprint for Survival*. London: The Ecologist Magazine.
- Folke, C. (2006). Resilience: The Emergence of a Perspective for Social–Ecological Systems Analyses. *Global environmental change* 16(3): 253–267.
- Garschagen, M., (2011). Resilience and Organisational Institutionalism from a Cross-Cultural Perspective: An Exploration Based on Urban Climate Change Adaptation in Vietnam. *Natural Hazards* (2013) 67: 25–46 DOI 10.1007/s11069-011-9753-4.
- Garschagen, M., and Romero Lankao, P. (2015). Exploring the relationships between urbanization trends and climate change vulnerability. *Climatic Change*, 133 (1): 37–52. doi:10.1007/s10584-013-0812-6.
- Giddens, A. (2011). *The Politics of Climate Change*, 2nd edn. Cambridge: Polity.
- Golubchikov, O. (2011). *Climate Neutral Cities: How to Make Cities Less Energy and Carbon Intensive and More Resilient to Climatic Challenges*. Geneva: United Nations Economic Commission for Europe (UNECE).
- ICLEI (2016, March 4). *Low-Carbon City*.
- Krasny, M.E., Lundholm, C., Shava, S., Lee, E., and Kobori, H. (2013). Urban Landscapes as Learning Arenas for Biodiversity and Ecosystem Services Management, in Elmquist, T., Fragkias, M., Goodness, J., Güneralp, B., Marcotullio, P.J., and McDonald, R.I., et al. (eds.) *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities*. The Netherlands: Springer, pp. 629–664.
- Leichenko, R. (2011). Climate Change and Urban Resilience. *Current Opinion in Environmental Sustainability*. 3: 164–168.
- Lumley, S., and Armstrong, P. (2004). Some of the Nineteenth Century Origins of the Sustainability Concept, *Environment, Development and Sustainability* 6(3): 367–378.
- McPhearson, T., Andersson, E., Elmquist, T., and Frantzeskaki, N. (2015). Resilience of and through Urban Ecosystem Services. *Ecosystem Services* 12: 152–156.
- Meadows, M., Meadows, M., Randers, J., and Behrens, W. (1972). *The Limits to Growth*. London: Pan Books.
- Meerow, S., Newell, J.P., and Stults, M. (2016). Defining Urban Resilience: A Review. *Landscape and Urban Planning* 147: 38–49.
- Middleton, N., O’Keefe, P., and Moyo, S. (1993). *Tears of the Crocodile: from Rio to reality in the Developing World*. London: Pluto.
- Nagendra, H. (2016). *Nature in the City: Bengaluru in the Past, Present, and Future*. Delhi: Oxford University Press.
- Olsson, L., Jerneck, A., Thoren, H., Persson, J. and O’Byrne, D. (2015). Why Resilience Is Unappealing to Social Science: Theoretical and Empirical Investigations of the Scientific Use of Resilience. *Science Advances* 1(4), p.e1400217, DOI: 10.1126/sciadv.1400217.
- Parnell, S. (2016). Defining a Global Urban Development Agenda, *World Development* 78: 529–540. <http://dx.doi.org/10.1016/j.worlddev.2015.10.028>.

- Pickett, S.T.A., Cadenasso, M.L., McGrath, M. (eds.) (2013). *Resilience in Ecology and Urban Design: Linking Theory and Practice for Sustainable Cities*. New York: Springer.
- Pincetl, S. (2016). Urban Precipitation: A Global Perspective, in K.C. Seto, W.D. Solecki, and C.A. Griffith (eds.) *The Routledge Handbook of Urbanization and Global Environmental Change*. London and New York: Routledge, pp. 152–168.
- Pugh, C. (ed.) (1996). *Sustainability, the Environment and Urbanization*. London: Earthscan.
- Pugh, C. (ed.) (2000). *Sustainable Cities in Developing Countries*. London: Earthscan.
- Richards, J., and Bradbury, S. (2007). Sustainability is not only about carbon emissions. *Building Engineer* 82(9): 40.
- Romero-Lankao P, and Dodman D. (2011). Cities in Transition: Transforming Urban Centers from Hotbeds of GHG Emissions and Vulnerability to Seedbeds of Sustainability and Resilience: Introduction and Editorial Overview. *Current Opinion in Environmental Sustainability* 3(3): 113–120.
- Sánchez-Rodríguez, R. (2008). Urban Sustainability and Global Environmental Change: Reflections for an Urban Agenda in G. Martine, G. McGranahan, M. Montgomery and R. Fernández-Castilla (Eds.), *The New Global Frontier Urbanization, Poverty and Environment in the 21st Century*. London and Sterling, VA: Earthscan, pp. 149–164.
- Sánchez-Rodríguez, R., Seto, K. C., Simon, D., Solecki, W. D., Kraas, F., and Laumann, G. (2005). Science Plan Urbanization and Global Environmental Change Project (IHDP Report No. 15). Bonn: International Human Dimensions Programme on Global Environmental Change.
- Satterthwaite, D. (1993). The Impact on Health of Urban Environments. *Environment and Urbanization*, 5 (2): 87–111.
- Satterthwaite, D. (1997). Sustainable Cities or Cities That Contribute to Sustainable Development? *Urban Studies* 34 (10): 1667–1691.
- Seto, K.C., Solecki, W.D., and Griffith, C.A. (eds.) (2016). *The Routledge Handbook of Urbanization and Global Environmental Change*. London and New York: Routledge.
- Seto K.C., S. Dhakal, A. Bigio, H. Blanco, G.C. Delgado, D. Dewar, et al. (2014). Human Settlements, Infrastructure and Spatial Planning in Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, et al. (eds.) *Climate Change 2014: Mitigation of Climate Change*. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.
- Seto, K.C., Reenberg, A., Boone, C.G, Fragkias, M., Haase, D., Langanke, T., et al. (2012). Urban Land Teleconnections and Sustainability. *Proceedings of the National Academy of Sciences*, 109(20): 7687–7692.
- Simon, D. (1989). Sustainable Development: Theoretical Construct or Attainable Goal? *Environmental Conservation* 16(1): 41–48.
- Simon, D. (2003). Dilemmas of Development and the Environment in a Globalising World: Theory, Policy and Praxis, *Progress in Development Studies* 3(1): 5–41.
- Simon, D. (2016) Green cities: from tokenism to incrementalism and transformation, in Simon, D. (ed.) *Rethinking Sustainable Cities: Accessible, green and fair*. Bristol: Policy Press.

- Solecki, W., R. Leichenko, and K. O'Brien. (2011). Climate Change Adaptation Strategies and Disaster Risk Reduction in Cities: Connections, Contentions, and Synergies. *Current Opinion in Environmental Sustainability* 2011 (3): 35–141.
- Steele, W., Mata, L., and Fuenfgeld, H. (2015). Urban climate Justice: Creating Sustainable Pathways for Humans and Other Species. *Current Opinion in Environmental Sustainability* 2015(14): 121–126.
- Strunz, S. (2012). Is Conceptual Vagueness an Asset? Arguments from Philosophy of Science Applied to the Concept of Resilience. *Ecological Economics* 76: 112–118.
- Thornbush, M., O. Golubchikov, and S. Bouzarovski (2013) Sustainable Cities Targeted by Combined Mitigation–Adaptation Efforts for Future-Proofing. *Sustainable Cities and Society*, 9: 1–9.
- Vale, L.J., and Campanella, T.J. (2005). *The Resilient City: How Modern Cities Recover from Disaster*. New York: Oxford University Press.
- Ward, B., and Dubos, R. (1972). *Only One Earth*. Harmondsworth: Penguin.
- Weiss, T. and Burke, M.J. (2012). Legitimacy, Identity and Climate Change: Moving from International to World Society? *Third World Quarterly* 32(6): 1057–1072.
- World Commission on Environment and Development (WECD) (1987). *Our Common Future*. Oxford: Oxford University Press.
- Zorrilla, C. (2002). Reflections on Sustainability from the Trenches. *Development* 45(3): 54–58.