

Editorial

# Climate Resilient Urban Development

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A combination of population growth, unprecedented rates of urbanization, and a changing climate, is leading to complex resilience challenges for Governments and societies around the world. With global population set to exceed 9 billion by 2050, and people living in cities expected to double over the same time frame, a range of high-level UN frameworks has recently been introduced to actively promote international actions for sustainable development and human wellbeing. In addition to the Sustainable Development Goals (SDGs); the Sendai Framework for Disaster Risk Reduction (UNISDR), the Paris Agreement on Climate Change (UNFCCC), and the New Urban Agenda (UN-Habitat), have all been recently endorsed to help shape more sustainable and resilient urban development pathways.

In support of these important contemporary agendas, this special edition showcases multi-disciplinary perspectives on ‘climate resilient urban development’ from around the world; including contributions from the Pacific region, Europe, Switzerland, Czech Republic, Thailand, China, South Korea, Mexico, and South Africa. One of the central themes from the collated papers relates to the institutional dimension of enhancing urban climate resilience e.g. analyzing the challenges and opportunities facing the Pacific urban agenda [1]; reviewing urban planning research for climate change [2]; assessing municipal government adaptation strategies in South Korea [3]; examining transboundary issues between neighboring local authorities in South Africa [4]; and analyzing the interface of actors, institutions, and physical infrastructure in relation to water management in NE Thailand [5].

A second theme cutting through the papers focuses on different approaches for assessing climate vulnerabilities and risks, or for identifying potential adaptation measures e.g. the value of microclimate modelling for climate sensitive urban design [6]; the utilization of climate risk assessments in a European context [7]; assessing livelihood vulnerabilities in the context of increasing flood risks [8], the use of computational fluid dynamics and GIS in the development of urban ventilation corridors [9], participatory impact assessments for heat waves [10], and operationalizing vulnerability assessments in Mexico [11].

The first paper of this special edition provides a useful introductory text to the topic of climate resilient urbanization. “*Unpacking the Pacific Urban Agenda: Resilience Challenges and Opportunities*” [1] reviews the complex socio-ecological challenges being faced by fast growing cities in the South Pacific; influenced by the unique characteristics of remote and developing island States. As well as mapping these characteristics to the resolutions of the Pacific Urban Agenda, the paper concludes by highlighting the challenges and opportunities of implementing climate resilience actions in support of the global New Urban Agenda.

“*A Review of Urban Planning Research for Climate Change*” [2] analyzed the literature on urban planning and climate change research, based on the contents of the Web of Science database, to look at how it evolved over the period 1990–2016. Noted trends included a shift from generating knowledge of climate impacts on spatial systems (such as cities) towards the institutional dimensions of how to adapt, and an increasing linkage to human wellbeing agendas such as health, urban equity, and urban sustainability. The period 2005–2008 was identified as representing a threshold point

with the total number of academic papers increasing substantially (and a shift in emphasis from single to multi-dimensional studies). Post 2010, it was found that papers focusing on the governance frameworks for operationalizing adaptation have achieved greater prominence.

The paper by Lee and Kim [3]—*Assessing Strategies for Urban Climate Change Adaptation: The Case of Six Metropolitan Cities in South Korea*—investigated six metropolitan cities and screened their efforts according to the Implementation Plan for Climate Change Adaptation Strategy, in combination with annual budget reports. Their analysis found that adaptation budgets for all cities were generally smaller than the Implementation Plan guidelines, the strategies were not developed to adequately account for local context, and priorities tended to be disaster-related with emphasis on resilient infrastructure, water management, and the health sector.

*“Local Authority Responses to Climate Change in South Africa: The Challenges of Transboundary Governance”* [4] focused on the development of adaptation strategies in two adjacent municipalities in Natal province, South Africa. These municipalities (one urban, the other predominantly peri-urban/rural), whilst separated by administrative boundaries, share common biophysical, politico-economic, and social systems. The analysis, based on expert and stakeholder interviews, argues that weak inter-municipal collaboration has acted as an impediment to effective adaptation actions and is reflective of discontinuities within and between adjacent urban metropolitan and rural contexts in South Africa.

*“Urban Water Crises under Future Uncertainties: The Case of Institutional and Infrastructure Complexity in Khon Kaen, Thailand”* [5] examines the institutional challenges facing water management practice in a time of increasing uncertainty through a social–ecological–technological analytical lens. The authors argue that critical consideration of the interface of actors, institutions and physical infrastructure is a valuable approach to better understanding system vulnerabilities, and a platform for more effective adaptation. However, their findings highlight important adaptation constraints including infrastructure deficits (to deal with both current and future risks) and institutional complexities, emphasizing the need for new polycentric, multi-scalar governance arrangements that are learning-oriented and adaptive to changing conditions.

The paper by Mauree et al. [6] addressed new decision support tools and methods, specifically *“A New Framework to Evaluate Urban Design Using Urban Microclimatic Modeling in Future Climatic Conditions”*, which was designed to better link existing methodologies to more accurately determine energy heating and cooling demand under different future climate scenarios. Their findings indicate that whilst there will be a decrease in heating needs, there will be a substantive increase in cooling demand, exaggerated further by changes to local micro-climate. As a consequence, proposed renovations would not be sufficient to achieve climate resilient buildings. The authors conclude by reflecting on options for improved urban design.

*“Enhancing the Practical Utility of Risk Assessments in Climate Change Adaptation”* by Connelly et al. [7] explores the value of risk-based approaches to climate assessments through both conceptual and applied lenses. Their paper argues that spatial risk assessment methodologies identify the highest risks and the locations where impacts are most likely, enabling prioritization of risks and allowing decision-makers to consider different choices under conditions of uncertainty. However, the authors also introduce a caveat—how practitioners and policymakers interpret risk-based concepts will be critically important if they are to underpin adaptation decision-making.

The paper by Beringer and Kaewsuk [8] on *“Emerging Livelihood Vulnerabilities in an Urbanizing and Climate Uncertain Environment for the Case of a Secondary City in Thailand”* focused on increasing flood risks in Thailand and how they are not only exaggerating existing vulnerabilities but are creating new vulnerabilities and poverty patterns. Sustainable urban development is argued to be undermined by a lack of land use regulations and ineffective water governance, inadequate monitoring of development, an increase in impervious surfaces, and insufficient wastewater treatment. Using a vulnerability index and household interviews the study found financial (income and debts)

and infrastructure (housing and infrastructure) vulnerabilities to be most significant in the peri-urban study area of Khon Kaen city.

“Integrating CFD and GIS into the Development of Urban Ventilation Corridors: A Case Study in Changchun City, China” [9] considered another important aspect of urban climate resilience; the use of ventilation corridors to combat urban heat and cool cities (as well as helping to disperse air pollution). Using GIS and the principles of computational fluid dynamics, simulations were conducted to determine the characteristics of wind speed and direction at different heights in Changchun City. Five ventilation corridors were identified and modelled to showcase potential improvements in air movement that would help to mitigate current and future urban heat.

Heatwaves were also the focus of the paper by Lorencová et al. [10] on “Participatory Climate Change Impact Assessment in Three Czech Cities: The Case of Heatwaves”. Their analysis integrated scientific and participatory assessments to determine heat impacts in three different cities, to prioritize risks, and to explore potential adaptation options. Two Representative Concentration Pathways were used to enable ‘in-city’ and ‘inter-city’ comparison, with the Brno case found to be subject to the highest impact (10.5% of its area).

“Vulnerability Assessment to Climate Variability and Climate Change in Tijuana, Mexico” [11] added to the methodology reflections put forward by the papers on risk and impact assessment by developing a methodology for operationalizing vulnerability assessment. Targeting flood vulnerability, findings from the research indicate that over 10% of the city’s population lives in areas considered highly vulnerable to flooding, with another 18% subject to medium-high vulnerability. The authors argue that this information is a necessary first step in developing locally specific adaptation strategies which contribute to sustainable urban development.

The range of papers included in this special edition on climate resilient urban development—targeting multiple hazards, different assessment approaches, and emphasizing the institutional dimensions of achieving climate resilient pathways—showcase the multi-faceted nature of the shocks and stresses (both external and internal) impacting on the sustainable development of cities. The special edition also highlights the emergence of new vulnerabilities affecting urban dwellers across the world and the need for improved governance arrangements to respond to these contemporary urban challenges, and to meet the targets posed by frameworks such as the SDGs. Scientific knowledge, as represented by papers in this special edition, plays an important role in helping to inform urban resilience policies and actions. As such, bridging the science-policy divide needs to be a common goal for both communities of practice.

**Conflicts of Interest:** The author declares no conflict of interest.

## References

1. Kiddle, G.L.; McEvoy, D.; Mitchell, D.; Jones, P.; McCartney, S. Unpacking the Pacific Urban Agenda: Resilience Challenges and Opportunities. *Sustainability* **2017**, *9*, 1878. [[CrossRef](#)]
2. Jiang, Y.; Hou, L.; Shi, T.; Gui, Q. A Review of Urban Planning Research for Climate Change. *Sustainability* **2017**, *9*, 2224. [[CrossRef](#)]
3. Lee, J.-S.; Kim, J.W. Assessing Strategies for Urban Climate Change Adaptation: The Case of Six Metropolitan Cities in South Korea. *Sustainability* **2018**, *10*, 2065. [[CrossRef](#)]
4. Leck, H.; Simon, D. Local Authority Responses to Climate Change in South Africa: The Challenges of Transboundary Governance. *Sustainability* **2018**, *10*, 2542. [[CrossRef](#)]
5. Friend, R.; Thinphanga, P. Urban Water Crises under Future Uncertainties: The Case of Institutional and Infrastructure Complexity in Khon Kaen, Thailand. *Sustainability* **2018**, *10*, 3921. [[CrossRef](#)]
6. Mauree, D.; Coccolo, S.; Perera, A.T.D.; Nik, V.; Scartezini, J.-L.; Naboni, E. A New Framework to Evaluate Urban Design Using Urban Microclimatic Modeling in Future Climatic Conditions. *Sustainability* **2018**, *10*, 1134. [[CrossRef](#)]
7. Connelly, A.; Carter, J.; Handley, J.; Hincks, S. Enhancing the Practical Utility of Risk Assessments in Climate Change Adaptation. *Sustainability* **2018**, *10*, 1399. [[CrossRef](#)]

8. Beringer, A.L.; Kaewsuk, J. Emerging Livelihood Vulnerabilities in an Urbanizing and Climate Uncertain Environment for the Case of a Secondary City in Thailand. *Sustainability* **2018**, *10*, 1452. [[CrossRef](#)]
9. Chang, S.; Jiang, Q.; Zhao, Y. Integrating CFD and GIS into the Development of Urban Ventilation Corridors: A Case Study in Changchun City, China. *Sustainability* **2018**, *10*, 1814. [[CrossRef](#)]
10. Krkoška Lorencová, E.; Whitham, C.E.L.; Bašta, P.; Harmáčková, Z.V.; Štěpánek, P.; Zahradníček, P.; Farda, A.; Vačkář, D. Participatory Climate Change Impact Assessment in Three Czech Cities: The Case of Heatwaves. *Sustainability* **2018**, *10*, 1906. [[CrossRef](#)]
11. Sánchez Rodríguez, R.A.; Morales Santos, A.E. Vulnerability Assessment to Climate Variability and Climate Change in Tijuana, Mexico. *Sustainability* **2018**, *10*, 2352. [[CrossRef](#)]



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