

A Case Study on Planning, Development and Management of Sustainable Cities: A Commentary from the Guest Editors

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Abstract—Cities are the most dramatic manifestations of human activities on the surface of the earth. These human-dominated organisms—i.e., cities—degrade natural habitats, simplify species composition, disrupt hydrological systems, and modify energy flow and nutrient cycling. Today, these consequential impacts of human activities, originated from population increase, rapid urbanization, high private motor vehicle dependency, deregulated industrialization and mass livestock production, are increasing exponentially and causing great deal of environmental, social, and economic challenges both at global and local scales. In such a situation, establishment of sustainable cities, through sustainable urban development practices, is seen as a potential panacea to combat these challenges responsibly, effectively, and efficiently. This paper offers a critical review of the key literature on the issues relating to planning, development and management of sustainable cities, introduces the contributions from the Special Issue, and speculates on the prospective research directions to place necessary mechanisms to secure a sustainable urban future for all.

Keywords: *sustainability; sustainable development; sustainable urban development; sustainable city; sustainable urban ecosystems; sustainability assessment; smart cities*

1. Background and Literature Review

Environmental externalities mainly generated from population increase, rapid urbanization, high private motor vehicle dependency, deregulated industrialization, and mass livestock production have placed serious concerns for the future of our wellbeing, and even our existence in the long run [1–4]. Realization of the fact that urgent measures must be taken to combat environmental externalities responsibly, effectively, and efficiently have resulted in the rediscovery of the need for more eco-friendly practices [5–7]. Subsequently, during the last few decades, “sustainability” and “sustainable development” have become popular topics not only for scholars, particularly in the fields of environmental economics, technology and science, urban planning, development, and management, but also for urban policy makers and professional practitioners [8–10]. The emergence

of these new concepts starting from early 1970s is an outcome of the response to the growing concerns about the impacts of development practices on the state of the environment [11–13].

As a result of both conceptual and empirical research conducted over the last five decades, presently the notion of “sustainability” has been clearly understood; however, a precise definition with a broad consensus is yet to be devised [14,15]. In generic terms, sustainability is a normative concept that indicates the way humans should act towards nature, and the way they should be responsible towards one another and future generations [16,17]. Berkes *et al.* [18] see sustainability as a process to determine the relationship among ecological, social and economic dimensions. This relationship is ascertained based on resilience to both natural and anthropogenic disturbances, desirability to human societies, and temporal and spatial scale boundaries [19]. The idea of meeting the reasonable needs of the current generation, while enhancing the lives and ecosystems of future generations has been discussed extensively in academic debates [20]. This understanding is considered as a fundamental characteristic of sustainability [21]. Nevertheless, not all practices are completely sustainable or unsustainable; there are many shades of grey in between these two opposite poles. Allen [22] coins the concept of strong-*versus*-weak sustainability; where weak sustainability is the substitutability between human and natural capitals in an acceptable level, while strong sustainability is the maintenance and enhancement of the natural capital. This has turned the evaluation of levels or degrees of sustainability [23,24], in other words sustainability assessment, into a major area of research and advocacy for scholars [25–28].

The renowned Brundtland Report [29] gave a significant boost to the “sustainable development” idea and the subsequent efforts. Successively, the concept is adopted in many disciplinary scopes, and also in many countries, regions, cities,

and firms worldwide [30,31]. Driven from the sustainability concept, the essence of sustainable development is seen as meeting the fundamental human needs, while preserving the critical life-support systems of our planet [32,33]. It is broadly defined as a development type that can be continued either indefinitely or for the implicit time period of concern [34]. In the debates on sustainable development, the role of societies is critically analysed for managing economic, social, and natural capitals, which are considered non-substitutable and their consumption is irreversible [35–37]. One of the most popular definitions comes from Allen [22]; sustainable development is the development that satisfies the human needs and improves the quality of life in such a way that ecosystems should keep renewing themselves.

A thorough review of the literature reveals that there is no harmony in the operational contents of sustainable development [38]. It covers dynamic environmental, social, and economic concerns at different spatio-temporal scales [39]. This brings about its many interpretations [40]. Scholars and practitioners do not have a solid consensus about what is to be sustained, what is to be developed, how to link environment and development, and for what extent of time [41]. However, the most focused understanding lies with the “the triple bottom line” sustainable development approach, which considers environmental quality, economic prosperity and social justice [42]. As a matter of fact, sustainability represents a nested hierarchy consisting of environment, society and economy as living environment, which enables human society to build an economic system that is not a threat to the environment [43]. Furthermore, in recent years “the quadruple bottom line” sustainable development perspective, also involving the governance domain, has gained a wider acceptance.

Today more than half of the world’s population lives in urban areas, and the future of humanity is absolutely urban [44]. Urban areas are the centre of economic development where sustainability is a critical concern [45]. It is not only due to the concentration of the human and financial resources, but also due to the phenomenal growth of urban centres and increasing share of urban population globally [46,47]. In cities, depletion of natural resources and destruction of natural areas are the usual costs of an improved quality of life that disrupts urban ecosystems [48]. There is no other option remaining to achieve the prosperity in urban development without considering the sustainability in planning and development—or “sustainable urban development” [49]. In sustainable urban development, the primary goal is to make cities and their ecosystems healthy and sustainable over time in terms of their environmental, economic and social dimensions [50]. This perspective gives birth to the concepts of “sustainable cities” and “sustainable urban ecosystems”. The sustainable cities concept has brought the need for rethinking of sustainable urban development practices considering the size of cities [51].

Böhringer and Jochem [52] present a quite convincing view on the development of sustainable cities; an issue that cannot be clearly measured, and is difficult to improve. Bell and Morse [53] indicate that quantification has limitations, and clearly it is not possible to measure all of the human experience; and clearly there is a trade-off between necessary simplifications and at the same time having sustainability indicators that are meaningful. Today, more and more cities are prioritizing assessment of sustainability of their cities or urban development; and many local governments have made efforts to develop thorough appraisal schemes with consideration for environment, society and economy dimensions—in line with the triple bottom approach [54–56]. However, current research and practice expose that sustainability assessment process itself raises weakness and threats, which need to be improved, especially in comparative analysis [57–60].

Stipulated by Yigitcanlar *et al.* [61], prosperity and environmental sustainability of cities are inextricably linked; therefore, cities can only maintain their prosperity when environmental and social objectives are fully integrated with economic goals. In the light of this view during the last two decades, many cities of the developed world have introduced new frameworks and guidelines to incorporate sustainability in their urban planning and development processes. In Europe, for instance, the report “Sustainable Urban Development in the European Union: A Framework for Action” [62] and the Leipzig Charter [63] are the primary policy documents, which have set up the strategies for urban sustainability to be practiced by national and local governments. Additionally, many national scale documents have placed sustainable urban development as the prime objective of planning and development, such as the Fifth National Policy Document on Spatial Planning in the Netherlands [64], and Planning Policy Statement 1 in the UK [65]. There are also numerous local efforts to promote sustainable city formation via the leverage of urban planning and design. An earlier practice analysis by Berke and Conroy [66] in 30 American cities reveal that no significant differences in how extensively sustainability principles are supported between the plans that state an intention to integrate sustainable urban development and those that do not. However, in recent years, planning efforts of many local governments from Europe, North America and Australia have figured out new and innovative ways to better integrate sustainability principles, technologies and frameworks in their planning schemes [67–70]. Furthermore, some efforts—with limited success so far—are also put in place in the context of developing countries including China, Korea, Malaysia, Turkey, and Vietnam [71–74]. However, a lot more needs to be done to improve the conditions especially in the rapidly emerging economies of the developing world [75,76].

Besides national and international guidelines and frameworks, academia and industry have also contributed to develop sustainability assessment methods and tools [77]. These tools and methods have provided support for making better decisions in the sustainable development processes [78–81].

Furthermore, growing awareness also has an important impact on some of the industry practices today, as we witness the appearance of new sustainable businesses and green technology firms [82,83]. On this very point, Utting [84] identifies the role and responsibilities of corporate businesses for adopting policies and practices to support and promote sustainable (urban) development. The key promoters for implementation of sustainability management in industries include the “World Business Council for Sustainable Development” [85], “Global Reporting Initiative” [86], “Organisation for Economic Co-operation and Development’s Sustainable Development Standards” [87], and “United Nation’s Transforming Our World: the 2030 Agenda for Sustainable Development” [88]. The United Nation’s 2030 Agenda declares that global challenges—e.g., extreme poverty, environmental degradation, and climate change—can only be solved if all parties contribute to implement the “Sustainable Development Goals” [89,90]. This view is highly critical, as the realization of sustainable cities cannot be achieved without all businesses and governments going sustainable along with the communities as a whole in all countries [91]. Furthermore, the rapid advancements in the domain of urban technologies are also seen as a significant contributor to the efforts in dealing with unsustainable outcomes produced from our cities [92]. This technology perspective eventually led to the development of a new city brand—so-called “smart cities” that symbolises a new kind of technology-led sustainable urban utopia [93,94].

Review of the key literature finds that majority of academic research focuses on the planning and development aspects of sustainable cities, while issues related to their governance seems to be in neglect [95]. As much as planning and development of sustainable cities, these cities’ management or governance is also a highly crucial and also challenging task—as urban governance and sustainability are rapidly becoming key issues in cities all around the world—thus need further attention from scholars [96]. Yigitcanlar and Teriman [97] suggest a continuous link between urban planning and development processes in order to form an integrated mechanism for achieving sustainable outcomes. While such integration is essential, we also suggest that the management process should be an incorporated mechanism in the planning and development processes.

2. The Special Issue

We are all aware that cities around the globe are being redesigned to become more sustainable. Despite significant research progress in sustainability and cities individually, relatively little investigation has been made by integrating the two themes together. At least three types of environment co-exist in a city—*i.e.*, natural, artefact, and social—and each of these generate both positive and negative externalities for a city [98]. As a result, diverse views prevail in relation to the sustainability of cities. Some scholars argue that the term of sustainable cities is an oxymoron since cities cannot be

sustainable at all [99]. Others say that the idea is utopian [100]. Others assert that cities will, must, and are becoming more and more sustainable [101].

Against this background, it is possible to state that there has been growing, but still rather limited, research that systematically investigate sustainable cities, and the specific roles planning, development and management plays in their formation, stimulation and sustained success. Given that there is no formula that can unilaterally be applied in all of the urban environments to achieve sustainability, this Special Issue aims to gather diverse views and report progress towards sustainable cities. A fundamental objective of this Special Issue is to compile and present the cutting edge work of researchers who focus on a joined-up thinking of both themes—*i.e.*, sustainability and city. By doing so, we believe this Special Issue on “Planning, Development and Management of Sustainable Cities” contributes to the knowledge pool in this area, particularly with new evidence driven from empirical research.

Following this guest editorial commentary, the Special Issue includes the following case study, review and research papers:

- (1) Article: “Typology of Cities based on City Biodiversity Index: Exploring Biodiversity Potentials and Possible Collaborations among Japanese Cities” by Yuta Uchiyama, Kengo Hayashi and Ryo Kohsaka
- (2) Article: “The Influence of Low-Frequency Noise Pollution on the Quality of Life and Place in Sustainable Cities: A Case Study from Northern Portugal” by Juliana Araújo Alves, Lígia Torres Silva and Paula Cristina C. Remoaldo
- (3) Article: “Sustainable Water Infrastructure Asset Management: A Gap Analysis of Customer and Service Provider Perspectives” by Sangjong Han, Hwankook Hwang, Seonghoon Kim, Gyu Seok Baek and Joonhong Park
- (4) Article: “Moving towards Sustainability: Road Grades and On-Road Emissions of Heavy-Duty
- (5) Vehicles: A Case Study” by Wendan Zhang, Jian Lu, Ping Xu and Yi Zhang
- (6) Article: “Visualization of a City Sustainability Index (CSI): Towards Transdisciplinary Approaches Involving Multiple Stakeholders” by Koichiro Mori, Toyonobu Fujii, Tsuguta Yamashita, Yutaka Mimura, Yuta Uchiyama and Kengo Hayashi
- (7) Case Report: “Assessing Sustainability of Mixed Use Neighbourhoods through Residents’
- (8) Travel Behaviour and Perception: The Case of Nagpur, India” by Sarika Bahadure and Rajashree Kotharkar

- (9) Review: “Ecologizing Our Cities: A Particular, Process-Function View of Southern California, from within Complexity” by Ashwani Vasishth
- (10) Article: “A Framework for Sustainable Urban Water Management through Demand and Supply
- (11) Forecasting: The Case of Istanbul” by Murat Yalçıntaş, Melih Bulu, Murat Küçükvar and Hamidreza Samadi
- (12) Article: “Application of Environmental Change Efficiency to the Sustainability of Urban Development at the Neighborhood Level” by Hsing-Fu Kuo and Ko-Wan Tsou
- (13) Article: “Spatio-Temporal Features of China’s Urban Fires: An Investigation with Reference to Gross Domestic Product and Humidity” by Zhenbo Wang, Xiaorui Zhang and Bo Xu
- (14) Article: “Critical Connections: The Role of the Built Environment Sector in Delivering Green Cities and a Green Economy” by Peter Newton and Peter Newman
- (15) Article: “Framing Processes in the Envisioning of Low-Carbon, Resilient Cities: Results from Two Visioning Exercises” by Stephen McGrail, A. Idil Gaziulusoy and Paul Twomey
- (16) Article: “Aligning Public Participation to Stakeholders’ Sustainability Literacy: A Case Study on Sustainable Urban Development in Phoenix, Arizona” by Matthew Cohen, Arnim Wiek, Braden Kay and John Harlow
- (17) Article: “Managing Knowledge to Promote Sustainability in Australian Transport Infrastructure Projects” by Jay Yang, Mei Yuan, Tan Yigitcanlar, Peter Newman and Frank Schultmann
- (18) Article: “Sustainable Urban Transport in the Developing World: Beyond Megacities” by Dorina Pojani and Dominic Stead
- (19) Review: “Trees in Canadian Cities: Indispensable Life Form for Urban Sustainability” by Peter N. Duinker, Camilo Ordóñez, James W. N. Steenberg, Kyle H. Miller, Sydney A. Toni and Sophie A. Nitoslawski
- (20) Article: “The Bumpy Road toward Low-Energy Urban Mobility: Case Studies from Two UK Cities” by Tim Schwanen
- (21) Article: “Scaling-up Strategy as an Appropriate Approach for Sustainable New Town Development? Lessons from Wujin, Changzhou, China” by Hao Chen, Qiyang Wu, Jianquan Cheng, Zhifei Ma and Weixuan Song
- (22) Article: “Neighborhood Sustainability Assessment: Evaluating Residential Development Sustainability in a Developing Country Context” by Tan Yigitcanlar, Md. Kamruzzaman and Suharto Teriman
- (23) Article: “Regional Open Innovation Roadmapping: A New Framework for Innovation-Based Regional Development” by Wim Schwerdtner, Rosemarie Siebert, Maria Busse and Ulf B. Freisinger
- (24) Article: “Incorporating Bio-Physical Sciences into a Decision Support Tool for Sustainable Urban Planning” by Zina Mitraka, Emmanouil Diamantakis, Nektarios Chrysoulakis, Eduardo Anselmo Castro, Roberto San Jose, Ainhoa Gonzalez and Ivan Bleic

3. Concluding Remarks and Research Directions

The Special Issue generates new insights by investigating the sustainable cities from various disciplinary angles (*i.e.*, urban studies, urban planning, urban management, urban design, architecture, civil engineering, construction management, regional science, environmental science, bio-physical sciences, environmental planning, and knowledge management) and country contexts (*i.e.*, Australia, Canada, China, Germany, India, Japan, Malaysia, Portugal, Turkey, the UK, and the USA) as well as international comparisons.

In the light of the sustainability related matters discussed by the contributors of the Special Issue, we compile the following sets of generic research questions focusing on the “planning”, “development”, and “management” domains of sustainable cities. We believe investigating these issues further in prospective research projects by scholars of this highly interdisciplinary field will shed light on better conceptualization and practice of sustainable urban development and sustainable cities.

- What is a sustainable city supposed to be, and how can benchmarks be determined and set considering sustainability is a vague term?
- What is the current status of cities and the inhibitors and threats on the way towards sustainable urban development?
- What are the commonalities amongst cities that are moving towards sustainability, and what are the factors of success and failure?
- How can sustainability frameworks be developed and applied, recognizing that every city is unique, to the planning of cities?
- How can institutional and social capacities be developed and further enhanced for the formation of sustainable cities?
- How can sustainable cities be governed to make sure that existing high sustainability levels are maintained and improved over time?

Lastly, we wish to thank the authors of the Special Issue papers for accepting our invitation and submitting and revising their manuscripts within a short time frame, and thank the referees for their thorough and timely reviews. We also thank

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