

Editorial

# City 4.0: Digital Transformation of Urban Settlements

Tan Yigitcanlar <sup>1,\*</sup>, Bo Xia <sup>1</sup>, Tatiana Tucunduva Philippi Cortese <sup>2</sup> and Jamile Sabatini-Marques <sup>3</sup>

<sup>1</sup> City 4.0 Lab, School of Architecture and Built Environment, Faculty of Engineering, Queensland University of Technology, 2 George Street, Brisbane, QLD 4000, Australia; paul.xia@qut.edu.au

<sup>2</sup> Graduate Program in Smart and Sustainable Cities, University Nove de Julho, Rua Vergueiro, São Paulo 01525-000, Brazil; taticortese@gmail.com

<sup>3</sup> Institute of Advanced Studies, University of São Paulo, São Paulo 05508-060, Brazil; jamile.sabatini@abes.org.br

\* Correspondence: tan.yigitcanlar@qut.edu.au; Tel.: +61-7-3138-2418

The combination of the computer and distributed networks during the recent decades has led to two ‘Digital Revolutions’ that today allow anyone to create, disseminate, and access any information anywhere, any time, and from any smart device. The birth of the ‘Digital Age’ is a result of a research ecosystem that was nurtured by government spending and military–industry–academia collaboration, along with the alliance of community organizers, communal-minded hippies, do-it-yourself hobbyists, and homebrew hackers. Strictly speaking, this collaborative creativity that defines the digital age included the collaboration between humans and machines—also known as ‘collaborative intelligence’.

This interaction has changed the way in which some services are delivered. For instance, today, the world’s largest taxi company, Uber, owns no vehicles; the world’s most popular media owner, Facebook, creates no content; the world’s most valuable retailer, Alibaba, has no inventory; and the world’s largest accommodation provider, Airbnb, owns no real estate. In addition, owing to rapid developments in the digital age, technology is widely seen as an effective apparatus to help us solve some of the most challenging problems the world is currently facing, particularly when our impact is strongly considered alongside our technological capabilities.

At present, unexceptionally, all parts of the world are confronted with various environmental, social, health, and economic crises—e.g., life-threatening natural disasters, the loss of biodiversity, the destruction of natural ecosystems, regional disparities, socio-economic inequity, pandemics, and digital and knowledge divides that are mainly caused by a rapid population increase and an expansion of resource consumption, combined with industrialization, urbanization, mobilization, agricultural intensification, and excessive consumption-driven lifestyles. The rapid advancement in digital technologies provides us with the hope that the impacts of global-scale environmental, social, and economic crises can be eased with the help of appropriate technology.

Furthermore, in recent years, the expansion of the Fourth Industrial Revolution (or Industry 4.0) to cities has disrupted the way in which cities are planned and developed as well as having generated a new city conceptualization—i.e., City 4.0. This new smart city blueprint, City 4.0, aims to leverage the power of engaged and connected citizens, digital technology, and data to ensure and enhance the quality of urban life, productivity, and sustainable development. In other words, City 4.0 is a city that utilizes technological developments and digitalization to transform local public services and the local economy to produce sustainable and desired urban, environmental, and societal outcomes for all.

Following this guest editorial backdrop, this Special Issue (‘City 4.0: Urban Planning and Development in the Age of Digital Transformation’) contains the following 10 papers that review, empirically explore, or theoretically expand the City 4.0 concept and practice from the various angles of urban planning and development (or, in simple terms, urban



**Citation:** Yigitcanlar, T.; Xia, B.; Cortese, T.T.P.; Sabatini-Marques, J. City 4.0: Digital Transformation of Urban Settlements. *Sustainability* **2024**, *16*, 671. <https://doi.org/10.3390/su16020671>

Received: 7 January 2024  
Accepted: 11 January 2024  
Published: 12 January 2024



**Copyright:** © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

planning and development in the age of Industry 4.0, which is also referred to as planning the digital transformation of urban settlements).

In Paper #1, entitled 'Understanding City 4.0: A Triple Bottom Line Approach', authors expand our understanding of City 4.0 by elaborating it from three diverse but interrelated perspectives—namely, societal, environmental, and economic lenses or domains (also known as the triple bottom line approach)—and highlight the key City 4.0 themes—namely, circularity, adaptability, livability, accessibility, authenticity, and responsibility. The study findings inform researchers, local and regional authorities, and urban planners about the rising importance of the notion of City 4.0 and its prospective research areas.

In Paper #2, entitled 'Synergy of Patent and Open-Source-Driven Sustainable Climate Governance under Green AI: A Case Study of TinyML', authors provide a conceptual expansion of climate and environmental policy in open synergy with proprietary and open source Tiny Machine Learning (TinyML) technology, and offer an industry collaborative and policy perspective on the issue, through using differential game models. This study finds that collaboration and sharing can lead to the implementation of green AI, reducing energy consumption and carbon emissions, and helping to fight climate change and protect the environment.

In Paper #3, entitled 'Does the Digital Economy Promote Coordinated Urban–Rural Development? Evidence from China', authors investigate whether and how the digital economy affects coordinated urban–rural development by using a panel data model, a Spatial Durbin Model (SDM), and a mediating effects model. The study findings provide a reference for China and other developing countries similar to China on how to promote coordinated urban and rural development in the development process of the digital economy.

In Paper #4, entitled 'Smarter Sustainable Tourism: Data-Driven Multi-Perspective Parameter Discovery for Autonomous Design and Operations', authors offer an approach for leveraging big data and deep learning to discover holistic, multi-perspective (e.g., local, cultural, national, and international), and objective information on a subject. This study develops a machine learning pipeline to extract parameters from the academic literature and public opinions on Twitter, providing a unique and comprehensive view of the industry from both academic and public perspectives.

In Paper #5, entitled 'Does Cross-Border E-Commerce Promote Economic Growth? Empirical Research on China's Pilot Zones', authors investigate whether the construction of China's Cross-Border E-Commerce (CBEC) comprehensive pilot zones can promote economic growth and social sustainable development. This study employs the difference-in-differences method to test the impact of the establishment of CBEC comprehensive pilot zones on economic growth and discusses the impact mechanism.

In Paper #6, entitled 'Augmenting Community Engagement in City 4.0: Considerations for Digital Agency in Urban Public Space', authors develop four augmented reality experiences to learn more about the potential for this technology to transform community engagement practices in the context of City 4.0. The study findings highlight the value of augmented reality's affordances to bring to light new interactions between community members and project stakeholders.

In Paper #7, entitled 'Transformation of Industry Ecosystems in Cities and Regions: A Generic Pathway for Smart and Green Transition', the author examines the pathways towards a digital and green transition by assessing a generic pathway for the transformation of industry ecosystems in cities and regions based on processes of prioritization, ecosystem identification, and platform-based digital and green transition. This study generates insights into pathways, priorities, and methods. This enables public authorities and business organizations to master the current industrial transformation of cities.

In Paper #8, entitled 'Automatically Generating Scenarios from a Text Corpus: A Case Study on Electric Vehicles', authors propose to further automate the process of scenario generation by guiding pre-trained deep neural networks (i.e., BERT) through simulated conversations to extract a model from a corpus. Their case study on electric vehicles shows

that the approach yields similar results to previous work while almost eliminating the need for manual involvement in model building, thus focusing human expertise on the final stage of crafting compelling scenarios.

In Paper #9, entitled ‘Musawah: A Data-Driven AI Approach and Tool to Co-Create Healthcare Services with a Case Study on Cancer Disease in Saudi Arabia’, authors propose a data-driven artificial intelligence (AI)-based approach (called Musawah) to automatically discover healthcare services that can be developed or co-created by various stakeholders using social media analysis. This study emphasizes that open service and value healthcare systems based on freely available information revolutionize healthcare in manners similar to the open source revolution by using information made available by the public, the government, third and fourth sectors, or others, allowing new forms of preventions, cures, treatments, and support structures.

In Paper #10, entitled ‘Crowdsourcing Public Engagement for Urban Planning in the Global South: Methods, Challenges and Suggestions for Future Research’, authors provide a comprehensive overview of the crowdsourcing methods applied to public participation in urban planning in the Global South, as well as the technological, administrative, academic, socio-economic, and cultural challenges that could affect their successful adoption. This study puts forward important suggestions for both researchers and practitioners, where crowdsourcing has great benefits for the development of sustainable cities in the Global South.

This Special Issue, with its 10 paper contributions, generates new insights by investigating City 4.0 from various disciplinary angles to the digital transformation of urban settlements. We, the guest editors, believe that this Special Issue will be an important repository of relevant information, material, and knowledge to support research, policymaking, practice, and transferability of experiences regarding City 4.0.

Before we close, we wish to thank the authors of this Special Issue’s papers for accepting our invitation and submitting and revising their manuscripts within a short time frame. Moreover, we would like to thank the referees for their thorough and timely reviews, as well as the journal’s Assistant Editor, Ms. Sunnie Wei, for inviting us to serve as the Guest Editors of this Special Issue.

**Author Contributions:** Conceptualization and writing—original draft preparation, T.Y., B.X., T.T.P.C. and J.S.-M. All authors have read and agreed to the published version of the manuscript.

**Conflicts of Interest:** The authors declare no conflicts of interest.

**Disclaimer/Publisher’s Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.