

Urban Sustainability

Ali Cheshmehzangi · Maycon Sedrez ·
Hang Zhao · Tian Li · Tim Heath ·
Ayotunde Dawodu *Editors*

Resilience vs Pandemics

Innovations in Cities and
Neighbourhoods

 Springer

Urban Sustainability

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We collectively dedicate this book to all those who sacrificed their lives to make our communities safer and more resilient during the course of the COVID-19 pandemic.

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About This Book

The COVID-19 pandemic and other highly transmissible diseases outbreaks have given a new significance to the concept of “resilience”, placing it in the spotlight of built environment-related studies. New directions have emerged from expanding on adaptive planning, urban layouts, urban morphologies, spatial planning, healthy cities, etc. To enhance resilience in the post-pandemic era, various theories, practices, and hypotheses are being formulated by scholars around the world.

In this volume, several leading scholars and practitioners provide forefront discoveries about the built environment resilience during and after the recent pandemic. Historical perspectives of resilience and other highly transmissible diseases are also relevant to understand the COVID-19 issues. The contributors elaborate on critical exploratory, innovative, and cutting-edge research approaches, highlighting the effects of COVID-19 and other highly transmissible diseases in the design, planning, and perception of the built environment. This prominent aim of this book is to gather scientific experiences, reviews, analyses, discussions, recommendations, and solutions in the fields of urban planning, urban design, urban management, environmental science, architecture, etc.

Resilience vs Pandemics: Innovations in Cities and Neighbourhoods aims to document resilience-related innovations and new perspectives for the built environment, how people’s interactions adapt to new realities, and which mechanisms, tools, and strategies are required for such transformations in the following two scales of the built environments:

- (1) City/District; research on planning, commuting and mobility, politics, urban configurations, regulations, transmission and prevention, models, top-down processes, innovation processes, etc.
- (2) Community/Neighbourhood; research on collaboration, transmission and prevention, isolation and quarantine, social aspects, accessibility to services, technologies, education, policies, and innovative solutions.

The volume covers a wide range of studies, including physical and non-physical studies, which may refer to the city infrastructure, green/blue spaces, housing, policy-making, health services, social and economic issues, etc. The findings and results

contribute to the decision-making of governments, organisations, and institutions, as well as inspire scholars and future research for developing resilience in the post-pandemic era.

The book includes multidisciplinary studies from scholars, institutions, practitioners, and stakeholders performing research and plans in the fields of urban studies, architecture, urbanism, social sciences, computer sciences, history, politics, etc. The target audience recognises the relevance of resilience in the built environment to achieve more sustainable cities.

Ali Cheshmehzangi

Maycon Sedrez

Hang Zhao

Tian Li

Tim Heath

Ayotunde Dawodu

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About the Editors

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Tim Heath is a qualified architect, a town planner, and an urban design practitioner having worked in the UK for over 30 years and for the past 15 years in China where he has undertaken consultancy and projects related to architecture, urban design and building, and urban environmental performance assessments. He is the course director of the M.Arch. Sustainable Urban Design and the director of Postgraduate Programmes. He has previously been the director of the Institute of Architecture, the head of the School of the Built Environment, and subsequently the head of the Department of Architecture and Built Environment. He has also been the associate dean for Internationalisation and External Relations in the Faculty of Engineering, and an acting vice provost for Research and Knowledge Exchange at the University of Nottingham, Ningbo Campus, China. He has also acted as an external examiner in many prestigious universities around the world for undergraduate and postgraduate programmes as well as being a Ph.D. examiner. He has chaired many academic and professional accreditation and validation panels in the UK, Malaysia, China, and for the UAE's Commission for Academic Accreditation. He is also a member of the Human Factors Research Group.

Ayotunde Dawodu is a sustainable urban researcher and the energy engineer with a zeal for developing and implementing sustainable solutions across the urban fields: Waste Management, Transport, Energy (Efficient and Renewable), Spatial Planning, and Ecology Sectors, equipped with a B.Sc. in Mechanical Engineering, M.Sc. in Sustainable Energy Engineering, and Ph.D. in Energy Technologies and Sustainable Development. He also possesses expertise in Sustainable Building Design/Analysis and strongly advocates integrated community participation in urban decision-making and planning. Ayotunde also specialises in sustainability assessment tool methods

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Urban Resilience to Future Pandemics



Ali Cheshmehzangi, Maycon Sedrez, Ayotunde Dawodu, Tim Heath,
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Abstract The COVID-19 pandemic is undoubtedly the most severe public event in recent years, revealing how vulnerable our cities and neighbourhoods are. Although the concept of resilience has already emerged for responding to multi-disasters in existing research, the highly transmissible diseases have given a new significance to “resilience” and placed it in the spotlight of city sustainability-related studies. This chapter is an introduction to the book, which briefly describes the research context, aim, and structure of this book and highlights the role that urban scholars can play in pandemics. In order to prepare better for future probable pandemics, this book mainly focuses on innovations for enhancing built environment resilience and urban sustainability.

Keywords Resilience · Pandemics/Epidemics · Cities · Innovation · Neighbourhood · Urban sustainability

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1 Preparing for the Future: Resilience in Pandemics

Now that COVID-19 is no longer a public emergency, it remains a threat to global health and not the only one [1]. It is predicted that infectious diseases such as dengue, Yellow fever, and Zika virus will affect about 60% of the population in the world by 2080, and 58% of known viruses will be exacerbated by the deteriorating climate [2, 3]. Thus, there is a call from the WHO chief that the world must be ready to respond to the next pandemic [1]. Although the disease outbreak is a public health emergency, in which the participation of medical health seems to be the most important, the planning and design professionals also cannot be absent in the discourses about the existing and post-epidemic actions [4].

In our previous books of the *sustainability* series, “resilience” was primarily discussed in the topics of climate change, green infrastructure, and urban transition. In fact, most traditional “urban resilience” concepts have relied on environmental dimensions, such as the mitigation of natural hazards [5]. Unlike “engineering resilience” which focuses on a single state of equilibrium, Walker [6] and Holling et al. [7] define resilience as systems’ capacity to adapt, adjust and transform instead of returning to their initial states, which laid the theoretical foundation of urban resilience research. Before COVID-19, little research combined health emergencies with urban resilient thinking and built-environment impacts. Instead most studies have been focused on risk management, medical services, social organisation, and governance. In fact, public health issues were positioned as the core of global sustainable development in the United Nations Political Declaration on Universal Health Coverage in 2019 [8]. Moreover, the reduction of losses in disasters is mentioned in Sustainable Development Goal 11 to make cities and human settlements inclusive, safe, resilient, and sustainable [9]. Therefore, more urban research is needed to address the city issues caused by epidemic events.

In recent years, various issues brought on by diseases have further highlighted the city’s capacity for learning (preparedness), robustness (persistence), innovative capability (transformability), and flexibility (adaptability) [4]. And new directions have emerged from expanding on adaptive planning, social management, urban morphologies, healthy cities, etc. To enhance resilience in the multi-disaster era, scholars are formulating various theories, practices, and hypotheses worldwide. On the one hand, different evaluation methods are developed by global research groups. One initiative is the ARUP team’s holistic framework of city resilience, which structured indexes of health & well-being, economy & society, infrastructure & environment, and leadership & strategy [10]. Meanwhile, a Comprehensive Urban Resilience Framework is conceptualised by Ali Cheshmehzangi to support city management [11]. On the other hand, strategies and measures are also proposed by worldwide research. For instance, multi-purpose and multi-functional public spaces are applied for adaptive measures, especially green and blue infrastructures, as they are beneficial for citizen’s both physical and mental health during lockdown periods [12–16]. However, some pandemic issues still lack practical and effective solutions from urban stakeholders, and some of them are summarized from our previous work:

- A. the key factors and variables which build urban resilience in developing countries, especially the resource-limited regions;
- B. sustainable and alternative mobility solutions based on soft modes;
- C. accurate and effective city monitoring tool to access vitality and resilience during and after pandemics;
- D. the governance methods in metropolitan areas with sprawled urbanisation and integrated dynamic transportation systems;
- E. low-cost and accessible mechanisms and tools for promoting social participation and integrating multi-level public management;
- F. application of urban morphology analysis in pandemic studies;
- G. evaluation of feasibility and effectiveness of the quarantine regulations;
- H. the spatial solutions for challenges in vulnerable cities and informal communities;
- I. the impacts of changes in human behaviours and lifestyles on built environments.

In light of the current progress in urban resilience studies and pandemic research, we note that there are still many possibilities that can be explored. For this book, we invite chapters that provide forefront discoveries about the built environment resilience during and after the pandemic, which covers a wide range of policies, strategies, guidelines, and discussions from various perspectives. Moreover, the authors highlighted the effects of COVID-19 and other highly transmissible diseases in the design, planning, and perception of the built environment, as well as elaborated on critical exploratory, innovative, and cutting-edge research experiences, reviews, analyses, discussions, recommendations, and solutions in the fields of urban planning, urban design, urban management, environmental science, and architecture.

2 The Aim and Objectives of the Book

The book aims to document resilience-related innovations and new perspectives for the built environment, how people's interactions adapt to new realities, and which mechanisms, tools, and strategies are required for such transformations in the following two scales of the built environments:

- (1) City Level: including the metropolitan areas, urbanized regions, transportation networks, city planimetric layout and fabric;
- (2) Neighbourhood Level: including network pattern, spatial morphology, streets and blocks form, and human activities.

Based on the contributions of chapters at these two scales, the objectives of the book can be concluded as below:

- (1) To explore the possibility of linking pandemic innovations with built environment resilience from a comprehensive and interdisciplinary perspective in multi-scales and multi-contexts;

- (2) To share valuable insights into how pandemic innovations can be applied in cities and neighbourhoods specifically;
- (3) To provide strategies, guidelines, and experience to scholars, institutions, practitioners, and stakeholders performing research and plans in the fields of urban studies.

The book covers both physical and non-physical studies, which refer to city infrastructure, public spaces, networks, policymaking, health services, and social issues. We hope the findings and results will expand the knowledge for government decision-makers, organizations, and institutions, as well as inspire scholars to develop research about resilience in the post-pandemic era.

3 Structure of the Book

The book is divided into two parts based on the studied scales of the built environment, and each part includes five chapters, including various case studies, theoretical research, or specific policies and strategies. The selection criteria are based on the subject scope (urban studies) and the aim of this book, which focuses on the pandemic impacts on built environments. The different scales ensure the comprehensiveness of the study, including both the macro planning of the city and the attention to the small-scale space. In addition, the different cases in the following chapters provide us with reflections from different countries, which may inspire related exploration in different regions. Meanwhile, we can compare and learn lessons from their experiences.

This book responds to the call of WHO and aims to prepare for potential threats. Therefore, it is arranged based on the studied scales to cover the comprehensive and multi-context topics better. These are summarised as (1) Innovations in Cities and (2) Innovations in Neighbourhoods.

PART 1: Innovations in Cities

The first part provides five cases of resilience innovations at the city scale, including case studies in India, Brazil, America, and European cities. They discussed the determinants of urban resilience, mobility innovation, monitoring tools, multilevel governance, and human resilience. A perspective of master urban intervention is highlighted in these studies. Below is the summary of the five chapters included in this part.

Chapter 2—“Exploring the Determinants of Urban Resilience Against Pandemics: Case of Four Large Indian Cities”

By Sudha Panda, and Soumyendu Shankar Ray

Cities are the epicenters of people and economic activities but with Covid-19 affecting both lives and livelihoods, all economic activities have been brought to a grinding halt. It is important therefore for cities to understand the factors which build urban resilience to be in a better state of preparedness. The study aims to study some of the

determinants of urban resilience against Covid-19 in the context of 4 large Indian cities across the first wave and second wave of the pandemic, in 2020 and 2021 i.e. Mumbai, Bengaluru, Pune and Surat. The explanatory variables for the infection which have been taken are the crowding variables (population, gross density, net density, street crowding and indoor crowding), Health resources variable (hospital beds and medical facilities), Socio-economic variables (poverty) and Environmental variables (Solid waste generated, Sewerage discharged, Water Supply and Open Spaces). The analysis is done at a granular level: wards, the smallest administrative unit of a city. It uses the multiple linear regression method to find the coefficient of correlation between the dependent variable (infection rate) and independent variables under Crowding variables, Socio-Economic variables, Health Resources variables and Environmental variables. The test of an ideal urban development model, be it a compact city or a sprawling city, is its resilience to natural and manmade disasters. In a developing nation like India, where resources are limited, it is imperative that resources are optimally used, both under normal and pandemic conditions. Crowding variables are seen to have a much stronger influence in prevention and control of the virus transmission than Socio-Economic, Health Resources or Environmental variables which justifies the stringent lockdown measures taken by the Indian government.

Chapter 3—“*The Healthy City: How Sustainable Mobility Policies Gave a Resilient Response to the COVID-19 Crisis Through Tactical Urbanism*”

By Vicente Iborra Pallarés, María Flor García, Luís Aragonés Pomares, and Armando Ortuño Padilla

City and public health is a binomial with a long common story. Throughout history, there have been many signs of linkages between adequate urban planning and the health of the inhabitants of our cities. A few months before the outbreak of the COVID-19 health crisis, this relationship was highlighted again by the United Nations Organization stating the links between Goals 3 and 11 of the Sustainable Development Goals.

This health crisis changed our cities and the way we moved around them and we saw how some cities were more resilient than others. In this study, the dimension to be used to define the greatest resilience of a city is the reaction time from the moment the crisis broke out. The cities to which we are going to refer (Berlin, Milan, Oakland and Bogota) were able to adapt to the situation and overcome the critical period from a mobility point of view in record time (during the first six months of the COVID-19 crisis). That is precisely why these cities were cited as examples of good international practices by the general press worldwide. This media repercussion was relevant, since it showed to a wider audience, different sustainable mobility solutions based on soft modes, for trips of less than 5 km. All of these solutions shared two common aspects: they were based on “tactical urbanism” and constituted “urban laboratories”.

This work has a double objective: on the one hand, to analyse the characteristics that defined the international good practices referenced by the generalist press; and