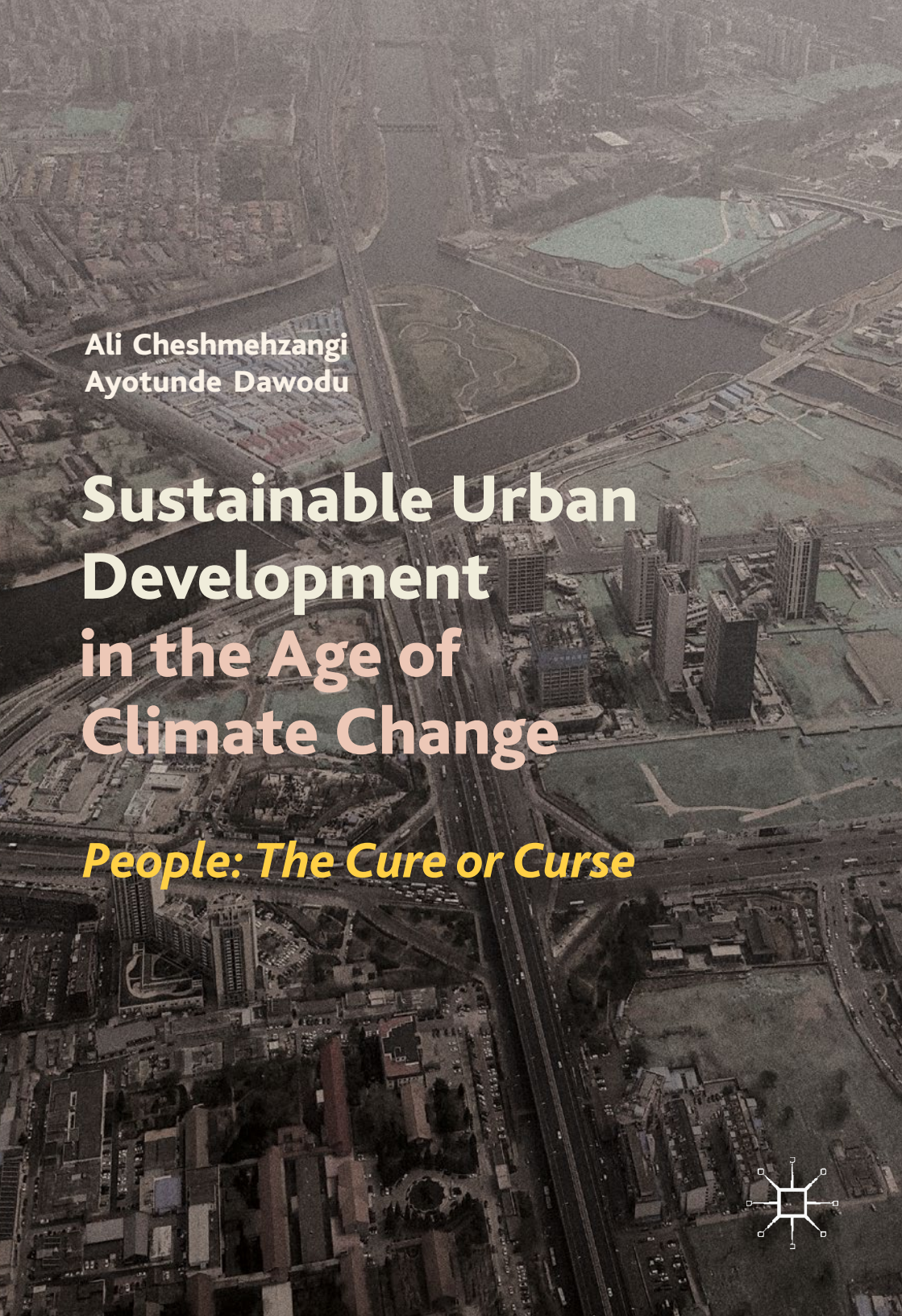

Ali Cheshmehzangi
Ayotunde Dawodu

Sustainable Urban Development in the Age of Climate Change

People: The Cure or Curse

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palgrave
macmillan

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ISBN 978-981-13-1387-5 ISBN 978-981-13-1388-2 (eBook)
https://doi.org/10.1007/978-981-13-1388-2

Library of Congress Control Number: 2018952289

Cover credit: Ali Cheshmehzangi
Cover design by Tom Howey

This Palgrave Macmillan imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

We dedicate this book to those who repudiate climate change and its impact on humanity. We urge them to become smarter. It's that simple.

We also collectively dedicate this book to youth around the world, on whom we depend the most for building the future. We specifically mention the youth of Nigeria, with the hope that your resourcefulness and vibrancy will help to mitigate the failures of leadership.

Ali Cheshmehzangi:
For Amir and Sara, my two fellow travellers, whom I care about unconditionally!

Ayotunde Dawodu:
For my parents: Dr Jaiyeola Dawodu and Mrs Omowunmi Margaret Dawodu
For my siblings: Olayemi Dawodu and Oluwaseyi Dawodu

Preface

Since around the start of the 1980s, and mainly since the inception of Agenda 21, research from a number of disciplines has sought to develop methods of sustainable urban development and to tackle the issues around and impacts of climate change. They have particularly focused on innovations concerning new patterns, paradigms and experimental scenarios that relate to city transitions—eco, green, resilient, low carbon, smart and so on. The framework of sustainable development goals (SDGs) established by the United Nations also highlights the directions of transformations and transitions, and is aimed at greater prosperity for all. One of the goals is 'sustainable cities and communities', and most of the others are also associated with the urban sustainability agenda. In an urbanising world, this level of attention is inevitable. The implementation of SDGs is set to have a significant impact on the global scale and is aimed at providing substantial achievements by the year 2030.

In recent decades, much of the focus has been on finding sustainable pathways for the development of a better society, a better future and a better planet and this will continue. To date, there has been little attempt to put together a set of people-oriented and bottom-up scenarios for transitions; the type of initiatives that we regard as the correct direction for sustainable urban development in the age of climate change.

Our planet is collapsing. Its resuscitation depends on us providing the cure, and its degradation owing to our inaction is our inevitable curse. We depend on the planet for our survival, and not the other way around. For a long time, it has been advocated through religion that the afterlife is a better place beyond this current existence. In this view, our expected

saviours will not come to save this planet but will take us to a world beyond. The new concepts that are appearing in our advanced civilisation reconfirm this scenario with a different narrative and suggest a better future on another planet. If we remain as the curse, this may just happen. To become the cure, as we believe we should, we can become the life-force that sustains our planet.

For this to take place, we have to start equipping future generations with the tools that will allow them to help the generations that follow them. Whether this takes place or not is our choice.

Ningbo, China

Ali Cheshmehzangi
Ayotunde Dawodu

Acknowledgements

We appreciate the efforts put in place regarding our initial case study research, which was conducted by our graduating students of the Architecture Bachelor's degree programme (in 2017–18) at the Department of Architecture and Built Environment, University of Nottingham, Ningbo, China (UNNC). We particularly thank our research intern, Ryan Jonathan, and our editorial support, Megan Hau. We also thank Bamidele Akinwolemiwa and Juan Yang for their insight and creative input on the various case studies. In terms of moral support, we thank Olutoye Remi-John, Olawale Olanubi, Chinazor Ukwuegbu, Maryam Dehbozorgi, XiKai Yang and YanAn Huang. We also thank the International Doctoral Innovation Center (IDIC) and the Centre for Sustainable Energy Technologies (CSET) for their consistent support over these years.

More importantly, our special thanks go to many activists, individuals and people-driven organisations that fight against issues of climate change at the bottom of the pyramid. They inspire and encourage us and deserve our highest gratitude.

Finally, we thank those who believe in what we do.

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About the Authors

Ali Cheshmehzangi holds a PhD in Architecture and Urban Design (Nottingham), a Master's in Urban Design (Nottingham), a Graduate Certificate in Professional Studies in Architecture (Leeds) and a Bachelor's degree in Architecture (Leeds). He is an urbanist and urban designer by profession. Ali is the Head of Department of Architecture and Built Environment and Director of CSET at UNNC. He is also Associate Professor of Architecture and Urban Design and Director of Urban Innovation Lab (UIL). He has recently completed a comparative project concerning smart-eco city transitions in cities of the EU and China. He now works on sustainability assessment and low-carbon development of cities in China. Ali has previously worked in several UK universities and practices, and has worked on several practice and research projects on eco-cities in China (Cao Feidian eco-city, Meixi Lake eco-city, Chongming Island, etc.), low-carbon town planning, urban modelling of residential neighbourhoods in several countries, green infrastructure of cities, toolkits for resilient cities (with Arup and Siemens), sponge city development and green development in Ningbo City, and other projects related to eco/green/smart city developments in various contexts. He has developed a comprehensive planning toolkit, called Integrated Assessment of City Enhancement (iACE). More recently, he has developed the new theme of Eco Fusion and has focused on the direction of eco-development in China. He is also the coauthor of two books published by Palgrave, *Designing Cooler Cities* (2017) and *Eco-Development in China* (2018).

Ayotunde Dawodu is a Mechanical Engineering (BSc) and Sustainable Energy Engineering (MSc) graduate from the University of Lagos, Nigeria, and the University of Nottingham, UK, respectively. He is currently in his concluding year as an IDIC (International Doctoral Innovation Centre) PhD researcher from the Department of Architecture and Built Environment at UNNC. His current research is based on the built environment and is focused on creating a method that can be used to develop Neighbourhood Sustainability Assessment Tools for the sub-Saharan African region. This means creating a tool that measures and assigns sustainability points to a list of urban issues, via the development of sustainability indicators. The aim is to provide an innovative and systematic approach to sustainable urban development for the African region that can be used by developers, planners, clients and policy-makers, who wish to actualise the modern-day goal of sustainable cities. His areas of interest include sustainable urban planning, sustainability assessment, sustainable energy in buildings, people-centred planning for cities and sub-Saharan African urban development. Ayotunde is also the winner of the Star of Research award (2016/2017) at the UNNC, for being the most outstanding researcher in the Faculty of Science and Engineering.

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CHAPTER 1

Introduction: Climate Change and Cities—Perspectives, Planning and People

1.1 A General Overview

This book is the result of several years of research into cities and city environments, which focused on the issues of energy, resilience, cooling, heat events and adaptive planning; all of which are directly linked to sustainability. This work highlights the issues surrounding climate change and its impact on cities and living environments. In an urbanising world, this relationship between urbanisation and climate change cannot be neglected. As expressed by Dow and Downing (2011, p. 42) climate change 'results from complex interactions with the natural environment, coupled with social and economic changes. Such complexity is not fully understood, and is impossible to predict.' Furthemore, cities are also complex social and economic entities, and this adds significantly to the complexity of climate change. In fact, some of these complex changes have the potential to 'create large-scale humanitarian crisis in the future' (ibid.). As the situation becomes more complex, the result will be more unpredicted scenarios. Some of these climate change effects will ultimately bring substantial changes to how we drive future development. They will eventually influence some of our decisions regarding where we choose to live, work and stay, and will impact our well-being and quality of life.

A. Cheshmehzangi, A. Dawodu, *Sustainable Urban Development in the Age of Climate Change*,
https://doi.org/10.1007/978-981-13-1388-2_1

According to the United Nations Environmental Report (2012), cities occupy only 3% of the global land surface but consume more than 75% of our overall energy and produce more than 50% of global waste. However, cities are our major economic hubs, accounting for the generation of 80% of global gross domestic product. The latter figure alone makes urbanisation inevitable. This is regardless of any of the negative results, particularly for developing nations who look up to the achievements of developed nations. The fact is that there is no rural developed nation. Hence, we anticipate that urbanisation will continue, as it can be expected to make nations more prosperous as they aim for more growth and economic development. This never-ending human need, or perhaps greed (Gough 2016), will continue to change our climates and earth systems. The ultimate impact of this will be on societies, which will become more fragile and more sensitive to the impacts of climate change. There are indications that the resilience of many global habitats are already being challenged. Therefore, the expected consequences will not only be environmental, but will also have significant implications for societies, as well as the future of our living environments, cities and nations.

In the last two decades, most of our built environment development has been concentrated on urban development and urban expansion, multiplying the number of mega-cities, extending the physical boundaries of many cities and increasing the density of many urban environments. These trends have changed our cities significantly, and will continue to change the major cities of developing nations around the globe. The facts and figures for urbanisation have been introduced and discussed by many scholars, but their correlation with the increasingly important issue of climate change is yet to be assessed in detail. When the Paris Talks closed in 2015, much of the global attention was on the initiation of the process of decarbonisation of cities (Cheshmehzangi 2016). The argument that we are living on an urban planet, and that urbanisation will continue until at least 2050 puts major pressure on the direction of urban transformations and sustainability ideals. Hence, climate change matters: its impacts are widespread, from food security concerns, to issues of energy, water, environment and society, particularly concerning the resilience of our urban environments.

Cities and operations within city environments are major contributors to climate change. Nevertheless, in recent years they have also played an increasingly large role in combating climate change impact. The objective of this book is to understand the impact of climate change on cities and how people can act to reverse or mitigate some of these impacts. As argued by Dodson (2010, p. xix), many of our human activities are economic, and generally

contribute to the changes in climate that will eventually affect our quality of life and well-being. Therefore, the need for transformation is essential:

> We are faced with the need to develop new knowledge, a better understanding of how biophysical and socio-economic systems interact, develop new strategies and actions, and new international cooperative arrangements in order to solve what is the defining challenges of the twenty-first century.

In this respect, we argue in support of changes, or at least tangible transitions, in institutions and institutional arrangements, mindsets and mentalities, behaviours and preferences, and more importantly general knowledge. Hence, human beings as the planet's dominant species need to be more responsive to these challenges and become more reflective when it comes to finding the right solutions. Future pathways should be informed by decisions taken in the past and ought to differ in many ways. Leaving the majority out of decision-making processes will harm us in the long run.

Most people are currently not very involved in the process of change, but given the number of projects that exist around the globe we anticipate an increase in engagement in these transformational and transitional processes. The implementation of people-led and people-oriented projects and/or initiatives will mean a new round of interventions in cities that will mitigate the effects of climate change. In this book, we highlight some of these projects and suggest methods of implementation that will help to achieve sustainable development goals. Our arguments focus on the people dimension as central to climate change mitigation. We do not suggest quick fixes or unrealistic interventions but emphasise long-term visions and bottom-up scenarios.

1.2 Climate Change Matters

First, it is important to clarify that climate change is different from global warming. This is a mistake that is made by many, especially the general public. Climate change itself should be regarded as 'global climate change' (see climate.nasa.gov). Although many aspects of climate change relate to warming issues, the term also covers other complex climatic conditions. Regardless of their nature, the role of human activities in this climate change is certainly a major concern. For instance, anthropogenic global warming (AGW) is simply a term used for global warming caused by the actions of humans. Many of the temperature fluctuations and sudden seasonal changes signify new climatic conditions that affect regions and even nations. In recent years,

we have seen tangible delays in seasonal change or sudden changes of temperature. Some of these effects are unprecedented but are occurring more frequently. Cities are often affected the most. This is because they generally have a higher population in a concentrated area, higher intensity of activities, and higher temperatures owing to urban heat island effects (UHIE). Thus, it would be an mistake not to relate climate change matters to city operations and urbanisation.

We have to come to the recognition that as well as changing the planet, urbanisation is changing us as a species significantly as well. As Girardet puts it (2008, pp. 3–4), 'all-out urbanisation is fundamentally changing the condition of humanity and our relationship to the earth'. He argues that we are increasingly changing ourselves into 'an urban species'. In reality, by making such transformations we experience many changes, with our needs changing our lifestyles and consumption patterns, and our new perspectives affecting what we acquire and what we care about. The growing consumer-based societies can relate to these changes closely, and they encounter new issues of governance, sudden increases in energy demands, food supply requirements, water shortages and environmental degradation. We put ourselves into a cycle, in which at first we affect our environment and climate, and then are affected by our environment and climate. This continues until we or the environment changes; and if this is to be a positive move, it would better come from us rather than the planet.

Mistakenly or just through thoughtlessness, in many disciplines we often regard humans as separate from the eco-system rather than part of it—a common egocentric mistake that separates us from nature and our environment. To understand the issues created by climate change we should first understand its causes and effects. Much climate change is created by human activity and is caused by our accumulated neglect during more than two centuries of industrialisation, rapid development, environmental degradation and increased production and consumption. In recent years, globally we have recorded many hottest years and hottest days. The increasing frequency of extreme heat days indicates a gradual change in our climatic conditions. Resulting from climate change, many of our natural disasters are also directly linked with the increase in temperature. These include more frequent hurricanes and wildfires, both of which are fuelled by increasing water and atmospheric temperatures.

In their ongoing study, *Global Climate Change: Vital Signs of the Planet*, NASA (see climate.nasa.gov) gives a comprehensive introduction to the scientific evidence of climate change and how climate has changed over

the years. Nine areas of compelling evidence for climate change are listed: (1) global temperature rise; (2) warming oceans; (3) shrinking ice sheets; (4) glacial retreat; (5) decreasing snow cover; (6) sea level rise; (7) declining Arctic sea ice; (8) extreme events; and (9) ocean acidification. All this is based on global warming and its adverse impact on the global ecosystem (Cheshmehzangi and Butters 2017). The following sheds some light on this evidence as it relates to cities and city environments.

1.2.1 Global Temperature Rise

Globally, the average surface temperature has been steadily rising since the late nineteenth century, accounting for an increase of 1.1 °C. In many cities, particularly in the warmer climate zones, this increase has been more than 2.0 °C, and in some locations up to 4.0 °C. In fact, most of the recorded global warming has occurred in the past four decades, with 2016 and 2017 been verified as the warmest years on record. If this continues to increase, as is expected in city environments in particular, we should witness severe cases of UHIE and urban overheating scenarios, with increases in cooling load and demand, health issues, discomfort and vulnerability of the affected populations.

1.2.2 Warming Oceans

The rise in temperature not only affects the land surfaces of the planet, but also affects (to a greater degree) the oceans, which absorb much of the heat. Such atmospheric changes have resulted in an increase in temperature both in the top layer (up to 700 m) and in the deeper waters. Although this increase appears very minimal (Levitus et al. 2009), its longevity is the main concern. The impact on cities of warming oceans is mainly related to the increase in frequency of tropical cyclones/storms and the intensity of hurricanes. These increasingly affect many coastal cities globally. The most affected regions, where cities are often located, are coastal zones and bay areas. Climate change puts significant pressure on the resilience of such regions.

1.2.3 Sea Level Rise

The continuous shrinkage of ice sheets, glacial retreat and declining Arctic sea ice are all contributing to sea level rise in many parts of the world. The gradual disappearance of land owing to sea level rise has affected human