The Urban Book Series

Ender Peker
Anlı Ataöv *Editors*

Governance of Climate Responsive Cities

Exploring Cross-Scale Dynamics

Springer

The Urban Book Series

The Urban Book Series is a resource for urban studies and geography research worldwide. It provides a unique and innovative resource for the latest developments in the field, nurturing a comprehensive and encompassing publication venue for urban studies, urban geography, planning and regional development.

The series publishes peer-reviewed volumes related to urbanization, sustainability, urban environments, sustainable urbanism, governance, globalization, urban and sustainable development, spatial and area studies, urban management, transport systems, urban infrastructure, urban dynamics, green cities and urban landscapes. It also invites research which documents urbanization processes and urban dynamics on a national, regional and local level, welcoming case studies, as well as comparative and applied research.

The series will appeal to urbanists, geographers, planners, engineers, architects, policy makers, and to all of those interested in a wide-ranging overview of contemporary urban studies and innovations in the field. It accepts monographs, edited volumes and textbooks.

Now Indexed by Scopus!

More information about this series at http://www.springer.com/series/14773

Ender Peker · Anlı Ataöv
Editors

Governance of Climate Responsive Cities

Exploring Cross-Scale Dynamics

Springer

Editors
Ender Peker
British Institute at Ankara
Ankara, Turkey

Anlı Ataöv
Middle East Technical University
Ankara, Turkey

ISSN 2365-757X ISSN 2365-7588 (electronic)
The Urban Book Series
ISBN 978-3-030-73398-8 ISBN 978-3-030-73399-5 (eBook)
https://doi.org/10.1007/978-3-030-73399-5

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The idea of this book came out from a wide range of contributions from scientists in urban design and planning, who participated in the International Conference on Production of Climate Responsive Urban Built Environments held in the Istanbul Policy Center, Istanbul, Turkey, in May 2019. The book presents the selected papers which focus on the governance dimension of climate responsiveness at the national, city and neighbourhood scales. The book particularly focuses on facilitating knowledge generation that plays the role of a catalyser in combining research, plans and policies, and authorities together through the emergence of climate governance mechanisms. It is based on the assumption that when global, national or regional decisions are hierarchically applied to localities, they become inadequate in guiding the evolution of resilient responses. Bottom-up planning and design processes facilitate more effectively the construction of these responses and the implementation of relevant actions.

Respectively, the book aims at reflecting on how institutional arrangements and governance mechanisms in combating climate change can emerge at different scales through cross-scale interactions in different contexts. It includes applied cases, from different countries around the world including Chile, Ecuador, Italy, Turkey and the UK, that present how far the governance dimension of climate responsive planning processes facilitate finding and implementing locally working solutions. The book highlights the significance of bottom-up scaling and cross-scale interactions in the governance of climate responsive cities.

The book underlines two main contributions. First, it becomes possible to generate actionable and resilient solutions when they are formulated at the local level through the participation of relevant interest groups. Local initiatives constitute the ground for finding working solutions to context-specific needs in the face of climate change. Second, different mitigation and adaptation policies at different urban scales call for the emergence of context-sensitive governance mechanisms. Within the complex structure of climate action decision-making, horizontal and cross-scale relationships should be taken into account.

The book comprises two groups of papers. The first group draws the theoretical and methodological framework of resilient and actionable climate-responsiveness through urban design and planning. The second group presents a set of case studies showing how community-driven solutions work better for practice.

Ankara, Turkey

Ender Peker
Anlı Ataöv

Acknowledgements

We would like to thank all the authors without whose efforts this book could not have been written.

We are grateful to the Istanbul Policy Center for funding and hosting the International Conference on Production of Climate Responsive Urban Built Environments, which enabled the initiation of this book project. We also would like to thank the staff at Springer, in particular Juliana Pitanguy and Sanjievkumar Mathiyazhagan, for their help and support.

Contents

Editors and Contributors

About the Editors

Ender Peker is a post-doctoral research fellow at British Institute at Ankara (BIAA), specializing in climate responsive urbanism, with a particular focus on the ways in which the built environment is co-designed by technical rules, regulations and actors. He holds a Ph.D. in Planning from the University of Reading, UK, and a MSc degree in Urban Design from Middle East Technical University. He worked as an urban designer, lecturer, researcher and consultant for private and public institutions and non-governmental organizations in Turkey, Germany and the UK. He was involved as a visiting scholar at the Leibniz Institute for Research on Society and Space, the Joint Centre for Urban Design at Oxford Brookes University and the Department of Planning and Landscape at the University of Manchester in the UK. His research interests cut across the following themes: (i) urban design and the built environment, (ii) climate responsive design and architecture, and (iii) participatory planning and governance.

Anlı Ataöv is a professor in the Department of City and Regional Planning at Middle East Technical University (METU). She received her Master's in strategic planning from Ohio State University (OSU) in the US. She holds doctorate degrees in environmental aesthetics from the Ohio State University and in action research from the Norwegian University of Science and Technology (NTNU) in Norway. She worked as a planner, professor, researcher and consultant for private, public, and national/international non-governmental organizations and institutions in Turkey, the U.S., Norway, Denmark and the U.K. She received national and international academic awards and grants, worked as a member of natural conservation commissions. Her professional and academic practice and publications mainly focus on participatory planning and design, sustainability and social change, cultural/natural conservation planning and area management, people and environment, arts and design.

Contributors

Anlı Ataöv Middle East Technical University, Ankara, Turkey

Antonio Báez YES Innovation, Pontificia Universidad Católica Del Ecuador, Quito, Ecuador

Gilda Berruti Department of Architecture, Federico II University of Naples, Naples, Italy

Darinka Czischke Faculty of Architecture and the Built Environment, TU Delft, Delft, The Netherlands

Simin Davoudi Newcastle University, Newcastle upon Tyne, UK

Micaela Duque YES Innovation, Quito, Ecuador

Ozlem Edizel-Tasci Boston University, Boston, MA, USA

Aksel Ersoy Faculty of Architecture and the Built Environment, TU Delft, Delft, The Netherlands

Graeme Evans University of the Arts London, London, UK

Macarena Gaete Cruz Faculty of Architecture and the Built Environment, TU Delft, Delft, The Netherlands

Grace Garofalo GMG Diseño y Construcción, Pontificia Universidad Católica Del Ecuador, Quito, Ecuador

Ignacio Loor Universidad San Gregorio de Portoviejo, Portoviejo, Ecuador

Mauricio Masache-Heredia Ecoglobal Solutions, Universidad Regional Amazónica IKIAM, Tena, Ecuador

Gabriela Mejía GMG Diseño Y Construcción, Pontificia Universidad Católica Del Ecuador, Quito, Ecuador

Paco Mejía GMG Diseño Y Construcción, Quito, Ecuador

David Montoya Universidad Central Del Ecuador, Quito, Ecuador

Maria Federica Palestino Department of Architecture, Federico II University of Naples, Naples, Italy

Ender Peker British Institute at Ankara (BIAA), Ankara, Turkey

Nicolas Salmon YES Innovation, Quito, Ecuador

Ellen Van Bueren Faculty of Architecture and the Built Environment, TU Delft, Delft, The Netherlands

Grace Yépez YES Innovation, Pontificia Universidad Católica Del Ecuador, Quito, Ecuador

Mónica Yépez YES Innovation, Quito, Ecuador

Chapter 1
Governance of Climate Responsive Cities: Scale Matters!

Ender Peker and Anlı Ataöv

Abstract This chapter draws the theoretical framework of the book. Firstly, it presents a reflection on the discussions of scale in environmental governance literature and conceptualizes a framework of scale that addresses climate change governance. The framework is composed of three main categories including (i) scientific knowledge, (b) plans and policies, and (c) authorities of action. Within this trihedral frame, 'practice' is positioned as the social context in which these categories can interplay adaptively. Secondly, it introduces the chapters that exemplify the practice of governance around the world across different scales, with a particular focus on the social and spatial aspects of climate responsiveness.

Keywords Scale · Governance · Climate change · Action · Local · Practice

Due to its complex nature, climate change has reciprocal relations with several issues such as sustainable urban development, resource efficiency, food security and many other biotic dimensions linked to cities and urban life. The contribution of cities to climate change and the environmental impact on cities have been dealt with scientifically for more than a half-century. Transnational organizations also express their concern about climate change and seek ways to overcome it through initiating agreement processes with governments for the last thirty years. In pursuit of this, practical attempts of combating climate change at national and city authorities are more recent.

Within this context, scale remains an important topic of discussion with the questioning of 'what is the right scale' for achieving climate change targets. This is particularly put forward through the policy discussions about mitigation and adaptation. Studies of environmental governance also elaborate on the question of scale (Meadowcroft 2002; Bulkeley 2005, 2010; Bulkeley and Betsill 2005; Betsill and Bulkeley 2006; Cash et al. 2006; Urwin and Jordan 2008). Climate change is seen

E. Peker (✉)
British Institute at Ankara (BIAA), Ankara, Turkey
e-mail: ender.peker@biaa.ac.uk

A. Ataöv
Middle East Technical University, Ankara, Turkey
e-mail: ataov@metu.edu.tr

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_1

as a complex matter whose governance is brought by multiple scales of interaction between actors, institutions and environmental systems (Adger et al. 2005; Newell 2006; O'Brien et al. 2000; Wapner 1996; Bulkeley 2005; Ostrom 2008, 2010). Respectively, different scales of governance highlight the social component of climate change through discussions on different measures such as civil and political rights (Brooks et al. 2005; Ensor et al. 2015), the availability of decision-support tools (Nay et al. 2014), financial and technical capacity (Dessai et al. 2005; Glaas et al. 2010), socio-political goals (Haddad 2005; Næss et al. 2005; Burch and Robinson 2007), networks and willingness to learn (Conway 2005; Gupta et al. 2010; Tompkins 2005).

Bulkeley (2005) particularly emphasizes that environmental governance should be sensitive to both the politics of scale and the politics of networks. While the politics of scale involve social struggles in the continuous reorganization of spatial scale (Swyngedouw 2000), the politics of networks advocate horizontal relations through associations (Smith 2003). Bulkeley (2005) explains three different conceptualizations of the spaces and scales of global environmental governance, which include the nation-state as the primary arena of political authority, the presence of horizontal networks and the location of political authority in these networks, and the association with global civil society that distorts the notions of hierarchies. These networks often serve as a reference to local practice.

Cash et al. (2006) combine the network scale with temporal and spatial scales recognizing social interactions and associations related or unrelated to political or geographic space. Additionally, they highlight the administrative and legislative as well as the plan scales. While the administrative and legislative scales refer to statutory political boundaries created by constitutional means, the plan scale represents strategies, policies, projects and tasks applicable within those administrative and legislative scales. Furthermore, Cash et al. (2006) portray aspects of knowledge as a scale debating on the gap between highly generalizable understanding produced in formal science and local understanding generated through practice.

These discussions on scale in climate change establish the ground for how governance can be methodologically approached to determine and implement interventions that work and are meaningful for climate responsive cities. Taking these discussions in literature as a point of departure, this book presents governance with a particular focus on the social and spatial aspects of climate responsiveness and reads the practice of governance across different scales. The book also values the aspect of knowledge generation as a catalyser to combine all these. Respectively, the book conceptualizes a framework of a scale composed of three main categories including (A) Scientific Knowledge, (B) Plans and Policies and (C) Authorities of Action, (Fig. 1.1). This framework presents 'practice' as the social context in which these three can interplay adaptively.

The *first* category includes the scales of scientific knowledge in climate change from different disciplines such as architecture, urban design, planning, engineering, sociology, geology, water, agriculture, forestry and the environment. In general terms, science focuses on a particular reality and often uses parameters in order to understand it. Every discipline takes this position to some extent and identifies its field of

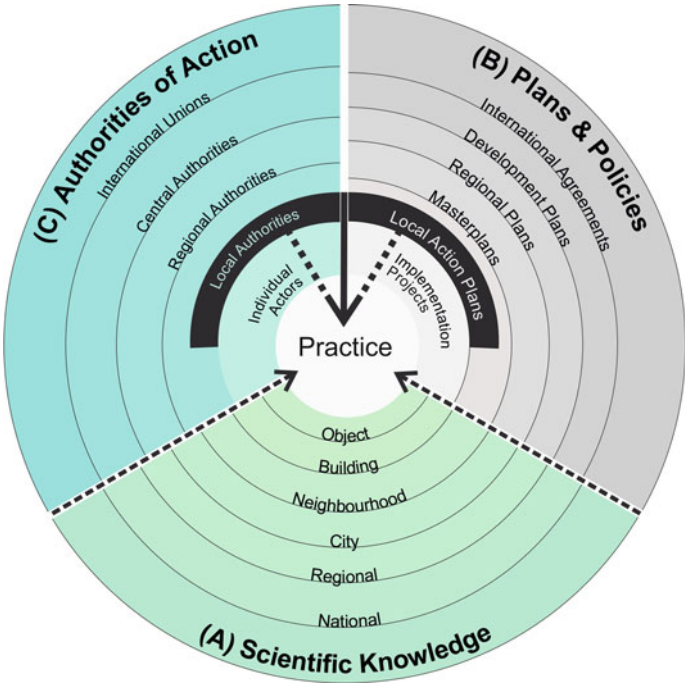

Fig. 1.1 Scales of scientific knowledge, plans and policies, authorities of action

work through its own logic. Social and technological development stands as an important driving force in this act and that is often related to the physical world. Within the context of climate change, research can be categorized under six general levels including object, building, neighbourhood, city, regional and national. Research activities vary from the design of a turbine blade with aerodynamics that can generate maximum energy from wind to the most efficient energy system construction at the national level or from the green design architectural characteristics at the building level to the green–blue infrastructure systems at the regional level. Research related to people also covers a variety of domains ranging from the individuals' perception of climate change to institutional behaviour within, between and across organizations.

Today's scientific scope recognizes the complex character of the world's reality grasped as much as the human intellect capacity can allow, however, scientific research encounters limitations both paradigmatic and methodological in deciphering the structure and behaviour of this complexity. It draws rigid boundaries of scale within which inquiries are conducted under normal circumstances. This, in turn, further supports the repetition of the accustomed research practice which results in strengthening already constructed boundaries and deepening the created scientific space nourished within them. Multi-disciplinary scientific research attempts to cross these boundaries. Although most disciplines work together, they often do not provide

a shared holistic explanation of the complexity of reality in the way it exists. Innovative solutions revealed from scientific research are also often conceptualized in an 'ideal world' scenario where there is an optimum fit between climate and response. However, in practice, the direct application of scientific knowledge is almost impossible due to context-based characteristics which require the formulation of specific interventions in line with real-life circumstances. Technical design solutions provided from different disciplines should be interpreted, classified and prioritized in a way that maximizes their input into urban development.

The knowledge produced should be more human-oriented and harmonized with social and political realities of the local environment. To do that, it is essential to understand social production processes. This includes an understanding of the way people develop responses to climate change, the way it affects urban daily life activities and the way people use or live in urban built environments. For example, reducing energy consumption and maximizing comfort levels in society while being sensitive to the wider needs and desires of citizens, calls for an understanding of both the formation of the physical environment and the social dynamics that are influenced by the design of the urban built environment.

Secondly, policies and plans stand as the mediums for implementation in practice with their capacity of enabling (or disabling) the use of scientific knowledge. Climate policies at the national level are often shaped by international assessment reports written by groups of scientific scholars under a convention or network. National policies and plans generate a body of strategic documents with the assumption that they shed light on the policies and plans under a territorial division cascaded from international, to national, and from regional to local (Bulkeley and Betsill 2003; Owens 2004). This assumption often fails to eventuate in practice due to two reasons. First, climate policies and plans are prepared through hierarchical scaling that does not directly coincide with territorial divisions and with spatial plans prepared in reference to these divisions. Here, the ambiguity of how climate policies and plans should be integrated into existing spatial plans remains to be a challenge. Second, the rigid boundary of scales in scientific conceptualization becomes blurred across different plan types that respond to the issues related to building, neighbourhood, city and regional territorial divisions. For example, strategic plans embody strategies that talk to a wider territory at an abstract level, regional plans offer spatial strategies for city-regions, masterplans show the codes of spatial development in the city or neighbourhood, and implementation plans define tangible tools and methods for implementation at the local scale down to single parcels. However, there is not a clear cut definition of scales among these plans. They are all intertwined. The boundary of one does not start where the boundary of others ends. It is expected that they function in harmony but, due to the unpredictability of socio-political circumstances taking place in reality, planning cannot ensure the realization of this harmony.

This raises the issue of understanding social realities which is vital for making action happen in reality. Here, the *third* category of scales appear as the authorities who are responsible for the management and realization of actions. Authorities are traditionally defined in reference to territorial definitions. The smaller territories are governed by a 'lower' level of authorities, while the bigger ones are administered by

'higher' authorities. This somewhat positions some authorities legally superior than others. Respectively, authorities at different levels become responsible for planning, implementing and monitoring spatial plans that either directly address climate change or indirectly touch on climate-relevant issues. Looking from a climate governance perspective, however, boundaries of scale become almost invisible since decisions are not only taken territorially but also through global networks allowing cross-scale interactions between local authorities with international bodies (Bulkeley 2005). In some cases, local authorities become independent in pursuing the guidance of international authorities or collaborating with global social networks. But this does not necessarily match what is introduced by central governments with a top-down approach.

What the human system attempts to accomplish in specialized but often disconnected terrains from one another through intellectual activities in science, laws, and authority, real-life processes self-design in such a way that all connections are intelligently constructed as a natural outcome. This book agrees that the social component of climate action can play the role of a catalyser in stimulating real-life processes, merging different scales, and creating cross-scale interactions to respond to climate change more effectively and creatively. It attempts to go beyond the question of 'what is the right scale for intervention', which takes a partial analytical approach but rather argues the need for approaching climate change governance more holistically and allowing shifts from one scale to another feeding and being fed by one another.

The chapters in this book, in fact, present cases around the world which particularly show the value of focusing on the practice and its contribution to connecting research, plans and policies, and authorities together. They demonstrate climate responsive attempts that allow the emergence of spatial solutions from within social dynamics of self-constructed governance mechanisms.

Chapter 2, by *Simin Davoudi*, draws a theoretical framework for the challenges of governing the complexity and uncertainties emerging in the face of climate change. It does that within the context of spatial planning as a field that deals with shaping the future of cities. This introduces an opening discussion to the book, which frames a relational approach in creating climate responsive cities. The chapter questions the meaning of resilience and elaborates on how the term is interpreted in policies and practice. It discusses the differentiating meanings of resilience from engineering and evolutionary perspectives, and reassociates them with an understanding of space and place, followed by spatial planning.

Chapter 3, by *Ender Peker* and *Anlı Ataöv*, presents a participatory inquiry conducted with 13 municipal authorities in Turkey, which are engaged in local climate action on a voluntary basis. The chapter demonstrates the shared challenges of implementing local climate actions and a climate governance system co-designed by participant municipalities. The municipalities in this chapter exemplify how cross-scale interactions between local authorities and international networks compensate for the lack of governance at the regional and national level. They present a collective attempt to connect all levels of authorities from neighbourhood to national and how they can work together through dialogue.

Chapter 4, by *Gilda Berruti* and *Maria Federica Palestino*, illustrates a case study from Naples, Italy, representing a condition of weak governance where different levels of government work separately and are unable to implement cross-sectoral policies associated with climate change. The chapter shows the significance of global social movements (i.e. Friday for Future), local research centres and civil society on the establishment of a mutual learning process that consequently plants the seeds of multilevel governance to be nourished from the bottom. The learning process presented through the case allows both the development of technical and political capacities in local authorities and the sharing of climate responsive visions and action with the community. The governance mechanism here helps implement policies and ensure their integration into different scales of spatial plans from urban to regional.

Chapter 5, by *Ozlem Edizel-Tasci* and *Graeme Evans*, discusses the significance of citizen science projects and participatory design to help generate climate responsive planning and design solutions especially for the adaptation to climate change. The study presented in this chapter demonstrates the benefits of a more co-designed and co-produced approach, with increased awareness on environmental issues and better governance for sustainable energy in response to climate change. It explores different ways of community engagement including public education, consultation and deliberation in the case of Three Mills in East London, the UK, that allows older and younger people to come together to work for environmental change in their community.

Chapter 6, by *Nicolas Salmon*, *Grace Yépez*, *Micaela Duque*, *Mónica Yépez*, *Antonio Báez*, *Mauricio Masache-Heredia*, *Gabriela Mejía*, *Paco Mejía*, *Grace Garofalo* and *David Montoya*, presents a participatory inquiry conducted as part of a co-design process in an urban design competition formally launched by the Municipality of Quito, Ecuador. It demonstrates a governance mechanism constructed through co-designing at the neighbourhood level in sync with the urban, national and global resilience strategies. The process promotes full collaboration of authorities, the design team, and residents who aspire to a positive change in their neighbourhood. This empowerment eventually leads to the prioritization of ambitious and long-term issues such as climate resilience and sustainability at the neighbourhood level.

Chapter 7, by *Macarena Gaete Cruz*, *Aksel Ersoy*, *Darinka Czischke* and *Ellen Van Bueren*, illustrates how co-design can enhance preparedness of institutional systems and their resilience through two cases of public space design from Chile. By investigating the barriers and enablers of these design processes, the chapter discusses to what extent co-designing can contribute to urban evolutionary resilience. Both cases exemplify diverse forms of collaboration allowed by existing institutional systems as well as by the creation of new organizations to include multiple socio-ecological needs and requirements of the communities.

Chapter 8, by *Ignacio Loor*, focuses on informal settlements which are often kept out of the formal scalar division of authorities. Through the case of Quito, Ecuador, the chapter presents the capacity of local communities to self-organize and find working solutions for them against a variety of impacts of climate change. Solutions are generated by residents, with the support of local NGOs and civil societal groups, to take control of unbuilt spaces within their neighbourhood and to transform them in

such a way to address community needs. The chapter demonstrates the significance of locally embedded social knowledge in generating mechanisms that attempt to reduce the impact of climate change.

Chapter 9, by *Anlı Ataöv* and *Ender Peker*, argues for the value of co-designing a process of democratic planning in which a working climate governance mechanism can emerge through participation, action and reflexive feedback across different scales. By doing so, it shows how social aspects of climate action can be harmonized with the technical aspects while allowing the shared meaningful and working solutions to emerge in a systematic way. It highlights the significance of the integration of experience-based socio-political knowledge and scientific research. As an ending discussion to the book, the chapter draws a methodological framework that can potentially initiate a social process together with all involved actors to empower and raise awareness through plan-making in the face of climate change.

References

Adger WN, Arnell NW, Tompkins EL (2005) Adapting to climate change: perspectives across scales. Glob Environ Chang 15(2):75–76

Betsill MM, Bulkeley H (2006) Cities and the multilevel governance of global climate change. Glob Gov 12(2):141–159

Brooks N, Adger WN, Kelly PM (2005) The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. Global environmental change 15(2):151–163

Bulkeley H (2005) Reconfiguring environmental governance: towards a politics of scales and networks. Polit Geogr 24(8):875–902

Bulkeley H, Betsill MM (2003) Cities and climate change: urban sustainability and global environmental governance. Routledge, London

Bulkeley H, Betsill M (2005) Rethinking sustainable cities: multilevel governance and the 'urban' politics of climate change. Environ Politics 14(1):42–63

Bulkeley H (2010) Cities and the governing of climate change. Annu Rev Environ Resour 35:229–253

Burch S, Robinson J (2007) A framework for explaining the links between capacity and action in response to global climate change. Clim Policy 7(4):304–316

Cash DW, Adger WN, Berkes F, Garden P, Lebel L, Olsson P, Pritchard L, Young O (2006) Scale and cross-scale dynamics: governance and information in a multilevel world. Ecol Soc 11(2):8

Conway D (2005) From headwater tributaries to international river: observing and adapting to climate variability and change in the Nile Basin. Glob Environ Chang 15:99–114

Dessai S, Lu X, Risbey JS (2005) The role of scenarios for adaptation planning. Glob Environ Chang 15:87–97

Ensor JE, Park SE, Hoddy ET, Ratner BD (2015) A rights-based perspective on adaptive capacity. Glob Environ Chang 31:38–49

Glaas E, Jonsson A, Hjerpe M, Andersson-Sköld Y (2010) Managing climate change vulnerabilities: Formal institutions and knowledge use as determinants of adaptive capacity at the local level in Sweden. Local Environ 15(6):525–539

Gupta J, Termeer C, Klostermann J, Meijerink S, van den Brink M, Jong P, Nooteboom S, Bergsma E (2010) The adaptive capacity wheel: a method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. Environ Sci Policy 13(6):459–471

Haddad B (2005) Ranking the adaptive capacity of nations to climate change when socio-political goals are explicit. Glob Environ Chang 15:165–176
Meadowcroft J (2002) Politics and scale: some implications for environmental governance. Landsc Urban Plan 61(2):169–179
Næss LO, Bang G, Eriksen S, Vevatne J (2005) Institutional adaptation to climate change: flood responses at the municipal level in Norway. Glob Environ Chang 15:125–138
Nay JJ, Abkowitz M, Chu E, Gallagher D, Wright H (2014) A review of decision-support models for adaptation to climate change in the context of development. Climate Dev 6(4):357–367
Newell P (2006) Climate for change: Non-state actors and the global politics of the greenhouse. Cambridge University Press, Cambridge
O'Brien R, Goetz AM, Scholte JA, Williams M (2000) Contesting global governance: multilateral economic institutions and global social movements. Cambridge University Press, Cambridge
Ostrom E (2008) Institutions and the environment. Econ Aff 28(3):25–31
Ostrom E (2010) A multi-scale approach to coping with climate change and other collective action problems. Solutions 1(2):27–36
Owens S (2004) Siting, sustainable development and social priorities. J Risk Res 7(2):101–114
Smith R (2003) World city topologies. Prog Hum Geogr 27(5):561–582
Swyngedouw E (2000) Authoritarian governance, power, and the politics of rescaling. Environ Planning D Soc Space 18:63–76
Tompkins EL (2005) Planning for climate change in small islands: insights from national hurricane preparedness in the Cayman Islands. Glob Environ Chang 15:139–149
Urwin K, Jordan A (2008) Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. Glob Environ Chang 18(1):180–191
Wapner PK (1996) Environmental activism and world civic politics. SUNY Press, Albany, NY

Ender Peker is a post-doctoral research fellow at BIAA, specializing in climate responsive urbanism, with a particular focus on the ways in which the built environment is co-designed by technical rules, regulations, and actors. He holds a PhD in Planning from the University of Reading, UK, and a MSc degree in Urban Design from Middle East Technical University. He worked as an urban designer, lecturer, researcher and consultant for private and public institutions, and non-governmental organizations in Turkey, Germany and the UK. His research interests cut across (i) urban design and the built environment, (ii) climate responsive design and architecture and (iii) participatory planning and governance.

Anlı Ataöv is a professor in the Department of City and Regional Planning at Middle East Technical University. She holds doctorate degrees in environmental aesthetics from the Ohio State University and in action research from the Norwegian University of Science and Technology in Norway. She worked as a planner, professor, researcher and consultant for private, public, and national/international non-governmental organizations, institutions and commissions in Turkey, the US, Norway, Denmark, and the UK. Her professional and academic practice and publications mainly focus on participatory planning and design, sustainability and social change, cultural/natural conservation planning and area management, people and environment, arts and design.

Chapter 2
Resilience, Uncertainty, and Adaptive Planning

Simin Davoudi

Abstract We live in a complex and uncertain world which, among other things, is faced with climate breakdown with unknown and potentially catastrophic consequences. Governing uncertainties is particularly challenging for spatial planning which is primarily a future-oriented activity. In response to this challenge, the concept of resilience has attracted growing attention and become a keyword of our time. But, what does resilience actually mean, and how is it interpreted in policies and practices? This chapter unpacks two fundamentally different meanings of resilience (engineering and evolutionary) and discusses how they are aligned with two different understandings of space and place (absolute and relational) and two different approaches to spatial planning (blueprint and adaptive). The chapter argues that the engineering interpretation of resilience is underpinned by principles that are similar to those underlying the absolute understanding of space and blueprint approaches to planning, while the evolutionary interpretation of resilience is aligned with the relational understanding of space, and the adaptive approaches to planning.

Keywords Resilience · Planning · Uncertainty · Evolutionary resilience · Adaptive planning

2.1 Introduction

In October 2018, the world received another stark warning from the Inter-Governmental Panel on Climate Change whose latest report stated that we only have 12 years to keep the increase in the global mean temperature to 1.5 °C relative to pre-industrial levels; that every fraction of additional warming would worsen the impact of climate change on a whole host of natural and social processes. Alongside this apocalyptic future, the report also invokes a message of hope and suggests that if we take urgent and radical action in cutting greenhouse gas emissions, we can save the world from climate catastrophe.

S. Davoudi (✉)
Newcastle University, Newcastle upon Tyne, UK
e-mail: simin.davoudi@ncl.ac.uk

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_2

It is widely acknowledged that spatial planning has a critical role to play in the transition away from fossil fuel economies by considering, for example, how land should be used to reduce urban sprawl, what kind of buildings should be designed to increase energy efficiency, and how renewable energy can be incorporated into new developments (Davoudi et al. 2009). However, even if the best mitigation measures are in place to keep global warming from breaching 1.5 °C, we will still be confronted with the consequences of past emissions. We will still experience sea-level rise, extreme weather events, water shortages, frequent flooding, heat waves, and wildfires. We do not know, however, the exact nature, severity, and implications of these events due to the complex feedbacks and radical uncertainties that are inherent in climate systems. Such uncertainties are not exclusive to climate change but are prevalent in all open systems.

When we look at events such as the 2008 banking crisis, periodic terrorist attacks, social upheavals, and even events in our own everyday life experiences, we realise how little we know, or indeed can know, about what happens next. Governing and managing such a state of flux is a great challenge for urban governance in general and planners in particular, whose job is to draw route maps into unknown futures.

2.2 The Growing Popularity of Resilience

In response to this challenge, one concept that has attracted everyone's attention more than any other is *resilience*. Many believe that building resilience will allow people and places to deal with the seemingly sudden shocks brought about by climate change. The attraction of this idea has been such that a growing number of think tanks, philanthropic organisations, governmental and non-governmental institutions, and corporate entities have made resilience their top priority. Examples include the United Nations' Sustainable Development Goal 11 which promotes "*inclusive, safe, resilient and sustainable cities and human settlements"*; the World Bank's *City Resilience Program*; Habitat III's *New Urban Agenda*; and the Rockefeller Foundation's *100 Resilient Cities.* Each of these organisations has developed a multitude of toolkits, guidelines, and indicators about how to make cities, citizens, and ecosystems more resilient. It is not surprising, then, that resilience has been heralded as "the buzzword of our time" (Zolli 2012), almost replacing the notion of sustainability.

2.3 Multiple Genealogies of Resilience

Resilience has a long and meandering genealogy with multiple roots in science, engineering, disaster studies, psychology, mechanics, and even anatomy. The term itself comes from the Latin *Resi-lire* meaning "spring back". According to Alexander (2013), resilience has been used historically in science by Francis Bacon in 1626; America's reaction to an earthquake in Japan in 1854; mechanics by William Rankine

in 1858; psychology in 1950, then in the 1980s by Norman Garmezy; as well as in coronary surgery, anatomy, and watchmaking.

However, neither its long history nor its widespread appeal has led to a common understanding of what resilience actually means and how it is being interpreted in policies and practices. To shine a light on these questions and map out how they are linked to planning, this paper will unpack two fundamentally different meanings of resilience and discuss how they align with two different understandings of space and place and two different approaches to spatial planning. In doing so, I draw extensively on my previous work (without repeated self-citations) on resilience (Davoudi, 2012a, 2013, 2016, 2017, 2018), as well as relational space and interpretive planning (Davoudi and Strange 2009; Davoudi, 2012b, 2015). I start with the engineering interpretation of resilience and show how its assumptions are similar to the absolute and bounded understanding of space and blueprint approaches to planning. I will then talk about the evolutionary interpretation of resilience and show how it is aligned with the relational understanding of space and adaptive approaches to planning (Fig. 2.1).

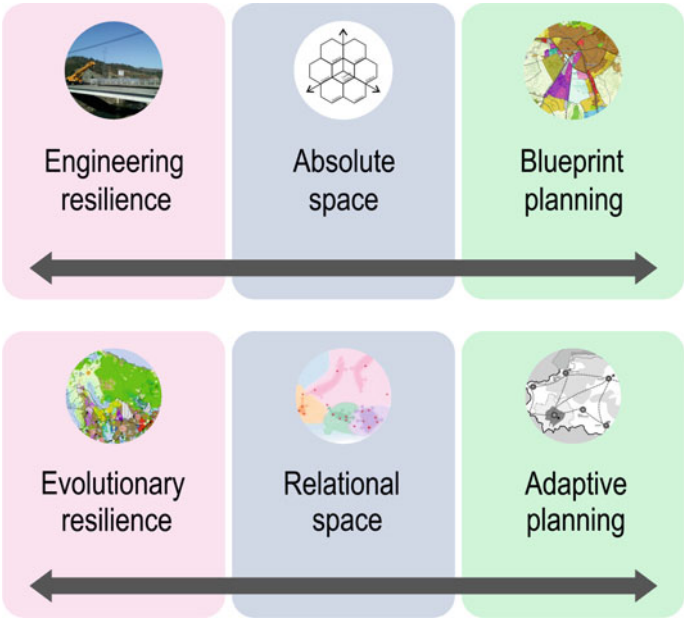

Fig. 2.1 Resilience, space and planning

2.3.1 *Engineering Resilience: Absolute Space and Blueprint Planning*

Physical scientists and engineers were among the first groups to use the term resilience to denote "the ability of a system to return to equilibrium after a disturbance" (Holling 1973, p. 17). This means that the *resistance* to disturbance and *the speed* at which the system returns to a state of equilibrium constitute the measures of the system's resilience. The faster the system *bounces back*, like a spring, the more resilient it is. Applying this idea to the socio-spatial contexts implies that a resilient city is a city that is able to recover and return to how it was before a crisis (such as a climate disaster, a terrorist attack, or political upheaval).

This engineering approach to resilience has influenced the debate in a wide array of disciplines. For example, economic geographers often draw on this definition to explain the trajectory of regional economic change as "a process of punctuated equilibrium" (Simmie and Martin 2010, p. 3). Similarly, in disaster studies, urban resilience is often defined as "the capacity of a city to rebound from destruction" (Vale and Campanella 2005), often putting an emphasis on quantitative measures of recovery. In psychology, where resilience thinking has a long history, the equilibrium model of resilience to trauma is defined as "the ability of adults [who have experienced a disruptive life event].to maintain a relatively stable level of psychological and physical functioning" (Bonanno 2004, p. 20). In public policy and everyday discourse, many of the references to resilience are implicitly or explicitly based on an engineering perspective, which places the emphasis on bouncing back to a previous, "normal" state, without questioning the desirability of the normal or seeking a new normal. This is problematic. For instance, for some of the survivors of Hurricane Katrina in 2005, resilience and return to "normal" would imply a return to poverty.

The equilibrium-based interpretation of resilience can be traced back to the Enlightenment, when the Scientific Revolution[1] stripped the universe from its divinity and symbolic value and conceived of it as an orderly, mechanical device—a giant clock in a state of equilibrium, governed by a set of mathematical rules. It was believed that the laws of nature could be unravelled through scientific discovery and that the behaviour of the clockwork universe could be predicted and controlled. While uncertainty was acknowledged, it was believed that the only limits to knowing the laws of nature were scientific or epistemic; that we could conquer uncertainty and predict future outcomes by having better science. Knowledge was seen as capable of knowing what is to be known (Chandler 2014). Our continued fascination with prediction and control has its roots in this way of thinking about urban futures and our aspiration to create, maintain, or return to an elusive and static equilibrium.

In planning, the quest for *spatial* equilibrium and the desire to impose order on the assumed disorder of cities has a long history and has been at the heart of modernist planning ideas in many western countries. A classic and highly influential example is the Charter of Athens (CIAM 1933), the brainchild of a group of avant-garde architects, planners, and urbanists who set up CIAM (*Congrès Internationaux d'Architecture Moderne*) in the 1930 s. For this modernist manifesto, a good city

was a city in "a state of equilibrium among all its respective functions" (CIAM 1933, p. 3). The Charter described cities of the early twentieth century as being in a state of "chaos" because of "uncontrolled and disorderly development, leading to increasing congestion, overcrowding, disorderly use of land, chaotic functional relations and spreading blight" (ibid.).

Their observations of urban problems then can apply to many contemporary cities across the world today. Their solutions for tackling these problems, however, were limited. Such a functionalist reading of the city and their physically-deterministic approaches to planning were based on a conviction that by simply building better cities they could build better societies (Davoudi and Madanipour 2012). Le Corbusier, the renowned author of the Charter claimed that, "the city is dying because it is not constructed geometrically" (Le Corbusier 1933, p. 7). Doxiadis's ambitious *Ekistics* theory was to develop a "science of human settlement" based on a series of "orderly classifications" of size, location, and function. His "ideal Dynapolis" which was supposed to be a dynamic city, was in fact rigidly pre-determined to be "unidirectional" and "built on the basis of a rectangular grid network of roads" (Doxiadis 1968, p. 365).

In many ways, their prescriptions suffered from the same misconceptions that underpin the engineering notion of resilience. They conceptualised space as an absolute, neutral container; a bounded entity in itself, independent of people, objects, and events. This static view of spatial relations led to the top-down and inflexible blueprint plans of the post-war era. The planning process was expert-driven and plans were presented to the public as *fait accompli*. Planners believed that a functional equilibrium and a steady state in the city could be achieved by the commanding power of the plan. Le Corbusier (1933, p. 7) wrote in capital letters that "the plan must rule".

In the 1960s, the rise of systems theory (cybernetics) powered by computer modelling gave planners even more confidence about their ability to predict the behaviour of urban systems by unpacking the behaviour of their component parts. That, in turn, would enable them to control the future trajectory of the city through technical-rational planning procedures. These ideas have had a profound influence on the architecture and planning practices of post-war Europe and indeed elsewhere. They have left their mark on numerous cities and towns around the world. In the UK, they led to the planning disasters of the 1960s and 1970s. Although the technical-rational approach still dominates planning practices in many parts of the world, it has been significantly challenged by new developments in spatial theory, as well as evolutionary resilience thinking.

2.3.2 *Evolutionary Resilience: Relational Space and Adaptive Planning*

Evolutionary resilience is not about bouncing back to normality, but about the ability to change, adapt, and, crucially, transform in response to sudden shocks or cumulative

pressures (Carpenter et al. 2005). It is about untried beginnings and about breaking away from an undesirable "normal." Here, resilience is not a fixed asset or a trait, but a continually changing process. It is not a *being* but a *becoming* that may emerge when systems are confronted with shocks. In the social context, this means that people may *become* resilient not in spite of adversities but because of them.

Evolutionary resilience recognises that the seemingly stable state that we see around us in nature or society can suddenly change and become something radically new, with characteristics that are profoundly different from those of the original. Faced with adversities, we hardly ever return to where we were. This in and of itself is not such a ground-breaking idea. What *is* new, however, is the acknowledgement that unpredictable shifts in a system can happen with or without external shocks and with or without proportional or linear cause and effects. This perspective sets the resilience of a system in the context of the evolution of the system itself.

This understanding of resilience is rooted in complexity theory, which has challenged the Newtonian view of the world and its mechanistic assertion of equilibrium. It considers the universe as complex and inherently unpredictable. It questions stasis and equilibrium, and defines open systems as non-linear, self-organising, and "permeated by uncertainty and discontinuities" (Berkes and Folke 1998, p. 12). Its take on uncertainty is radically different from engineering resilience. According to complexity theory, we don't know the unknown, not just because of our limited science, but also because of the logical impossibility of knowing it (Chandler 2014) since we are dealing with "unknown unknowns," a phrase popularised by Donald Rumsfeld, the former U.S. Secretary of Defence.

Complex systems such as cities can be approached heuristically as a non-linear iteration of an adaptive cycle with four distinct phases: exploitation or growth, conservation, collapse or creative destruction, and reorganisation. The first loop of the cycle relates to the emergence, development, and stabilisation of a particular pathway. The second loop relates to its rigidification and decline, while at the same time signalling the opening up of unpredictable possibilities or spontaneous reorganisation, which may lead to a new growth phase. So, as systems mature, their resilience reduces and they become "an accident waiting to happen." When systems collapse, a window of opportunity opens up for alternative pathways. This disruptive phase is, therefore, the time of greatest uncertainty yet high resilience, since it is the time of innovation and transformation. It is at this moment that a crisis can be turned into an opportunity.

In response to some of the paradoxes of the adaptive cycle (such as flexibility vs. redundancy), Buzz Holling, the Canadian theoretical ecologist, and his team have developed the Panarchy[2] model. This model suggests that systems function in a series of nested, adaptive cycles that interact at multiple scales (from small to large), multiple speeds (from slow to fast), and multiple timeframes (from short to long). Therefore, small changes can amplify and cascade into a regime shift, while large interventions may have little or no effect. This means that the past behaviour of a system is no longer a reliable predictor of its future behaviour, even when circumstances are the same (Folke et al. 2010).

What does all of this mean for planning? Does complexity mean the end of planning? If nothing is certain except uncertainty itself, would "planning be condemned

to solve yesterday's problems" (Taylor 2005, p. 157)? The short answer is no. On the contrary, preparedness is at the heart of evolutionary resilience ranging from being prepared for short term emergency responses and immediate recovery to long term adaptive capacity building. The latter means developing "a qualitative capacity that can absorb and accommodate future events in whatever unexpected form they may take" (Holling 1973, p. 21).

Complexity and evolutionary resilience call for a different type of planning which is premised on a different understanding of space and place. Instead of thinking about space as a bounded physical container, we need to think about it as relational, fluid, and contingent; as being socially and culturally constructed through the interactions of people, objects and events. As David Harvey (1996, p. 53), following Henri Lefebvre, argued many years ago, our social interactions, "do not operate *in* space-and-time, but *actively construct"* them.

Our traditional approaches to the physical geography of proximity need to be complemented by the relational geography of connectivity, which is a key feature of a globalised world of material and virtual flows of people, goods, and ideas, as well as environmental resources and pollution. As planners, we need to constantly remind ourselves that people do not live in a framework of geometric relationships; they live in a world of meanings (Hubbard et al. 2004). They attach meanings and values to the places in which they live and work and, by doing so, shape cities through their social encounters, cultural exchanges, historical memories, and everyday life experiences.

Relational understandings of space highlight the contingency of our socio-spatial relations and resonate with the concept of evolutionary resilience, which considers cities to be in a constant process of becoming. To plan under the condition of fluidity and uncertainty, we need to move away from technical, rational, and blueprint planning and embrace what may be called adaptive planning. One of the first discussions about adaptive planning emerged in the 1900s when John Dewey (1927), a key advocate of American pragmatism, suggested that, "policies should be treated as experiments, with the aim of promoting continual learning and adaptation in response to experience over time". The concept of adaptive planning owes its resurgence to evolutionary resilience and its application in tackling the uncertainties of adaptation to climate change and the adaptive management of socioecological systems.

Adaptive spatial planning is driven not by the "will to order" space, such as imposing nested spatial hierarchies or geometrical grids, but by the "will to connect" multiple, overlapping relations between materials, people, resources, and knowledge. This requires combining "matters of facts" with "matters of concern", to use Bruno Latour's (1993) words. It requires paying attention to the objective and physical matters *of* spatial relations, as well as the subjective and social concerns *about* the place. As Henri Lefebvre (1991, p. 38) argued, there is a dialectical relationship between the "conceived spaces" of planners and systems analysts, the "perceived spaces" of imagination, and the "lived spaces" of everyday life.

Adaptive planning is not about predicting and controlling these relational complexities or eradicating uncertainty. It is about working with them, making adjustments along the way, and identifying transformative opportunities that may arise from them. Rather than a retreat to conformity and formulaic policies, adaptive planning

focuses on the exploration of the unknown in search of *novel* practices. It is the rejection of fixity and rigidity—of blueprint plans and their rationalistic assumptions. It is about recognising the ubiquity of change and seizing the potential for disruptive innovation. Such a radically different approach to planning requires at least three conditions:

- agile institutional frameworks that can enable creativity and self-organisation;
- highly networked and reflexive planners capable of spontaneous and imaginative responses to changing circumstances; and
- inclusive processes that draw on diverse voices and values and multiple forms of knowledge from systematic and experimental knowledge to tacit and experiential knowing.

As mentioned earlier, the complexity theory suggests that small changes can amplify and lead to major shifts. Using this principle, the notion of *urban experimentation* has gained a growing following. Planners and other actors purposefully intervene in urban areas through small, yet disruptive experiments (such as the temporary greening of High Street in London) in order to innovate, learn, or experience how a small intervention may lead to a larger, transformative change.

Another growing phenomenon is the emergence of "Urban Labs" or "Living Labs". These initiatives often use the notion of experimentation in a scientific way and see the city not as a social construct but as a test bed for collecting data. They collect millions of mega-bites of sensor-driven data ranging from traffic flows to air pollution without always knowing what to do with them. The data is useful and makes some of the relational flows more visible, but urban labs suffer from the same problems that led to criticisms of the technical-rational planning traditions. Like them, urban labs are primarily preoccupied with collecting matters of facts through quantitative measurements, and not matters of concern. They, too, are based on expert-driven predictions and a control mentality that focuses on the physical attributes of the city and abstracts the social relations, the sense of place, and the multiple and diverse ways in which people experience and engage with places. Like their less sophisticated predecessors, their scientific, data-driven view of the city leads them to believe that better data creates better places or better policies for places.

2.4 Conclusion

We have come a long way in advancing our modelling techniques of forecasting and projecting in order to master uncertainties. These have been immensely helpful for dealing with probable futures and not so helpful for dealing with the unknown. This challenge, plus the entrenched technical-rational mindset and blueprint planning method, has led John Friedmann (1993, p. 482), one of the great planning theorists, to suggest that, "The conventional concept of planning is so deeply linked to the Euclidian mode that it is tempting to argue that if the traditional model has to go, then the very idea of planning must be abandoned". While acknowledging his insight,

I beg to differ with this proposition and to suggest an alternative path forward for planning.

It is true that complexity and uncertainty are the defining features of our time, but this does not mean that we should abandon planning. It means that we need a different kind of planning; one that takes the fluidity and complexity of social, spatial, and ecological relations seriously. One that, more than anything else, mobilises the power of creativity and imagination and does not underestimate our ability to imagine how we might be otherwise.

Acknowledgements This chapter was first published as: Davoudi S (2019) Resilience, uncertainty, and adaptive planning. Ann Rev Territ Gov W Balk 1:120–128. Available at: http://www.co-plan.org/en/resilience-uncertainty-and-adaptive-planning/. The Chapter draws on the author's published works on resilience, relational space, and interpretive planning. To avoid repeated self-citations in the text, readers are encouraged to refer to the following papers which have been extensively drawn upon in the writing of this chapter:

Davoudi S, Lawrence J, Bohland J (2018) The anatomy of resilience machine. In: Bohland J, Davoudi S, Lawrence JL (eds) The Resilience Machine. Routledge, London.

Davoudi S (2017) Self-reliant resiliency and neoliberal mentality: a critical reflection. In: Trell E, Restemeyer B, Bakema MM, van Hoven B (eds) Governing for resilience in vulnerable places. Routledge, London, pp 1–7.

Davoudi S (2016) Resilience and governmentality of unknown. In: Bevir M (ed) Governmentality after neoliberalism. Routledge, London, pp 152–171.

Davoudi S, Brooks E, Mehmood A (2013) Evolutionary resilience and strategies for climate adaptation. Planning Pract Res 28(3):307–322.

Davoudi S (2012) Resilience: a bridging concept or a dead end? Planning Theor Pract 13(2):299–307.

Porter L, Davoudi S (2012) The politics of resilience for planning: a cautionary note. Planning Theor Pract 13(2):329–333.

Davoudi S (2015) Planning as practice of knowing. Planning Theor 14:316–331.

Davoudi S (2012) The legacy of positivism and the emergence of interpretive tradition in spatial planning. Reg Stud 46(4):429–441.

Davoudi S, Strange I (eds) (2009) Conceptions of space and place in strategic spatial planning. Routledge, London.

Notes

1. Catalysed by scientists such as Nicolas Copernicus, Galileo, Francis Bacon, Rene Descartes, and Isaac Newton.
2. Panarchy from the Greek God of Pan (Ruler of Nature) refers to "how variables at different scales interact to control the dynamics and trajectories of change in ecological and socio-ecological systems" (Gunderson 2009, p. 4).

References

Alexander DE (2013) Resilience and disaster risk reduction: an etymological journey. Nat Hazards Earth Sys Sci 13:2707–2716

Berkes F, Folke C (1998) Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press, Cambridge
Bonanno GA (2004) Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? Am Psychol 59:20–28
Carpenter SR, Westley F, Turner G (2005) Surrogates for resilience of social–ecological systems. Ecosystems 8(8):941–944
Chandler D (2014) Beyond neoliberalism: resilience, the new art of governing com-plexity. Resilience 2(1):47–63
CIAM (1933) The Athens Charter. Retrieved from http://modernistarchitecture.wordpress.com/2010/11/03/ciam%E2%80%99s-%E2%80%9Cthe-athens-charter%E2%80%9D-1933/
Davoudi S, Crawford J, Mehmood A (eds) (2009) Planning for climate change: strategies for mitigation and adaptation for spatial planners. Earthscan, London
Davoudi S, Madanipour A (2012) Two charters of Athens and two visions of utopia: functional and connected. Built Environ 38(4):459–468
Dewey J (1927) The public and its problems. Holt and Company, New York
Doxiadis C (1968) Ekistics. Hutchinson, London
Folke C, Carpenter S, Walker B, Scheffer M, Chapin T, Rockstrom J (2010) Resilience thinking: integrating resilience, adaptability and transformability. Ecol Soc 15(4):20–28
Friedmann J (1993) Toward a non-Euclidean mode of planning. J Am Planning Assoc 59(4):482–485
Gunderson (2009) Comparing ecological and human community resilience. CARRI Research Report 5. Emory University, Atlanta GA. Retreived from: http://www.resilientus.org/library/Final_Gunderson_1-12-09_1231774754.pdf
Gunderson LH, Holling CS (eds) (2002) Panarchy: understanding transformations in human and natural systems. Island Press, Washington, DC
Harvey D (1996) Justice, Nature and Geography of Difference. Blackwell, Oxford
Holling CS (1973) Resilience and stability of ecological systems. Annu Rev Ecol Syst 4:1–23
Hubbard P, Kitchin R, Valentine G (2004) Editors' introduction. In: Hubbard P, Kitchin R, Valentine G (eds) Key thinkers on space and place. Sage, London
Latour B (1993) We have never been modern. C. Porter (trans). Weatsheaf, USA
Le Corbusier (1929) The city of tomorrow and its planning. John Podher, London (Etchelle F (1924) Trans. from *L'Urbanisme*. Edition Cres, Paris)
Le Corbusier (1933) La Ville Radieuse. Freal et Cie, Paris (Knight P, Levieux E, Coltman D (1967) Trans. from *The Radiant City*. Faber & Faber, London)
Lefebvre H (1991) The production of space. Blackwell, Oxford (Donaldson-Smith N (1974) Trans. from the original edition)
Simmie J, Martin R (2010) The economic resilience of regions: towards an evolutionary approach. Cambridge J Reg Econ Soc 3(1):27–43
Taylor P (2005) Time: from hegemonic change to everyday life. In: Clifford N, Holloway SL, Rice S, Valentine G (eds) Key concepts in geography. Sage, London, pp 151–164
Vale LJ, Campanella TJ (eds) (2005) *The resilient city: how modern cities recover from disaster*. Oxford University Press, New York
Walker B, Holling CS, Carpenter S, Kinzig, A (2004) Resilience, adaptability and transformability in social-ecological systems. Ecol Soc 9(2):5. Retrieved from: http://www.ecologyandsociety.org/vol9/iss2/art5/
Zolli A. (2012) Learning to bounce back. The New York Times, November 2. Retrieved from: http://www.nytimes.com/2012/11/03/opinion/forget-sustainability-its-about-resilience.html

Simin Davoudi is Professor of Environment and Planning, Director of Global Urban Research Unit, and Co-Director of Newcastle University Centre for Researching Cities. She is past President of the Association of European Schools of Planning and Fellow of the: Royal Town Planning Institute, Academy of Social Sciences, and Royal Society of Arts. Simin has served as expert advisor for the UK government, European Commission and several research councils and held

visiting professorships in universities of, Amsterdam, Nijmegen, BTH (Sweden), Virginia Tech, RMIT and Tampere. Her research covers the socio-spatial and political aspects of urban planning, environmental governance, climate change, resilience, and imaginaries.

Chapter 3
Barriers to Implementing Local Climate Action Plans in Turkey: Searching for a Potential Way Out

Ender Peker and Anlı Ataöv

Abstract Although decision-makers involved in urban development have started to recognize the severity of the impact of urban built environments on climate, a sufficient level of action has yet to be achieved particularly at the local level in many countries. Turkey, as a developing country, has been putting efforts in producing national-level action plans for the last two decades. Although these attempts are fundamental for achieving targets in the process of combating the climate crisis, the local climate action planning takes place independent from the national efforts yet with a commitment to international agreements. These voluntary individual institutional attempts, in turn, result in struggles for local authorities. Taking this as a point of departure, this chapter focuses on the experienced barriers and factors of failure in the implementation of local plans through a participatory inquiry conducted with 13 municipalities in Turkey. Challenges are explored through a set of group interviews and participatory workshops with representatives from the municipalities. The findings reveal that shared challenges are related to decisions, regulations, institutional and financial capacity, and governance. The shared significant potential way out of the deadlock is the activation of a cross-levelled interaction between national and local governance mechanism.

Keywords Local climate action · Climate change · Governance · Local planning

E. Peker (✉)
British Institute at Ankara (BIAA), Ankara, Turkey
e-mail: ender.peker@biaa.ac.uk

A. Ataöv
Middle East Technical University, Ankara, Turkey
e-mail: ataov@metu.edu.tr

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_3

3.1 Introduction

> Turn Over A New Leaf: It is necessary to achieve changes in production processes in the fields of energy, urbanization and transportation… Turkey declared its target of 21% reduction in greenhouse gas emissions by 2030…
>
> Fatma Güldemet Sarı
>
> The Minister of Environment and Urbanization, 2015

> …Turkey, with its rapidly growing economy, has a target of 21% reduction in greenhouse gas emissions by 2030. To achieve this, we are planning to implement high quality infrastructure projects that benefit from clean technology and provide energy efficiency…
>
> Mehmet Özhaseki
>
> The Minister of Environment and Urbanization, 2017

> …Climate change threatens the future of our children…We aim at reducing greenhouse gas emissions up to 21% by 2030. We will develop our cities accordingly…
>
> Murat Kurum
>
> The Minister of Environment and Urbanization, 2018

The above press briefings by the last three Ministers of Environment and Urbanization of Turkey since 2015 and the people protesting politicians for the sake of posterity (Fig. 3.1) exemplify Swyngedouw's (2010) argument regarding climate-associated policies' being-sustained by decidedly populist gestures. Although the same rhetoric about cities continues to take place at the national level but disconnected from their realities, cities seek ways to cope with the climate crisis within their limited capacities supported by their international liaisons. Within this context,

Fig. 3.1 Demonstration in Copenhagen at the UN Climate Change Conference COP 15 (Andrew Revkin)

cities are positioned as the main actors in both causing the problem and finding working solutions. The development of urban built environments has serious effects on the natural environment and climate (Smit et al. 2000; Jankovic and Hebbert 2012; Shashua-Bar et al. 2012), while different urban geographies are increasingly being affected by extreme weather and climate events (Birkman et al. 2010; Carter et al. 2015). This reciprocal relationship between cities and climate change calls for action towards producing climate responsive urban living environments. These environments should be resilient to potential impacts of climate change and also be responsive in the sense of minimizing city-driven greenhouse gas emissions for the sake of ordering urban life.

Although decision-makers involved in urban development have started to recognize the severity of this issue, a sufficient level of action has yet to be achieved in both at the national (e.g. revisions in urban development legislations, revisions in institutional structure) and local level policies and practices (e.g. designing climate responsive neighbourhoods, use of low/zero carbon emissions technologies). In the Turkish context, there are two underlying challenges in achieving sufficient climate responsive action. The first challenge is about pursuing a holistic approach that grasps both mitigation and adaptation issues and applying integrated methods for the realization of climate responsive urban spatial decisions. The second challenge refers to a lack of collective working mechanisms that involves a variety of actors and institutions in climate action plan-making.

Taking these challenges as a point of departure, this chapter presents an inquiry that, on the one hand, explores how the current approach, mechanisms and methods respond to the emerging climate crisis, and on the other hand, understands the dynamics of decision-making, and reveals the barriers to implementing local action plans at the local level. It also explores meaningful ways of how to overcome experienced barriers through governance. To do that, the study investigates the practice of 13 local municipalities in Turkey that have started taking action for combating climate change in recent years and catalyses these municipalities to co-design a climate action governance mechanism that can work for them.

3.2 Going Beyond Climate Policies: Making Action Happen

Cities, as multi-sectoral formations, have an active contributing role in increasing greenhouse emissions, primarily caused by the consumption of non-renewable energy sources. Different sectoral activities use a certain amount of energy and, thereby, release varying levels of carbon emissions in a fully functioning city (Boqiang and Liu 2017; Feeney and Nilsson 2001; Janulis 2004; Xie et al. 2017; Zhou et al. 2013).

Tackling the multi-sectoral problem calls for interventions that include various policies and actions from different disciplines. Additionally, a number of researchers (Roggema 2009; Hammond et al. 2012) claim that adaptation to climate change is dominantly a spatial problem. Beyond the meaning of physical formation, spatiality also refers to the practices of individual and social life continuously (re)produced

within the urban space. Considering that sectors such as construction and transportation are bound up in the production of space and shape the way in which the physical environment is organized, it becomes essential to approach urban development with respect to climate change responsiveness.

Looking from the mitigation perspective of climate change, the built environment components at various scales can have effects at two critical levels: at one level is energy consumption, and thus carbon emissions; at the other level is the urban microclimate (Bourbia and Boucheriba 2010; Davies et al. 2008; Hamin and Gurran 2008; Kleerekoper et al. 2012). Urban components such as urban form, building masses and vegetation systems, with their capacity of creating atmospheric change, have a significant role in the formation of urban climate (Birkeland 2002; Smith 2005). Thus, to sustain urban daily life, the formation of the built environment leads to double effects, not only on urban microclimates but also on energy consumption. This calls for both technological advancements and application for renewable energy use in cities and legislative revisions as well as control tools to achieve carbon reduction targets in urban environments.

Looking from the adaptation side, local-specific vulnerabilities, societal responses and the potency of the local people to generate adaptive and innovative solutions within their local setting becomes crucial (Peker 2020). Adaptation to climate change is dominantly a local challenge due to its crossing issues interlinked to the local planning practices and the socio-cultural contextual character. As Agrawal (2008) suggests, the local authorities have the power of (i) structuring impact and vulnerability, (ii) mediating between individual and societal responses to climate change, and (iii) providing means and tools for accessing resources through governance.

In reference to these arguments, although mitigation technologies (i.e. renewable systems for carbon-free energy, low-carbon heating systems) mostly stand as universally shared solutions, adaptation to climate change calls for an in-depth understanding of the needs and requirements of the inhabitants as well as their lifestyles and for the emergence of working solutions in the localities. This makes climate change responsiveness a socio-technical issue. Mitigation design and engineering tools help shape everyday life practices at different scales ranging from thermal comfort at the building scale to transportation modes and commuting patterns at the city scale. The adaptability of these tools at the local level relies on cultural and symbolic meanings locally attached to them (Peker 2020). Thus, the activities of designers, producers and users in that sense should be aligned and coordinated by taking into consideration both social and technical dimensions which, in reality, are in fully integrated operation. In line with this, mitigation and adaptation issues also take place concurrently in reality despite its conceptual differentiation in theory. Planning can provide an opportunity to cope with both issues simultaneously and exchangeably in such a way that efforts in both intentions can feed each other. The multi-level governance approach (Bulkeley et al. 2014; Jordan et al. 2015) also enriches this view by providing a framework that suggests finding patterns where mitigation and adaptation interact through multiple levels of governance (Gupta et al. 2007; Klein et al. 2005; Locatelli et al. 2015).

Within the planning framework, the production of urban spaces represents a salient issue in establishing a ground for mitigation and adaptation targets in cities. Urban spaces are actively created and (re)produced by different actor groups such as public authorities, private entrepreneurs, knowledge institutions and public interest groups. Therefore, changing the dominant mode of space production is not achieved with a short-term and one-step action by one specific actor group. The impulse for the change emerges at one point, gradually grows and turns into a transition of the whole urban production system. In this sense, the transition towards a climate responsive development in cities accompanies innovation and internalization of sustainable actions at different scales by different actors. Long and Long (1992) views climate responsiveness not as the implementation of a technological solution but as an ongoing transformational process in which different actor interests are integrated. Guy (2013) explains this with a socio-technical perspective and claims that there is not a singular optimal technological pathway, but rather, an enlarged context of a more heterogeneous coalition of practices should be taken into account.

Technical deterministic planning does not produce effective solutions responsive to the climate crisis. Since the climate crisis involves issues that call the social aspects ranging from inequalities to governing institutions, climate responsive planning should be socially sensitive. The Multi-Level Perspective (MLP), evolved from socio-technical studies (Schot et al. 1994; Geels 2004), provides a useful theorization for a transition from technical deterministic planning to socially integrated practice. MLP explains transition when three hierarchical levels of systems are interlinked and work together affecting one another. A hierarchically upper system covers the hierarchically lower system and a change in one system leads to a bigger change in the other.

This kind of system thinking is also in sync with hierarchical spatial system thinking. Figure 3.2 shows an adaptation of MLP to a multi-level framework for

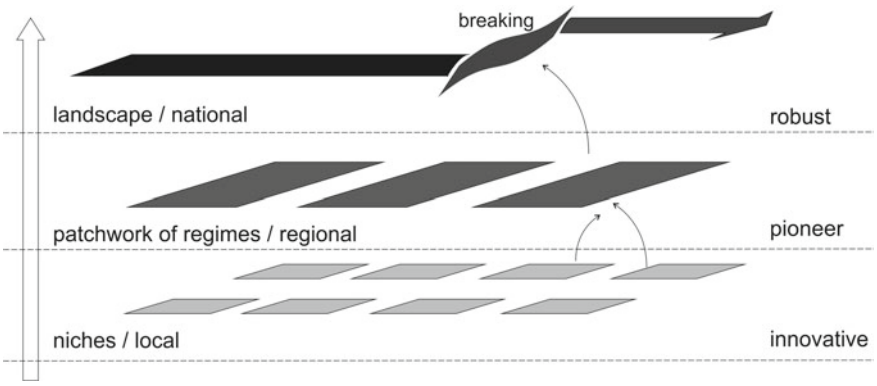

Fig. 3.2 Multi-level framework for climate responsive urban space production. Adapted from Geels (2002) in Peker (2016)

achieving climate responsive urban space production, composed of three spatial scales including local, regional and national.

The first level consists of niches, 'the locus for radical innovations' (Geels 2005b). Niches originate from a requirement as a reaction or a solution to a specific life condition at a local level. They are essential elements since they provide space for learning processes like learning by doing, learning by using and learning by interacting (Geels 2005a). The strength of a niche comes from its attachment to daily life experiences but its realization relies on other dimensions. However, a niche may not be easily accepted and internalized by all actors identified in other dimensions of the framework. In each dimension, different actors take charge of different roles to realize it. A technological climate solution developed at a global scale may not be accepted by different societal groups due to the cultural and symbolic meanings shaped locally. However, the acceptance and internalization of one idea should take place at all scales for that idea to be translated into action (Geels 2002).

Geels (2002) claims that the activities of different systems should be aligned with each other and coordinated in an 'ideal' (i.e. fully functioning) order. Furthermore, this order is constructed upon a relationship between 'social and technical regimes'. Geels (2002) uses this term to refer to the semi-coherent set of rules carried by different actor groups. According to Geels (2005b), the accumulation of resolved regimes leads to change at the macro-level of MLP, which he calls the landscape level. The term 'landscape' is used to emphasize the literal connotation of relative 'hardness' of change and to mention the material aspects of the society such as city structures, transportation infrastructures and electricity grids (Geels 2005b).

Effecting change at the landscape level is complex and requires action over an extended period of time. The stable structure of the existing regimes at this level may not show sufficient interest nor provide funding to niche innovations at the local level (Geels 2005a). The technical deterministic planning system stands as a robust landscape that is not open to radical changes in the short run. However, responding to climate crisis calls for being open to change and to easily make revisions and modifications in regulative measures. This may even be potentially triggered by the niches in localities that initiate a change in the meso-level in the first place. For example, hidden values, cultural norms, and beliefs embedded in a neighbourhood community life can change domestic energy consumption patterns. Innovative spatial solutions can be generated from everyday life experiences, which may eventually constitute a working solution for energy reduction.

Within this framework, planning, when it is conducted as an open system, can also work as a medium for the niches to come about and to trigger a change in the whole system of space production. Climate action plans are detailed strategic frameworks prepared by local authorities for measuring, planning and reducing greenhouse gas emissions and for identifying vulnerabilities and adaptive precautions to the impacts of climate change. Some of the spatial and sectoral issues of climate action plans overlap with the concerns of spatial plans. If the planning system works rigidly as a closed system with no active engagement of local actors and with no dialogue between climate action plans and other plans such as strategic, regional, national and environmental, the niche effect cannot be achieved. The Turkish context, in fact, exemplifies

this. The spatial planning system in Turkey draws a rigid framework mainly based on technical determinism which zones land-uses, and which, in turn, underestimates the significance of climatic variations in different localities across the country. Although local authorities are delegated to make their local plans, the existing system imposes decisions hierarchically from national to local, and thus, local plans are legally bound by regional and/or provincial plans. Respectively, climate responsive efforts often focus on formulating climate strategies also at the national level. However, spatial planning can offer intervention areas to accommodate climate action inputs and to harmonize them with spatial decisions from local to regional.

3.3 Climate Change Agenda in Turkey: Prospect from National to Local

According to the Intergovernmental Panel of Climate Change (IPCC) (2007) predictions, Turkey is in the face of less precipitation and the risk of drought under the conditions of climate change. Although Turkey has supported international negotiations regarding climate change mitigation and adaptation for the last two decades, neither the country's promises at the international level nor national actions are sufficient to respond to the country's vulnerabilities and to stabilize the rising carbon emissions (Şahin 2016; Turhan et al. 2016).

Until 2010, climate change-oriented policies in Turkey were sanctioned only in national development plans prepared by the State Planning Organization, the responsible institution for national planning at that time. This made the climate change policies remain as rhetoric that is hidden in policy lines without an actual implication to action for many years. Today, the Ministry of Environment and Urbanisation (MoEU) is the major public institution coordinating national climate change policies and plans while local municipalities represent the authority for city-specific, local climate action planning. Figure 3.3 presents an overview of authorities responsible for climate action planning and relevant plans and strategy documents within an order of macro, meso and micro levels.

At the macro level, the Eleventh Development Plan stands as a significant document showing the distribution of financial resources within the context of Turkey's development process. It sets forth general strategies for combating climate change as well as increasing the quality of life. In this regard, the plan suggests the dissemination of solar and wind power plant applications, the extension of public transportation systems in cities, the encouragement of non-motorized modes of transport, the creation of pedestrian zones, the development of cycling masterplan and the increase in the number of green areas with public gardens. The development plan also places special importance on natural areas through strategies such as increasing forests assets and protecting water resources. In this direction, the government aims at preparing different sub-plans for river basin management, sectoral water allocation, drought and flood management. Finally, the Eleventh Development Plan highlights

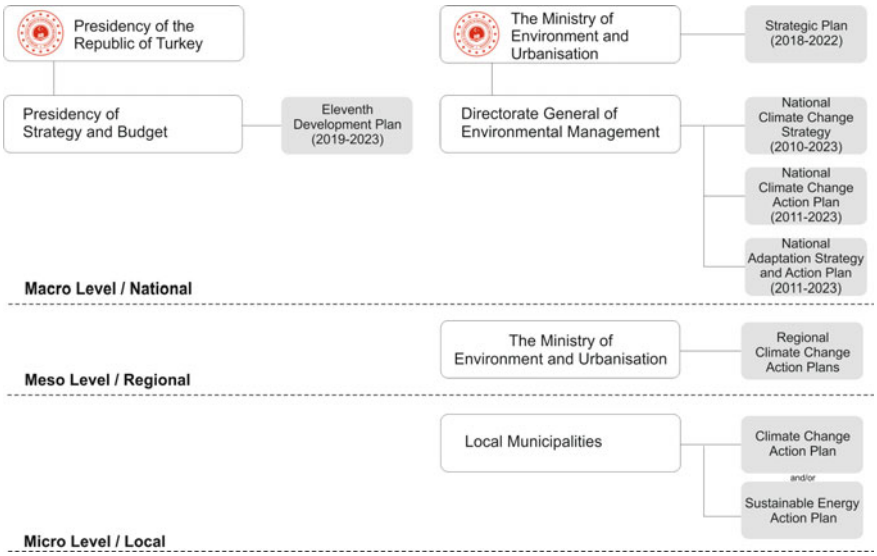

Fig. 3.3 National, regional and local strategic documents for climate change (The Regional Climate Change Action Plan has only been prepared for the Black Sea Region so far)

the importance of participation of all stakeholders and a comprehensive collaboration in the creation of a climate-resilient infrastructure and long-term integrated urban planning and design.

The MoEU, as the national level coordinating institution for climate action and the current national focal point to the UNFCCC, produced four strategic documents. The Strategic Plan of the MoEU (2018–2022) promotes local climate action and aims at taking measures for climate change adaptation. In pursuit of the plan, the government has taken practical steps so far on implementing the 'Zero Waste Action'[1] in all public institutions until 2023. In order to promote environmentally friendly, energy-efficient and resilient building, the Strategic Plan formulates strategic goals such as developing new building techniques, using local materials and carrying out an effective building inspection. The other three strategic documents of the MoEU, the National Climate Change Strategy (2010–2023), the National Climate Change Action Plan (2011–2023), and the National Adaptation Strategy and Action Plan (2011–2023) are prepared directly for addressing the challenge of climate change.

The National Climate Change Strategy (2010–2023) presents Turkey's visions and goals for mitigation and adaptation. The National Climate Change Action Plan (2011–2023) tackles climate change mitigation with a sector-oriented approach.

[1]Zero Waste Action executed by the Presidency of the Republic of Turkey and implemented by the MoEU in 2017, aims at reducing environmental risks, costs and increasing efficiency by preventing waste, as well as ensuring that employees have a 'sensitive consumer' feeling as they contribute to the development of environmental protection awareness within public institutions. To do that, the MoEU adopted a Zero Waste Management Action Plan for 2018–2023.

Within this sectoral division, the plan assigns direct responsibilities to local authorities about the issues including transportation, water and land use. In reference to other sectors, the plan calls municipalities the 'relevant organizations' which, in fact, does not present any clear set of roles or responsibilities. The National Climate Change Adaptation Strategy and Action Plan (2011–2023), on the other hand, focuses on the adaptation dimension of climate change. The plan assigns local authorities only with a few duties regarding urban water management. It approaches local authorities as passive receivers that are somehow influenced by agriculture, ecosystem services, biodiversity and forestry, natural disaster risk management and public health. This dual structure in national plans, one dealing only with mitigation, the other with adaptation, leads to underestimating the value that can generate from synergies and conflicts of the cross-cutting areas in mitigation and adaptation.

Looking from the local perspective, however, the production of climate responsive cities comes under the authority of municipalities. With respect to climate responsiveness, the municipalitys' power and the key role that municipalities play in shaping urban environments are filtered by national, state-led climate change policies and programs (Bulkeley and Betsill 2005). This is clearly visible in both the National Climate Change Action Plan and the National Adaptation Strategy and Action Plan. National authorities position municipalities with a top-down approach considering themselves as lawmakers and municipalities as implementers. However, when it comes to local climate action planning, instead of pursuing national strategies, local authorities let transnational municipal networks guide their activities through international relations.

3.4 Methodological Framework

This study assumes that municipal authorities are the key official agents in the production of urban space with their power to coordinate actions among different interest groups and enable (or disable) community involvement with their policy programs in Turkey. However, in the context of Turkey, a very limited number of municipalities have completed their climate action plans. As of 2020, only, about 10% of all metropolitan municipalities are recorded to include the notion of climate change in their political and planning agenda and prepared climate action plans. More critically, the implementation of these plans in action often falls short. Taking these shortcomings into account, the methodological framework of this research puts the municipalities in the centre, which attempt to take a step in changing the way cities respond to climate change but which encounter obstacles.

Figure 3.4 shows the municipalities leading climate change action in Turkey. Among those, 13 municipalities, six of which representing the metropolitan municipalities and seven of them, district municipalities, took part in this study. The metropolitan municipalities include İstanbul, Bursa, İzmir, Muğla, Antalya and Gaziantep. The district municipalities include two from İstanbul (Kadiköy and

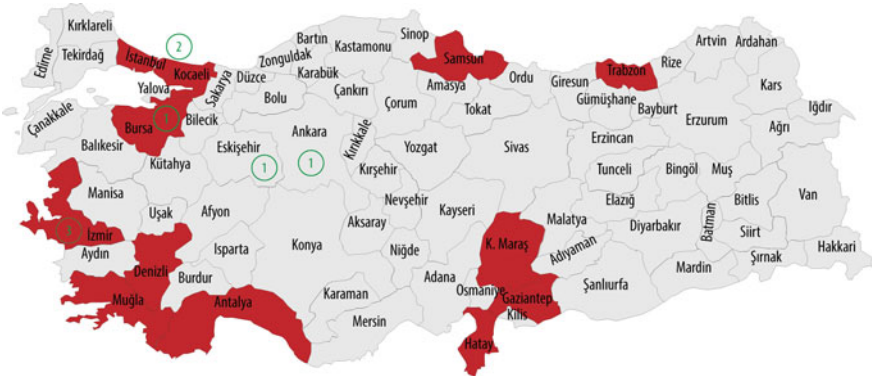

Fig. 3.4 Municipalities leading climate change action at the local level

Maltepe), two from İzmir (Karşıyaka and Seferihisar), one from Bursa (Nilüfer), one from Ankara (Çankaya) and one from Eskişehir (Odunpazarı).

The inquiry is designed to include both traditional and participatory research methods and techniques. In the first phase, a set of group interviews were conducted at relevant administrative units within the selected municipalities. In the majority, it was discovered that climate action plans are managed by the municipalities' directorates for *environmental protection and control* while in the others by directorates for *external relations*. In the former, the general approach of municipalities was to downsize the climate crisis into an environmental problem while in the latter, it was more about a concern to find the necessary funding for climate plans from external/international bodies and networks. The aim of the interviews was to understand what was done for climate change mitigation and adaptation to date. Involved representatives were asked semi-structured questions which revealed descriptive data. Each group interview lasted about an hour and was recorded on a voice recorder with the consent of participants. The conversation during interviews was also simultaneously typed by the research assistant. In total, 42 staff with different roles ranging from decision-making to management and technical were interviewed. The interview transcriptions were analysed using the conventional content analysis technique (Hsieh and Shannon 2005). Respectively, the content categories were extracted from the collected data and initial codes were gradually constructed throughout interviews. Later, the codes were reconfigured with reference to existing theoretical concepts of climate change and presented descriptively using the expressions of participants' experiences.

The outcomes of the interviews constructed the conceptual framework of a participatory workshop at the following stage. The workshop was designed to facilitate dialogue among participants on the shared challenges upon which the majority of municipalities were struggling to act. The ultimate aim was to co-define the prioritized action areas. 28 representatives from involved municipalities and the MoEU participated in the workshop. The first session started with a presentation of research

findings from the group interviews. It is followed by participants' reflections on the validity and meaningfulness of interview findings. At the end of this session, participants reached an agreement on the need of working more depth on the issue of climate governance more urgently than the other issues. In the second session, participants were divided into two working groups which were moderated by the authors. Group discussions were documented on flip charts in front of the participants and simultaneously typed by two research assistants. Participants prioritized their needs and developed recommendations on the prioritized areas. Then, group leaders presented the highlights of their work to all participants to be discussed all together to refine the shared proposal. Finally, a series of feedback interviews were conducted with participants upon the completion of the workshop.

3.5 Exploring Municipal Level Climate Action in Turkish Municipalities

Findings reveal that more than three fourth of the involved municipalities (%85) approaches climate crises from an energy-oriented point of view and focuses on carbon reduction to cope with it. Only less than one fourth (%15) considers the adaptation dimension along with climate change. Following the general two-headed conceptualization, cities often develop stand-alone adaptation and mitigation approaches disconnected from each other and largely focused on mitigation (Grafakos et al. 2018). That leads to a lack of synergies among mitigation and adaptation strategies, preventing them to be socially and economically efficient (Dang et al. 2003).

There are two underlying reasons behind this unbalanced orientation. First, municipalities often start including the issue of climate change in their agenda after they become a member of a transnational municipal network, particularly after signing the Covenant of Mayors. The covenant signatories are committed to submitting the Sustainable Energy and Climate Action Plan (SECAP) that outlines key actions on carbon reduction. This in a way compels municipalities to prepare SECAP with a focus on energy but does not enforce the implementation of relevant strategies since transnational municipal networks do not hold an authority to control and sanction their members (Kern and Bulkeley 2009). The second reason is related to the low level of awareness about the adaptation measures and the context-bound nature of adaptation strategies. Universal mitigation principles for carbon reduction are often found easier to use than coming up with local-specific adaptation strategies which require context-based understanding and assessment studies. Moreover, adaptation calls for shared action that engages actors, not only local municipalities but also others.

An analysis of action plans, prepared by the involved municipalities, shows that their strategies and actions mainly cluster around narrow-scoped mitigation issues such as carbon reduction in municipal buildings through solar panels and LED lighting or replacement of municipality car fleets with low-carbon vehicles. Waste

reduction also appears as another issue due to the 'Zero Waste' project executed by the Presidency of the Republic of Turkey. Within this limited framework, the city transportation should be undertaken as a network and a sufficient level of mitigation action has yet to be achieved also for residential, commercial and industrial sectors.

Despite the lack of the adaptation component in climate change action plans, the municipalities have venues that touch on climate adaptation issues. Although the most common adaptation strategy in action plans is increasing the amount of green space per person, that ratio in cities does not even meet the national masterplan standards. Other adaptation ways comprise organizing activities to raise awareness and to stimulate behavioural change. Moreover, issues such as public health and risk for disaster are listed only by a few municipalities.

Currently, preparing local action plans is a voluntary-based activity, not a compulsory public duty. They do not hold a legal status. Thus, when it comes to the implementation of actions in the plans, almost all municipalities seek ways of integrating the defined actions with their strategic plans.

3.5.1 The Common Challenges of Local Action

This study identifies five challenges that the involved municipalities encounter in implementing climate change decisions in practice. These include (1) the lack of actionable knowledge, (2) legislative limitations, (3) staff-related and institutional hardship (4) financial burdens and (5) lack of a collective working mechanism. These challenges also provide clues for how to activate cross-institutional proactive relationships and to establish climate change governance in cities that overcome existing barriers (Amundsen et al. 2010; Juhola 2016; Newell 2006; Vedeld et al. 2016). Table 3.1 presents the particularities of these challenges and the section below details them about the involved municipalities' experiences.

3.5.1.1 Lack of Actionable Knowledge

This study shows that the lack of planning and/or implementation stands as the most mentioned barrier (%70) for municipalities and that it is mainly the lack of actionable knowledge which prevents municipalities from taking action (%57). Decisions are not constructed in a way that is directly implementable. Moreover, this study reveals that half of the municipalities define climate change as an unfamiliar topic that stands outside of their daily agenda.

Most often, action plans are reports in the form of a booklet which are not always easy to comprehend. Moreover, they often convey a strategic meaning that consists of abstract concepts whose applicability relies on the formulation of relevant actions but which are left at the abstract level. The majority of action plans are prepared by consultants of climate change. The municipal staff often cannot internalize what is written, thus, cannot read and implement the plan. Unless abstract level mitigation

Table 3.1 Common challenge areas revealed from the context analysis

[1] Lack of actionable knowledge	[2] Legislative limitations	[3] Staff-related & institutional hardship	[4] Financial burdens	[5] Lack of a collective working mechanism
* Integration of decisions to existing plans * Lack of detailing action steps * Lack of database	* Undefined legal status of local climate action plans * Conflicts between jurisdictions * High level of private land ownership	* Low level of awareness among staff and managers * Other institutional priorities * Staff shortage and lack of time	* Lack of central budget allocation * Lack of funding for climate-related projects	* Lack of multi-level institutional collaboration (between (i) divisions within municipalities, (ii) metropolitan and district municipalities, (iii) ministries and municipalities) * Lack of an objective third party

and adaptation strategies are detailed and concrete action steps are defined with their responsible actors, methods, tools and implementation timeframe, it seems unlikely to achieve a high level of objectives of the plan.

Meeting mitigation objectives requires an updated database on building energy consumption. However, district municipalities, in particular, lack the building-based information, thus, cannot trace their energy consumption, and cannot calculate carbon emissions per buildings. While it is possible to access city-scale consumption data for electricity, natural gas or water in general, relevant values at neighbourhood and building scales are either not collected or hidden due to property rights. It is even more difficult to calculate the energy consumption for urban transportation modes such as buses and minibuses serving within districts. This problem originates from the lack of a district-wide consumption data gathering system. The absence of accurate data forces district municipalities to estimate, and thus, to assume the overall consumption figures and patterns. As a result, local action plans have inefficient and unrealistic carbon reduction targets.

3.5.1.2 Legislative Limitations

Local climate action plans do not have a legal status and this remains a significant barrier for ensuring the application of actions identified in the plan. Within the current legislative framework, the actualization of actions is highly correlated with the political power and convincing capacity of the plan leaders (i.e. mostly the Director of Environmental Protection and Control) in terms of how much they could

include climate actions into strategic plan decisions. The commitment of mayors and city councils to climate action is also a key for transforming the vision of city development, governance and urban life. No matter how the national regulations frame climate action plans, the leaders' commitment solve the majority of internal challenges within municipalities.

The distribution of legal authorities between metropolitan municipalities and their district municipalities within them also creates some conflicts particularly for the mitigation and adaptation actions that call for a holistic approach for the entire city. For example, the Istanbul Metropolitan Municipality and its 39 district municipalities need to work together to establish a cycling network supported with green corridors in the city. However, district municipalities have only the authority of designing walkable and cycling-friendly streets for secondary and side streets while the authority for main arterials belongs to the metropolitan municipality.

Considering the spatial dimension of climate action plans, the land ownership pattern also comes to the forefront as a significant parameter that sometimes limits, other times enables the implementation of climate action within municipal boundaries. For example, in cities where the size of parcels is small and the ratio of private ownership is high, it becomes more challenging to increase green and permeable surfaces by creating public parks and urban forests. Such circumstances call for alternative policies that regulate and control the building development and parcel-based landscape design provided by the private sector and/or subcontractors.

3.5.1.3 Staff-Related and Institutional Hardship

In the current institutional structure of municipalities, climate change action plans are seen as environmental projects that are undertaken alongside the daily routine agenda. This creates a set of challenges both in the planning and implementation processes. First, the leadership of an action plan is delegated to the director of the responsible administrative unit within municipalities where the action planning activities are carried out. It becomes the responsibility of those units to seek ways for bringing up the climate plan to the municipal agenda by convincing the top-level management. Secondly, the staff under those units has to put an extra effort to be able to respond to the requirements of the climate action plan in addition to their ongoing workload. This even results in a situation where a limited number of personnel takes responsibility for the whole plan.

In three fourth of the involved municipalities (76%), mitigation and adaptation activities are carried out by a team of less than five staff members. This comes with two other major problems, the lack of craft knowledge in needed disciplines of climate change and the scarcity of time. Respectively, almost all municipalities (%90) get consultancy services either from individual experts or from private firms to compensate sometimes for incapabilities other times inabilities. This fulfils municipalities' short-term needs but the dependency on external support always remains as a barrier for capacity development and empowerment of the internal staff. Dealing with climate change becomes an outsider issue, it is not internalized because the work is

not done by the staff. This also does not allow the diffusion of climate change-related knowledge and experience within institutions.

3.5.1.4 Financial Burdens

Funding is one of the most significant parameters that influence both climate action planning and the implementation of decisions. This is stated as a problem in all involved municipalities. The MoEU cannot allocate funds for action plans because they have not yet gained any legal status. To overcome this, the leading administration units seek external funding opportunities, mainly regional and international, for the realization of the projects identified in action plans. Although there are success stories in terms of benefiting from available funding, this attempt also relies very much on the capacity of the leading team as exemplified in the following interview extract: '*Our team is composed of three environmental engineers. We are experienced and capable of working on the environmental side of the climate problem. However, we don't have enough knowledge about the financial dimension of the issue. We need technical support for that. For example, we need financial analysts for making studies on how much financing is needed for initial investments for energy transformation projects or island-based heating systems*'. This also shows the incremental approach to implement one-shot solutions that are only included partially in the plans.

3.5.1.5 Lack of Collective Working Mechanism

All institutions stress the need for working together at three different levels. The first is among different administrative units within municipalities. Considering that the mitigation and adaptation actions are closely related to different socio-spatial issues, an internal collaboration within the municipality across different units becomes inevitable. This is not only critical for generating the multi-dimensional decisions of the plan but also for integrating climate action plans with other existing local plans including development master plans, urban transportation and disaster mitigation plans. For example, low-carbon building strategies are correlated with the parcel-based development codes defined by the directorate for development and urbanization, comfort and public health strategies fall within the remit of the directorate of health services, and greening strategies are directly related to the landscape projects of the directorate of parks and gardens.

Secondly, many strategies and actions identified in local climate action plans go beyond the authority of district municipalities. Moreover, some actions by definition cannot be implemented solely by either district or metropolitan municipalities. Those actions require the synchronization of plans across all municipalities. The only way to achieve this is by establishing a collective working mechanism from the start of plan-making to implementation as well as the follow-up of action plans. The following extract exemplifies the need for that: '*We have witnessed the implementation of some projects overnight without any information or notice… The metropolitan municipality*

have occupied one of the lanes and replaced that with a cycling path. That came as a surprise… Where does that new path connect to? Who will use that path?'

The third level where there is a need for collaboration is between the MoEU and local municipalities. This is mostly related to the ways in which the institutional roles are identified and also perceived by the staff working in authorized administrations within municipalities. For example, there is a clear-cut perceived division between law-making and practice, which, in turn, results in hierarchy between institutional bodies and officials. This prevents the construction of a horizontal ground for collaboration across involved institutions. Although the national strategic documents highlight key concepts such as participation, it is hard to monitor how it happens in reality. Top-down projects exclude local realities and thus, fail to respond to local-specific needs and requirements as well as to explore niche solutions. This is expressed in the following statement: '*When the planning authority of the urban transformation project was delegated to the metropolitan municipality, and later, to the MoEU, unfortunately, all of our internal efforts to plan the reuse of greywater in the areas have been disregarded. We have experienced similar disappointments also for stream improvement projects*'.

Lastly, the lack of objective third parties often results in conflicts derived from the political polarization among different authorities within the same city. This becomes particularly more visible in cities where the metropolitan municipality and district municipalities are from opposite political parties. This is, in fact, not a specific attitude for climatic concerns, rather a conscious choice for not collaborating with the so-called opposition groups on municipal affairs. Even in the absence of a conflict, third parties are seen as the mediator of active collaboration with their capacity of opening grounds for dialogue, shared knowledge and partnerships.

This study, initiated by the Istanbul Policy Center, itself, played the role of a third party, facilitating the design of a governance mechanism with the involvement of actors at all scales. The feedback interviews explain this as follows: '*I wish we could come together more often. We have had the opportunity to see what other municipalities do for the first time in that workshop. I am not saying we were not aware of it but I mean coming together and working on the same task is really valuable. However, I wish there were more representatives from the Ministry of Environment and Urbanization. It would have been very useful if the Istanbul Policy Center kept organizing such kinds of structured, goal-driven meetings and workshops*'.

3.5.2 A Potential Way Out Through Climate Governance

Among the five groups of barriers, all participants agreed on the lack of collective working mechanism as the primary issue of municipalities in climate action plan making. Participants expressed the need for designing a climate governance system model to overcome that issue. Such a model had to be constructed on a multi-level and multi-actor ground and continuous communication and dialogue had to be

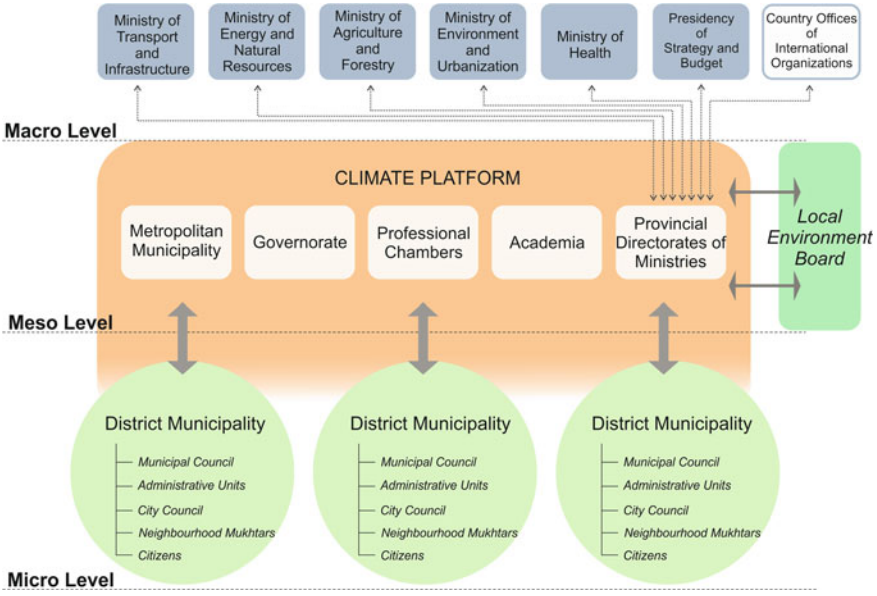

Fig. 3.5 Climate Change Governance Mechanism

fostered. Figure 3.5 shows the schema that is proposed by the involved municipalities. The governance structure is composed of three levels. This is also similar to the Geels' framework (2002), which includes micro, meso and macro levels. Here, while the micro-level represents the local actors, the macro level includes national actors. Slightly different from Geels, the meso level represents actors mainly at the provincial[2] scale in addition to a few regional ones. This may be driven from different contexts upon which the governance mechanisms are configured. Also, at the micro and meso levels of the proposed structure, in addition to single institutions, there are organized bodies mainly in the form of a council composed of groups of institutions that meet on a regular schedule either to seek solutions to specific issues or to take decisions about the cities.

In respect to this general framework, the governance mechanism suggests the presence and working together of district municipalities, municipal councils,[3] city councils,[4] civil organizations, the mukhtars[5] and citizens at the micro level. Metropolitan municipalities, governorships, provincial directorates of ministries, professional

[2]Turkey is divided into 81 provinces. Each province is divided into a number of different districts. A province involves urban areas as well as natural and agricultural lands.

[3]Municipal council which consists of representatives from political parties is the highest level decision-making body within a municipality. It is led by the mayor.

[4]City council refers to a democratic structure composed of representatives from central authority, local authority, professional chambers, NGOs and civil society. It functions as an advisory body that supports sustainable development of the city.

[5]Mukhtars are the elected heads of neighbourhoods.

chambers, academia, and local environment boards are represented at the meso level. The presentation of local environment boards is particularly important because it is composed of the representatives of meso actors who meet every other three months to decide on environmental conservation and rehabilitation projects and to ensure their implementation. The ministries of transportation and infrastructure, energy and natural resources, agriculture and forestry, environment and urbanization, health, municipality unions, development agencies, research centres, and the Presidency of Strategy and Budget as well as international organization country offices are positioned at the macro level.

Within this institutional ecology, this perspective proposes the formation of an apolitical institutional organization or a platform that could potentially work as an objective third party encouraging and facilitating climate action at all scales. Such an institutional formation can be called '*Climate Coordination Platform*' or '*Climate Action Coordination Platform*' and involve actors at the meso level, not only the institution leaders such as the mayors but also the climate change team representatives in municipalities. It is suggested that a climate change division is established in each municipality with new legal regulations and metropolitan municipalities or city councils can take the leadership of the platform in each city. Additionally, this proposal sees the representatives of district municipalities and city councils as a part of the platform. The platform should closely work with the Local Environment Board because the board setting can provide opportunities for the implementation of climate change project investments. Furthermore, in this mechanism, it is important that representatives from climate change units in the Ministry of Environment and Urbanization should have close collaboration with the metropolitan municipalities.

The platform can embody different working groups for (1) research, (2) data management and inventory, (3) policy-making, (4) education, and (5) implementation and control (Fig. 3.6). These working groups are expected to be complementary with joint studies on cross-cutting issues. This calls for a holistic approach that considers the coexistence of different disciplines and the horizontal-vertical relations of different authorities. While central and local authorities do inspections vertically, civil organizations and councils can do the same thing horizontally. The approach welcomes the integration of practical know-how in policies in search of meaningful policy practices in localities and geo-climatic territories.

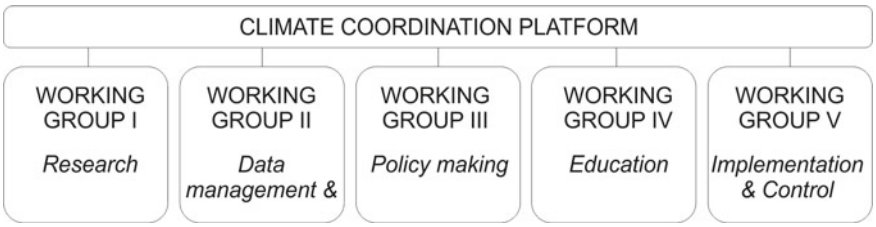

Fig. 3.6 Working groups of proposed climate coordination centre

Participants suggest that the platform should contribute to the generation of knowledge on climate change. Respectively, it should support and collaborate with scientific work. It should systematically gather information relevant to climate change to support spatial decisions and legislations. This can be facilitated by a digital database system allowing documentation of the existing data. The database can be updated in two-year periods. Such a system can also store information on local actions. This can trigger competition among local authorities in the long run, which can be supported by an incentive system based on rewarding annual accomplishments. In the long run, such a system can trigger competition among local authorities.

An effective follow-up mechanism can ensure the sustainability of this proposed governance mechanism. Participants see that in the Ministry of Environment and Urbanization and local municipalities, units and divisions relevant to climate change action should organize institutional meetings every month. At the provincial scale, the platform should organize follow-up and evaluation meetings every three months. Action reports with the help of a self-evaluation digital system can support these meetings. These reports can include the documentation of actions and suggestions of actions to ameliorate existing conditions. For specific issues to be emerged contextually or on a need-base, more frequent meetings, workshops and feedback sessions can be organized. The platform should provide the Ministry of Environment and Urbanization with a yearly inspection report on the local performance. An enforcement system should also be applied in collaboration between the ministry and local authorities to control activities such as environmentally polluting industrial production, which is, in fact, not under the authority of municipalities.

3.6 Ending Remarks

This research reveals that ensuring change in urban development to achieve climate responsive cities calls for working together in a multi-scalar system. This refers not only to collaboration among administrative units within a local municipality, but also a comprehensive working governance mechanism that goes beyond the authority of the municipality. Such a mechanism should allow cross-scale interactions between involved institutions and facilitate the generation of shared decisions to be embedded in the plans of all scales. This study created a participatory setting for dialogue and working together between and among local municipalities and the Ministry of Environment and Urbanization. It was catalysed by a third party, a leading research institute dedicated to climate change, democracy and governance. The communicative environment created through this research worked as a small-scale practice of collaboration, showed the practicability of such efforts, and validated the need for its continuity.

However, for this effort to become a common practice at a larger scale, the major challenge is the current institutional structure which rigidly assigns roles of policy-making to central authorities and roles of implementing to local municipalities. This division imposes a culture of ‘chain of command’ which wipes out the chance of

understanding local requirements as well as exploring the innovative niche solutions embedded in localities. One way to support this is by treating planning as an open system that allows local emergences to feed local plans. This can eventually also establish the ground for local sensitive climate action planning. Both urban and climate decisions of cities can take place together in all plan documents as shared decisions.

Turkey has to break down the top-down approach in planning for climate change and recognize the sensitivities and willingness of localities to make a change. This may also lead to opening rooms for the involvement of local authorities in law-making. In other words, the existing vertical mechanism in law-making and plan implementation needs to take gradually a horizontal nature.

Acknowledgements This study was conducted as a part of Mercator-IPC Fellowship Program of Istanbul Policy Center (IPC)–Sabancı University. We would like to thank the IPC staff for their support and encouragement, and the Center for providing a stimulating intellectual milieu. Additionally, we also would like to thank Prof. Dr. Ayda Eraydın and Prof. Dr. İlhan Tekeli for their valuable review and comments which have significantly helped the chapter improve, and Oktay Şekercisoy and Prof. Dr. Demirkan Çöker for their review and proof-reading.

References

Agrawal A (2008) The role of local institutions in adaptation to climate change. World Bank

Amundsen H, Berglund F, Westskog H (2010) Overcoming barriers to climate change adaptation—a question of multilevel governance? Environ Plann C: Gov Policy 28(2):276–289

Birkeland J (2002) For Sustainability: a source book of integrated eco-logical solutions. Earthscan Publications Ltd, London

Birkmann J, Garschagen M, Kraas F, Quang N (2010) Adaptive urban governance: new challenges for the second generation of urban adaptation strategies to climate change. Sustain Sci 5(2):185–206

Boqiang L, Liu K (2017) Using LMDI to analyze the decoupling of carbon dioxide emissions from China's heavy industry. Sustainability 9(7):1198

Bourbia F, Boucheriba F (2010) Impact of street design on urban microclimate for semi arid climate. Renew Energy 35:343–347

Bulkeley H, Betsill M (2005) Rethinking sustainable cities: multilevel governance and the 'urban' politics of climate change. Environ Polit 14(1):42–63

Bulkeley H, Andonova LB, Betsill MM, Compagnon D, Hale T, Hoffmann MJ, Newell P, Paterson M, Roger C, VanDeveer SD (2014) Transnational climate change governance. Cambridge University Press

Carter JG, Cavan G, Connelly A, Guy S, Handley J, Kazmierczak A (2015) Climate change and the city: building capacity for urban adaptation. Prog Plann 95:1–66

Dang HH, Michaelowa A, Tuan DD (2003) Synergy of adaptation and mitigation strategies in the context of sustainable development: the case of Vietnam. Clim Policy 3(sup1):S81–S96

Davies M, Steadman P, Oreszczyn T (2008) Strategies for the modification of the urban climate and the consequent impact on building energy use. Energy Policy 36:4548–4551

Feeney LM, Nilsson M (2001) Investigating the energy consumption of a wireless network interface in an ad hoc networking environment. In: Proceedings IEEE INFOCOM 2001. Conference on Computer Communications. Twentieth Annual Joint Conference of the IEEE Computer and Communications Society (Cat. No. 01CH37213), vol. 3, April. IEEE, pp 1548–1557

Geels FW (2002) Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case study. Res Policy 31:1257–1274
Geels FW (2004) From sectoral systems of innovations to socio-technical systems: insights about dynamics and change from sociology and institutional theory. Res Policy 33(6/7):897–920
Geels FW (2005a) The dynamics of transitions in socio-technical systems: a multi-level analysis of the transition pathway from horse-drawn carriages to automobiles. Technol Anal Strat Manag 17(4):445–476
Geels FW (2005b) Co-evolution of technology and society: the transition in water supply and personal hygiene in the Netherlands (1850–1930)—a case study in multi-level perspective. Technol Soc 27:363–397
Grafakos S, Pacteau C, Delgado M, Landauer M, Lucon O, Driscoll P (2018) Integrating mitigation and adaptation: opportunities and challenges. In: Solecki RCW, Romero-Lankao P, Mehrotra S, Dhakal S, Ali Ibrahim S (eds) Climate change and cities: second assessment report of the urban climate change research network. Cambridge University Press, New York, pp 101–138
Gupta J, Van Der Leeuw K, De Moel H (2007) Climate change: a 'glocal' problem requiring 'glocal'action. Environ Sci 4(3):139–148
Guy S (2013) Pragmatic ecologies. In: Harrison AL (ed) Architectural theories of the environment. Routledge, London, pp 138–150
Hamin EM, Gurran N (2008) Urban form and climate change: balancing adaptation and mitigation in the US and Australia. Habitat Inter 33:238–245
Hammond FN, Gyau KBA, Adiaba SY (2012) Urbanization and climate change. In: Booth FHC, Hammond FN, Lamond J, Proverbs D (eds) Solutions for climate change challenges in the built environment. Blackwell, Malaysia, pp 33–44
Hsieh HF, Shannon SE (2005) Three approaches to qualitative content analysis. Qual Health Res 15(9):1277–1288
IPCC (2007) Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge
Jankovic V, Hebbert M (2012) Hidden climate change—urban meteorology and the scales of real weather. Clim Change 113(1):23–33
Janulis F (2004) Reduction of energy consumption in biodiesel fuel life cycle. Renew Energy 29(6):861–871
Jordan AJ, Huitema D, Hildén M, Van Asselt H, Rayner TJ, Schoenefeld, JJ, … Boasson EL (2015) Emergence of polycentric climate governance and its future prospects. Nat Clim Change 5(11):977–982
Juhola S (2016) Barriers to the implementation of climate change adaptation in land use planning. Inter J Clim Change Strat Manage 8(3):338–355
Kern K, Bulkeley H (2009) Cities, Europeanization and multi-level governance: governing climate change through transnational municipal networks. JCMS: J Common Mark Stud 47(2):309–332
Kleerekoper L, Van Esch M, Salcedo TB (2012) How to make a city climate-proof, addressing the urban heat island effect. Resour Conserv Recycl 64:30–38
Klein RJ, Schipper ELF, Dessai S (2005) Integrating mitigation and adaptation into climate and development policy: three research questions. Environ Sci Policy 8(6):579–588
Locatelli B, Pavageau C, Pramova E, Di Gregorio M (2015) Integrating climate change mitigation and adaptation in agriculture and forestry: opportunities and trade-offs. Wiley Interdisc Rev Clim Change 6(6):585–598
Long N, Long A (eds) (1992) Battlefields of knowledge: the interlocking of theory and practice in social research and development. Routledge, London and New York
Newell P (2006) Climate for change: non-state actors and the global politics of the greenhouse. Cambridge University Press, Cambridge
Peker E (2016) Provision of urban thermal comfort: a socio-technical approach to climate responsive urban design. Doctoral dissertation, University of Reading

Peker E (2020) Re-thinking the production of urban built environments in the face of climate change. Urban Res Pract 13(4):465–471
Roggema R (2009) Adaptation to climate change: a spatial challenge. Springer, The Netherlands
Şahin Ü (2016) Warming a frozen policy: challenges to Turkey's climate politics after Paris. Turk Policy Q 15(2):117–129
Schot J, Hoogma R, Elzen B (1994) Strategies for shifting technological systems: the case of the automobile system. Futures 26:1060–1076
Shashua-Bar L, Tsiros XI, Hoffman M (2012) Passive cooling design options to ameliorate thermal comfort in urban streets of a Mediterranean climate (Athens) under hot summer conditions. Build Environ 57:110–119
Smit B, Burton I, Richard JT, Wandel J (2000) An anatomy of adaptation to climate change and variability. Clim Change 45(1):223–251
Smith PF (2005) Architecture in a climate of change: a guide to sustainable design. Architectural Press, Oxford
Swyngedouw E (2010) Apocalypse forever? Post-political populism and the spectre of climate change. Theory Cult Soc 27(2–3):213–232
Turhan E, Cerit Mazlum S, Şahin Ü, Şorman AH, Cem Gündoğan A (2016) Beyond special circumstances: climate change policy in Turkey 1992–2015. Wiley Interdisc Rev Clim Change 7(3):448–460
Vedeld T, Coly A, Ndour NM, Hellevik S (2016) Climate adaptation at what scale? Multi-level governance, resilience, and coproduction in Saint Louis, Senegal. Nat Hazards 82(2):173–199
Xie R, Fang J, Liu C (2017) The effects of transportation infrastructure on urban carbon emissions. Appl Energy 196:199–207
Zhou J, Lin J, Cui S, Qiu Q, Zhao Q (2013) Exploring the relationship between urban transportation energy consumption and transition of settlement morphology: a case study on Xiamen Island, China. Habitat Inter 37:70–79

Ender Peker is a post-doctoral research fellow at BIAA, specializing in climate responsive urbanism, with a particular focus on how the built environment is co-designed by technical rules, regulations and actors. He holds a PhD in Planning from the University of Reading, UK, and an MSc degree in Urban Design from Middle East Technical University. He worked as an urban designer, lecturer, researcher and consultant for private and public institutions, and non-governmental organizations in Turkey, Germany and the UK. His research interests cut across (i) urban design and the built environment, (ii) climate responsive design and architecture, and (iii) participatory planning and governance.

Anlı Ataöv is a professor in the Department of City and Regional Planning at Middle East Technical University. She holds doctorate degrees in environmental aesthetics from the Ohio State University and in action research from the Norwegian University of Science and Technology in Norway. She worked as a planner, professor, researcher and consultant for private, public, and national/international non-governmental organizations, institutions and commissions in Turkey, the US, Norway, Denmark and the UK. Her professional and academic practice and publications mainly focus on participatory planning and design, sustainability and social change, cultural/natural conservation planning and area management, people and environment, arts and design.

Chapter 4
Exploring the Governance of Naples, Italy, Through a Climate Responsive Approach

Gilda Berruti and Maria Federica Palestino

Abstract Combating climate change is not among the priorities of public policies in Italy. Neither the adoption of the National Strategy for Climate Adaptation has led to implement a national policy. This is why the governance of climate change varies across regions depending on the environmental sensitivity, and attitudes by local institutions, the kind of activism by public administrators, their power or fragility, and the abilities in drawing from EU funds. This chapter points out that bringing climate to the center calls for multilevel governance not only by means of technical and political abilities, but also by sharing climate responsive narratives, and actions with people. This allows exploring climate effects on local contexts and even adding creativity to the governance model. Naples cannot consider climate change as a priority due to the perception of more urgent problems to be solved. Accordingly, the chapter discusses how narratives of climate change work for both the ongoing new urban plan and strategic metropolitan plan by promoting shared processes of socio-ecological regeneration. The chapter argues that the only way to put global environmental challenges into fragile cities' agendas is to assume climate change as an opportunity to radically rethink social, ecological, and economic relations.

Keywords Multilevel governance · Climate change · Community-based adaptation · Planning processes · Urban region of Naples

4.1 Introduction: How the Challenge of Climate Change Is Changing European Cities

The issue of climate change has increasingly attracted the attention of urban and regional planners as cities and urban regions seek to become carbon free (Davoudi et al. 2009). In response, the European Union promoted a funding mechanism to

G. Berruti (✉) · M. F. Palestino
Department of Architecture, Federico II University of Naples, Naples, Italy
e-mail: gberruti@unina.it

M. F. Palestino
e-mail: palestin@unina.it

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_4

launch voluntary climate planning at the city scale, through agreements such as the Covenant of Mayors, Mayors Adapt, and, lately, the Covenant of Mayors for Climate & Energy. These agreements between cities and the European Union have been in effect since 2008 and are intended to spur local administrations to reduce emissions and adapt urban cores to climate change (hereafter, "CC") by means of voluntary plans.

As these tools began working their way through Europe, different environmental policies and strategies were implemented in different European countries. It is not an accident, therefore, that only a few cities from countries in transition to sustainability, such as Denmark and Sweden, supported the Covenant of Mayors because, already being nearly carbon free, they did not need any assistance from the EU. Italy, by contrast, is the most involved European nation, with 4,736 cities and towns participating in climate planning processes, while Spain, the second nation, has 2,580 cities, and Belgium, the third nation, has 492 cities (Covenant of Mayors 2020). While Italian mayors are primarily involved in managing the transition, attempts have been also made at the national scale. However, the National Strategy for Adaptation to CC, in effect since 2014 (Castellari et al. 2014), does not yet constitute a National Plan, thus preventing national policies and the related funding for CC adaptation from being delivered.

What is crucial to underline about the substantial participation of Italy in the Covenant of Mayors is the growth of local actions with diverse effectiveness and duration. In fact, pending the National Plan for Climate Adaptation, local actors have adopted uneven approaches, which are commensurate to their administrative capabilities and interests. Those authorities which have focused on training public officials and educating local entrepreneurs and economic actors will be the most successful in managing the climate crisis. Planning in compliance with environmental needs, in fact, necessarily implies efforts to integrate sectoral approaches and policies, thus moving beyond past governance models.

According to the Association for the Industrial Development in Southern Italy (Svimez 2019) there are different degrees of development and inequalities between southern and northern local administrations. In particular, Svimez identifies a double gap, consisting of the distinction between north and south, on the one hand, and between Italy and the rest of Europe, on the other. In fact, if we compare the GDP per inhabitant of various Italian regions with that of other European regions, we note that the poverty of southern cities compared to center-north cities has increased since 2006.

In line with this, to respond to environmental challenges taking into account the socio-economic and spatial effects of CC, the north acts differently than the south. The northern Italian urban regions are upgrading their governance models, in order to be prepared to take advantage of the so-called "climate urbanism" that is typical of neoliberal urban regimes (Long and Rice 2019), based on energy-efficient buildings, smart mobility, and green adaptation. For Southern Italian urban regions, by contrast, CC strategies remain a luxury, as they are not at all wealthy and competitive in global markets. Here, the different levels of government work separately, and as they are not acquainted with the concept, are unable to implement cross-sectoral policies.

Italian universities and research centers, on the other hand, are increasingly involved in European programs such as Horizon 2020 or Life, which facilitate attracting funds and building "learning networks" of scholars and public officials configuring local elites focused on CC (Musco 2014). Equally, both entrepreneurs and civil society are crucial in supporting environmental issues, with objectives and tools changing according to contexts.

These learning networks often enact promising experiments as a response to CC, which local administrations have to preserve against the risk of being abandoned due to local coalitions' changing priorities. In fact, planning the city in compliance with climate needs demands administrative foresight and political will to implement long-term visions. This condition is met when common goals are set, and each department's objectives are adjusted, joining efforts and facilitating a multilevel governance. Accordingly, a steady dialogue with citizens, involving civil society, associations, and movements, ensures the continuity of an integrated policy responding to CC.

In this chapter, we focus on a case study of the urban region of Naples, a poor and fragile area in the south of Italy, where CC struggles to become one of the priorities of urban policy makers because local administrations are used to sectoral planning and tend to focus on the daily resolution of ordinary problems. As we will show, the acknowledgment of a climate sensitive approach due to the media wave triggered by the *Friday for Future* movement, and mutual learning processes activated by local elites, succeeded in impacting planning instruments and revealed itself as an opportunity for policy and decision-makers. Moreover, the City of Naples now has the opportunity to take advantage of grassroots practices and participation as alternative drivers of environmental transition.

In this framework, we point out that bringing CC to the core of public policies not only improves local institutions' skills, but even brings innovation to the governance model in use, according to local demands. Since the context matters, we suggest that Naples' sustainable transition can be creatively implemented drawing upon the variety and richness of its social capital, and experimenting with "community-based adaptation" (Dodman and Mitlin 2013).

After reporting on the national climate policy in Italy, we will discuss how the CC issue has been tackled in the urban region of Naples, analysing the planned regeneration processes at the urban and metropolitan level: from the Urban Plan to the Strategic Metropolitan Plan. We argue that the way to put global environmental challenges onto fragile cities' agendas is not by approaching CC as a technical problem to solve, but "as an opportunity to radically rethink and rebuild social, ecological, and economic relations" (Gillard et al. 2016, p. 256). In the Naples case, in fact, the local elites' push for climate policies and the resonance of global climate challenges on local groups and movements worked as a driving force that enhanced the implementation of climate policies and their integration into urban and regional planning.

4.2 Methodology

The governance of the urban region of Naples has been explored in the framework of "Occupy Climate Change!" (OCC!) research, in which several scholars from the Department of Architecture (DiARC) of Federico II University of Naples are involved, coordinated by the Environmental Humanities Lab at KTH-Royal Institute of Technology of Stockholm, in concert with scholars from the different cities chosen as case-studies.[1]

The research, still ongoing, started in 2018, just before the adolescent Greta Thunberg sat down in front of the Stockholm Parliament in late August with a "School strike for climate" sign, protesting against what she perceived to be the Swedish government's indifference to the CC emergency. The main aim of OCC! was the adoption of an "urban political ecology" approach aimed at exploring how the effects of CC were perceived in New York, Malmö, Istanbul, Rio de Janeiro, and Naples.

The Naples case study, in particular, was developed to investigate how the phenomenon of CC was perceived, not only by social movements and civil society, but also by local institutions. Parts of the field investigations were used to build theories from the case-study introduced later on. In particular:

1. An analysis was performed on articles appearing in local newspapers for a three-year period (2018–2020), in order to understand how the global challenge of CC has been narrated by the local media. This textual and content analysis evaluated the extent to which the demands of ordinary citizens, social behaviors, decision-makers, and political agendas were influenced, and whether traditional urban regenerative instruments changed in the face of CC.
2. An analysis was performed on the main formal acts of decision-making regarding CC (city board and council resolutions), and the interpretation of planning documents on this subject.
3. About twenty in-depth interviews with key informants, chosen among local politicians and officials, practitioners, associations, movements, and green entrepreneurs.

The impact of media reporting and formal acts on local contexts were useful to test the general knowledge of CC in the urban region of Naples, thus orienting the interview process.

4.3 National Climate Policy in Italy

Although the National Strategy for CC Adaptation in Italy was established in 2014, the planning process, which began in 2017, has not yet been completed (CMCC 2017). Due to the lack of a national framework on CC, the climate action plans

[1]This Naples case study was initiated thanks to a research agreement between KTH and DiARC signed in 2018, whose scientific coordinator for DiARC is Maria Federica Palestino.

required by the EU are at risk of becoming extemporary measures. In fact, in Italy only a few adaptation plans designed for towns such as Bologna and Padua can be considered as best practices; while on the provincial level a significant role in the field of adaptive planning has been undertaken by the Metropolitan City of Venice, supported by the IUAV University. The lack of a national plan for CC adaption is a serious deterrent to the implementation of specific adaptive strategies even at the regional scale (Giordano et al. 2014), except for the regions of Emilia-Romagna, Veneto, Lombardy, and Sardinia, where regional laws already provide a climate adaptation framework (Magni 2019).

In addition, planning instruments which have been drawn up at the regional, metropolitan, and municipal levels hardly integrate mitigation and adaptation challenges into the urban and regional governance scheme (Pietrapertosa et al. 2019). If in northern Italy cities CC is emerging as a key issue in which local administration has to be engaged, in the fragile cities of southern Italy characterized by weak public facilities and difficulties in administration, public officials struggle to keep themselves up to date and are used to working in a sectoral way. The lack of staff turnover, the extreme workload, and the general unpreparedness in the environmental field are significant reasons to explain this gap. In these cities, CC is not considered a priority for public policies also due to the "readiness argument," which stresses the perception of local deficiencies, thus impeding local administrations from addressing global environmental concerns (Bai 2008).

On the other hand, looking at the Metropolitan Cities set up as successors to provinces,[2] we deal with a more climate-responsive planning policy. Since their birth, Metropolitan Cities have been directed to include strategic and regional planning tools embedding environmental dimensions in the planning process. Metropolitan Cities, in fact, deal with the strategic development of metropolitan areas and update the three-year Metropolitan Strategic Plan. They are charged with the task of developing cooperation and integration among the different stakeholders coming from the public sector, the scientific and technical field, the social-organizations, and the entrepreneurial arena. Moreover, being intermediate institutions, Metropolitan Cities have the power to establish connections between regional and municipal levels, promoting integrated approaches aimed to build policies both vertically and horizontally. Thanks to the Metropolitan Conference of Mayors, Metropolitan Cities can even coordinate local climate adaptation plans, thus improving the strength of climate measures and oversee wide area projects in the field of blue and green infrastructures, protection of natural ecosystems, waste management, sustainable energy, and mobility.

What has to be highlighted, however, is that metropolitan authorities as well as municipalities and regions do not have the same capabilities and political influence throughout Italy, and are subject to the aforementioned socio-economic and capability gaps between northern and southern regions (De Luca and Moccia 2017).

[2]Ten Metropolitan Cities were established by the Law 56/2014, namely Rome, Milan, Naples, Turin, Bari, Florence, Bologna, Genoa, Venice, and Reggio Calabria. Three others were established in 2015—Palermo, Catania and Messina—and Cagliari in 2016.

4.4 The Governance of Climate Change in the Urban Region of Naples

With about 955,000 inhabitants living in an area of 119 square kilometers, Naples is the capital of a metropolitan area of 92 municipalities, with about 3 million inhabitants on 1.171 square kilometers constituting the Metropolitan City of Naples. The city, located in the south of Italy, is also the regional capital of Campania, with 550 municipalities and 5.827 million inhabitants, covering an area of 13.670 square kilometers.

Naples is the driver of a densely and disorderly urbanized area, with a high land take and a high rate of administrative unregulation[3] (De Leo and Palestino 2017) and urban informality in terms of uncontrolled land use, ranging from unlawful waste disposal to unauthorized building (Berruti and Palestino 2020a). Together with Rome, Milan, and Turin, Naples is one of the largest Italian cities; however, the operation of its administrative machinery and the governance model in use are not so advanced. Fragmentation of decision-making processes, sectoral responses to urban problems, and failed integration of stakeholders in policy-making are some of the most acute problems registered (Obersteg et al. 2019; Berruti and Palestino 2020b). Pressed by various obstacles and local concerns, institutions such as the City of Naples, the Metropolitan City, and the Campania Regional Authority are focused on the current structural deficiencies, thus inhibiting CC from being tackled by public policies (Bai 2008).

Power conflicts between the mayor of the City and the Metropolitan City of Naples[4] and the governor of the Campania Region (Berruti and Palestino 2018), disparities in technical and administrative skills, and difficulties in attracting European funding have troubled not only the City but also the Metropolitan City government.

As some interviews show, at the end of 2018 the issue of CC was not yet at the attention of local politicians and officials, nor of local movements and civil society. In particular, social movements and the civil society just returned from the environmental disaster known as the Land of Fires (Palestino 2015; Berruti and Palestino 2020a), were mainly focused on Campania poisoning and the troubles in managing waste disposal (Armiero 2014; De Rosa 2017).

In February 2019, once the media suddenly tackled the issue of CC due to the fame garnered by Greta Thunberg as the inspirer of the *Fridays for Future* movement, the topic unexpectedly entered the Neapolitan political agenda as well. Preparations for the first global march planned by the *Fridays for Future* movement in spring 2019

[3] 'Unregulation' is used here to describe the degenerative effects that a lack of governmental control and inadequate rules and laws have on Italian society, generating forms of exploitation and abuse that often make the government an object of private interests and illicit businesses.

[4] According to the national law on Metropolitan Cities (Law 56/2014), mayors of Metropolitan Cities coincide with mayors of capital cities. Inter institutional power conflicts are mainly related to political antagonisms between the mayor and the governor of the Campania Region.

presented the opportunity to give a strong push to both urban and metropolitan policies, resulting in the elaboration of the preliminary draft of the Urban Plan of Naples, and the activation of the Metropolitan Strategic Plan. It even becomes theoretically fair to state that local policymakers adopted the classic "garbage can" decision-making model (Cohen et al. 1972), by which a particular convergence of interests is exploited to turn an accident into an opportunity. In fact, research on CC carried out by Federico II University came into play as an opportunity for the planning processes enacted by the City and the Metropolitan City. This resulted in the collaboration between Federico II University and local administrations, triggering the assembly of an elite of technicians and scholars working at the city and metropolitan level, with a specific interest in integrating environmental concerns in city and metropolitan planning.

This collaboration among institutions resulting in the activation of mutual learning processes was ratified through the partnership with the City of Naples in the Clarity project (funded by the European Union's Horizon 2020 research and innovation program) and the memorandum of understanding between DiARC and the Metropolitan City of Naples on the Oxygen Common Good Program.

4.4.1 How CC Entered the Public Discourse

Before 2019, national media has basically ignored the issue of CC and the related impacts on the city of Naples. This was also true for international media. In the most important local newspapers, the issue of CC has only emerged through stories of deaths and accidents in the urban region of Naples due to landslides, floods, heatwaves and dryness, fires, lightning, fallen trees, and so on. As a matter of fact, due to the weather alerts spread by the Civil Protection Department since the unusual snowfall for Naples in February 2018, the press started to report City ordinances closing schools and public areas to ensure the safety of citizens. Also due to the increase of extreme weather events, media began reporting on the lack of ordinary and extraordinary urban maintenance, making indirect links of CC to the irreversible deterioration of urban public spaces. During February 2019, a proper media debate on CC started in conjunction with two events, involving for the first time a wide and diversified representation of the Neapolitan society. The first event was organized by associations and movements concerned with local environmental struggles and was purposed to promote the first *Friday for Future* urban routine in order to prepare for the global strike in March. This event is important because it marks the first involvement of local movements, which had previously been sceptical about the issue, but now influenced by the media wave. The second event was a meeting among urban elites interested in promoting a forestation plan for the metropolitan area of Naples.

Both events have shown the will to help the CC issue rise and stay high on public and governmental agendas, thus emphasizing its role in the political arena (Palestino et al. 2020a; Swyngedouw 2010). This happened, on the one hand, thanks to various

associations and movements, by introducing new narratives for re-appropriating the spaces of everyday life; and on the other hand, thanks to researchers, politicians, and administrators, who lobbied for what would later produce the metropolitan strategy called "Oxygen Common Good."

4.4.2 How CC Entered the Agenda-Setting of the City of Naples

In 2009, the City of Naples joined the Covenant of Mayors, and started measuring climate-altering emissions for the Sustainable Energy Action Plan (SEAP), a voluntary plan for the reduction of CO_2 emissions. However, the CC issue began rising on the governmental agenda only in 2011, thanks to the commitment of the deputy mayor who put environmental issues at the forefront of decision-making and reorganized the whole administrative apparatus around them. The deputy major also encouraged the spread of limited traffic and pedestrian areas in the historic center by supporting private mobility limitation strategies, thus promoting the environmental transition of Naples.

Today, the remains of these efforts toward sustainability and their consequent impact on how CC is perceived by citizens can be found in two main measures: the presence of tight and faded cycle paths, gradually disused after the initial collective interest[5]; and the involvement (sometimes with fortunate results) of inhabitants in public space management as farmer gardens, in response to the lack of city-sponsored care.[6]

In 2014 the City of Naples, thanks to the installation of a small office in the Environment Department, called "Environmental Controls and SEAP Implementation," joined Mayors Adapt, with the aim of either developing a comprehensive local adaptation plan, or integrating adaptation to CC into planning strategies. However, the implementation of a CC adaptation plan was hampered by the sudden resignation of the deputy mayor in 2015, which had the effect of reducing the importance of sustainable development policies and weakening the Environment Department. This new stage, led by a politician more interested in promoting environmental education than governing the transition to sustainability, resulted in weakened technical objectives for the benefit of a greater symbolic emphasis.

Once in 2017, the City of Naples became a partner in the Clarity research project, "Integrated Climate Adaptation Service Tools for Improving Resilience

[5] More symbolic than real, given the small size of the road section in the city center and, consequently, the scarcity of space available for the use of bicycles, these tracks have had more educational than utilitarian value. They have been the cause of countless road accidents with consequent damages to citizens who heroically decided to use them in their daily movements.

[6] We are referring to the 'Social Urban Garden' which is located in the public housing neighborhood of Ponticelli, where a group of citizens under the guidance of the local health authority has been entrusted with the partial adoption of a 12 hectares urban park, giving it back to public use (see Palestino 2017).

Measure Efficiency" (www.clarity-h2020.eu), upon request of Federico II University of Naples, CC returned to local government's attention, progressively involving more offices and regaining the value of technical skills.

In the framework of the Clarity research, the City of Naples had a double role: On the one hand, as an end-user it was involved in co-designing and assessing the climate services to be developed; on the other hand, as a data provider it was engaged in the input data collection of simulation models, and in the definition of urban plans and projects (Comune di Napoli 2020b). As a data provider, the City of Naples worked at the metropolitan level, systematizing databases which had been structured by the Campania Region and the Province of Naples. As an end-user, the City contributed to the elaboration of the requirements of the research, namely, to develop a decision-making tool useful to investigate impacts of adaptation measures and risk reduction options in the local context, through the comparison of alternative strategies. The decision-making tool that emerged is a Climate Services Information System (CSIS), able to exploit the added value of Climate Services by providing a CC adaptation platform based on a coherent methodology integrating a marketplace and a community for Climate Services (Dihè 2017). The platform allows two levels of increasingly detailed analysis of urban contexts: from the initial screening, providing simulations based on available open data in Europe (e.g., Copernicus, Eurostat), to expert services, providing accurate simulations based on local data.

At the beginning of 2019, the growing media coverage of the global struggle against the CC crisis, combined with the involvement of the City of Naples in the Clarity project, led to the progressive involvement of officials and technicians in CC, subsequently followed by politicians, who had been previously inattentive to the issue. This made it possible, suddenly and unpredictably, to keep CC on the city government agenda and move it up the list of policy priorities.

In particular, the integrated work of municipal officials within Clarity, including urban planning, public housing, mobility, and the environment, proved to be very useful for updating the ongoing Urban Plan, reinforcing the environmental strategy called "Safe and Sustainable City" (Comune di Napoli 2019) (Fig. 4.1). Both the climate-based experimentation on the guidelines document of the Urban Plan and the "Oxygen Common Good" resolution by the Metropolitan City and the City of Naples were approved in March 2019.

The collaboration between the City of Naples and scholars involved in the Clarity research began to bridge the gaps in the environmental skills of the administrative apparatus, allowing public officials to properly pursue the Preliminary Plan and the Environmental Report. Furthermore, this fruitful interaction provided a meaningful framework for discussing the Preliminary Plan with the designated actors. Moreover, what convinced officials to utilize the Clarity methodology was that the most fragile urban areas, where the City was already oriented to implement urban regeneration plans, also had the greatest problems with climate impacts and risks, such as flood and soil erosion, water quality and availability reduction, and housing security. Finally, the platform for climate services used as a decision-making tool to assess in advance the climate impacts of the proposed projects or plans met stakeholders' expectations.

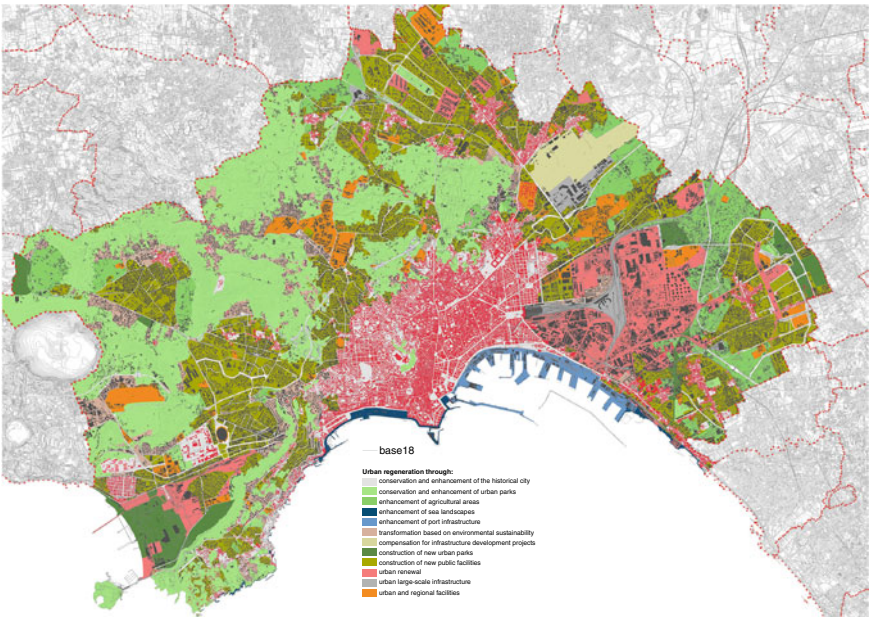

Fig. 4.1 The map of urban regeneration in the Preliminary Plan of Naples (Comune di Napoli 2020a)

The consequence of this alignment of interests and objectives born within the Clarity research recently led the City to start the elaboration of the Sustainable Energy and Climate Action Plan (SECAP), which had not previously been addressed due to lack of resources; drawing on the first studies carried out to classify buildings and open spaces in Naples based on climate effects, together with further infrastructural interventions financed by the national government. The Clarity research also triggered resumption of work for the Urban Plan for Sustainable Mobility that had been at a stalemate.

The Preliminary Urban Plan and Environmental Report were approved at the beginning of 2020; now, it is necessary to continue plan making. Urban strategies can be refined, starting from what has already been outlined for areas of urban regeneration and public facilities in the Preliminary Plan. These are, in fact, the contexts from which climate adaptation planning can be launched.

4.4.3 How CC Entered the Agenda-Setting of the Metropolitan City of Naples

The media wave coverage of CC, starting in February 2019, has also conditioned the decision-making of the Metropolitan City where, from 2017 onwards, the mayor was

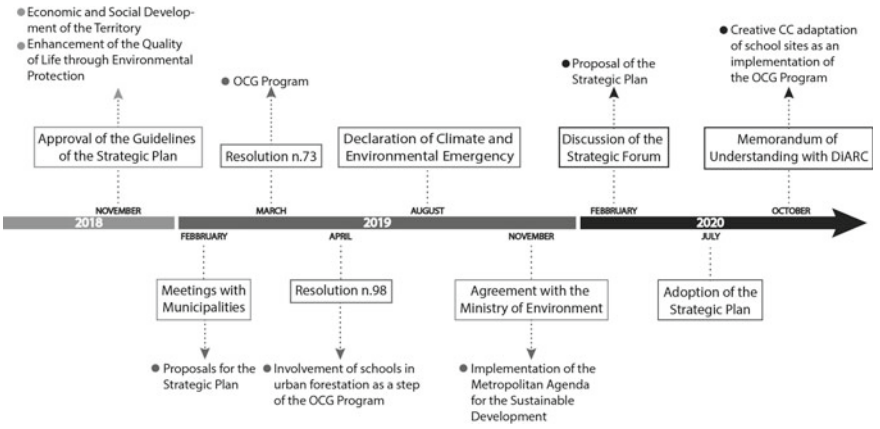

Fig. 4.2 Measures related to climate change in the Metropolitan City of Naples

undertaking a political battle to give space and political visibility to environmental concerns. This happened mainly through legal instruments such as the Strategic Plan of the Metropolitan City and several formal acts, in particular metropolitan resolutions, focused on CC (Fig. 4.2).

In November 2018, the Metropolitan City of Naples (henceforth MCN) approved the "Guidelines of the Strategic Plan," with a double specific focus: the "Economic and Social Development of the Territory," and the "Enhancement of the Quality of Life through Environmental Protection." The Strategic Metropolitan Plan making could start because the metropolitan mayor was able to recover a budget surplus of the former provinces. The sum of 500 million euros, quite significant for a fragile administration like the Metropolitan City of Naples, allowed MCN to distribute economic resources to the 92 municipalities in the area, and to launch the Strategic Metropolitan Plan.

In February 2019, the homogeneous areas of the plan[7] were defined according to identity, historical and functional reasons, geomorphological and landscape contexts, and socio-economic relations. Then, MCN initiated public meetings, inciting municipalities to present projects related to the main focus of the plan, followed by a Forum open to local representatives where proposals were discussed and networking was promoted.

Based on these interactions and upon the proposal by the metropolitan deputy mayor, in March 2019 the Metropolitan Council approved resolution n. 73 "Oxygen Common Good - Naples metropolis 30/50," which binds MCN to the implementation of measures to protect the climate and territory, working on oxygen production and the containment of gases responsible for overheating. The resolution was not born extemporaneously, but was the result of a three-year dialogue triggered by the Metropolitan City with research bodies and civil society, working together as a local

[7] According to the national law on Metropolitan cities, the metropolitan area has to be divided into homogeneous areas in order to define the Strategic Metropolitan Plan.

elite focused on responding to the CC crisis. This dialogue started in 2016, with a specific attention to schools and education in order to activate a long-range collaboration. In execution of the measures launched in the United Nations conference in Katowice, the resolution presented a program of activities to be implemented through the Strategic Metropolitan Plan, with the aim of promoting urban, infrastructural, and production transformations capable of containing the process of global warming by 2050. The Oxygen Common Good program (henceforth OCG), introduced by the resolution, aims to experiment, within the Strategic Metropolitan Plan of Naples, about a formula that could be extended to other Italian cities joining the National Association of Italian cities.

Resolution n. 98, approved in April 2019, also focused on the OCG program, and stimulated the active involvement of the 352 high schools under the direct management of the MCN in urban forestation and planting. In this framework, urban forestation is interpreted mainly as an educational practice to be carried out through participatory workshops on CC adaptation of green areas within high schools. Moreover, in August 2019, the Metropolitan Council approved the declaration of climate and environmental emergency, committing to implement within six months initiatives for the reduction of emissions, the commencement of building resilience projects, the introduction of renewable energies, the revision of urban planning and mobility projects, and the development of urban forestation. Furthermore, pilot projects have been planned to experiment and design a Metropolitan Agenda developing the "2030 Agenda for Sustainable Development" objectives in the local context. The declaration of climate emergency, of essentially symbolic value, marks another important moment, in that the MCN has taken a substantial political stance to tackle CC. Unfortunately, responses to CC are still not among the priorities of the Campania Region's Agenda and measures, except for some initial orientation in rural policies and risk mitigation.

As for the Strategic Plan process, the double focus of the plan was structured into Axes and Actions. Concerning the actions, the Strategic Plan recognizes a difference between the "flywheel actions," in relation to which further projects are subsequently programmed, and the correlated actions. Apart from the "development" focus, the "quality of life" line is divided into three axes: Zero land consumption, the OCG axis, and Safe cities. In particular, the OCG axis aims to increase urban resilience through the conscious management of resources supporting CC adaptation by the protection and enhancement of green areas, bio-climate control, and energy efficiency.[8]

The tool for implementing the Strategic Plan Guidelines related to the National Strategy for Sustainable Development is the OCG program. With respect to the contents of the program, MCN signed an agreement with the Ministry of the Environment in November 2019, promoting actions aimed at strengthening the internal functioning of the administrative apparatus (e.g., the establishment of the OCG office); triggering relations with the outside world through the activation of a network including Federico II University; and fostering education on the issue of the UN

[8] As for public funds, 95.0 million euros have been assigned to the OCG axis: 4.6 million for energy efficiency, 53.4 million for parks and green areas, and 37.0 for waste and sewerage management.

agenda for high schools in the metropolitan area. In particular, regarding the planting of three million trees, MCN involved several Italian universities, turning to experts and technicians to understand how to restore equilibrium conditions for the area and its inhabitants' well-being.

In February 2020, actors participating in the Strategic Forum were invited to submit comments and proposals and in July the Strategic Plan was adopted by the Metropolitan Council.

Finally, to encourage citizens' awareness of CC, a memorandum of understanding has been signed between MCN and DiARC in October 2020. The University has recognized the high symbolic and formative value of the OCG resolution n. 98 by MCN, in which the OCG program is addressed to the 352 high schools within the Metropolitan City[9] with the aim of training teachers and students on the creative CC adaptation of school sites. Considering the highly positive impact of such a policy, not only in terms of environmental education but also in enhancing the quality of life, especially if extended to the scale of the metropolitan area, the University was fully committed to supporting the implementation of this resolution. The agreement allowed the activation of an experimental didactic laboratory that was held at DiARC during 2020, whose aim was to analyse and test suggestions coming from the resolution, building a communicable vision of its main contents (Palestino et al. 2020b). While in fact the resolution is no more than a declaration of intents, the idea of translating it into a more general vision is the first step toward its implementation.

Once high schools were classified according to the size of the open spaces to be re-naturalized, the prevailing typological aggregations were analysed. Inventoried one by one, possible adaptive solutions were proposed for each type, useful for stimulating the active involvement of teachers and students in creative workshops on the adaptation and forestation of their institutes.

4.5 Conclusions

Beyond voluntary adaptive plans, which remain limited, and sectoral measures, actions to cope with CC have recently been integrated into the urban planning process in Naples by promoting multilevel governance models and encouraging cross-sectoral interactions among public actors. As for Naples, some partnerships were facilitated because the mayorships of the City and of the Metropolitan City were held by the same person; otherwise, they would have been rather difficult to pursue, as in fact is the case with the difficult relationship with the Regional Authority.

The commitment of public actors follows two different paths: (i) the symbolic promotion of environmental values addressed to students, as tested in the didactic experience held at DiARC; (ii) the opportunistic exploitation of university research

[9] As for schools in the City of Naples, the data of the Ministry of Education indicate the presence of 162 state schools, of which 63 high schools are administered by MCN for a total area of 92 hectares, of which about 50 hectares are dedicated to greenery and outdoor sports.

toward urban governance, the improvement of legal instruments, and networking with Europe. For its part, Federico II University, recognizing the effort made by local authorities, and at the same time understanding their structural deficiencies, was willing to support them. Support was directed to technical aspects through the "Clarity" research partnership, and to foster the active participation of high schools to climate adaptation through the public engagement memorandum of understanding on the OCG program.

What we have learned from the case of Naples is that, once governance becomes multilevel and open to proposals from research centers or civil society, a mutual learning process is triggered. This learning process proceeds, on the one hand, by developing technical and political abilities, thus overcoming problems related to knowledge gaps or the functioning of the administrative apparatus, and, on the other hand, by sharing climate responsive narratives, visions, and actions with people. In this way, by focusing on climate effects in local contexts, creative governance models can be explored.

This is true mainly in case of fragile or economically depressed cities where climate urbanism does not take root, lacking the necessary preconditions, while community-based adaptation acquires strength due to the institutional willingness to invest in symbolic aspects which can give rise to well-rooted policies in the local society.

Whether Neapolitan administrators and politicians are investing in climate policies as "a lever for place-based regeneration policies" (Palestino et al. 2020a), it is not by chance that this regeneration concerns urban public spaces. Those, in fact, are precisely the common spaces that, by undergoing the disastrous effects of CC, erase the sense of community and destroy the uniqueness of the urban landscape.

Acknowledgements We acknowledge the *Occupy Climate Change!* research funded by FORMAS (Swedish Research Council for Sustainable Development) under the National Research Programme on Climate (Contract: 2017-01962_3).

References

Armiero M (2014) Garbage under the volcano: the waste crisis in campania and the struggles for environmental justice. In: Armiero M, Sedrez L (eds) A history of environmentalism. Bloomsbury Academic, London, pp 169–184

Bai X (2008) Integrating global environmental concerns into urban management: The scale and readiness argument. J Ind Ecol 11(2):15–29

Berruti G, Palestino MF (2018) Le aree-rifiuto come sfida dell'economia circolare. Un cantiere aperto nella regione urbana di Napoli. Urbanistica Informazioni 278:26–31

Berruti G, Palestino MF (2020a) Contested land and blurred rights in the Land of Fires (Italy). Inter Plann Stud 25(3):277–288

Berruti G, Palestino MF (2020b) Wastelands as an opportunity for managing Naples' sustainable transition. Eur Spat Res Policy 27(2):33–42

Castellari S, Venturini S, Giordano F, Ballarin Denti A, Bigano A, Bindi M, Bosello F, Carrera L, Chiriacò MV, Danovaro R, Desiato F, Filpa A, Fusani S, Gatto M, Gaudioso D, Giovanardi O, Giupponi C, Gualdi S, Guzzetti F, Lapi M, Luise A, Marino G, Mysiak J, Montanari A, Pasella D, Pierantonelli L, Ricchiuti A, Rudari R, Sabbioni C, Sciortino M, Sinisi L, Valentini R, Viaroli P, Vurro M, Zavatarelli M (2014) Elementi per una Strategia Nazionale di Adattamento ai Cambiamenti Climatici. Ministero dell'Ambiente e della Tutela del Territorio e del Mare, Roma. Retrieved from https://www.minambiente.it/sites/default/files/archivio/allegati/clima/snacc_2014_elementi.pdf

Centro Euro-Mediterraneo sui Cambiamenti Climatici—CMCC (2017) Piano Nazionale di Adattamento ai Cambiamenti Climatici. Retrieved from https://www.minambiente.it/sites/default/files/archivio_immagini/adattamenti_climatici/documento_pnacc_luglio_2017.pdf

Cohen MD, March JG, Olsen JP (1972). A garbage can model of organizational choice. Administrative science quarterly, 1–25.

Comune di Napoli (2019) Napoli 2019–2030. Città, Ambiente, Diritti e Beni Comuni. Documento di Indirizzi del PUC. Retrieved from https://www.comune.napoli.it/flex/cm/pages/ServeAttachment.php/L/IT/D/1%252Fe%252F9%252FD.194f8300cdfa79d96fa4/P/BLOB%3AID%3D37912/E/pdf

Comune di Napoli (2020a) Carta della Rigenerazione Urbana. Retrieved from https://www.comune.napoli.it/flex/cm/pages/ServeAttachment.php/L/IT/D/1%252Fb%252F5%252FD.60dd1fc7fedf6cd0bcf0/P/BLOB%3AID%3D37912/E/pdf

Comune di Napoli (2020b) Rapporto Preliminare di Vas-vi. Retrieved from https://www.comune.napoli.it/flex/cm/pages/ServeAttachment.php/L/IT/D/1%252F9%252F2%252FD.e7456b9ad07748ac7a95/P/BLOB%3AID%3D37912/E/pdf

Covenant of Mayors (2020) Map of Covenant signatories. Retrieved August 12, 2020 from https://www.covenantofmayors.eu

Davoudi S, Crawford J, Mehmood A (eds) (2009) Planning for climate change: strategies for mitigation and adaptation for spatial planners. Earthscan, London

De Leo D, Palestino MF (2017) S-regulation matters. In Balducci A, Fedeli V, Curci F (eds) Post-metropolitan territories. Looking for a new urbanity. Routledge, London and New York, pp 274–280

De Luca G, Moccia FD (eds) (2017) Pianificare le città metropolitane in Italia. Interpretazioni, approcci, prospettive. Inu Edizioni, Roma

De Rosa SP (2017) Reclaiming territory from below: grassroots environmentalism and waste conflicts in Campania, Italy. Lund University, Lund

Dihè P (ed) (2017) Clarity H2020. D5.1 Exploitation Requirements and Innovation Design v1, Clarity Consortium. Retrieved from https://clarity-h2020.eu/sites/default/files/clarity/public/content-files/deliverables/CLARITY%20D5.1%20Exploitation%20Requirements%20and%20Innovation%20Design%20v1.0b%20final.pdf

Dodman D, Mitlin D (2013) Challenges for community-based adaptation: discovering the potential for transformation. J Inter Dev 25(5):640–659

Gillard R, Gouldson A, Paavola J, Van Alstine J (2016) Transformational responses to CC: beyond a systems perspective of social change in mitigation and adaptation. WIREs Clim Change 7(2):251–265

Giordano F, Capriolo A, Mascolo RA (2014) Le linee guida del progetto life act per l'adattamento ai cambiamenti climatici a livello locale. Urbanistica Tre Giornale on-line di Urbanistica 5:21–26

Long J, Rice JL (2019) From sustainable urbanism to climate urbanism. Urban Stud 56(5):992–1008

Magni F (2019) Climate proof planning. L'adattamento in Italia tra sperimentazioni e innovazioni. Franco Angeli, Milano

Musco F (2014) Ricerche e pratiche per l'adattamento climatico: l'esperienza di Venezia. Urbanistica Tre, Giornale on-line di Urbanistica 5:27–36

Obersteg A, Arlati A, Acke A, Berruti G, Czapiewski K, Dąbrowski M, Heurkens E, Mezei C, Palestino MF, Varjú V, Wójcik M, Knieling J (2019) Urban Regions Shifting to Circular

Economy—understanding Challenges for New Ways of Governance. Urban Plann 4(3):19–31. https://www.cogitatiopress.com/urbanplanning/article/view/2158

Palestino MF (2015) How to put environmental injustice on the planner's radical agenda. Learning on the Land of Fires-Italy. In Macoun M, Maier K (eds) Proceedings 29th Annual AESOP 2015 Congress Definite Space—Fuzzy Responsibility. Prague, Czech Republic, pp 2576–2586

Palestino MF (2017) Ponticelli smart Lab: Un ambiente ibrido per l'implementazione di approcci esperienziali al cambiamento climatico. In D'Ambrosio V, Leone MF (eds) Progettazione ambientale per l'adattamento al Climate Change 2. Strumenti e indirizzi per la riduzione dei rischi climatici, vol. 26. Clean, Napoli, pp 126–133

Palestino MF, Berruti G, Quagliano S (2020a) Climate change as a lever for place-based regeneration policies: the case of Naples, Italy. In: Peker E (ed) Proceedings book of the conference on production of climate responsive urban built environments. Istanbul Policy Center, Istanbul, pp 83–89

Palestino MF, Amore MP, Cuntò S, Molinaro W (2020b) Reinventare le scuole come hub di rigenerazione socio-ecologica. Una ricognizione sulle potenzialità degli spazi aperti degli istituti superiori di Napoli. BDC. Bollettino Del Centro Calza Bini 20(1):181–196. Retrieved from http://www.serena.unina.it/index.php/bdc/article/view/7550

Pietrapertosa F, Salvia M, De Gregorio Hurtando S, D'Alonzo V, Churche JC, Geneletti D, Musco F, Reckieng D (2019) Urban climate change mitigation and adaptation planning: are Italian cities ready? Cities 91:93–105

Svimez (2019) II Mezzogiorno nella nuova geografia europea delle disuguaglianze. Retrieved from http://lnx.svimez.info/svimez/wp-content/uploads/2019/11/rapporto_svimez_2019_sintesi.pdf

Swyngedouw E (2010) Apocalypse forever? Post-political populism and the spectre of climate change. Theory Cul Soc 27(2–3):213–232

Gilda Berruti is Assistant Professor of Urban Planning at "Federico II" University of Naples, Department of Architecture, where she took her Ph.D. in Urban and Regional Planning. Her research interests include public spaces between urban form and social dimension, the social construction of urban policies and plans, the sustainable city as an aspect of the new urban question. Currently, she carries out research on the relationship between planning rules and urban informalities. She is coordinator of the Community "Governance and citizens' rights" of the National Institute of Urban Planning (INU) since 2020.

Maria Federica Palestino is Associate Professor of Urban Planning at "Federico II" University of Naples, Department of Architecture, where she took her Ph.D. in "Evaluation Methodologies for the Conservation of Architectural, Urban and Environmental Heritage." Her primary research is focused on the strategic role of cultures, creativity and images in regeneration processes and polices. According to the theoretical framework of Urban Political Ecology, in her latest research projects she is exploring the empowerment of fragile communities and places, in order to recover from socio-ecological decline through counter-visuality.

Chapter 5
Community Engagement in Climate Change Policy: The Case of Three Mills, East London

Ozlem Edizel-Tasci and Graeme Evans

Abstract Vulnerable communities and places are often the ones most affected by the impacts of climate change. Effective governance with the involvement of local communities, NGOs and organizations is therefore crucial for sustainable policies and to mitigate and adapt to the impacts of climate change. Active engagement of communities in climate change policy helps local governments to identify resources, needs and problems and think strategically about addressing these issues. This chapter aims to address the rationale and practicalities of community engagement in climate change policy and presents a case study in East London, located at Three Mills. The community engagement activities presented in this chapter were undertaken as part of the Hydrocitizenship research project. Findings from cultural ecosystems mapping activities along with socially engaged art practice generated by the Active Energy project with local elders and student design exhibition, together demonstrate the benefits from a more co-designed and co-produced approach, with increased awareness on environmental issues and better governance for sustainable energy in response to climate change. It also emphasizes the importance of citizen science and participatory design to help to generate climate-responsive planning and design solutions, especially for the adaptation to climate change, notably flood risk, pollution and global warming.

Keywords Public participation · Citizen science · Three Mills

5.1 Introduction

Access to clean water is a fundamental right for sustainable communities, economies and biodiversity, as well as an essential element of cultural landscapes and heritage.

O. Edizel-Tasci (✉)
Boston University, Boston, MA, USA
e-mail: edizelt@bu.edu

G. Evans
University of the Arts London, London, UK
e-mail: g.l.evans@fashion.arts.ac.uk

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_5

There are a growing number of water-related risks in urban environments due to climate change and urbanization, including increased flood risk, drought/scarcity risk, pollution and degradation of aquatic ecosystems. Vulnerable communities and places are often the ones most affected by the impacts of climate change. Effective governance with the involvement of local communities, NGOs and organizations is therefore crucial for sustainable policies and to mitigate and adapt to the impacts of climate change. Active engagement of communities in climate change policy helps local governments to identify resources, needs and problems and think strategically about addressing these issues. An example of how engagement can achieve this in practice is seen here through the Hydrocitizenship research project which over a three-year period responded to an urban community which is subject to growing risks and incidents of flooding, water pollution and access problems, in a deprived riparian neighbourhood of east London. This project sought to demonstrate the benefits of creative engagement at different scales in order to highlight and articulate what living with/on water might mean—and the rights and responsibilities that being a *Hydrocitizen* might entail, in the context of climate change.

This chapter aims to address the rationale and practicalities of community engagement in climate change policy. To do so, it presents a case study in the Lower Lee Valley, East London, located at Three Mills where the largest tidal mill in the world ceased to operate during the Second World War. Today, the mill is a low-key heritage visitor attraction with neighbouring industrial buildings and growing housing and leisure development arising from the Olympic Park, a legacy from the 2012 Summer ('sustainable') Games (Evans 2014). Three Mills and its surroundings communities are also an especially vulnerable community to climate change impacts such as flooding (from river and surface/run off), water pollution and wider waste impacts. It is important to engage with communities at a local level in order to inform policy formulation in climate change at both local and national level and bring awareness of alternative strategies to mitigate climate change. Hence, this research explores community engagement in various forms—from providing meaningful information and educating the public, to consultation and deliberation—as well as having older and younger people come together to work for environmental change in their community.

Three different community engagement activities in the Three Mills site are introduced in this chapter: Cultural ecosystems mapping utilizing Participatory GIS, Active Energy water turbine installation, and a student design exhibition (Fig. 5.1). All of these activities were undertaken as part of the Hydrocitizenship research project (UK Arts & Humanities Research Council-funded, 2014–2017) which investigated, and made creative contributions to the ways in which citizens and communities live with each other and their environment in relation to water in a range of UK neighbourhoods. These community engagement activities aim to inform local agencies and policymakers about the values, concerns and knowledge that people have of their environment and increase community engagement in climate change policy. Hence, while all engagement activities start at the local, their overall impacts vary between local, national and global scales. The cultural ecosystems mapping collects local spatial data on the needs and opinions of people and then the analysis of this data is shared with local policymakers and NGOs which sets an example for the

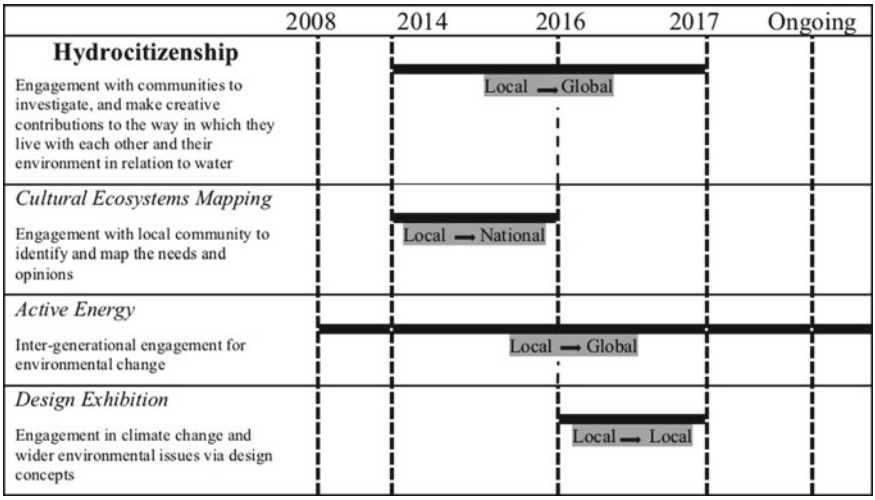

Fig. 5.1 Timeline, purpose and impact (local, national, global) of the Three Mills engagement activities

national climate change policy. On the other hand, the *Active Energy* can present a global impact in the climate change policy in term of the use of low-tech technology solutions in several other locations in the world. Finally, the design exhibition had a local impact in understanding the climate change threats that the Three Mills is facing and raised awareness of environmental challenge.

Findings from Participatory GIS (P-GIS) mapping activities followed by socially engaged citizen science generated by the artist-led Active Energy project with local elders, and finally, creative design exhibitions based on the waterside heritage, together demonstrate the benefits to be derived from a more co-designed and co-produced approach to engagement, with improved accessibility/connectivity and better governance for sustainable solutions in response to climate change impacts. This iterative approach also emphasizes the importance of participatory engagement in research-based interventions to help to generate climate-responsive planning and design solutions, especially for adaptation to climate change, notably flood risk, pollution and global warming.

5.2 Impacts of Climate Change

The climate can be described simply as the ‘average weather’, typically taken over a period of 30 years. More rigorously, it is the statistical description of variables such as temperature, rainfall, snow cover or other properties of the climate system (ASC 2011). Climate change, therefore, refers to changes that can be identified in the mean and/or the variability of these properties, and that persists for an extended

period—decades or longer—with the effect that 'altered frequencies and intensities of extreme weather, together with sea-level rise, are expected to have mostly adverse effects on natural and human systems' (IPCC 2007).

Several countries have accepted climate change as an immediate risk to development, poverty eradication efforts and the welfare of their citizens. Although greenhouse gas emissions are projected to drop about 6% in 2020 resulting from the COVID-19 pandemic, the United Nations considers this improvement only temporary. According to the Intergovernmental Panel on Climate Change (IPCC), the global temperature rise will exceed the goal to limit of two degrees Celsius that countries have agreed upon to avoid the most dangerous impacts of climate change (Paris Agreement), if the greenhouse gas emission in the world continues as it was before the pandemic.

Across the globe, both annual average temperature and global sea levels have increased significantly since the early 1990s (Hay et al. 2015; IPCC 2013). The intense climate events taking place in vulnerable ecological systems and populations intensify existing social and environmental threats. This generates significant risks for cities. As the IPCC projects: 'climate change is to increase risks for people, assets, economies and ecosystems, including risks from heat stress, storms, extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea-level rise, and storm surges' in urban areas, especially for those 'lacking essential infrastructure and services or living in exposed areas' (IPCC 2014).

Climate change has also been witnessed across the world in different ways from physical systems such as the composition of the atmosphere to biological processes such as shifts in the ranges of plants and animals towards the poles and higher altitudes (Wilson and Piper 2010). The stability of life is very much related to these systems. However, the impacts of climate change continue to accelerate, and they are mostly not possible to avoid hence, they must be managed and mitigated. Different impacts dominate in different parts of the world. Over the next 10–15 years, the extreme weather events will have the most important impact on Europe. Mediterranean regions will witness more frequent droughts and peak summers, while winter floods and summer droughts will become more common in continental Europe. Biophysical conditions in Western Europe will therefore change as a result of storms and heavy rainfalls (Kelemen et al. 2009) with increased flooding and water pollution—as is being experienced in our UK case study.

5.3 Vulnerability and Climate Change

The nature and the intensity of climate change impacts depends on the vulnerability of places and people. Vulnerability is defined as a function of both exposure and sensitivity, where exposure refers to 'the character, magnitude and rate of climate change and variability to which places are exposed' and the latter refers to the adaptive capacity of the place (Davoudi et al. 2009, p. 10). Vulnerability is the degree to which people, places, economic sectors and infrastructures are prone to and unable to

cope with the impacts of climate change. It is shaped by many factors, including 'the cultural and economic characteristics of urban residents, level of technical and institutional capacity of city governments; built environment and infrastructure; quality of ecosystem services; and the threats from human-induced, interconnected stresses and actions such as resource overexploitation and environmental degradation of areas providing natural resources and services' (Rosenzweig et al. 2018, p. 68).

The level of vulnerability is different between places and also between population groups. Demographic and socioeconomic profiles are the most significant factors that affect the level of vulnerability (Davoudi et al. 2009). Therefore, children and the elderly are the groups who are considered as the most vulnerable (Evans 2013a), along with people with poor health who would struggle to cope with the impacts of climate change. Also, low-income groups with little or no resources to resist or reduce the adverse effects of climate change on their well-being are among the most vulnerable (Satterthwaite et al. 2007). For example, both Hurricane Katrina in New Orleans and Hurricane Sandy in New York disproportionately impacted social groups with lower incomes and social status, particularly ethnic minorities and women. Risks are even higher for many residents in most cities of low- and middle-income countries and affect a greater proportion of the urban population as a result.

Individuals with low incomes and low socioeconomic status are therefore affected disproportionately by the consequences of both gradual climate change and extreme weather events (Hardoy and Pandiella 2009). This disproportionate impact on low-income communities is usually a result of lack of capacity within urban governments or their inability and reluctance to address the large infrastructure and service deficits.

5.4 Climate Change Governance

Climate change impacts are not only governmental concerns; they challenge a range of actors across sectors to create coalitions for climate governance in order to mitigate and adapt to climate risks. Urban climate change governance can be defined as the set of formal and informal rules, rule-making systems, and local and global actor networks that aim to steer cities towards mitigating and adapting to climate change (Biermann et al. 2009; Jagers and Stripple 2003). Thus, urban climate change governance involves various actors and institutions in a broader socioeconomic and political environment. Climate change governance needs to embark on effective stakeholder engagement with deeper insights from the community to address climate change in an effective and inclusive way.

Institutional capacity to govern climate change impacts is defined by the response and response capacity (Rosenzweig et al. 2018; Tompkins and Adger 2005). Response is 'any action taken by any region, nation, community or individual to tackle or manage environmental change, in anticipation of that change or after change has occurred' (Tompkins and Adger 2005, p. 564). The climate change response should consider wider development pressures and economic, environmental and social well-being targets of the society. On the other hand, response capacity is the resources

and assets needed to manage both the causes of environmental change and the consequences of that change (Rosenzweig et al. 2018). For instance, in the UK, agencies such as the UK Climate Impacts Programme (UKCIP), the Energy Saving Trust and the Carbon Trust have been investing in education for the public to alter behaviour and increase society's ability to cope with future impacts. Tompkins and Adger (2005, p. 564) stress that such investment aims to 'enable individuals to start to respond to climate change, to promote uptake of new technology, to enable them to internalize the costs of responding to climate impacts, and to reduce future investments in disaster management'. Governments need to figure out how much to invest in technologies—and of what kind in—order to mitigate or adapt to climate change considering this response capacity (Francese 2016; Waelbers 2011). Low tech-solutions in our case study included simple engineered (and replicated) water turbines to demonstrate the power of water through electricity generation and water oxygenation, to visualization and spatial data analysis using accessible GIS mapping and layering techniques, as well as design-led solutions to adaptive reuse of waterside assets. Other technologies adopted locally included anaerobic waste generation of electricity and compost as an example of the circular economy in action.

Community-based engagement that can lead to both behavioural change and inform policymaking can also overcome response capacity limitations and help empower local communities in this process. Although climate change governance is mostly led by state or municipal governments, in countries such as Canada and the United States, non-governmental and civil society actors have started to play important roles in climate change policymaking. Networks of actors play several roles in urban climate change governance as providers of resources, facilitators of interactions with other cities that face similar challenges, and shapers of the climate change discourse more broadly (Betsill and Bulkeley 2007). Climate change governance can therefore be a challenging process due to the involvement of actors from different scales with different interests, priorities, values and goals.

5.5 Community Engagement

Community engagement types such as consultation, communication and participation distinguish between different means of 'engaging' people. Engagement can refer to 'the formal processes used to include members of the public in decision making processes, and to facilitate the collection or integration of their views, to a greater or lesser extent' (Cass 2006, p. 3) For instance, in the case of renewable energy, it can be explained as the public perceptions and constructions of renewable energy technology. There are various ways of conducting community engagement in climate change policy: providing information and educating the public, consultation and participation/deliberation (Haggett 2009; Rowe et al. 2005) (Table 5.1).

The first type of engagement is providing information and going further in this by educating the public. In this method, the flow of information is generally one way and it is mostly focussed on pragmatic attempts to win support for an application or

Table 5.1 Three types of public engagement (Rowe et al. 2005)

	Flow of information	
Public communication: sponsor	⟶	Public representatives
Public consultation: sponsor	⟵	Public representatives
Public participation: sponsor	⟵ ⟶	Public representatives

intervention, and to avoid the 'problems' of opposition (Cowell 2007). It is in the frame of the 'decide–announce–defend' process which involves informing people of plans that have already been made, and uses passive ways of communication with communities such as distributing leaflets, advertising and providing exhibitions and displays (Haggett 2009). Therefore, engagement in this scenario is limited to 'information provision' and is not an effective way of generating public support and trust, since there are no mechanisms for the public to provide an opinion or feel empowered.

Secondly, rather than just providing predetermined information to communities, their responses and opinions are gathered in public consultation (e.g. via surveys). No formal dialogue takes place between the communities and decision-makers. The information obtained from the public in this case is believed to represent currently held opinions on the topic in question (Rowe et al. 2005). This method particularly helps to address 'qualified support' (Bell et al. 2005), where people support the general principles of a proposal, but oppose particular schemes or aspects.

Finally, engagement as deliberation/participation is where there is two-way information exchange. People are not only involved in discussing the plans but are also involved in developing them (Haggett 2009) and providing community knowledge. The process usually involves the representatives of communities, or at least a sample, rather than the whole community. The act of dialogue and negotiation helps to alter the views of the members of both parties (Rowe et al. 2005). This can be through interactive panels, workshops, focus groups or meetings where the outputs are intended to inform the policy and practice. For example, the UK Government adopted all levels of engagement from information provision to participation to engage the public and other stakeholders in the Energy White Paper in 2003 and the key issues that were raised by the public were mainly addressed in the subsequent White Paper (Chilvers et al. 2005).

These three forms of engagement are different in terms of their structure and aim. There is no agreement in the literature on which form is the most appropriate, or effective in climate change policy (Dryzek et al. 2011; Pellizzone et al. 2015). However, a holistic approach to community engagement in climate change policy especially in terms of renewable energies, is deemed to be the most suitable. Each engagement method can be applied at different stages of the process with different communities, i.e. they are not mutually exclusive, but can be used sequentially. Also,

it is possible that diverse stakeholders in climate change policy can be responsible for different forms of community engagement. The engagement undertaken at Three Mills, as detailed below, incorporated all three of these types, with an emphasis on participation, co-design and co-production of project delivery.

5.6 Three Mills, East London

The Lee Valley, East London is a 68 km long landscape containing the River Lea, Navigation and Relief Canals, thirteen major fresh water reservoirs that provide drinking water, tributaries such as New River, and the 2012 Olympic Park (Evans 2018). A major part of London's industrial history such as metalwork, brewing, ordnance and textiles lies in the Lower Lee Valley, with historic inventions from the Enfield rifle, *parkesine*—the first man-made plastic—to the first colour TV, all manufactured here. Moreover, the River Lee has been providing fresh drinking water and sanitation to the city for several centuries. Therefore, the Lee Valley has been the home of 'innovation and industrial production throughout this time, now represented by arts and creative industries, new housing and leisure developments on the revalorised waterfronts' (Evans 2016, p. 91). As a result, the Lower Lee Valley has traditionally welcomed artists who used the low-cost, old industrial buildings as their studio space.

Hosting the 2012 Olympic Games has also helped to put the Lower Lee Valley on the map, but this has also increased gentrification and land-use, and put pressure on the cultural and creative production and heritage buildings in the area (Evans 2016). There are several waterside heritage buildings in the Lee Valley, one of the oldest being the House Mill, at Three Mills. The House Mill is a Grade 1-listed eighteenth-century tidal mill set on the River Lee at Bromley-By-Bow in East London. The House Mill was built in 1776 on the site of an earlier mill and between two houses. The neighbouring Clock Mill was rebuilt in 1817 and there was also a windmill that survived until about 1840. The House Mill wheel was operated by the tidal flow up the Thames Estuary and Bow Creek to provide flour for local bakers. In addition to flour-making, the mill served the famous gin distillery next door on Three Mills Island.

The House Mill stopped functioning in 1941 after the area was bombed during the Second World War. All buildings on the Three Mills site were subsequently partially restored and converted with minimal interventions, restoration of the fabric and the waterways below the building. Being the oldest surviving and largest tidal mill in the UK, today, the House Mill is a low-key heritage visitor attraction with neighbouring industrial buildings and growing housing and leisure development surrounding the Olympic Park, a legacy from the 2012 Summer Games (Evans 2014). The site thus offered an excellent opportunity for engagement, with a tidal flow that rose from 1 to 8 m each day providing a dramatic backdrop to both the risks and potential of water, and an example that was highly visible but also everyday.

5.7 Community Engagement in Three Mills

The community engagement activities at Three Mills have been undertaken as a part of the three-year Hydrocitizenship research project. The project has been funded by the Arts and Humanities Research Council (AHRC) Connected Communities programme (2014–2017) with a particular emphasis on co-design and co-production. A range of research and engagement methods were adopted as part of an overall Participatory Action Research (PAR) approach, with a focus on citizen science and visualization, in order to engage in what is a complex environmental sphere and set of challenges.

Three linked community engagement activities undertaken in the Three Mills site are introduced in this chapter. In chronological order these were: Cultural ecosystems mapping (P-GIS); Active Energy water turbine; and student-led design projects culminating in an exhibition at Three Mills. These activities were undertaken as a part of the Hydrocitizenship research project as discussed above. These activities engaged with communities in different ways and at differing scales. Cultural ecosystems mapping ensured a participatory process at neighbourhood scale, including waterways and heritage facilities, and identified the needs and opinions of the community. The Active Energy demonstration water turbine project brought older and younger people together for environmental change in their community and participants learned about the need for sustainable forms of energy and clean water generation to help counter climate change locally—upstream and downstream—and the wider implications for global warming. Finally, university architecture students selected the Three Mills area for their final year major design project in relation to the Hydrocitzienship project. The student projects were exhibited at the House Mill which aimed to raise awareness of the environmental challenges and presented possible solutions to developing the waterfront both imaginatively and sustainably for the future. All of the three activities sought to inform local agencies and other policymakers about the values, concerns and knowledge that people have of their environment and increase community engagement in climate change policy.

5.7.1 Cultural Ecosystems Mapping

Cultural mapping is considered as a participatory visual tool to link methodologies for especially interdisciplinary projects (Duxbury et al. 2015; Edizel and Evans 2017; Longley and Duxbury 2016). It can be undertaken in various ways and GIS is increasingly one of the most preferred methods. Participatory-GIS (P-GIS) techniques used for community mapping also helps to involve communities in decision-making processes within their neighbourhoods in an effective and accessible way (Crawhill 2008). P-GIS in particular has been demonstrated to be effective in working across all age and ability groups (Evans 2015).

Participants who responded to an open invitation across the neighbourhood, were asked voluntary socio-demographic questions at the beginning of the cultural mapping session, and they were then asked to point out recreational uses, cultural uses and problem areas with the use of a large aerial view map and colour-coded stickers (Edizel and Evans 2017) which could also be annotated with comments and explanations of their choices. The data is digitalised into GIS software afterwards, which can also be combined or layered with other data, e.g. environmental, land-use, flood inundation. This activity helps to identify the needs and opinions of the community and presents an opportunity to lead to a broader approach to development in general and notably to local environmental improvements and relationships (Evans 2013b).

Several mapping sessions were held at invited and public events (e.g. festivals) across the area, providing both an iterative and place-specific set of responses. The Hydrocitizenship research team working in the Lee Valley area ran a cultural ecosystem mapping stall during successive National Mills Weekends (2016 and 2017) (Fig. 5.2). Nearly 60 individual participants in total have taken part in the Three Mills cultural ecosystems mapping exercise. The majority of the participants were aged between 45 and 64 years (60%) and lived close to Three Mills site, the remainder were from the wider Lee Valley and East London area. Three Mills and its surroundings are one of the most deprived neighbourhoods in London (Index of Multiple Deprivation 2019), hence a particularly vulnerable community to climate change impacts—notably from flooding, water pollution and wider waste impacts. However, more than 50% of the participants had never been to the House Mill before, so the engagement also raised awareness amongst a wider community and helped connect with adjoining areas. This is important in climate change terms where watercourses

Fig. 5.2 Cultural ecosystem mapping stall—National Mills Weekends 2016

flow through many communities where behaviour and events upstream inevitably impact downstream.

The cultural ecosystems mapping project encouraged the participants to (re)think about the value of water spaces. There was a pattern of having the heritage locations identified by the participants and meeting places together and they tend to concentrate along the River Lee such as the House Mill, the View Tube or the Old Ford Lock (Fig. 5.3). When the participants were asked about what the Active Energy project (see below *Active Energy* section) made them think about, the answers varied, but sustainable energy, water pollution/environment, art, and citizen science and progress for the environment, were some of the outstanding concepts. All participants agreed with water being an important urban amenity for them, and acknowledged using water spaces frequently for walking, cycling or just 'sitting by'.

Water is critical for socioeconomic development, food security and healthy ecosystems, and is vital for reducing diseases, improving the health, welfare and productivity of populations (UN 2020). The global climate crisis is increasing variability in the water cycle, thus reducing the predictability of water availability and demand, affecting water quality, worsening water scarcity and threatening sustainable development. These impacts accelerate even more with population increase, land-use change and ecological degradation and affect the vulnerable communities significantly (UN 2019). During the mapping exercise, the participants had the opportunity to discuss the negative effects of climate change on the spaces they value between themselves and the project team. The activity also made them realize how

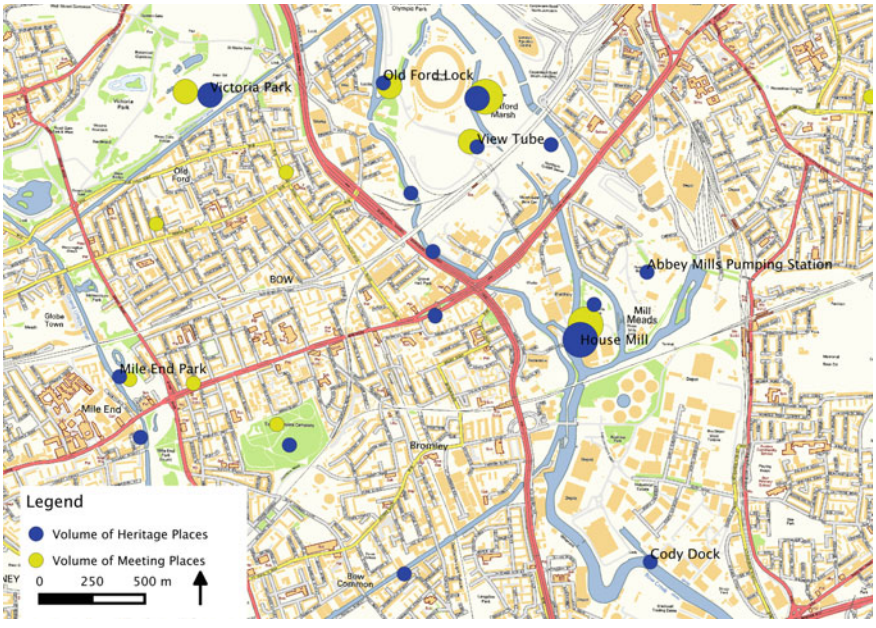

Fig. 5.3 Mapping of the Heritage and Meeting Places at the Three Mills area

much the places they value are under threat in the case of pollution or flood risk due to climate change.

Cultural ecosystems mapping generally entails a holistic approach, in this case to water-related issues and it has proven to be a 'valuable tool to articulate community perspectives, experience and aspirations and thereby to inform local agencies and other policymakers about the values, concerns and knowledge that people have of their environment' (Edizel and Evans 2017, p. 135). The mapping exercise was able to integrate a number of environmental and quality of life issues at an understandable spatial scale, capturing useful information from participants of direct benefit to the Three Mills venue itself, and raising awareness of future engagement opportunities and aspirations for the site. This included the renovation of the water mill wheel and House Mill which visitors were able to explore over two weekends.

The cultural ecosystems mapping was also able to validate and support a socially engaged art project, Active Energy, which benefitted from co-design and co-production of knowledge and the articulation of community visions. Findings and suggestions arising from the annotated maps were in particular able to inform the design of the Active Energy project, in terms of the location and theme that the water turbine would address and highlight, as well as provide an indication of the spatial relationships up and downstream of the site. This was important in view of the flows (flood water, pollution) and different impacts felt across this waterway. One of the major findings from the cultural ecosystems mapping revealed that local meeting places where people get together to have a drink/meal or enjoy the natural environment are also considered as a part of local and regional heritage. This shows that people like to spend their time around locations which they value as part of their cultural heritage which are under threat in the case of pollution or flood risk due to climate change. These findings were also shared with local policy makers and NGOs which helps to raise awareness to climate change at local and national level.

5.7.2 Active Energy

Active Energy first started as a participatory action research project on the democratization of technology development by a group of local community artists. The team explored 'how the experience of older people was not only being excluded from the development of new technologies, but often left this age group victim to the technological design and control of others' (Leeson 2018, p. 64). A group of retired men, all former dock and maritime workers from the local area, including an engineer who had worked with steam turbines, and others with mechanical interest and experience, had discussed how water wheels might be used in nearby tidal waters to produce renewable energy. Meeting at a local pensioners club at Age UK in Bow, the idea to generate electricity from a water turbine for a public art installation there, led to the introduction of a local community artist to develop this idea further. This was the start of a long-term collaboration of artist, Dr. Loraine Leeson with the self-named pensioners group, *The Geezers*. Conscious of the rising impact of rising

electricity costs to those on lower incomes, the group had asked—how could technology be used to harness the power of tidal water as a sustainable source of energy, and which could improve life for themselves and their community? As van Ruijven and his colleagues (2019) stress, the lower the level of income per person, the larger the share of income that families need to spend to adapt to a given increase in energy demand. Low-income communities have to cope with challenges to adaptation that are not only financial such as 'in areas that have unreliable electricity supplies, or lack grid connections altogether, increased exposure to hot days increases the risk of heat-related illnesses and mortality' (International Institute for Applied Systems Analysis 2019). The Geezers continued developing their ideas for tidal turbines, making their case for the local resourcing of renewable energy and also to start an inter-generational project at a local boys' secondary school. This was motivated by their desire to pass on their local knowledge and experience to a younger generation and promote the potential of renewable low-cost energy from this local natural resource. This has led to The Geezers, who were previously isolated older men, finding themselves mentoring underachieving local schoolboys.

The opportunity to realize the Active Energy project presented itself through the umbrella Hydrocitizenship research project in 2016, which was already collaborating with the *Love the Lea* project at Thames 21 (T21), an NGO working to improve the watercourses for people and wildlife in Greater London, including at Three Mills island. T21 had expertise in water management and a useful local resource for boat access. They proved to be vital for the Active Energy project to develop its water turbine and both launch and tow the turbine up to the Three Mills site. The outflow from House Mill at the Three Mills heritage site was designed to be utilized to drive a floating stream wheel powering an aerator to help oxygenate the water and counteract the effects of pollution on the river's fish and wildlife (Fig. 5.4). Three Mills has thus been an outstanding site for the project which has informed our understanding of water power in a location with an extensive tidal range (Leeson 2020). This riparian heritage site was a microcosm of climate change—downstream of areas undergoing major development and flood prevention measures, with rising water levels and flooding, and water pollution from road run off and upstream spillage into the river and feeder-canal.

The Active Energy mobile water wheel was launched at Three Mills in 2017, below the House Mill building during the National Mills Weekend, a national event to celebrate mill heritage. This was an opportunity to bring awareness of renewable energy, the importance of community input to design, and the value of the older population to wider society. There is increased demand for water for energy, agriculture, industry and humans all over the world. Hence, it is not an overstatement to say that climate change is felt most directly through water (UN 2019).

Following the success of the Three Mills water wheel project, in 2019, a second water wheel based on the original model was created for the Waterworks River in the Queen Elizabeth Olympic Park upstream from Three Mills. Science students at a secondary school located nearby the river, and post-16-year-old engineering students at a college of further education were involved in workshops leading up to its installation. Following contact by the Active Energy team, led by Lorraine

Fig. 5.4 Installation of the water wheel at the Three Mills

Leeson, engagement was facilitated through the school and college STEM (Science Technology, Engineering and Maths) curricula which justified the involvement of students during school time, and also contributed to their wider learning around sustainability and the local environment. As Leeson (2020) observes: 'participants visited the wheel in situ and learned about the need for sustainable forms of energy to help counter climate change as well as the ecological challenges for their local rivers. In group workshops working models of turbines suitable for the generation of renewable energy were created'. The project team presented their work at the London Legacy Development Corporation (a mayoral agency charged with developing the post-Olympics zone), held during a week of world action for climate justice. The Active Energy project celebrated how older and younger people have come together to work for environmental change in their community. During the event, participants engaged in conversations about what was necessary to bring about environmental change locally and globally.

The Active Energy project is hoping to set an example for slow-moving tidal rivers in developing countries and the particular challenges they face. Also, more renewable energy workshops for schools and public awareness events will help to increase community engagement in climate change policy and low technology solutions.

5.7.3 Design Exhibition

Finally, engagement in climate change and wider environmental issues was also undertaken with university architecture design students who had selected the urban

waterfront of the area as the site for their final year major design projects. Using the theme: Edge Condition, signifying the water/land boundary, edge city and liminal state of this post-industrial and ancient environment, students had spent several months in fieldwork, investigating buildings—their past and recent use—as well as water infrastructure and communities of interest, with the challenge to produce design visions and concepts for these sites along this waterway. They had access through lectures undertaken by Hydrocitizenship team members to the cultural ecosystems findings and visualizations, and as part of the design process had undertaken fieldwork and site visits, talking to local people and organizations about the history and issues surrounding the waterside buildings and their potential use. Following the Active Energy water turbine installation, an exhibition of their final design schemes for the reuse of Three Mills heritage buildings was organized in collaboration with the Three Mills heritage organization, in order to maintain the momentum and continue engagement.

The opportunity to display their work was also enhanced through the London Architecture Festival (LFA) which was held annually across the city in June, with the year's LFA theme, *Memory*, which was particularly apposite to the industrial and intangible heritage of the area. A month-long exhibition of student design projects was housed at Three Mills in the foyer/café area. This provided local residents, visitors to the Three Mills Heritage Centre, and an architectural audience, to view and experience the site and thus raise awareness of the environmental challenges, history and possible solutions to developing the waterfront both imaginatively and sustainably for the future. Design concepts displayed at the Three Mills exhibition ranged from a Post-Apocalyptic Flood Survival Centre ('Sinking Future') to a Boat Crafting Station and various creative and cultural spaces for community and educational use (Fig. 5.5).

Fig. 5.5 Post-Apocalyptic Flood Survival Centre ('Sinking Future') from Three Mills exhibition

5.8 Conclusion

This case study of community engagement in climate and wider environmental change has highlighted the importance of co-design and co-production in research-based interventions that stress the importance of local knowledge (Geertz 1985) in a field that is dominated by complex technical and spatial dimensions, as well as time horizons that are beyond most community comprehension, or at least, the power to effect real change. Information providing, consultation and participation have been experienced through the engagement activities in the Three Mills as well as raising awareness in environmental and key climate issues in the area.

The value of inter-generational engagement, and the use of socially engaged creative practice, citizen science and visualization of community experience and aspirations towards their environment, are all valuable lessons for the future. This includes the benefits of accessible technology that is both inclusive and sustainable (Evans 2013a). The use of heritage—built, natural and intangible—as sites for engagement and innovation (Evans and House 2017), has also provided a useful context to draw on memory, skills, adaptation and resilience in the face of multiple environmental challenges in areas undergoing pressures from urban development. This suggests that climate change policy and action needs to start with engagement at this level, both to inform policy formulation itself, as well as ensure co-operation and buy-in with local communities who have a deep and historic connection with the ecosystems in which they co-habit. The engagement activities at Three Mills helped to communicate community experience, opinions and concerns with the local agencies and policymakers. Thames 21, an NGO that effectively contributes to policy and advisory groups that introduce effective and sustainable measures, was actively involved in the Active Energy project. They were also informed from the findings of the cultural ecosystem mapping activities.

The participatory action research nature of the Hydrocitizenship project enabled several forms of engagement and inter-action at different scales, and the iterative process allowed findings and knowledge generated at one stage to be fed into the next. So cultural ecosystem mapping with individuals and small groups produced valuable insights to community perceptions, usage and issues that informed the Active Energy water turbine installation in terms of its location, engagement strategy, and raised awareness of the project itself and key climate issues. Student design projects also drew upon these maps and related findings, as well as benefiting from the water turbine experience as it highlighted both the power of water and potential of the redundant water wheel at Three Mills, which was the chosen site for their architectural schemes and final exhibition. Displaying the large-scale maps was also a resource and prompt for further engagement with local communities and facilitated a visual record and integration of local knowledge and opinions. Citizen science methods used in the water turbine development provided a more intense form of engagement with co-production and collaboration of the Geezers elder group, who—as local ambassadors—were able to tap into local inter-action with school children, as well as local visitors to the site. As the most physical manifestation of the project, which

was then replicated upstream, this helped to both widen the extent of community engagement, raise the profile of the project and its stakeholders, and thus present a success story and exemplar intervention in climate change response.

References

ASC (2011) Adapting to climate change in the UK: measuring progress. Adaptation Committee Progress Report, ASC

Bell D, Gray T, Haggett C (2005) The 'social gap'in wind farm siting decisions: explanations and policy responses. Environ Polit 14(4):460–477

Betsill M, Bulkeley H (2007) Looking back and thinking ahead: a decade of cities and climate change research. Local Environ 12(5):447–456

Biermann F, Betsill M, Gupta J, Kani N, Lebel L, Liverman D, Schroeder H, Siebenhüner B (2009) Earth system governance: people, places and the planet. Science and implementation plan of the earth system governance project. Bonn

Cass N (2006) Participatory-deliberative engagement: a literature review. School of Environment and Development, Manchester University

Chilvers J, Damery S, Evans J, van der Horst D, Petts J (2005) Public engagement in energy: mapping exercise. Report for the Energy Research Public Dialogue Project, Research Councils UK

Cowell R (2007) Wind power and 'the planning problem': the experience of Wales. Eur Environ 17(5):291–306

Crawhill, N. (2008). The role of participatory cultural mapping in promoting intercultural dialogue—'we are not hyenas'. UNESCO

Davoudi S, Crawford J, Mehmood A (2009) Planning for climate change: strategies for mitigation and adaptation for spatial planners. Earthscan

Dryzek JS, Norgaard RB, Schlosberg D (2011) Climate Change and society: approaches and responses. In: Dryzek JS, Norgaard RB, Schlosberg D (eds) The Oxford handbook of climate change and society. Oxford University Press

Duxbury N, Garrett-Petts WF, MacLennan D (2015) Cultural mapping as cultural inquiry: introduction to an emerging field of practice. In: Duxbury N, Garrett-Petts WF, MacLennan D (eds) Cultural mapping as cultural inquiry. Routledge.

Edizel Ö, Evans G (2017) Participatory mapping and engagement with urban water communities. In: Ersoy A (ed) The impact of co-production: from community engagement to social justice. Policy Press, pp 119–135

Evans G (2013a) Ageing and climate change: a society-technology-design discourse. Des J 16(2):239–258

Evans, G. (2013b). Cultural planning and sustainable development. In: Baker G, Stevenson D (eds) The Ashgate research companion to planning and culture. Routledge, pp 223–228

Evans G (2014) Designing legacy and the legacy of design: London 2012 and the Regeneration Games. Archit Res Q 18(4):3534–4366

Evans G (2015) Cultural mapping and planning for sustainable communities. In: Duxbury N, Garrett-Petts W, Maclennan D (eds) Cultural mapping as cultural inquiry. Routledge, pp 45–68

Evans G (2016) The Lee Valley: an industrial river system and heritage landscape. In: Vanore M (ed) Patrimoni e Paesaggi Costruiti Dall'acqua. University of Venice

Evans G (2018) Hydrocitizenship: concepts and insights from the Lee Valley, UK. In: Cooper M, Chakraborty A, Chakraborty S (eds) Rivers and society: landscapes, governance and livelihoods. Routledge

Evans G, House N (2017) The edge condition: re-use of industrial heritage on urban waterfronts: a case of London's second river. Interv I Adapt Reuse 8:26–33

Francese D (2016) Technologies for sustainable urban design and bioregionalist regeneration. Routledge
Geertz C (1985) Local knowledge: further essays in interpretive anthropology. Basic Books
Haggett C (2009) Public engagement in planning for renewable energy. In: Davoudi S, Crawford J, Mehmood A (eds) Planning for climate change: strategies for mitigation and adaptation for spatial planners. Routledge, pp 321–332
Hardoy J, Pandiella G (2009) Urban poverty and vulnerability to climate change in Latin America. Environ Urban 21(1):203–224
Hay CC, Morrow E, Kopp RE, Mitrovica JX (2015) Probabilistic reanalysis of twentieth-century sea-level rise. Nature 517(7535):481–484
International Institute for Applied Systems Analysis (2019) More energy needed to cope with climate change. ScienceDaily. https://www.sciencedaily.com/releases/2019/06/190624111437.htm
IPCC (2007) Climate change 2007: impacts, adaptation and vulnerability. Cambridge University Press
IPCC (2013) Climate change 2013: the physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press
IPCC (2014) Climate change 2014: synthesis report. Cambridge University Press
Jagers SC, Stripple J (2003) Climate governance beyond the state. Glob Governance: Rev Multilater Int Organ 9(3):385–399
Kelemen A, Munch W, Poelman H, Gakova Z, Dijkstra L, Torighelli B (2009) The climate change challenge for European Regions (Regional Policy) [Regions 2020]. European Commission
Leeson L (2018) Art: process: change: inside a socially situated practice. Routledge
Leeson L (2020) Active energy: communities countering climate change. Women Eco Artists Dialog-Magazine & Directory 11.
Longley A, Duxbury N (2016) Introduction: mapping cultural intangibles. City Cult Soc 7(1):1–7
Pellizzone A, Allansdottir A, De Franco R, Muttoni G, Manzella A (2015) Exploring public engagement with geothermal energy in southern Italy: A case study. Energy Policy 85:1–11
Rosenzweig C, Solecki WD, Romero-Lankao P, Mehrotra S, Dhakal S, Ibrahim SA (2018) Climate change and cities: second assessment report of the urban climate change research network. Cambridge University Press
Rowe G, Frewer LJ, Rowe G, Frewer LJ (2005) A typology of public engagement mechanisms. Sci Technol Hum Values 30(2):251–290
Satterthwaite D, Huq S, Pelling M, Reid H, Romero-Lankao P (2007) Building climate change resilience in urban areas and among urban populations in low- and middle-income nations. International Institute for Environment and Development (IIED) Research Report. Commissioned by Rockefeller Foundation
Tompkins EL, Adger WN (2005) Defining response capacity to enhance climate change policy. Environ Sci Policy 8(6):562–571
UN (2019) Climate change and water. UN-Water Policy Brief. UN Water
UN (2020) Water and climate change. The United Nations World Water Development Report. United Nations Educational, Scientific and Cultural Organization.
van Ruijven BJ, De Cian E, Wing IS (2019) Amplification of future energy demand growth due to climate change. Nat Commun 10(1):1–12
Waelbers K (2011) Doing good with technologies: taking responsibility for the social role of emerging technologies, vol 4. Springer
Wilson E, Piper J (2010) Spatial planning and climate change. Routledge

Ozlem Edizel-Tasci is Adjunct Professor at the Metropolitan College of Boston University, MA. She specializes in sustainable development, climate change policy, water management, urban regeneration, participatory planning (P-GIS) and urban governance. Over the years, she has

engaged in several funded research projects in the US, UK and Turkey. She worked as a Post-doctoral Research Fellow for the *Hydrocitizenship* research project (2014–2017) in London, UK. She has been publishing in journals/books and presenting at international conferences mostly on climate change policy and public participation.

Graeme Evans is Emeritus Professor in Creative and Cultural Economy at University of the Arts London. He is also a Visiting Professor in the Department for Science Technology & Society at the University of Maastricht, The Netherlands. He has directed research institutes and centres in London and Maastricht and led numerous projects under UK and EU research programmes, including *Hydrocitizenship, Cities for People, VivaCity2020* and the *SmArt Cities & Waste* research network. He has published widely in urban, design and cultural journals, with books including *Designing Sustainable Cities* (Blackwells) and *Cultural Planning* (Routledge).

Chapter 6
Co-design of a Nature-Based Solutions Ecosystem for Reactivating a Peri-Urban District in Quito, Ecuador

Nicolas Salmon, Grace Yépez, Micaela Duque, Mónica Yépez, Antonio Báez, Mauricio Masache-Heredia, Gabriela Mejía, Paco Mejía, Grace Garofalo, and David Montoya

Abstract In Quito, climate change has shifted average temperatures, increased flooding during the rainy season, and intensified fires during the dry season. The city of Quito is committed to reducing its emissions at a 5% annual rate until 2025. For this purpose, Quito has developed specific plans like the "*Vision 2040*" and the "*Resilience Strategy*." The present paper results from an award-winning proposal to the "*Mi barrio ejemplar y sostenible*" [My exemplary and sustainable neighborhood]

N. Salmon (✉) · M. Duque · M. Yépez
YES Innovation, Quito, Ecuador
e-mail: nsalmon@yes-innovation.com

M. Duque
e-mail: mduque@yes-innovation.com

M. Yépez
e-mail: myepez@yes-innovation.com

G. Yépez · A. Báez
YES Innovation, Pontificia Universidad Católica Del Ecuador, Quito, Ecuador
e-mail: gyepez@yes-innovation.com

A. Báez
e-mail: abaez314@puce.edu.ec

M. Masache-Heredia
Ecoglobal Solutions, Universidad Regional Amazónica IKIAM, Tena, Ecuador
e-mail: mauricio.masache@ikiam.edu.ec

G. Mejía · G. Garofalo
GMG Diseño y Construcción, Pontificia Universidad Católica Del Ecuador, Quito, Ecuador
e-mail: gmejia966@puce.edu.ec

G. Garofalo
e-mail: ggarofalo915@puce.edu.ec

P. Mejía
GMG Diseño y Construcción, Quito, Ecuador
e-mail: gmejia@gmg.com.ec

D. Montoya
Universidad Central Del Ecuador, Quito, Ecuador

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_6

urban competition and is based on developing the "Vision 2040" for San Enrique de Velasco, a typical peri-urban district of Quito. This proposal was developed considering a co-design process using both traditional methodologies and an innovative tool based on collaborative urbanism. Against a deprived and segregated district, where the lack of green areas and access to nature is now affecting the daily life of residents, the proposal considers using nature-based solutions (NBS) as a main driver for rehabilitating pride and a cohesive spirit among neighbors, developing the local economy, recovering the important natural assets of the area, solving issues like stormwater management and lack of comfort in public areas with ecological means, and developing a new landscape.

Keywords Co-design · Nature-based solutions · Urban planning · Latin America · Resilience

6.1 Introduction

The city of Quito, located at 2,800 m above sea level in the Andes Mountains of Ecuador, was the first city recognized as a World Heritage Site by UNESCO in 1978. In 2016, it hosted the Habitat III conference in which the Sustainable Development Goals (ODS) were implemented at the city scale, giving birth to the New Urban Agenda. In 2017, the city signed its Resilience Strategy with the support of the 100 Resilient Cities global network; and in 2018, the Vision 2040 was presented by the municipality. This last initiative provides a prospective model for transforming Quito into a sustainable, inclusive, and competitive city, prepared against climate change and resilient to any issue the urban area will face in the years to come. Under this remarkable global and local framework, in 2018 the municipality of the city launched its first public urban contest with the theme "My exemplary and sustainable neighborhood." The particularity of the competition was the requirement of having a technical team made up of specialists led by an architect and an official representative of the registered neighborhood. The objective of the competition was to design a sustainable urban transformation project for the neighborhood, aiming at demonstrating the materialization of the Vision 2040 perspective. A management model and a roadmap for the implementation of the proposal were also to be provided. This requirement of the project generated an interesting dynamic as it was compulsory to demonstrate the co-participation process deployed for the design and decision-making, in addition to the proposal itself. The whole process also aimed at empowering neighborhoods for developing ambitious, resilient, and sustainable visions about themselves. Each team had to realize co-design workshops with residents through neighborhood assemblies and on-site visits. Our team participated with the San Enrique de Velasco (SEV) district as a project area, and this chapter presents the corresponding proposal awarded with the first prize in the northern sector of the city.

The competition was synchronized with the Vision 2040, prepared by the Municipality of Quito in 2017, implying particularly the notions of inclusivity, environmentally responsiveness and sensitivity to local life context. In pursuit of this, the competition team focused on enhancing the resilience and sustainability of the neighborhood in its co-design process, as a way to achieve lower environmental impact but also as strategy to develop the cultural, economic, and social performance in SEV through a green transition.

Urban resilience has been conceptualized for the city of Quito through its Resilience Strategy, where the approach of a resilient Quito emerged from the need to develop mechanisms to respond to acute impacts and chronicles stresses with which the city lives (Gunderson et al. 2002; Wu and Wu 2013; Washburn 2013). Following the structure of Resilience Strategy, resilience in SEV was evaluated through five principal stakes: (i) an empowered and inclusive neighborhood, (ii) a sustainable environment, (iii) a compact and integrated built context, (iv) a robust economy based on local resources with a focus on food autonomy, and (v) a safe territory against natural and human-made hazards.

In this framework, nature-based solutions appeared to be a tool to address most of these challenges, giving the opportunity to rehabilitate the great natural assets of the neighborhood and to re-structure the socio-eco-environmental cohesion of the neighborhood along with the restructuration of urban public spaces. Hence the use of NBS as a guiding line was proposed to the residents and incorporated to the design process as a principal mean to develop resilience in SEV.

This chapter presents the participatory inquiry conducted as part of this process and the governance mechanism emerged as a result of this intervention at the neighborhood level in synch with the urban, national, and global resilience strategies. After a presentation of the local context of SEV, the methodology employed for delivering a new vision of the neighborhood is detailed, with NBS as a tool to reconnect peri-urban areas with their natural assets and through the implementation of a collaborative design process that allowed to both integrate and empower residents. Then the results of the design competition process, now the backbone of the development plan for SEV, are presented.

6.2 Contextual Framework of SEV

SEV is a typical peri-urban neighborhood of Quito, located between two large urban ravines,[1] the *Quebrada Grande* (Grande Ravine) and *Quebrada San Antonio* (San Antonio Ravine), and surrounded by the protective eucalyptus forest on the slope of the Pichincha volcano (Fig. 6.1). Accordingly, these characteristics shape the neighborhood as an island on the west boundary of the city between Mariscal Sucre Avenue, the main western road of Quito, and the route to Nono, a secondary intercantonal connection road. SEV was originally an informal neighborhood that was

[1] "*quebradas*" a typical geological/landscape phenomenon in the Andean region.

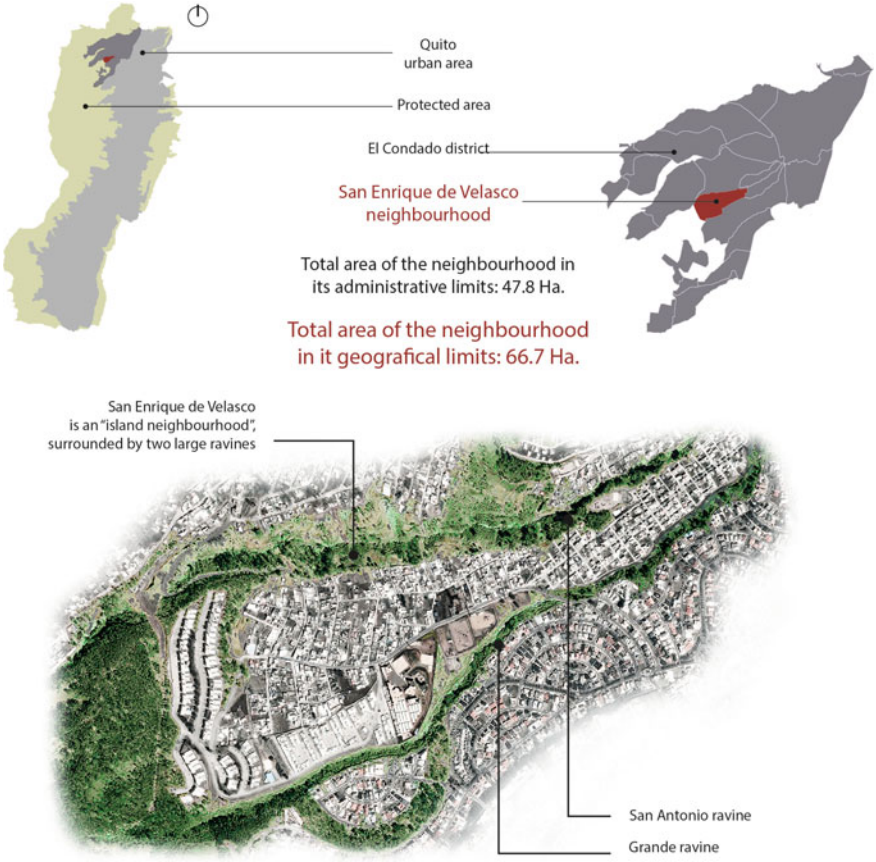

Fig. 6.1 Location of the San Enrique de Velasco neighborhood in the city of Quito. Aerial view of the area in 2018

created in this vulnerable area and responded to the basic needs of its inhabitants. It is a young neighborhood of the city—less than 40 years old—with an area of 47.88 Ha and a current population density of 48 inhabitants/Ha (Fig. 6.1).

With approximately 8000 residents in 2018, its growth accelerated in recent years through the creation of better connections with the city and the installation of basic services locally. Its population grew by 113% in recent years as large multifamily housing projects were implemented in this neighborhood, which introduced new residents into the neighborhood and generated social pressure and confrontation among the population. Despite the improvement of living conditions in recent years, the poverty and inequality index remain at 12.8% of the population (according to the census realized in 2010). Local population growth will constrain residents to less space per inhabitant, shrinking from 3336 m^2/hab in 1970 to 44 m^2/hab as projected for 2040. Currently in the neighborhood, there are only 3.4 hectares of

green area versus 352.5 hectares of built area, generating a deficit of approximately 3 m^2 of green area per inhabitant. By 2040 this deficit will increase if otherwise not adequately planned.

The neighborhood benefits from a remarkable natural context due to its location between deep and well-preserved natural ravines, with privileged views over the city. But it is poorly structured because of its disordered and incomplete consolidation. It also lacks services, facilities, public spaces, and qualitative green areas. SEV is a self-created neighborhood showing typical characteristics of an unplanned, informal settlement, with its own dynamics of growth and property ownership patterns (Clichevsky 2000). It is directly confronted with environmental and resilience issues related to the context of climate change.

Located on the slopes of the Pichincha volcano, SEV is naturally exposed to landslides and flood events. Most of the construction do not integrate permeable areas and expose the neighborhood and downstream districts to flooding risk, which is a recurrent issue in Quito. Comfort in public spaces and exposure to UV radiation are also key aspects as walking is the main mobility mean in SEV and UV radiations are among the highest in the world in Quito because of the combination of high altitude (2800 m absl) and its location on the equator line (Pozo et al. 2018). Water provision in Quito is directly dependent on the rainfall in the surrounding glaciers and might lack in a near future (PNCC 2015). Although SEV was historically getting water from natural sources up in the mountain, these are not used anymore and there is no culture of water savings neither water harvesting in the neighborhood. SEV fully depends today on municipal provision for all its use of water, including irrigation for micro-local urban agriculture activities particularly increased after COVID 19 crisis. Water may lack during the summers (approximately three months with little or no precipitation), with a decreasing trend in the precipitations in the sierra area of Ecuador due to climate change (PNCC 2015).

The neighborhood also suffers from a lack of connection with nature: lack of green space available and accessible, despite the large ravines surrounding the district (Fig. 6.2). The densification process of the neighborhood left almost no vegetation in the streets. The park at the main entrance of the neighborhood has never been structured as a park (it was previously a landfill) and is still underused, almost abandoned, resulting in safety issues, ugly landscape in a key area of SEV and a lack of recreational area for the residents. The two ravines surrounding SEV, Quebrada Grande, and Quebrada San Antonio, were historically a place for finding water and medicinal herbs. They were easily accessible from SEV and trails gave the possibility to follow the ravines up to the Pichincha slopes. The recent construction of several (illegally) gated communities has hindered the possibility for most of the residents of SEV to access the ravines, cutting the relationship between the neighborhood and its most important natural assets and decreasing therefore the resilience of the neighborhood in terms of inclusiveness and sustainable environment. These challenges called the consideration of surrounding natural systems in any kind of future interventions in the neighborhood.

Fig. 6.2 San Enrique de Velasco neighborhood

6.3 Nature-Based Solutions as a Tool for Resilient and Sustainable Urban Planning

Nature-based Solutions (NBS) are actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits (IUCN 2020). NBS is a tool for global and systemic planning of cities, and in several parts of the world these solutions offer encouraging results (Kabisch et al. 2016). IUCN (2020, p. 2) claims that "*NBS could provide around 30% of the cost-effective mitigation needed by 2030 to stabilize warming to below 2°C… Finding ways to work with ecosystems, rather than relying solely on conventional engineered solutions, can help communities adapt to climate change impacts.*" The European Commission also recently published a comprehensive set of six reports about the use of NBS for more sustainable urban planning (Naumann and Davis 2020; Vojinovic 2020; Bulkeley 2020a, b; Calfapietra 2020; Wild 2020). Some to name includes the Liverpool Primary Care Trust NBS program to strengthen health and wellbeing, particularly among disadvantaged groups (Drayson 2014), the Grey to Green project in Sheffield to increase the permeability in a flood prone area (Nowel 2016), the Urban Adapt project in Rotterdam to treat water and urban heat through participation (LIFE Urban Adapt 2018). In Latin America, although NBS and green urban

infrastructures are introduced recently in urban planning practices and investigations (Zucchetti et al. 2020) shows interesting perspectives, in terms of resilience increase and empowerment process, in analyzing green infrastructure projects of urban and peri-urban areas in Peru, Chile, and Argentina.

6.3.1 Water Management

In SEV, water is among the main challenges, whether it is managing stormwater or ensuring provision of water all year long for the district local economy (particularly productive gardens). The use of NBS against these challenges is particularly relevant. NBS for water management use or mimic natural processes to improve water availability, improve water quality, and reduce risks associated with water-related catastrophes and climate change (WWDR 2018). The solutions proposed by the urban NBS for water management are composed of strategic land protection, revegetation (including reforestation and forest reconversion), riverbank restoration including riverbank corridors, creation of artificial wetlands, conservation and restoration of existing wetlands, establishment of flood diversion, creation or strengthening of green spaces, increasing bioretention and infiltration, implementation of permeable pavements, green roofs, rain gardens, and rainwater recovery. The advantages of green infrastructures such as planted swells, bioretention cells, permeable pavement, rainwater collection, and rain gardens have been documented at the neighborhood level (Zellner et al. 2016), as well as on a large scale (Ahiablame et al. 2013; Ahiablame and Shakya 2016). At the level of small-scale private lots, specific studies have been published on green roofs and green walls at the level of their efficiency and their development in urban areas. These developments respond particularly to the application of incitement policies in Europe and North America. In South America, incitement policies differ from the aforementioned regions because they are mainly set on the reduction of property tax (31%) and legal obligations (23%), but incitement to use particular systems is not very clear (Liberalesso et al. 2020).

Proposals such as "LID - Low Impact Development" in North America (Ahiablame et al. 2012), "WSUD - Water Sensitive Urban Design" in Australia (Wong 2006), "Sponge Cities" in China (Chan et al. 2018), "SuDS - Sustainable Drainage Systems" in UK, and "LIUDD - Low Impact Urban Design and Development" in New-Zealand (Van Roon and Van Roon 2009) were evidenced regarding management of rainwater and runoff near its source. These proposals promote various systems that we have mentioned previously for water management in a systemic way at the level of neighborhoods and cities.

At the neighborhood level, generalizing the design and implementation of green infrastructures through, for example, the "Landscape Green Infrastructure Design" L-GriD, can generate important effects. It has been shown that with a little coverage representing 10% of the area, green infrastructures can largely contribute to the capture of runoff water in small storms and should be doubled or tripled to cope with major storms. Furthermore, these simulation tools have made it possible to understand

that the dispersed locations of these solutions are more effective in reducing floods in all types of storms than the grouped solutions (Zellner et al. 2016). However, the typology of solutions proposed in these dispersed batches are not specified.

Other studies focus on rainwater harvesting systems and their dimensioning. According to a study carried out in the state of Florida (Deitch and Feirer 2019), it is demonstrated that in dense housing areas, rainwater cisterns can reduce local floods by 20% and that the potential reduction in debit varies according to the size of the reservoir, the number and location of the drainage network. These studies focus on the pure calculation part of the reservoir with data on local rainfall and collection on roofs, but other rainwater management systems that could be complementary, are not included. Among the systems that can be adapted to private lots, green roofs can contribute to rainwater management. Considering the capacity of the substrate to retain and filter the water, a reduction from 54 to 62% of the water runoff in the buildings has been evaluated, depending on the characteristics of the system used and the local climatic conditions (Mentens et al. 2006).

Despite their enormous potential, these solutions are under-utilized in Ecuadorian urban areas, whether it is as public infrastructures or on private lots. Although the benefits of NBS in urban settings are now well demonstrated globally at the city and neighborhood levels by improving green spaces at the level of rainwater management as well as at the social level (WWDR 2018), their use as a practical and efficient solution, and their implementation processes are still largely unknown locally. The proposal for SEV is an attempt to overcome this weakness and pave the way for further replications in other peri-urban areas.

6.3.2 Comfortable and Healthy Public Space

Another great challenge faced by the urban context of San Enrique de Velasco is the exposure to radiation in outdoor spaces. This is particularly important in this neighborhood where 80% of the displacements are realized by foot and by bus (which requires walking to the bus station). Quito is facing a strong sunny period each day, almost all year long, with one of the highest UV radiation levels for a city in the world (Blumthaler et al. 1997) due to its altitude (2800 m a.s.l.) and localization on the Equator. The World Health Organization indicates an ultraviolet index of 11 as the maximum tolerable limit for human beings (Lucas et al. 2006). This level is reached in the city almost half of the year, especially at mid-day and such a phenomenon should be further increased by climate change in coming years (Ando et al. 1996). Against this strong climate, the city did not develop any protection strategy and most of the streets lack shading devices. As measured within the Treepedia Initiative carried out by the MIT Senseable LAB in 2015 (Li et al. 2015) the city of Quito has an average green cover of 10.8% which is among the lowest of the 27 other international cities evaluated in this work. Urban heat island effect has already been measured in Quito (Seiferling et al. 2017), and although it is not traduced by extreme temperatures for residents, it often means uncomfortable conditions at certain time of

the day and dangerous exposure to extreme UV levels. The capacity of NBS to regulate microclimate and especially thermal comfort in outdoors spaces has been largely documented (Calfapietra 2020). Natural conditions in Quito could afford much better vegetative coverage as the local permanently temperate climate is particularly propitious to plant development. Street tree planting and gardening buildings front spaces are therefore pertinent techniques to be applied in Quito to generate comfortable and healthy public space conditions (Pozo et al. 2018).

6.3.3 Relationship with Nature

In Ecuador and more generally in Latin America, the use and appropriation of nature-based systems are common among original indigenous inhabitants. But in most cases, in cities, urban migration has generated a transition process toward a weaker relationship between nature and urban residents. The natural use of ancestral NBS is lost from generation to generation, and the new inhabitants reduce their relationship with nature to ornamental purposes. Trees are cut on the streets or private gardens are transformed into concrete areas. Thereby, there is more consensus that the sustainable urban planning of neighborhoods using NBS would allow new urban inhabitants to establish a new relationship with nature as well as with the city. A conscious determination on appropriating the nature would lead to its protection as well. Moreover, solutions based on natural ecosystems are more flexible and adaptable to the new challenges that neighborhoods may encounter. At a district scale, community involvement in neighborhood planning may contribute to its appropriation, management, defense, respect, and evolution. It is possible to imagine nature and its systems as the cornerstone of sustainable urban proposals at this scale. Each urban project must respond to its natural context and establish a role for it. This type of positioning allows each place to have a project adapted to its physical context as well as local and global impacts.

The commitment to use nature as a support to sustainable urban proposals is as much a challenge as a great opportunity in peri-urban neighborhoods like SEV, which generally conflict with natural spaces as nature is mostly considered as a problem by new settlers. Most urban natural spaces are usurped, occupied, and destroyed in peri-urban areas of Ecuador and the Andean region. Where remnants of these natural spaces still exist, they are excluded from the planning and growth of the neighborhood, e.g. city ravines in the case of SEV. On the other hand, the use of nature-based solutions (NBS), delivering ecosystem services and implemented with purposes that are not only ornamental, can drastically change the relationship of inhabitants with their natural context. NBS has proven to be a strong tool for landscape, environmental, economic, and social revitalization as well as for combatting with climate change, at both neighborhood and urban scales. Therefore, the strategy deployed for SEV considers that NBS can support the neighborhood for taking on a new role as a pioneer in the transformation of the young, informal, and poorer areas, switching

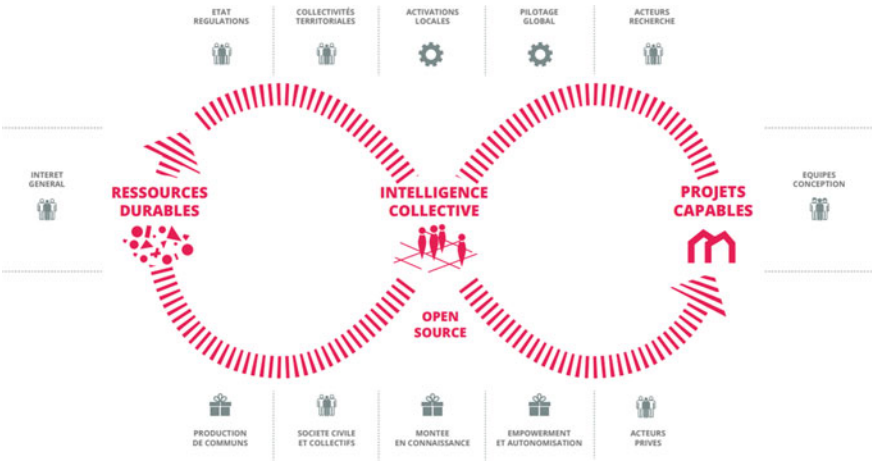

Fig. 6.3 The infinite loop of collective urbanism. Host Lab, Alain Renk (2017)

the way its inhabitants are perceived from invaders to protectors and guardians of urban limit areas that are of vital importance for the entire city.

6.4 Methodology: Co-design Process

Beyond a traditional Diagnosis—Design—Workshop linear sequence, it was decided to implement a more ambitious, circular, and iterative process that repeated this sequence three times in order to detail much more based on local input (Fig. 6.3). This was something that also represented the methodological framework of collective urbanism which integrates multiple groups of stakeholders in the design process of public areas and pursues open source (hence transparent) approaches. Accordingly, expertise is not only provided by a technical team but also by other stakeholders among which residents are counted as the "experts of the area." It allows sharing and understanding of multiple visions and constructing a shared perspective around common interests. This study sees this as an essential ingredient of mutual confidence and constructive interaction. It combines the advantages of top-down and bottom-up approaches at the same time. A shared perspective adds to the project a novel credibility and eases the process of finding resources for its implementation.

The technical team in SEV adopted the conceptual framework, methodology, and tools of collective urbanism. Within this framework, the project particularly applied an application called "Unlimited Cities" which is developed by the Host Lab and by 7 Billion Urbanist.[2] By doing so, the project aimed at ensuring the engagement of a variety of stakeholders from the beginning of the urban design competition to the end.

[2] www.7billion-urbanists.org.

In pursuit of the first workshop dedicated to a mutual presentation and assessment of the competition rules and objectives, cycles of collaborative work were iterated at two scales including neighborhood and street. This was done within a period of three months. Particularly, the neighborhood organization, cultural associations, and individual residents were present throughout the whole process. While at the neighborhood level, the iterative work included field analysis, diagnosis, collective sense making and design, at the street level, field analysis and design fed each other back and forth.

6.4.1 From Traditional Workshops and Meetings with SEV Residents…

The journey started with the first contact with the representatives of the SEV neighborhood, the leaders of the neighborhood assembly, and the organization of the first workshop began. For workshop No. 1 authorities, board members and neighborhood residents were invited into an assembly to inform the bases of the contest, activities, objectives, and the scope. A tour of the entire neighborhood was carried out in company with the leaders and residents to fully recognize the problems that the neighborhood encounters. During the tour, photos were taken, data was collected, the neighbors were met and asked about their parties, customs, and activities. This was followed by a visit of the SEV project design team to the site to experience the rich cultural heritage of San Enrique de Velasco, attending a cultural week.

The first event was a traditional storytelling of the neighborhood, which takes place every year called “Grandes Huellas.” At the event, older residents typically share how they lived when SEV was born, show pictures of festivals, and tell legends and stories of the neighborhood and its surroundings. Figure 6.4 presents pictures from some of these meetings and tours.

The second event was an open cinema that would take place on the courts, bringing a blanket and a bench. The cultural week ends with the Burning of the Chamiza, which also takes place every year. The event symbolizes a dedication to the moon when the harvest begins. These cultural events show a glimpse of how culturally strong SEV is; encouraging the elders to be active participants of the neighborhood, inviting the youth to be proud of their community and their shared values.

After this information was gathered in the first phase, processed and analyzed (i.e., generation of maps, cross-checking data, technical analysis of specific areas, comparison with pictures, identification of strengths and deficits in the neighborhood, assessment of specificities compared to other neighborhoods, identification of public plots, etc.), it was possible to specify the action plan for the next workshop.

A second workshop was held a few weeks later between residents and multidisciplinary professionals to share a diagnosis and envisage possible solutions. An objectively pessimistic diagnosis was presented to the residents and was accompanied with various scenarios of evolution of SEV in the near future, in order to

Fig. 6.4 Meetings, workshops, and tour of the neighborhood with the residents of SEV

generate reactions and share a realistic perception of how critical the situation was for SEV. But also, its potential to evolve. A framework for developing the VISION 2040 locally was also introduced and discussed. To do that, workshop attendees were divided into groups and brainstormed about the challenges and components of the project under the facilitation of two professionals. It was expected to get an in-depth understanding of where the neighborhood wants to be in the medium and long term.

An additional meeting was held with cultural collectives of SEV alone, despite them attending the second assembly, comprehending that culture and tradition were among the strongest values and characteristics of the community.

6.4.2 …To a Shared Diagnosis

To construct the proposal with the neighborhood residents, two development scenarios for 2040 were initially proposed (Fig. 6.5). These scenarios allowed the inhabitants to understand the importance of planning the neighborhood considering urban sustainability issues.

Multiple maps were presented to the assistance in order to open a discussion based on both technical figures and everyday life perspectives. Presenting the diagnosis allowed residents to focus on a realistic proposal that recognizes the natural capital of the neighborhood as a social and economic support. This diagnosis phase was repeated several times through which different issues emerged with more profound details at each time.

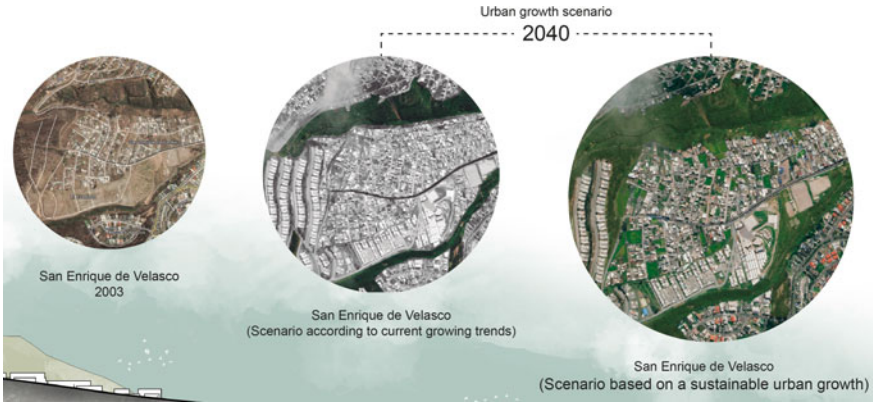

Fig. 6.5 Proposed growth scenarios for SEV in 2040

6.4.3 Completed by a Collaborative Urbanism Process

Influenced by great examples of collaborative urbanism already developed by our partner *Host LAB* and *7 Billion Urbanists* in Europe and Asia, the SEV project required to push the collaboration with the neighborhood beyond a traditional participatory approach, applying new digital technologies not only to propose and validate with the residents, but rather to co-develop the proposal. To do that, *Unlimited Cities,* a collaborative urban planning application was used. The app uses a numerical tool that allows hundreds of people to respond to given questions in a few weeks (Unlimited Cities 2016). It also allows configuring modified versions of urban space in a few minutes in reference to photographs taken by users. This study used the app on street expeditions with residents so that the design team could take photographs and modify them simultaneously on the field (Fig. 6.6). This is supported by open discussions on the assessments and suggestions for intervention and by a documentation of those in the app. The experience led to a strong collective appropriation by the residents, the insiders who are, in fact, the experts of the place. Furthermore, it allowed the understanding of accurate, practical, and living-based perceptions and recommendations about the daily life of the place.

Through this process, a set of 45 imaginary pictures were produced during workshops and short street interviews of five to ten minutes were conducted together with residents of SEV (Fig. 6.7). Participants were engaged in refining urban proposals in reference to their daily life issues and thus, reflecting to the complexity of urban situations and responding to their experienced problems. Eventually, their responses contributed to the formulation of urban scenarios that the SEV project team included in their proposal.

More specifically, the SEV residents focused on the issues including the quality of life and socio-economic as well as safety, risks, and traffic. In support of that, the technical team addressed the issues of urban growth and its impact on the environment

Fig. 6.6 Members of the design team interviewing a local resident with the Unlimited Cities tool; picture on the OE12 Street of SEV

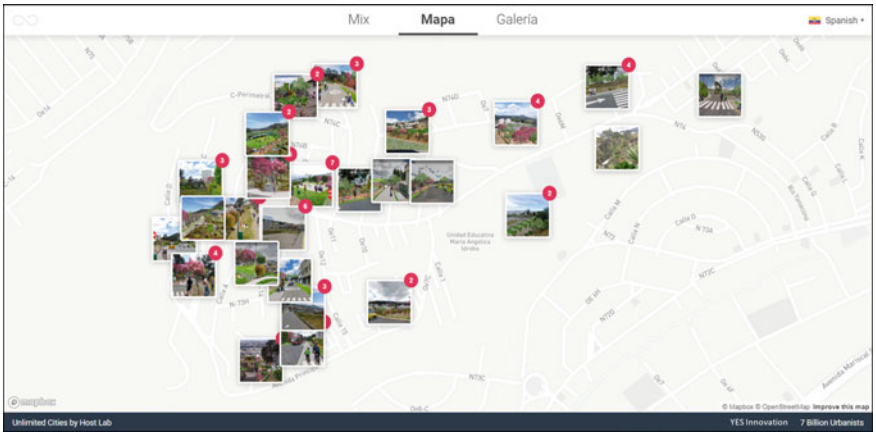

Fig. 6.7 Map of SEV including the imaginary pictures developed with SEV residents through Unlimited Cities

and sought ways that ensures a sustainable and resilient densification process in the neighborhood. This complementarity visioning represented the shared image of the SEV and also resulted in a collective learning process for all participants.

6.4.4 *Validation of the Proposal by the Neighborhood Assembly*

The shared vision 2040 was eventually presented to the neighborhood's dignitaries, cultural organizations, and the residents at a general assembly organized by the president and the secretary of the neighborhood board. After listening and exchanging points of view, the co-design proposal obtained full support and confirmed its validation (Fig. 6.8).

6.5 Shared Outcomes of SEV

Within the competition framework, the proposals were produced to convey multiple themes. In this article, we focus on the nature-based approach and the notion of resilience in the SEV neighborhood, formulated through the co-design process presented earlier.

In the diagnosis process, the residents freely expressed their concerns, problems and inconveniences in transportation, building construction, education, walls, security, and health services. The notions of environment, resilience, and climate change were not initially expressed among their priority. However, the co-design process raised participants' awareness about land use regulations and trends in SEV as well as the presence of natural assets and their conditions. Moreover, the participative process revealed the historical connection of the community with the ravines, water streams, and water springs, and that this was lost through time. Respectively, issues such as discomfort on the main street due to noise, poor air quality, and lack of shading elements, insufficient parks and green areas, degradation of public spaces were also mentioned during the process.

Taking these into consideration, the environmental issues were enlarged to include seven categories of problems (Fig. 6.9): Risk: landslide, fire, and flooding; ecosystemic value of green areas; water provision and use, rainwater and wastewater management; construction practices and the use of specific materials; waste

Fig. 6.8 SEV assembly with the official validation by the residents of the design proposal for the urban transformation of the neighborhood

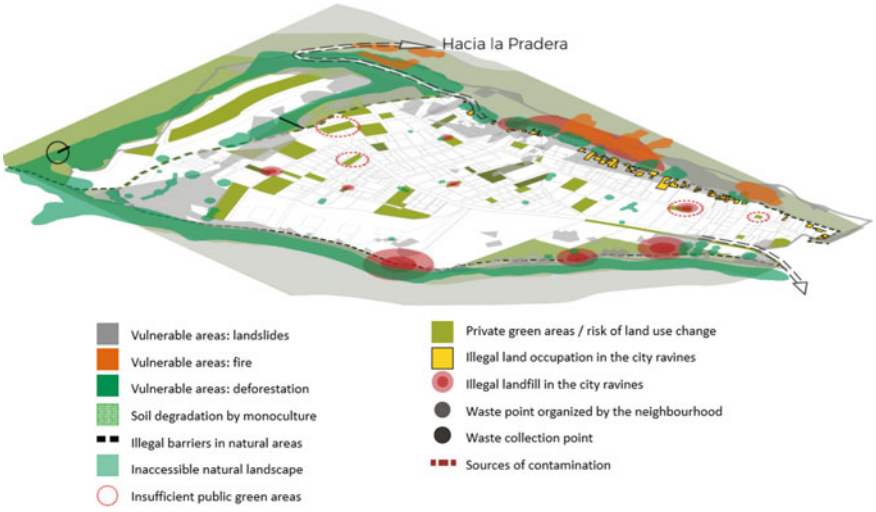

Fig. 6.9 Map of the environmental diagnosis in SEV

management practices; pollution (air quality, noise, soil, water); and landscape quality.

It was also concluded that SEV has largely neglected its natural assets, replaced trees with constructions, and thereby, decreased the resilience and the quality of life in the neighborhood. Thus, involved residents identified green areas, trees, vegetation, connection to the city ravines, and the development of a new landscape in the streets of SEV as a response to this situation. This was something that was not imagined previously. It was not even thought that those types of nature-based solutions could be implemented in a "poor" neighborhood like theirs. Moreover, residents became confident that these solutions could bring cost-effective responses to their demands. Respectively, the design team spatially illustrated these ideas in the form of re-connection between the neighborhood and its natural asset, generation of a new context for economic development based on the green economy.

6.5.1 Green Network: Connected City Ravines and Urban Green Corridors

Two sustainable green urban systems were proposed: a natural edge protection system and an internal green network (Fig. 6.10). The natural edge protection system is permeable and reinforced with productive agricultural activity. The internal green network is based on using residual spaces that are currently low-quality spaces dedicated to sports activities, green spaces in poor condition, and private green spaces. The proposed design suggested to weave a strong wooded and vegetated network so

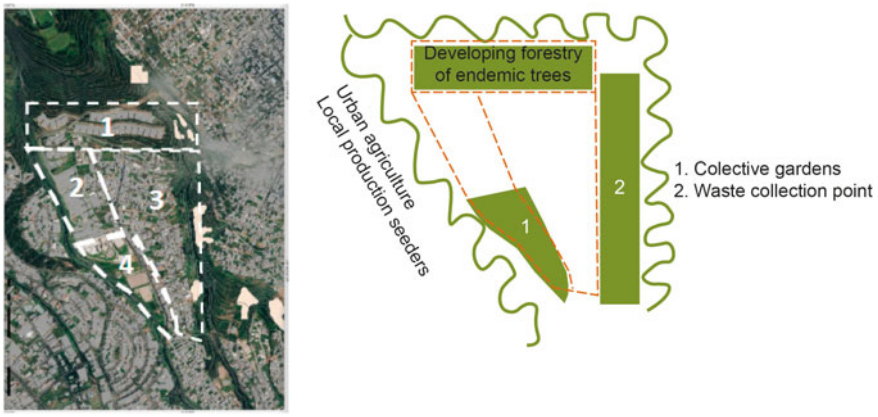

Fig. 6.10 Strategy diagram for establishing a sustainable plan for San Enrique de Velasco

that the connection between the surrounding ravines and the heart of the neighborhood can be ensured. The design also suggested the installation of a new equipment in the neighborhood and the operation of new production and training to support a specific economic-natural model based on forestry and entrepreneurship.

The proposed activities are located in such a way to seek advantage of the ravines' eco-systemic services such as microclimates, humidity, and biodiversity (Fig. 6.11).

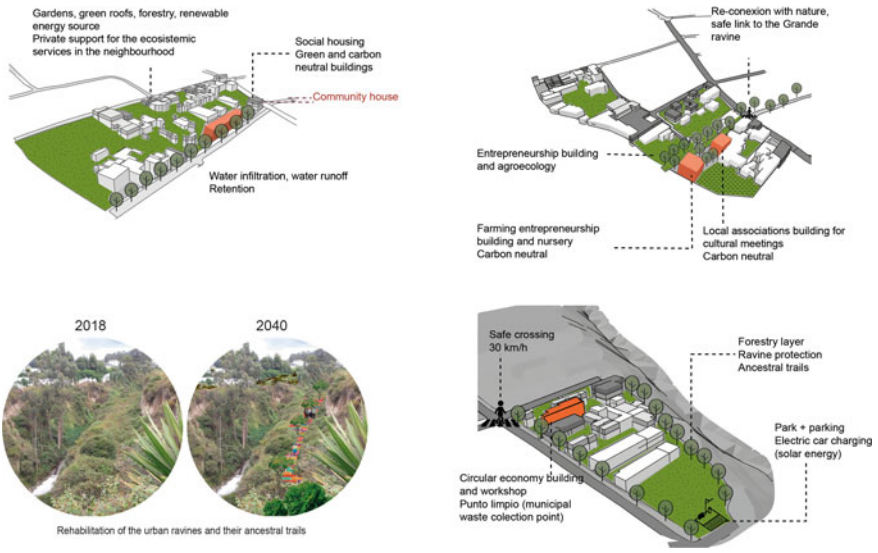

Fig. 6.11 Examples of nature-based solutions included in the project for San Enrique de Velasco, linking or creating transition with the surrounding ravines

These activities are thought to allow a better growing capacity in production spaces and to prevent ravine degradation at the same time.

6.5.2 *Nature as a New Type of Economic Driver: A Bet on Urban Forestry and Agriculture (Organization, Infrastructure, Added Value)*

Ornamental plants and trees delivered in the Quito plant market are currently grown in a valley nearby Quito located at a lower altitude. Growing in a warmer climate, these plants face difficulties in adapting to the climate in Quito. There is currently a lack of colder climate plant production. This is an opportunity that could be exploited by San Enrique de Velasco: offering native species in Quito's market according to the specific altitude in which they grow. Growing plants is a viable economic alternative to unemployment, but it can also be a strongly sustainable business when managed properly and when it includes sustainable principles like organic production and correct water management. We integrated this proposition into an urban planning strategy and a landscape proposal that utilizes specific mixed-use spaces (economic activity, entertainment, landscape) as plant growing can be multi-purpose (economy, CO_2 trap, aesthetics production). This forestry activity is supported by specific equipment allowing for logistics training, expert support, and trading. Urban agriculture is already practiced informally and strongly boosted by the proposal as well, with infrastructure all throughout the neighborhood and equipment also supporting this activity (Fig. 6.12).

The implementation of complementary or new urban equipment in the proposed green areas aims not only at delivering new services but also at better management of these spaces. For example, a productive ecological park is proposed at the lower entrance of the neighborhood, generating a new connection between the urban area and the Grande ravine. Some places in this park, that could enhance both local cohesion and self-maintenance, include a community nursery for training on native vegetation, innovative farming, facilitation of agricultural workers in the neighborhood, and community greenhouses for food and edible plants including ornamental as well as native trees for urban reforestation and wood production. Two buildings were proposed for entrepreneurship training programs. The project also suggested the installation of temporary markets in public areas to sell locally produced products.

6.5.3 *Development of Private Construction: Toward Green Real Estate Development*

San Enrique de Velasco is facing a strong densification process. Considering the urbanization trends and the location of the neighborhood in the city, this trend will

Fig. 6.12 Extract of the sustainable urban transformation planning proposal for San Enrique de Velasco and location of the key equipment to support the new green economy activities

be even stronger in the coming years. To be able to control this process and to ensure its sustainability, specific urban and building regulations were implemented, defining the environmental measures to be integrated in buildings as they are constructed.

A complete green process for construction densification within the neighborhood was proposed in order to reinforce the sustainability of the existing housing stock and insure the penetration of natural assets also in private lots. It proposed several typologies of housing, representative of the local architectural characteristics, and defined growing alternatives conciliating the private investments from local families and the greater interest of the community. The project proposed an extension work on buildings based on a business model which implies getting access to further building surface provided the integration of NBS in the project.

6.5.4 Nature as an Urban Technical Solution: Water Management, Shade, and New Landscapes

Nature-based solutions have demonstrated their capacity to improve the resilience of the city against strong natural events (Pozo et al. 2018) Quito is particularly exposed to flooding, especially during the winter season, as well as to strong solar radiation due to the combination of its geographical location and altitude (the UV index can be

Fig. 6.13 Schematic representation of the agro-ecological park at the entrance of SEV and on the border of the San Antonio ravine, including a mix of functional and entertaining landscape components

higher than 15). Thus, the design proposal suggested the implementation of multiple examples of ecological infrastructure (in streets, squares, district borders) throughout the neighborhood. It also aimed at training inhabitants on to the protection of this infrastructure for themselves, and its integration into private lots (Fig. 6.13).

6.6 Reflections on the Co-design Experience in SEV

The co-design process was the key to the proposal. It allowed the residents to analyze the problems that they could face with climate change and population growth scenarios. Otherwise, these two issues have almost never been territorialized. The inhabitants typically do not have a long-term vision of the future. They live in the immediacy of their needs and, in many cases, what will happen in the future is minimized. Three workshops including assessment, road mapping, and validating were held to change this. Moreover, we used a collaborative urbanism tool *Unlimited Cities* to survey more inhabitants on the street. The tool was adapted to our request by the developers as to generate imaginaries (i.e., street perspectives rendering several types of scenarios) that we could present directly to local inhabitants in the street and ask about the potential transformation of streets and public spaces.

Eventually, the co-design process promoted a full collaboration of both authorities, indirectly represented by the technical team, and residents who aspire to a positive change in their neighborhood. This complete and intense exchange since the beginning delivered:

1. This process resulted in the formation of a positive closeness to the neighborhood committee with whom a strong team was formed and was able to share the desire

of developing a promising future for the neighborhood. During this process, the involved inhabitants introduced their daily issues as well as their long-term aspirations. They also introduced new, concrete landscape issues from their own perspective, which clearly enriched the final transformation proposal.
2. A detailed understanding of daily life in the different corners of San Enrique de Velasco.
3. A constructive dynamic with the residents in front of the design work and the objective of the contest, considering a regular and repeated presence of the design team in the community.
4. An empowered community at the end of the process, with residents and their representatives who assimilated the long-term issues that may face SEV and the required measures to develop the sustainability and resilience of their neighborhood.

The participatory process, which was amplified by the Unlimited Cities tool to people who do not usually come to neighborhood assemblies, was then a powerful engine of ideas, inspiration, and a true co-construction of the present intervention proposal. This was eventually the basis of the decision process for the definitive proposal.

The possibility to use NBS in SEV enlightened the capacity for the neighborhood to bring its own answers to the issues considered before as fatalities such as risks of natural disasters, uncontrolled urbanization processes, concrete everywhere, pollution, degradation of public spaces, lack of safety, unemployment, and urban landscape. This clear empowerment process of the residents eventually led to the prioritization of ambitious and long-term issues such as resilience and sustainability in their neighborhood development plan. Before, the focus was on shorter term solutions including street pavement and painting of the local neighborhood house.

The proposal used NBS as a key driver for developing new perspectives for the neighborhood. The proposal intended to simulate the natural context, with more ravines and forests, to generate a true added value in the neighborhood. The team worked with the community in the historical recovery of the ravines, where traditional trails existed until recently. The team also promoted inhabitants to produce food and plants in their gardens by using traditional techniques and cultural practices. The public and private green areas were measured to graphically establish an index of fragmentation of the area. The remnants, which can be part of an internal network of green and public spaces, were identified in order to connect the three ecosystems at the edge of the neighborhood and to ensure that they contribute to the preservation of their ecological balance. The (re-)creation of this internal green network aims at reducing the deficit of green area per inhabitant, to naturally reinforce the habitat quality for biodiversity preservation, and to manage runoff water, which is currently one of the strongest problems in the hillside neighborhoods in Quito such as San Enrique de Velasco.

The relationship established in a few weeks with the neighborhood was strong. It was the first time for SEV residents to receive an “attention” of a technical team, associated with an initiative of the municipality. They were listened, empathized,

and spoken transparently. This helped establish confidence and trust between all stakeholders involved in a process of three months. Three main challenges were also faced during this process that required caution for future processes. They include the fragmented character of the neighborhood, local concern for engaging in the government's initiatives, and a lack of understanding of sustainable development and climate change.

The first is seen in the fragmented composition of the neighborhood. San Enrique de Velasco is a neighborhood that integrates traditional residents and new occupants. The community conformation of the neighborhood started after the agrarian reform in 1964, where the *wasipungueros* (land workers) are given land titles with property rights to occupy the spaces where they worked before (Jordán 2003). Over time, many owners sold their parceled lands or inherited to their children and grandchildren. This resulted in the arrival of new actors to the neighborhood like the "El Condado San Enrique de Velasco" Complex (Special Ordinance No. 0013, 2008). Different values brought by the newcomers has generated discrepancies with the ones of the traditional inhabitants, which also showed itself in the physical separation of a block wall. The design process also initially experienced a clear absence of the representatives from the "El Condado San Enrique de Velasco" Complex but treating the process as a social setting for all helped overcome this and ensure the participation the housing complex board.

The second one refers to multiple local resistances to traditional approaches coming from governmental institutions. The project's informal interviews with local inhabitants clearly showed this in an expression of distrust toward the Municipal Institute for Urban Heritage (IMPU), which was one of the promoters. To overcome this barrier, the team introduced itself as an independent collective, working within San Enrique de Velasco with an aim of achieving a common goal in pursuit of a multi-actor approach, demonstrating a united front and empowering the district association to reach sound negotiations (Venter 2007; Bryson et al. 2016).

The third challenge refers to a lack of awareness of key concepts about climate change, and sustainable development within San Enrique despite a traditional shared vision of "Sumak Kawsay," which means well-being, a general understanding about how-to live-in society and a new way of economic development with respect for nature (Altmann 2014) To overcome this, the workshops were used to draw a clear and pragmatic image of what the concepts represent, how they could affect the neighborhood, and more importantly why all participants should act together in an interconnected and interrelated manner.

6.7 Concluding Remarks

Nature is a strength if it is developed appropriately and represents a strong asset against climate change especially for a city like Quito, located in a highly natural area (biodiversity hotspot within the municipal territory and wild nature surrounding the urban core area). Respectively, the natural context in the neighborhood as a

solution to structural issues allowed the residents to change their opinion about its significance in the urban scheme of these hillside neighborhoods. Integrating nature-based solutions at the neighborhood scale was particularly pertinent to generate cohesive areas where appropriation, respect, and care could be given. This scale also reinforced the potential for NBS to tackle climate change (mitigation and adaptation) considering the symbiosis effect that can be generated between multiple solutions in a large enough but still controllable area.

The proposed NBS were simple and available as they are based on the existing local ecosystems in the surrounding city ravines. Forestry as a landscape, economic, and sensitization solution strongly increases the neighborhood's capacity for sustainable development, reinforces the engagement of the local community for ecological solutions, mitigates local risks, and thereby, improves the quality of life in general.

Currently, the project's implementation as a pilot project in the city of Quito is under discussion. SEV has been integrated as a pilot project for the project CLEVER Cities dedicated to the use of NBS as a tool for socio-economic regeneration of deprived districts and funded by the European Union. Different sources of governmental and international funding are also in the process of evaluation. There are discussions on transforming SEV into an urban lab for the transition of Latin American peripheral districts. The local community takes a leading role in demonstrating their commitment to the implementation of the proposal by providing necessary material, labour, and social organization. In the framework of CLEVER Cities, the Municipality of Quito decided to integrate SEV in its urban lab program and to monitor at the same time both co-design processes and the application of NBS at a neighborhood scale. SEV also became the experimental area to define NBS-related urban standards in the new land use and management regulation (PUGS) for the city of Quito.

References

Ahiablame LM, Engel BA, Chaubey I (2012) Effectiveness of low impact development practices: literature review and suggestions for future research. Water Air Soil Pollut 223:4253–4273

Ahiablame LM, Engel BA, Chaubey I (2013) Effectiveness of low impact development practices in two urbanized watersheds: retrofitting with rain barrel/cistern and porous pavement. J Environ Manag 119:151–161

Ahiablame L, Shakya R (2016) Modeling flood reduction effects of low impact development at a watershed scale. J Environ Manag 171:81–91

Altmann P (2014) El Sumak Kawsay y el patrimonio ecuatoriano. Histoire(s) de l'Amérique Latine 10:16

Ando M, Carcavallo R, Epstein PR, Haines A, Jendritzky G, Kalkstein LS, … Slooff R (1996) Effects on biological disease agents. In: World Health Organization (ed) Climate change and human health. Geneva, pp 71–105

Blumthaler M, Ambach W, Ellinger R (1997) Increase in solar UV radiation with altitude. J Photochem Photobiol B: Biol 39(2):130–134

Bryson J, Sancino A, Benington J, Sørensen E (2016) Towards a multi-actor theory of public value co-creation. Public Manag Rev 19(5):640–654

Bulkeley, H (2020a) Nature-based solutions towards sustainable communities. In: Analysis of EU-funded projects. European Commission
Bulkeley, H (2020b) Nature-based solutions for climate mitigation. In: Analysis of EU-funded projects. European Commission
Calfapietra C (2020) Nature-based solutions for microclimate regulation and air quality. In: Analysis of EU-funded projects. European Commission
Clichevsky N (2000) Informalidad y segregación urbana en América Latina. Una aproximación. CEPAL
Deitch MJ, Feirer ST (2019) Cumulative impacts of residential rainwater harvesting on stormwater discharge through a peri-urban drainage network. J Environ Manag 243:127–136
Drayson K (2014) Green society: policies to improve the UK's urban green spaces. Policy Exchange, London. Retrieved from https://policyexchange.org.uk/wp-content/uploads/2016/09/green-society.pdf
Gunderson LH, Holling CS, Pritchard L, Peterson GD (2002) Resilience of large-scale resource systems. In: Gunderson LH, Pritchard L (eds) Resilience and the behaviour of large-scale systems. Island Press, Washington, DC
IUCN (2020) Global standard for nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NBS. IUCN, Gland, Switzerland
Jordán F (2003) Reforma agraria en el Ecuador. Ponencia presentada al Seminario Internacional Resultados y perspectivas de las reformas agrarias y los Movimientos Indígenas y Campesinos en América Latina. Un i versidad Ma yor de Sa n Andrés, La Paz
Kabisch N, Frantzeskaki N, Pauleit S, Naumann S, Davis M, Artmann M, Haase D, Knapp S, Korn H, Stadler J, Zaunberger K, Bonn A (2016). Nature-based solutions to climate change mitigation and adaptation in urban areas: Perspectives on indicators, knowledge gaps, barriers, and opportunities for action. Ecol Soc 21(2):39
LIFE Urban Adapt (2018) LIFE urban adapt: demonstrating urban climate adaptation and resilience in inner city Rotterdam. Retrieved from: https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5239
Li X, Zhang C, Li W, Ricard R, Meng Q, Zhang W (2015) Assessing street-level urban greenery using Google Street View and a modified green view index. Urban For Urban Green 14(3):675–685
Liberalesso T, Cruz CO, Silva CM, Manso M (2020) Green infrastructure and public policies: an international review of green roofs and green walls incentives. Land Use Policy 96:
Lucas R, McMichael T, Smith W, Armstrong, BK, Prüss-Üstün A, World Health Organization (2006) Solar ultraviolet radiation: global burden of disease from solar ultraviolet radiation. World Health Organization
Mentens J, Raes D, Hermy M (2006) Green roofs as a tool for solving the rainwater runoff problem in the urbanized 21st century? Landscape Urban Plann 77(3):217–226
Naumann S, Davis MK (2020) Biodiversity and nature-based solutions. In: Analysis of EU-funded projects. European Commission
Nowell R (2016) Susdrain: celebrating SuDS – converting challenges to opportunities. Retrieved from: https://www.susdrain.org/files/resources/Presentations/roger_nowell_161101.pdf
PNCC (2015) Plan Nacional de Cambio Climático, Gobierno Nacional de la Republica de Ecuador, FOCAM Ecuador, PNUD
Pozo S, Yépez G, Salmon N (2018) Vegetation as a potential tool for improving thermal comfort and exposure to solar radiation in the streets of Quito. Conference proceedings: Passive and Low Energy Architecture Conference. Hong Kong
Seiferling I, Naik N, Ratti C, Proulx R (2017) Green streets – quantifying and mapping urban trees with street-level imagery and computer vision. Landscape Urban Plann 165:93–101
Unlimited Cities (2016) Unlimited cities: a tool for collective urbanism. Retrieved from http://unlimitedcities.org/
Van Roon M, Van Roon H (2009) Low impact urban design and development: the big picture. An introduction to the LIUDD principles and methods framework

Vojinovic Z (2020) Nature-based solutions for flood mitigation and coastal resilience. In: Analysis of EU-funded projects. European Commission
Washburn A (2013) The nature of urban design: a New York perspective on resilience. Island Press
Wild T (2020) Nature-based solutions improving water quality & waterbody conditions. In: Analysis of EU-funded projects. European Commission
Wong TH (2006) Water sensitive urban design-the journey thus far. Australasian J Water Resour 10(3):213–222
Wu J, Wu T (2013) Ecological resilience as a foundation for urban design and sustainability. In: Pickett STA, Cadenasso ML, McGrath BP, Hill K (eds) Resilience in ecology and urban design. Springer, Dordrecht, pp. 211–229
WWDR (2018) The United Nations world water development report 2018: nature-based solutions for water
Zellner M, Massey D, Minor E, Gonzalez-Meler M (2016) Exploring the effects of green infrastructure placement on neighborhood-level flooding via spatially explicit simulations. Comp Environ Urban Syst 59:116–128
Zucchetti A, Hartmann N, Alcántara T, Gonzáles P, Cánepa M, Gutiérrez C (2020) Infraestructura verde y soluciones basadas en la naturaleza para la adaptación al cambio climático. In: Prácticas inspiradoras en ciudades de Perú, Chile y Argentina (ed) Plataforma Mi Ciudad, Red AdaptChile y ClikHub

Nicolas Salmon Engineer (ISITV, France) and PhD (Polimi, Italy; UPV-EHU, Spain) in material science, he worked for ten years as chief technology officer in the French technological centre Nobatek/INEF4 dedicated to sustainable construction. He co-founded YES Innovation in 2015 in Quito, Ecuador, where he currently works as co-director, developing local and international projects focusing on sustainability and innovation for local architecture and urban planning, mainly using nature-based solutions and circular economy concepts. YES Innovation has been awarded for multiple projects in the recent years. He is also co-founder of the BIOM entrepreneurship and collaborates regularly as external lecturer, reviewer and researcher for the PUCE university.

Grace Yépez Architect (UCE, Ecuador), master in architecture (UBx, France), and PhD in sustainable urban planning (UBx, France). She runs GYA, an architecture company working in Ecuador and France, since 2004. She oversaw low impact urban planning projects in Nobatek/INEF4 in France for ten years and collaborated with the Architecture School of Bordeaux for the same period. Today she is co-director of YES Innovation, a consultancy dedicated to green architecture and urban planning in Quito, Ecuador, which she co-founded in 2015. Since 2016, she was also involved as lecturer in the UDLA and PUCE universities and was part of the board of the Ecuadorian College of Architects.

Micaela Duque Architect by the Pontificia Universidad Católica del Ecuador in 2019. Junior researcher in local and international projects. Head of urban and architectural projects at YES Innovation since 2019, where she has worked on several urban projects with important local recognitions such as the Metropolitan Corridor of Quito in 2020, My Sustainable and Exemplary Neighbourhood in 2018, and the Environmental Distinction for the Huanacauri project in 2018. She is currently involved on sustainable urban planning projects in Quito, Ambato, Esmeraldas and Portoviejo within national and international consortiums.

Mónica Yépez Agricultural engineer from the Escuela Superior Politécnica del Ejército, Quito—Ecuador (2001) and master in human resources from the Università Cattolica del Sacro Cuore, Milan—Italy (2004). She worked for 12 years in business and personnel management in Italy.

Since 2017, she works in YES Innovation on projects related to urban agriculture and participatory processes as well as on the development of materials and technologies based on biomaterials and nature-based solutions.

Antonio Báez Architect by the Pontificia Universidad Católica del Ecuador in 2019, he is focusing his work on the study and behaviour of cities, observing, analysing, and understanding their dynamics and particularities. He has also collaborated in several participatory projects in different territories that face conditions of poverty and informality, seeking to find strategies that would allow a social, economic, and environmentally friendly impact.

Mauricio Masache-Heredia He holds a Master of environments, focusing on energy efficiency, from the University of Melbourne—Australia and a degree in Electronic Engineering from the Army Polytechnic School (ESPE)—Ecuador. He is a proactive professional who promotes regenerative sustainability and positive design. He worked in multicultural and interdisciplinary teams in Ecuador, USA, Belgium and Australia. He has been a lecturer at the Faculty of Architecture of the Catholic University of Ecuador and has been co-director and thesis reader in the Master of Architecture and Sustainability. He is currently working as a professor-researcher in the Sustainable Architecture career at the Amazon Regional University Ikiam.

Gabriela Mejía Architect by The Pontifical Catholic University of Ecuador (2005). Magister in Master in the management of building and real estate companies by University San Francisco de Quito and the Polytechnic University of Madrid. (2012). Founder of GMG design and construction. She teaches in the Architectural Workshop, Building and Business Management and collaborates as Researcher Professor of Architecture of the Pontifical Catholic University of Ecuador. She is Active Member of the Research Group: SIT: Sustainability, Innovation and Technology and with the Group: Modern Architecture in Quito. Currently she is the Business Director of the Public Company of Habitat and Housing of the Municipality of Quito.

Paco Mejía Architect (1985) and Magister in heavy construction and infrastructure (1987) by the Central University of Ecuador. Oversight of works of GMG design and construction. Specialist in citizen participation with Municipality of Quito. He currently collaborates in the construction area with citizen participation workshops and construction of private works within GMG design and construction.

Grace Garofalo Architect by the Pontifical Catholic University of Ecuador (2016). Experience in design within the project of reconstruction of the campuses of the Pontifical Catholic University of Ecuador in Manabí after the earthquake of April 2016. First assistant of coordination of several exhibitions like “4 Modern Architects” (November 2018–January 2019). Independent experience on construction and design. Collaboration with GMG design and construction studio. Currently involved in the research projects Modern Architecture in Ecuador between 1950 -1965, carried out within the Pontifical Catholic University of Ecuador.

David Montoya Architect by the Central University of Ecuador, he has been involved in various urban projects in Quito, introducing co-design techniques and sustainability.

Chapter 7
How Co-design of Public Space Contributes to Strengthening Resilience: Lessons from Two Chilean Cases

Macarena Gaete Cruz, Aksel Ersoy, Darinka Czischke, and Ellen Van Bueren

Abstract The implementation of adaptation measures and the improvement of urban resilience is a growing concern recently. While urban projects are encouraged to become resilient, there is an interest in the design processes that produce them. In the Latin-American context, co-design is gradually taking a central role in space production, recognizing the need for involving multiple stakeholders to achieve more integrated and inclusive designs. However, in the case of Chile, institutions are rather rigid, over-regulated, and tend to operate in silos. We investigate how the co-design of public spaces can contribute to urban resilience through a case study of two Chilean design processes. The study applies the evolutionary resilience framework (ERF) to assess urban co-design processes (Davoudi et al., Plan Pract Res 28:307–322, 2013). Barriers and enablers reported by the interviewees shed light on how the co-design processes evolved and contributed to, or hindered resilience. Co-design is seen as a preparation-building process towards climate resilience that can be furthered through persisting, adapting, or transforming collaboration and design process factors. This study operationalizes the ERF framework and proposes a flowchart to identify factors influencing urban resilience. Although the Latin-American context may differ from other places, this study provides insights to co-design processes elsewhere.

Keywords Urban resilience · Evolutionary resilience · Co-design · Transformation · Chile · Public space

M. Gaete Cruz (✉) · A. Ersoy · D. Czischke · E. Van Bueren
Faculty of Architecture and the Built Environment, TU Delft, Delft, The Netherlands
e-mail: M.GaeteCruz@tudelft.nl

A. Ersoy
e-mail: A.Ersoy@tudelft.nl

D. Czischke
e-mail: D.K.Czischke@tudelft.nl

E. Van Bueren
e-mail: E.M.vanBueren@tudelft.nl

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_7

7.1 Introduction

Cities are interdependent urban systems, with multi-scalar components of social, ecological, and technical sub-systems that go beyond their jurisdictional as well as built-up boundaries (Boelens and de Roo 2016; Ersoy and Yeoman 2020; Meerow and Stults 2016; Van Bueren et al. 2012). Climate Change and natural hazards have direct as well as indirect impacts on these sub-systems and they challenge the way we have produced our cities and public spaces (Nightingale et al. 2020). As a result, it has been recognized that the design processes to produce the built environment are complex, making it necessary to work in integrated ways at different structural levels of decision-making and expertise (Folke et al. 2009; Savaget et al. 2019). Co-design has gained relevance in the context of the increasing need to climate-proof our cities, and thus their public spaces.

In most urban areas, the specialization of functions results in a general condition of decline, neglect, and contamination which impacts human health, the quality of life, and well-being. With the accelerated urbanization, the natural landscape inside as well as outside urban areas have become more ecologically fragmented which affects the environment but also its supportive role to our society (Brink et al. 2016; Wamsler et al. 2013). Implementing climate change adaptation measures in public spaces enables us to think about how a variety of environmental, social, technical, and economic challenges can be addressed to increase the resilience of cities through collaborative processes (Castán Broto and Bulkeley 2013; Wamsler and Raggers 2018).

In recent years, there is a growing awareness to incorporate climate change adaptation measures in Latin-American cities (Krellenberg et al. 2014; Romero-Lankao and Gnatz 2013). Although most countries have developed national or metropolitan plans (Chile, Colombia, Costa Rica, and others), difficulties arise when urban adaptation is to be implemented (Barton et al. 2015; Barton 2009). In the context of Chile, this is an emerging phenomenon that has been dealt with in sectorial ways with some exceptional examples in which actors from the various institutional systems involved have collaborated to design and produce resilient public spaces (Fernández and Courard 2018; Harkness et al. 2019; Moreno 2019). Two of these exceptional cases will be analyzed in this chapter. They have in common that their co-design process became crucial for the socio-ecological solutions of public spaces. However, the implementation of co-design is not always straightforward in rigid and over-regulated institutional settings that are ill-adapted to such collaborative processes.

In this chapter, we apply the evolutionary resilience framework (ERF) to study two Chilean urban park design processes. We aim to understand how these co-design processes confronted enablers and overcame barriers through changes. The ERF framework builds on the evolutionary resilience tradition (Folke et al. 2010; Gunderson and Holling 2001; Walker et al. 2004), and defines it as a process of change (Davoudi et al. 2013) emphasizing the preparedness capacity of institutional systems through persistence, adaptation, and transformation. Specifically, we aim to understand the dimensions of persistence, adaptability, and transformability in such

co-design process-oriented cases. To do so, the enablers and barriers for collaboration and design will be analyzed for each of the cases.

In the next section, we will explain this framework and describe how we applied it to assess the co-design processes followed in our case studies. After this, we briefly introduce our cases and comment on the results of the interview analysis. Finally, we discuss how co-design processes can contribute to the future discussions of the ERF.

7.2 Applying the Evolutionary Resilience Framework to Urban Co-design

The design and the implementation of resilient adaptation interventions are challenging tasks for cities due to their complex and dynamic structures. Understanding the link between the social and ecological sub-components of cities is crucial to develop their long-term capacities, and reconfigure socio-economic and institutional paths into sustainable ones. With the increasing uncertainty of internal and external stresses, cities need to improve their preparedness to change, and therefore their resilience. There is a long list of literature dealing with how cities respond to shocks and their experience with their recovery aftermath (Bristow 2010; Christopherson et al. 2010; Davoudi et al. 2012; Hudson 2010). While the engineering-angle of resilience focuses on the ability of a system to return to a previous state or its recovery aftershocks (Fingleton et al. 2012; Rose 2004), the ecological interpretation focuses on whether cities can modify their function and structure. This allows a system to change and adapt to new circumstances (Gunderson and Holling 2001; Holling 1973). More recently, there has been an increasing interest in the evolving nature of systems that understand the world as complex, dynamic, uncertain, and unpredictable. This approach to resilience has been coined as evolutionary (Davoudi et al. 2012).

Evolutionary resilience is understood as the capacity of complex socio-ecological systems to adapt and transform in response to stresses and shocks (Carpenter et al. 2001). It also suggests that change can happen due to internal stresses with *"no proportional or linear relationship between the cause and the effects,"* and that they hardly ever return to where they used to be (Davoudi et al. 2012, p. 302). The Evolutionary Resilience Framework (ERF) defines resilience as a process of change (Davoudi et al. 2013), and emphasizes the preparedness capacity of institutional systems to change by understanding it through the processes of persistence, adaptation, and transformation. Persistence implies "*resisting disturbances*," while adaptability refers to the ability to absorb shocks "*without crossing a threshold into an undesirable and possibly irreversible trajectory*." Transformability involves "*innovating toward desirable trajectories*" through change and the creation of new structures. These three are linked to the preparedness and "*learning capacity of governing bodies*" as dependent components (Davoudi et al. 2016, p. 712). In sum, the ERF incorporates the dynamic interplay among these three components to provide

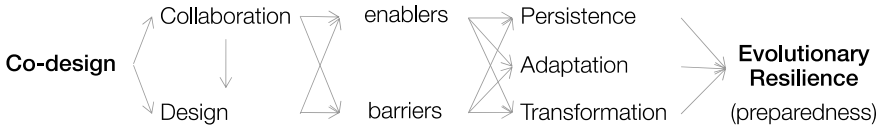

Fig. 7.1 Linking co-design to evolutionary resilience

an understanding of how complex socio-ecological systems can become more or less resilient through human action and intervention, as taking place in co-design, consisting of processes of collaboration and design and giving rise to factors enabling or obstructing persistence, adaptation, and transformation (Fig. 7.1).

The study of public spaces allows us to understand how complex socio-ecological systems shape urban spaces. Resilient and high-quality public spaces can stimulate long-term social and economic benefits for cities' green infrastructure and increase urban livability (Ersoy and Yeoman 2020). However, the unpredictable social and ecological dimensions of climate change push us to think not only about public space design solutions but also about the processes to produce them. Co-design, in this respect, aims to allow a wider variety of knowledge to be considered and analyzed by a broader group of experts and stakeholders than traditionally involved in urban design to provide more suitable and context-specific spatial designs that are better prepared for change.

Co-design originated in the encounter of participatory design (Mattelmäki et al. 2014), co-production (Parks et al. 1981), and co-creation traditions (Galvagno and Dalli 2014; Vargo and Lusch 2008). It suggested the involvement of customers, consumers in service marketing (Vargo and Lusch 2004), or users in industrial design (Sanders and Stappers 2008) in the process of developing products or services. It has over the years broadened its scope to new knowledge and application fields such as environmental studies (Djenontin and Meadow 2018; Moser 2016), urban design (Sørensen and Torfing 2018; Stelzle et al. 2017), governance and management (Ersoy 2017; Pestoff et al. 2013), architecture (Emmit and Ruikar 2013), planning (Healey et al. 2007; Webb et al. 2018) and industrial design (Koskela-huotari et al. 2013; Mattelmäki et al. 2014; Mattelmäki and Visser 2011; Sanders et al. 2010). In sum, there has been a diversification of actors involved in the design processes that have been understood as networked institutional systems (Manzini 2016; Mattelmäki et al. 2014).

Co-design focuses on the benefits of collaboration and its opportunities to improve the design outcomes. Collaboration is said to improve the results by integrating relevant knowledge, values, aims, and skills into the process (Huybrechts et al. 2017; Ostrom 1996; Sanders and Stappers 2014), while also promoting shared understandings, mutual learning, empowerment, and legitimacy, while adapting and transforming the design processes and results to overcome difficulties. In the urban field, participants from the public, private, and community sectors collaborate and interact toward developing better informed context-specific urban projects (Drilling and Neuhaus 2019; Sharifi et al. 2017; Webb et al. 2018). In the case of

cities facing climate change, and other forms of socio-ecological disturbances, co-design processes can provide benefits to public space by promoting collaboration and context-specific designs. The designs integrate the available disciplinary and local knowledge (social and ecological) into spatial solutions that respond to multiple present and future needs. Since today's institutions have often been developed for regulating a particular sector or domain, often making use of particular disciplinary knowledge, co-design processes tend to challenge existing institutions and have to overcome the persistence of barriers to adaptive or transformative change.

In this study, we investigate how co-design processes of public spaces may enhance urban evolutionary resilience. Specifically, we apply the three-dimensional evolutionary resilience framework to assess urban co-design processes within complex socio-ecological systems in two cities in Chile. We aim to understand how the dimensions of persistence, adaptability, and transformability interplay in urban co-design processes and how we can use this knowledge to improve the co-design process.

We analyze the co-design process enablers and the barriers reported by the interviewees that contributed to or hindered persistence and change. The encountered enablers may persist, while the barriers may either persist to be overcome through adaptability or transformability. Collaboration in the design process, either hinders or enhances institutional resilience, while design denotes how it is embodied in the resulting projects. The previous may thus affect the overall socio-ecological systems' evolutionary resilience.

The ecological resilience in terms of preparedness of systems is thus observed in their abilities to maintain, adapt, or transform process factors regarding collaboration and design within these processes. In this sense, co-design may contribute to the preparedness of institutional systems and the design decisions produced within them. It may allow collaborative barriers to change (adapt and transform) when facing social or ecological challenges. And it may also contribute to the design solutions for public spaces to better adapt and transform when facing social or ecological challenges such as climate change.

In the next section, the cases are presented, and the data collection and analysis are explained.

7.3 Method

We aim to investigate how co-design can enhance institutional systems' preparedness and its evolutionary resilience through a retrospective case study of public space co-design processes with the ERF, as specified in the previous section. The two selected study cases are city-sized urban parks with context-specific adaptation measures to deal with water scarcity and water-related climate change risks in the deserted north of Chile. The case study approach responds to the complex, context-sensitive, and contemporary nature of the phenomena (Yin 1994).

The study builds on primary and secondary data obtained through fieldwork conducted in December 2019 and January 2020. The primary data considered twenty-seven semi-structured in-depth interviews with key participants such as the project leaders, the design contract administrators, the community leaders, and the academics involved. Secondary data included both written and graphic documents such as public reports, media publications, design plans, and images. To make the sampling comprehensive, participants were selected from the different sectors and backgrounds (Ridder 2017) such as public, private, non-profit, academia, and the community. Also, multiple disciplines and roles were considered in the selection of the interviewees. The interview protocol, consisting of semi-structured questions, was built from the co-design ERF framework. It was revised with key informant experts in the field in Chile and The Netherlands. Also, a pilot interview was conducted with one interviewee of each of the cases, and adjustments were made to better suit the framework.

The interviews aimed to gain in-depth insights into the perceptions and meanings of the process concerning the enablers and barriers. We analyzed the main enablers and barriers reported by the interviewees and position them within the ERF. During the data gathering in the field, the interviewees were asked to describe their point of view on the co-design processes with an emphasis on their role and contribution to the projects. We asked them to describe the processes and to reflect on the enablers and barriers encountered in co-design. They then explained how the encountered barriers were modified and sometimes new structures were created to overcome them. They were requested to reflect on the flexibility of the participants' attitudes in the collaborative meetings and workshops, their sense of shared understandings, their sense of influence on the project, and their satisfaction with the designed urban park. They were also asked to reflect on the stiffness or flexibility of the institutional system and how much it changed to overcome the process barriers, or what enablers were present to do so. Explicit questions regarding the social and ecological design solutions of the public spaces were also asked using a map of the projects for them to point out. For additional verification, the transcripts and recordings were shared with some of the interviewees, as well as the systematized results to check for internal consistency.

Figure 7.2 shows a flowchart that we have proposed and followed to classify the enablers and barriers in the co-design process according to their influence on resilience specified by the concepts of persistence, adaptation, and transformation. The encountered enablers may persist, while the barriers may either persist or be overcame through adaptability or transformability. In support, the analysis method consisted of four main steps (Bryman 2015). First, we organized data and transcribed the interviews. Then, we designed a coding based on the framework of the study. This coding connected the themes and variables to the interview questions with the reported barriers and enablers. Next, we went through the data in rounds of initial familiarization and in-depth coding with Atlas Ti software. A semantic and latent approach allowed us to identify conceptual patterns. Finally, we used a deductive thematic analysis to categorize relevant themes linked to the ERF framework.

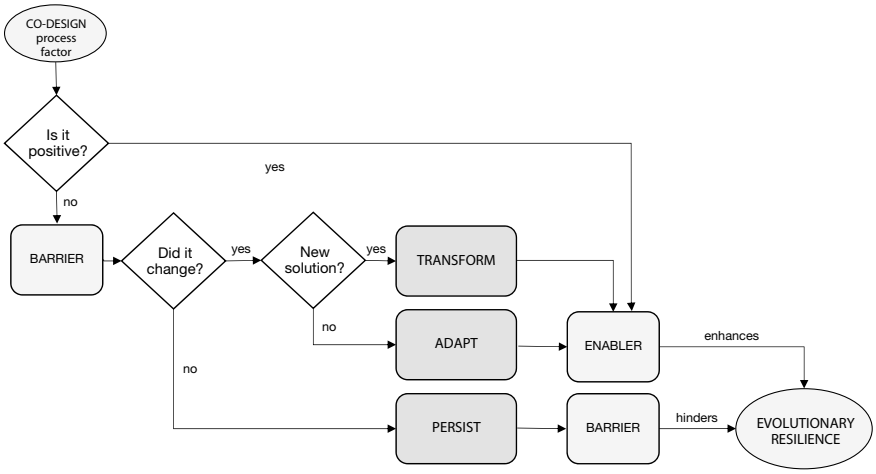

Fig. 7.2 Flowchart of process factors persisting, adapting, or transforming to influence evolutionary resilience

7.4 Cases

The study analyzed two public space design processes in-depth to understand how co-design contributed to, or hindered urban resilience. The cases were selected because they are some of the first context-specific climate change adaptation examples of co-design processes that occurred during the last decade in the Chilean context involving inter-sectorial partnerships, multidisciplinary teams, and engaged communities. These projects are receiving considerable attention from academia, national government entities, and private companies due to their public–private partnerships, collaborative approaches to design, and the transdisciplinary development of nature-based solutions to deal with climate change adaptation (CNDU 2014; Moreno 2018).

The cases are briefly described in Table 7.1. They are city-sized longitudinal urban parks for adaptation aiming for context-specific solutions to deal with water scarcity and water-related risks of climate change in the deserted north of Chile. Case 1 is an example of collaboration among two ministries, and a transdisciplinary team integrating urban landscape and hydraulic designers. It addresses flooding and mudslides through the naturalization of the riverbank, and water scarcity with low water requirement foresting and permeable pavements. Case 2 is a collaboration led by CREO Antofagasta and had strategic, transdisciplinary, and community co-design. CREO Antofagasta is a public–private-people-academia partnership NGO leading and articulating sustainable urban projects for the city. It addresses water scarcity through a landscape design with low water requirement species and the natural restoration and protection of the seaside. Both projects were led by the same urban design studio, whose chief is a renowned architect who holds the National Architecture Award.

Table 7.1 Description of the two cases

	Case 1 (Fig. 7.3) Kaukari Urban Park	Case 2 (Fig. 7.4) Antofagasta Seaside Park
Location	Copiapó city, Atacama region, Chile	Antofagasta city, Antofagasta region, Chile
Size	60 hectares. 3,5 km long	35 km long
Brief description	Public urban park in the riverbank	Public urban park along the city seaside
Climate change resilient design	Naturalization of the riverbank to adapt to flooding and mudslides. Low water requirement foresting and permeable pavements due to water scarcity	Landscape design with low water requirement species and the natural restoration and protection of the seaside. No considerations regarding sea storms or sea-level rise
Design consultancy	2011–2013 Teodoro Fernández Architecture Studio and Bonifacio Fernández Engineers	2017–2020 Teodoro Fernández Architecture Studio, Urbana ED, GSI Engineers
Main funding source	Shared budget from the Housing and Urbanism Ministry (Minvu) and the Public Infrastructure Ministry (MOP)	Shared budget from the Public Infrastructure Ministry (MOP) and BHP Billiton mining company

Fig. 7.3 Aerial view of Kaukari Urban Park in Copiapó city. (Tomás Gómez)

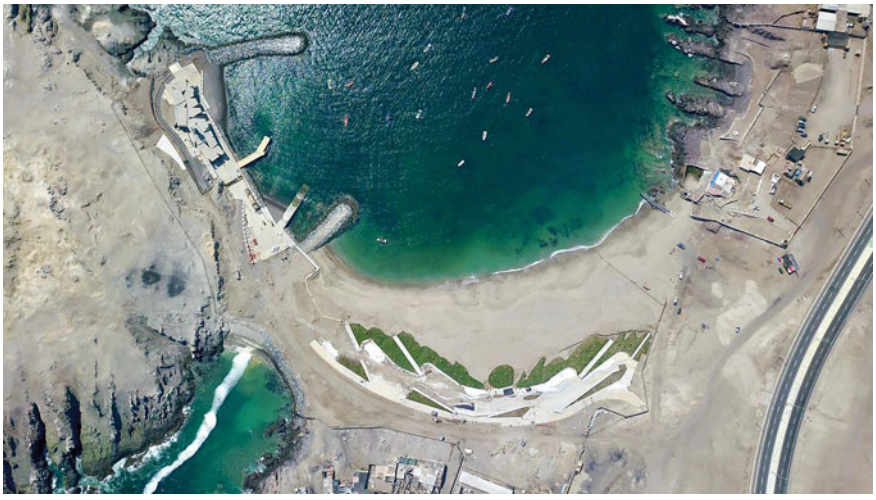

Fig. 7.4 Aerial view of Antofagasta Seaside Park in Antofagasta city. La Chimba artificial beach and fishing cove. (Nicolás Sepúlveda)

The first author of this chapter was involved partially in the two cases. We acknowledge such involvement could bring legitimacy issues but has enabled interviewees and access to data that would have been difficult otherwise. Likewise, the familiarity developed with the cities, the involved organizations, and the projects enabled valuable insights for this study (Labaree 2002).

7.5 Research Findings and Discussion

This section presents the findings of the study and discusses the implications of the ERF concepts in the co-design processes. The enablers and barriers of the processes reported by the interviewees, as well as their narratives about co-design, allowed us to analyze the main factors influencing resilience. The agglomerated results of case 1 revealed 14 enablers and 12 barriers, while case 2 revealed 21 enablers and 15 barriers. A summary of the enablers and barriers for collaboration and resilient design as identified in the interviews can be found in Table 7.2, followed by a discussion of the table. We classified the enablers and barriers according to their influence on resilience concepts of persistence, adaptation, and transformation, following the flowchart in Fig. 7.2, and identified how barriers have been overcome or removed through adaptation or transformation of the institutional or physical context of collaboration and design, thus changing the barriers into enablers. Maintained enablers were considered to enhance resilience, while barriers that had not been resolved (persisting) hindered it. Other barriers reported that were overcome through change,

Table 7.2 Collaboration and design enablers and barriers categorized according to the ERF concepts

Case 1—Kaukari Urban Park, Copiapó, Chile	Case 2—Antofagasta Seaside Park, Antofagasta, Chile
Collaboration process factors	
Persistent enablers	
• Importance of the river site for the citizens • Familiarity among the actors • Trust in the prestige of the design leader • Young actors were willing to innovate	• Importance of the seaside site for the citizens • Emerging participatory culture • Trust in the prestige of the design leader • Young actors were willing to innovate
Persistent barriers	
• Lack of participatory culture • Institutional rigidity	• Institutional rigidity • Communicational difficulties
Barriers adapted to enable	
• Stiffness of the design contract (barrier) Flexibility to change the design contract (enabler) • Stiffness of the financial procedure (barrier) The flexibility of two public entities to change the financial procedure (enabler)	• Stiffness of the design contract (barrier) Flexibility to change the design contract (enabler) • Stiffness of the public entities (barrier) The flexibility of the public entities to adapt two overlapping projects (enabler) • Stiffness of the leading organization (barrier) The flexibility of the leading entity to organize continuous multi-actor meetings
Barriers transformed to enable	
• Lack of participatory culture (barrier) It was overcome with the creation of a governance entity to influence the design and implementation processes (enabler)	• Difficulties to manage the participatory process (barrier) It was overcome with the creation of collaborative entities and multi-actor meetings (enabler)
Design process factors	
Persistent enablers	
• Compatibilized landscape architecture and hydraulic design projects • Riverbank at the heart of the valley city and culture in the desert	• Seaside at the heart of a coastal city and culture in the desert
Persistent barriers	
• Lack of control over the river water distribution and management	• Lack of design considerations regarding sea-level rise

(continued)

were classified as adapted, or transformed. These two types of changes enhanced the evolutionary resilience of their institutional systems.

Table 7.2 (continued)

Case 1—Kaukari Urban Park, Copiapó, Chile	Case 2—Antofagasta Seaside Park, Antofagasta, Chile
Barriers adapted to enable	
• Uncertainty about the hydraulic behavior of the river (barrier) Changes in the topography to increase the water capacity of the river (enabler) • A cultural vision of a green grass urban park (barrier) Flexibility to propose a low water requirement landscape design (enabler)	• Seaside accessible with cars (barrier) Flexibility to restrict car access (enabler) • Sea storm risks (barrier) Flexibility to lower the implementation costs and diminish maintenance (enabler) • Low budget for an extended project along with the city (barrier) The flexibility of the design to diminish and focalize the intervention areas (enabler)
Barriers transformed to enable	
• A multiplicity of activity requirements (barrier) It was overcome with the creation of a mixture of flexible and specialized spaces (enabler) • The park and the river were conceived as separate spaces (barrier) It was overcome with the proposal for a naturalized and accessible river (enabler)	• Rustic rocky seaside (barrier) It was overcome with the creation of an artificial beach and the habilitation of rocky areas (enabler)

7.5.1 Enablers of Collaboration and Design

Some enablers were acknowledged and maintained within the co-design processes. They contributed to the collaboration and design processes, thus contributing to evolutionary resilience. Collaborative enablers contributed to consolidate existing structures or organizations that govern and play a role in the creation, design, management, operation, of public spaces, or activate people to make use of them. Design enablers allowed the integration of the existing requirements for the climate-resilient design and the available knowledge into the projects.

Some enablers were recognized by the interviewees to have been of benefit to collaboration throughout the processes. In both cases, young professionals working for the main organizations were involved, who were young idealists aiming for innovation. They often knew each other and were willing to actively collaborate. The landscape architect for both of the cases had a nationally recognized and respected track record, so the process was somehow smoothed because everyone knew the results would be made context-specific and of good quality. Particularly in case 1, the main design disciplines (hydraulic engineering and urban landscape architecture) were led by two academics that were at the same time, twin brothers. This resulted in successful transdisciplinary collaboration. They had also been professors of some of the involved civil servants on the different public entities, and this smoothened the co-design process. In case 2, an emerging participatory culture was beneficial to collaboration in design. The leading NGO Creo Antofagasta was created to raise

collaboration among public and private entities, and a couple of community organizations emerged with time. This allowed collaboration, but communication and management difficulties were confronted in leading the process.

Some enablers reported by the interviewees were also of benefit to the designs. For both cases, the project sites are central natural landmarks (riverbank and seaside) within the cities. All citizens are beneficiaries of the future public spaces, this summoned them to support the designs. Additionally, in case 1, the two main designs, landscape architecture and hydraulic design were reported to be compatibilized in transdisciplinary ways due to the collaboration that occurred between the teams.

7.5.2 Barriers for Collaboration and Design

The barriers that persist throughout the co-design processes tend to hinder the resilience of a system in terms of its adaptive and transformative capacities. Most reported barriers for collaboration were present in both cases. The main differences regarded citizen involvement: in case 1 there was a lack of it, in case 2 it was a complex emerging process. In both cases, a participatory culture barely existed in the early days of the projects due to the recent national political history. For case 1 this was to the detriment of the participation of the community, so their involvement was mainly informative and somehow shallow. In case 2, over the years a collaborative culture was developed, achieving a much more mature and consistent collaborative institutional system, with new emerging community organizations and professionals. Nevertheless, in this case, some of the interviewees reported a lack of consistent communication throughout the process that led to a certain discomfort and mistrust toward the leading organization. Moreover, the Executive Council (a strategic consulting entity created for the process) was denounced to have become an informative, rather than consulting and genuinely participative entity. Furthermore, the interviewees reported a rigidity of national institutions in both cases. They commented on the excessive regulations and overall stiff management culture. For example, the public bodies were mandated to coordinate their actions, but their instruments and regulations were not designed to do so. This resulted in somehow linear, segregated, and autonomous projects instead of well-attuned ones. Another example of the institutional stiffness was the fact that the seaside in Antofagasta was managed by the Chilean Army, an entity with no formal command or interest in its development. This limited not only the use of the seaside area, but also, its strategic planning.

The barriers to design were different in both cases. For case 1, the lack of control over the river water distribution and management was a barrier that the design had to deal with and could not be influenced or modified. This made the naturalized river solution indispensable to overcome drier seasons. In case 2, the lack of design solutions to respond to the sea-level rise as a climate change risk was not considered at all, thus hindering the urban park's resilience.

7.5.3 Barriers Adapted, Turning into Enablers

The flexibility with which barriers faced are modified is considered a process of adaptation. Co-design contributes to the adaptation of the institutional systems by changing organizations or their roles to different duties regarding the needs of public spaces. Co-design contributes to the adaptation of design when the raised awareness of the unpredictable may condition the integration of flexible spaces where the social uses and ecological functions may change.

In both cases, the design contract was adapted to allow the integration of additional design square meters to allow for such future flexibility. The design contract deadlines were extended, but only in case 2, this was followed by a budget extension. Also, an extra project was incorporated into the design assignments in both cases. These extensions strategically promoted the early construction of the projects that could have lasted years otherwise. Additionally, in case 2 the leading public entity (Public Infrastructure Ministry) had two overlapping projects on the same seaside site: the urban park and the project for a seaside avenue. The conflicting planning and budget claims were solved by attuning both projects and sharing their building costs, giving more room for other investments in the region. Likewise, the construction budget of case 1 combined contributions from two ministries, a rather unusual arrangement for the Chilean context, allowing shared resilience investments. Furthermore, in case 2, the lack of a participatory culture was handled by CREO Antofagasta NGO through the continuous management of crucial actors for the project progress (public, private, academic, citizen), and joint meetings were organized among them. This allowed a shared understanding about the seaside uses and values, supported by a collaborative analysis of the opportunities and risks that were raised during the meetings. These shared understandings set the tone of the project and influenced the design. They also influenced all the actors' views on the seaside site, leading to the support of these shared understandings by all the involved organizations.

In case 1, the uncertainty about the hydraulic behavior of the desert river was handled by making changes in the topography to increase the water capacity of the river. Also, the cultural vision for a green grass urban park was assessed by the design team. They had the flexibility to propose a scarce water landscape design that nevertheless maintained the green image, but which was adapted to sustain in the desertic environment. In case 2 the seaside used to be accessible by cars. This was sensed by the community as an old habit with a detrimental effect on the ecological environment. The design was adapted to organize and restrict car access along the park. Also, the available budget was considered too low for the extended urban park project that run alongside the city. The design of the park was simplified and diminished to focus the intervention areas and lower the building costs. The low budget also conditioned the building costs to diminish the maintenance budget when facing storm sea risks. This allowed the project to leave space for future modifications and transformations.

In both cases, co-design played the role in adapting the existing collaborative interactions and in the development of design solutions to remain open and aware of the unpredictable and of the need to embrace changing circumstances.

7.5.4 Barriers Transformed into Enablers

The innovative creation of new structures when facing barriers in co-design can be understood as a transformation. Co-design contributes to resilience by allowing new associations, partnerships, and emerging organizations to play a role in the development and governance of public spaces. Co-design contributes to the transformation of the design because new innovative solutions may emerge, and future innovations may be promoted. For both cases, co-design succeeded in enabling collaboration and design, with openness for emerging organizations, meetings, partnerships, and design solutions as a result.

The main transformations or innovative solutions emerged from conflicts encountered through the co-design processes. In case 2, the variety of collaborative entities created throughout the process demonstrates transformation and innovation. Entities were created to stimulate the emerging collaborative culture. First, the main articulator and convenor, CREO Antofagasta NGO was created, followed by the creation of the Executive Council for strategic shared decision-making, and the Citizen Council for civil representation. These organizations facilitated the many multi-actor meetings throughout the process with the involvement of public, private, academic, non-profit, and community participants. In contrast, for case 1, the lack of a citizen participatory culture was countered by the early creation of the Governance entity, which aimed to socially manage and activate the implemented areas of Kaukari Urban Park and to play a role in the areas to be implemented. This organization allowed collaborative decision-making, as well as contributed to the activation of the public space.

Some barriers were recognized by the interviewees to have been transformed to the benefit of the design. For case 1 there were many activity requirements to be considered by the project (civil, cultural, recreational, sports, among others). This barrier was overcome with the creation of flexible and specialized spaces throughout the park in the river. Additionally, the park and the river, normally conceived as independent urban spaces in Chile, were designed together with the design proposal for a naturalized and accessible river. Similarly, the rustic rocky seaside was seen as a barrier for the urban park design. This was overcome with the creation of one artificial beach and the habilitation of rocky swimming areas.

Table 7.3 presents an assessment of the overall contribution of co-design, in terms of the collaborative process and design processes, to the evolutionary resilience of the urban parks in the two cases. Both collaborative processes seem to have contributed to resilience challenging the actors involved to come up with context-specific design solutions and new institutional arrangements.

Table 7.3 Assessing the evolutionary resilience of the two cases

Case 1—Kaukari Urban Park Copiapó, Chile	Case 2—Antofagasta Seaside Park Antofagasta, Chile
Collaboration	
• Some forms of resilience developed throughout the process through collaboration • The creation of the Governance entity might indicate later efforts to stimulate collaboration, and thus enhance resilience	• A high system's resilience is observed in collaboration dealing with the complexities of shared knowledge and decision-making within diverse participants • The creation of multiple entities shows collaborative intentions, yet some communication problems remain unsolved
Design	
• High resilience of the project concerning social and ecological aspects. The design decisions merge social and ecological solutions toward context-specific adaptation measures for public space	• Social resilience was enhanced through the designed project, while low ecological considerations with regard to context-specific water adaptation measures • The project responds mainly to social requirements, but not to some relevant climate change's ecological threats

Case 1 presented an ongoing process of resilience building through the collaborative involvement of multiple organizations in the design, management, and increased use of the urban park project. Some forms of resilience were made possible through transdisciplinary design solutions and flexible (and transformable) public spaces. In case 1 the collaboration seems to have been focused on the two involved public bodies and the two main design firms involved in the project for the riverbank park. These participants have shared understandings, and have developed collaborative interactions throughout the process. This seems to have influenced the project: the design responded to the social and ecological requirements that emerged from the process and merged solutions toward context-specific adaptation measures for public space. This can be observed in the naturalized riverbank that is accessible to visitors but also serves as a biodiverse ecological corridor. This rather new design solution for the country indicates that the project would be prepared to address multiple values of public space, as brought up by the participants in the process, and was prepared to accommodate the effects of a changing climate by adopting nature-based solutions that can mitigate the effects of drought and heavy rainfall. The institutional system resilience was being developed in February 2020, when the case study ended. At that time, interviewees expected that the Governance entity would help to enhance the institutional system's resilience by allowing for shared decision-making among its collaborators and channeling citizen requirements.

Case 2 seems to have made use of the "potential transformative opportunities which emerge from change" (Davoudi et al. 2013, p. 307) and started to prepare for a shift toward collaboration at an institutional system level. The actors collaborating in case 2 dealt with the complexities of shared knowledge and decision-making, and the involvement of diverse entities and professionals with some communication

problems. The design decisions suggest that only some resilience was accomplished through the integration of flexible spaces and low water-demand vegetation in the urban park design. The design decisions seem to have successfully incorporated the shared knowledge and understandings developed in the multi-actor meetings, nevertheless, climate change adaptation measures for sea-level rise and heavy rainfall weren't explicitly incorporated into the project nor in the interviewees' responses, even though these are well-known climate change threats nowadays. This suggests that the project responded mainly to the social requirements collaboratively agreed to by the actors involved, who only considered climate change effects to traditional park design and management, but were unaware of the impact of sea-level rise on this park.

7.6 Conclusions

The design processes that produce our built environments are complex and require the involvement of diverse levels of decision-making and expertise in integrated ways (Folke et al. 2009). Addressing climate change challenges in public spaces enables us to think about how a variety of environmental, social, and economic measures can be implemented to increase the resilience of cities.

There is a growing awareness of the need to implement climate change adaptation measures in cities. The unpredictable dimensions of climate change push us to reimagine not only the urban solutions but also the processes to design them. The emerging phenomenon of co-design has become crucial for the future of public spaces. Co-design, in this respect, allows a wider variety of knowledge to produce better informed context-specific social and ecological solutions that need to be supported by matching institutions. However, co-design is not common in a rigid, over-regulated, and non-participatory institutional setting as in Chile.

In this chapter, we applied a co-design perspective, consisting of an interrelation between collaboration and design processes, to the ERF framework to analyze two Chilean urban park cases. The framework defines resilience as a process of change (Davoudi et al. 2013) and emphasizes the preparedness of institutional systems, characterizing change through persistence, adaptation, and transformation.

We have investigated how co-design processes contributed to, or hindered, urban evolutionary resilience. We aimed to understand how co-design contributes to evolutionary resilience looking at the enablers and barriers to it in the process. While some barriers persisted, hindering resilience, others were overcome with change through adaptation or transformation. In this respect, the collaborative approach to the design process contributed to improving the institutional systems supporting more resilient design decisions. Collaboration barriers either persisted, or were adapted or transformed, when facing socio-ecological challenges, and the design solutions allowed public spaces to better persist, adapt, or transform, thus improving their resilience. The cases studied show institutional efforts to promote and sustain collaboration in the design processes of two urban parks in two cities of the Atacama Desert. In

both cases, the institutional systems allowed diverse forms of collaboration, and new organizations were created to represent and provide multiple ecological and social requirements to the design processes. Collaboration in the design decision-making processes seems to have happened at strategic, technical, and social respects in different levels. These complex collaborations seem to have informed and contributed to the designs, influencing the projects that resulted from them. The stiffness or flexibility with which the institutional settings overcome barriers and enablers of design and collaboration defines the evolutionary resilience of the projects and the processes to design them. Accordingly, co-design for climate change is a preparation-building process that can be furthered by overcoming the persisting barriers and enhancing the persisting, adapted, or transformed enablers.

The flowchart of enabling and hindering process factors offers a complementary understanding of evolutionary resilience and highlights the human action and intention embedded within institutional systems. In sum, the research presented in this chapter sheds light on the contribution of co-design to urban resilience, which is complicated due to the complexity of both concepts. By operationalizing and connecting both, this study makes a modest contribution to the understanding of the relationship between them.

While focused on the Latin-American context, this study provides valuable insights for urban public space production processes elsewhere. Our understanding of co-design contributing to resilience may help to develop collaborative and resilient institutional arrangements in practice. It may help researchers analyze and assess urban co-design processes to inform policymaking toward resilience. It may also help designers and practitioners to better manage and design urban co-design processes while enhancing evolutionary resilience. As citizens, public servants, and practitioners continue to learn how collaborative design enhances resilience, we might be able to promote more prepared institutional systems and public spaces.

Further research could explore ways in which co-design ensures the climate-proofing and livability of public spaces. Also how co-design may ensure collaborative design, operation, activation, and usage of public spaces to better adapt to socio-ecological challenges though the involvement of strategic, technical al social actors to the process. Additionally, studies on the social learning approach to the ERF and co-design may allow for the assessment of institutional systems' preparedness towards evolutionary resilience.

Acknowledgements This study has been supported by the Chilean National ANID Grant.

References

Barton JR, Krellenberg K, Harris J (2015) Collaborative governance and the challenges of participatory climate change adaptation planning in Santiago de Chile. Climate Dev 7(2):175–184

Barton JR (2009) Revisión de marcos conceptuales y análisis de enfoques metodológicos (barreras y viabilidad) para el desarrollo de una infraestructura urbana sostenible y eco-eficiente. CEPAL:

Eco-Eficiencia y Desarrollo de Infraestructura Urbana Sostenible En América Latina y El Caribe (ECLAC-ESCAP. ROA101), 1–86. Retrieved from https://www.cepal.org/ecoeficiencia/noticias/paginas/2/36162/Barton.pdf
Boelens L, de Roo G (2016) Planning of undefined becoming: first encounters of planners beyond the plan. Plan Theory 15(1):42–67
Brink E, Aalders T, Ádám D, Feller R, Henselek Y, Hoffmann A, et al (2016) Cascades of green: a review of ecosystem-based adaptation in urban areas. Glob Environ Chang 36:111–123
Bristow G (2010) Resilient regions: re-'place'ing regional competitiveness. Camb J Reg Econ Soc 3(1):153–167
Bryman A (2015) The nature and process of social research. In: Social Research Method, pp 3–16
Carpenter S, Walker B, Anderies JM, Abel N (2001) From metaphor to measurement: resilience of what to what? Ecosystems 4(8):765–781
Castán Broto V, Bulkeley H (2013) A survey of urban climate change experiments in 100 cities. Glob Environ Chang 23(1):92–102
Christopherson S, Michie J, Tyler P (2010) Regional resilience: theoretical and empirical perspectives. Camb J Reg Econ Soc 3(1):3–10
CNDU (2014) Sistema de Planificación Urbana Integrada. Propuestas para la implementacion de la Politica Nacional de Desarrollo Urbano. Santiago de Chile
Davoudi S, Brooks E, Mehmood A (2013) Evolutionary resilience and strategies for climate adaptation. Plan Pract Res 28(3):307–322
Davoudi S, Shaw K, Haider LJ, Quinlan AE, Peterson GD, Wilkinson C, et al (2012) Resilience: a bridging concept or a dead end? "Reframing" resilience: challenges for planning theory and practice interacting traps: resilience assessment of a pasture management system in Northern Afghanistan urban resilience: what does it mean in planni. Plan Theory Pract 13(2):299–333
Davoudi S, Zaucha J, Brooks E (2016) Evolutionary resilience and complex lagoon systems. Integr Environ Assess Manag 12(4):711–718
Djenontin INS, Meadow AM (2018) The art of co-production of knowledge in environmental sciences and management: lessons from international practice. Environ Manage 61(6):885–903
Drilling M, Neuhaus F (2019) The fragile body in the functional city: an editorial. Urban Planning 4(2):1
Emmit S, Ruikar K (2013) Collaborative design management. Routledge, New York
Ersoy A (ed) (2017) The impact of co-production: from community engagement to social justice. Policy Press. Connected Communities—Creating a new knowledge landscape, Bristol
Ersoy A, Yeoman R (2020) Reconfiguration of public space via nature-based solutions. In: Riegler J, Bylund J (eds) Unfolding dilemmas of urban public spaces: recommendations by JPI Urban Europe's AGORA. Urban Europe, Riga
Fernández T, Courard P (2018) Parque Kaukari Del Río Copiapó. ARQ 2018(99):70–82
Fingleton B, Garretsen H, Martin R (2012) Recessionary shocks and regional employment: evidence on the resilience of U.K. regions. J Reg Sci 52(1):109–133
Folke C, Carpenter SR, Walker B, Scheffer M, Chapin T, Rockström J (2010) Resilience thinking: integrating resilience, adaptability and transformability. Ecol Soc 15(4)
Folke C, Chapin FS, Olsson P (2009) Principles of ecosystem stewardship: resilience-based natural resource management in a changing world (eds: Folke C, Chapin FS, Olsson P). Springer, New York
Galvagno M, Dalli D (2014) Theory of value co-creation: a systematic literature review. Manag Serv Qual 24(6):643–683
Gunderson LH, Holling CS (2001) Panarchy: understanding transformations in human and natural systems. Island Press
Harkness A, Ramirez A, Rihm A, Orellana A, Lefevre B, Robertson C, et al (2019) Construyendo Gobernanza Metropolitana (eds: Rojas F, Vera F, Robertson C). Banco Interamericano de Desarrollo BID, Santiago de Chile

Healey P, Richardson T, Tewdwr-Jones M, Reeves D, Needham B (2007) Urban Complexity and Spatial Strategies Towards a relational planning for our times. Policy and planning in a world of difference

Holling CS (1973) Resilience and stability of ecological systems. Annu Rev Ecol Syst 4:1–23. Retrieved from https://www.jstor.org/stable/2096802

Hudson R (2010) Resilient regions in an uncertain world: wishful thinking or a practical reality? Camb J Reg Econ Soc 3(1):11–25

Huybrechts L, Benesch H, Geib J (2017) Institutioning: participatory design, co-design and the public realm. CoDesign 13(3):148–159

Koskela-Huotari K, Friedrich P, Isomursu M (2013, June) Jungle of "co". In: Proceedings of the Naples Forum on Service, pp 18–21

Krellenberg K, Jordán R, Rehner J, Schwarz A, Infante B, Barth K, Pérez A (2014) Adaptation to climate change in megacities of Latin America. Economic Commission for Latin America and the Caribbean (ECLAC), 98.

Labaree R (2002) The risk of 'going observationalist': negotiating the hidden dilemmas of being an insider participant observer. Qual Res 2(1):97–122

Manzini E (2016) Design culture and dialogic design. Mass Inst Technol 32(1):52–59

Mattelmäki T, Vaajakallio K, Kosinen I (2014) What happened to empathic design? Des Issues 30(1):67–77

Mattelmäki T, Visser FS (2011) Lost in Co-X. In: Proceedings of the IASDR2011

Meerow S, Stults M (2016) Comparing conceptualizations of urban climate resilience in theory and practice. Sustainability (Switzerland) 8(7):1–16

Moreno O (2018) Contain, restore, connect: landscape as infrastructure. ARQ 2018(99):83–85

Moreno O (2019) Infraestructura verde urbana. Estrategias de planificación y diseño del paisaje para la resiliencia y adaptabilidad socioecológica de ciudades regionales en Chile. El caso de Llanquihue. In: Sciaraffia F, Kumar Biswas S, Nideroest T, Zander H (eds) From the south: global perspectives on landscape and territory, 1st edn. Universidad del Desarrollo, Santiago de Chile, pp 82–91

Moser SC (2016) Can science on transformation transform science? Lessons from co-design. Curr Opin Environ Sustain 20:106–115

Nightingale AJ, Eriksen S, Taylor M, Forsyth T, Pelling M, Newsham A, et al (2020) Beyond technical fixes: climate solutions and the great derangement. Clim Dev 12(10):343–352

Ostrom E (1996) Crossing the great divide: coproduction, synergy, and development. World Dev 24(6):1073–1087

Parks RB, Baker PC, Kiser L, Oakerson R, Ostrom E, Ostrom V, et al (1981) Consumers as coproducers of public services: some economic and institutional considerations. Policy Stud J 9(7):1001–1011

Pestoff V, Brandsen T, Verscheure B (eds) (2013) New public governance, the third sector, and co-production, 1st edn. Routledge, New York

Ridder HG (2017) The theory contribution of case study research designs. Bus Res 10(2):281–305

Romero-Lankao P, Gnatz DM (2013) Exploring urban transformations in Latin America. Curr Opin Environ Sustain 5(3–4):358–367

Rose A (2004) Defining and measuring economic resilience to disasters. Disaster Prev Manag: Int J 13(4):307–314

Sanders E, Stappers PJ (2008) Co-creation and the new landscapes of design. CoDesign 4(1):5–18

Sanders E, Stappers PJ (2014) Probes, toolkits and prototypes: three approaches to making in codesigning. CoDesign 10(1):5–14

Sanders E, Brandt E, Binder T (2010) A framework for organizing the tools and techniques of participatory design. In: PDC 2010 Proceedings. Sydney, Australia. Retrieved from https://portal.acm.org/dl.cfm

Savaget P, Geissdoerfer M, Kharrazi A, Evans S (2019) The theoretical foundations of sociotechnical systems change for sustainability: a systematic literature review. J Clean Prod 206:878–892

Sharifi A, Chelleri L, Fox-Lent C, Grafakos S, Pathak M, Olazabal M, Yamagata Y (2017) Conceptualizing dimensions and characteristics of urban resilience: insights from a co-design process. Sustainability (Switzerland) 9(6):1–20
Sørensen E, Torfing J (2018) Co-initiation of collaborative innovation in urban spaces. Urban Aff Rev 54(2):388–418
Stelzle B, Jannack A, Noennig JR (2017) Co-design and co-decision: decision making on collaborative design platforms. Procedia Comput Sci 112:2435–2444
Van Bueren E, van Bohemen H, Itard L, Visscher H (eds) (2012) Sustainable urban environments: an ecosystem approach. Springer
Vargo SL, Lusch RF (2004) Evolving to a new dominant logic for marketing. J Mark 68(1):1–17
Vargo SL, Lusch RF (2008) Service-dominant logic: continuing the evolution. J Acad Mark Sci 36(1):1–10
Walker B, Holling CS, Carpenter SR, Kinzig A (2004) Resilience, adaptability and transformability in social-ecological systems. Ecol Soc 9(2)
Wamsler C, Brink E, Rivera C (2013) Planning for climate change in urban areas: from theory to practice. J Clean Prod 50:68–81
Wamsler C, Raggers S (2018) Principles for supporting city–citizen commoning for climate adaptation: from adaptation governance to sustainable transformation. Environ Sci Policy 85(March):81–89
Webb R, Bai X, Smith MS, Costanza R, Griggs D, Moglia M, et al (2018) Sustainable urban systems: co-design and framing for transformation. Ambio 47(1):57–77
Yin RK (1994) Case study research and applications: design and methods (ed: Oak T), 2nd edn. Sage, London New Dehli

Macarena Gaete Cruz is Ph.D. candidate in Urban Development Management (UDM) at Delft University of Technology, Faculty of Architecture and the Built Environment, Department of Management in the Built Environment. Her research focuses on co-design of resilient public spaces. She is an Architect and M.Sc. in Architecture from Pontificia Universidad Católica de Chile. She has experience in academia and practice, on design and management fields, and in the public and private sectors. She is assistant teacher at Universidad Católica de Chile.

Aksel Ersoy is Assistant Professor in Urban Development Management (UDM) at Delft University of Technology, Faculty of Architecture and the Built Environment, Department of Management in the Built Environment. He is interested in understanding the complex relationship between social and economic transformations taking place in developing economies, metropolitan cities and the built environment. His research experience has benefitted from a combination of theories and approaches in the discipline of planning, geography and beyond.

Darinka Czischke is Associate Professor at the Faculty of Architecture and the Built Environment, Delft University of Technology. She holds a PhD in Architecture from TU Delft, an MSc (Distinction) in Regional and Urban Planning Studies from the London School of Economics and Political Science and a B.A. in Sociology (First Class Hons) from the Pontificia Universidad Católica de Chile. In 2014 Darinka was awarded the Delft Technology Fellowship to establish her own research program in the field of contemporary collaborative housing approaches.

Ellen Van Bueren is Professor of Urban Development Management at the Faculty of Architecture and the Built Environment, Delft University of Technology. Her chair develops tangible concepts, tools, and principles for an integrated area-specific approach to contemporary urban challenges. Throughout her career, she has been inspired by her interest for the administration, management, and governance of sustainable urban development. She often balances developing

knowledge with actual practice. She is the author of scientific articles and books, is on the editorial boards of journals in these fields and teaches in various programs. She is a board member of the Leiden-Delft-Erasmus Centre for Sustainability and Principal Investigator at AMS Institute.

Chapter 8
Informal Green Infrastructure (IGI) and the Pursuit of Climate Responsive Environments in Quito City

Ignacio Loor

Abstract The loss of green landscape to informal settlements is a contributor to the pace of climate change in fast-growing Latin American cities. Yet, people who reside in informal settlements often rely on green arrangements to facilitate everyday life, for which preservation is often embedded in ordinary practices. This study explores green infrastructure (GI) in informal settlements and discusses prominent differences from those of the core city, for which the concept of informal green infrastructure (IGI) is adopted. Using Quito as a case study, the chapter explores how socio-spatial constraints blend with the pursuit of agency, surrounding green landscapes, and city networks to shape IGIs as infrastructures of everyday life. Learning from practices that sustain IGIs in place yields implications for climate change adaptation. The study identifies community allotments, footpaths, and pitches as the prevalent kinds of IGIs. Community allotments engender social networks of reciprocal exchange for women, which shapes its governance. Footpaths provide connectivity to the city's mobility infrastructures. Pitches enable leisure, income, and collective agency toward improved informal settlements. IGIs constitute green spaces developed, governed, and maintained by their users, and secure their ongoing functionalities by transforming incrementally in harmony with the networks in which their users are embedded.

Keywords Green infrastructure · Informal settlements · Climate change · Climate responsive infrastructure · Urban planning

8.1 Introduction

In the past twenty years, there has been a surge of interest in the contribution of urban green infrastructure (GI) to climate change mitigation and adaptation services. In informal settlements, this relationship has received scant attention. Sikder et al.

I. Loor (✉)
Universidad San Gregorio de Portoviejo, Portoviejo, Ecuador
e-mail: iwloor@sangregorio.edu.ec

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_8

(2015) have argued that cities can foster climate resilience by enhancing the adaptive capacity of informal settlements. This is because the often-poor environmental conditions in informal settlements affect not only their residents but also the health and environment of those who live in the city that host them. In this regard, questions have been raised during the Cities and Climate Change Science Conference[1] on how to engage informal settlements to address climate change and its possible effects at city scale (IPCC 2018).

This study explores GIs in informal settlements and understands how, despite the hardships of living in such contexts of resource scarceness and the unwillingness of government authorities in providing necessary infrastructure, GIs emerge and become essential in many aspects of everyday life. Understanding the link between GIs and informal settlements will help address climate change, not only as an opportunity for local communities to self-organize in a search of creating working solutions to the effects of climate change, but also as a push to cope with issues such as poverty alleviation, public well-being, and environmental preservation, particularly in cities of the Global South.

A focus on informal settlements is necessary because how they operate has important implications in planning for mitigation and adaptation to climate change (Choudhary et al. 2019). Because of the concentration of people without proper access to basic infrastructure for water, electricity, mobility, and sanitation, informal settlements are generally recognized as spaces of environmental degradation and hotspots for diseases (Nzengya 2018). This is particularly the case of cities in developing countries, where most of the urban growth is currently concentrated (Malakoff et al. 2016), and mainly in the form of informal settlements (Jain et al. 2015). UN (2018) documents 4.2 billion population of cities today, whose 900 million live in informal settlements.

Research consistently shows that climate change adaptive capacity is lower among poorer communities most of which reside in informal settlements (IPCC 2008). This means that, despite emitting lower per capita carbon footprints, the issues of poverty, unequal access to resources, food insecurity, and incidence of diseases in these communities contribute to strengthening their vulnerability to climate change. While this is the situation, informal settlements are rarely considered in urban planning, particularly when it comes to GI and climate action tasks. In this regard, research at the intersection of climate change and informal settlements is crucial to anticipate changing conditions and inform interventions aimed at adaptation. GI has been developed in the context of the Global North (Lindley et al. 2018). It is used to refer to cities' green spaces, and is often understood within frameworks such as beautification, public well-being, and environmental quality. The actors that are engaged in its formation and transformation typically include government bodies, advocacy agents, and non-governmental organizations (NGOs), for whom the challenge is often fueling pertinent investment (Mell 2015). In this context, GI often refers to parks, playgrounds, outdoor sports areas, farms, and corridors on river and canal banks.

[1] Cities and Climate Change Science Conference (City of Edmonton, Canada, 5–7 March 2018).

Thus, the concept is by and large positioned within formal institutional arrangements. Such mainstream conceptualization is hardly helpful in informal settlements, where GIs emergence and transformation are instead embedded in informal practices.

Correspondingly, this research uses a case study of informal settlements in Quito City to investigate how GI emerges and transforms in this context, and how their users engage in this process. Quito is an appropriate and revelatory case because its momentum enables to observe green space transformation simultaneously with growing informal urbanization. Besides, Quito holds a documented history of neighborhood organization and civic innovation that serves as a basis for analysis. Data collection uses ethnographic techniques, including participatory observations and interviews, both in-depth and on the go. Initial observations lead to identify three forms of GI: community allotments, footpaths, and pitches, as prevalent across informal settlements. These spaces are visibly well maintained and consistently used by neighbors. Then, the study approach GI as an element embedded in everyday practices of residents of informal settlements.

The remaining of the chapter proceeds as follows: the second part gives a brief review of the literature that interrelates GI, climate change, and informal settlements. This section ends by an adaptation of informal green infrastructure (IGI) to maintained vegetation-covered areas in informal settlements and its differentiation from the formation and transformation processes of conventional GI in the core city. The third part introduces the research approach and describes the methods utilized in this study. The fourth part contextualizes the research by providing descriptive elements of informal settlements in Quito. The fifth, sixth, and seventh parts examine the IGIs selected in this study: urban community allotments, footpaths, and pitches. The last section includes a discussion of the empirical and practical implication of the findings.

8.2 Green Infrastructure for Climate Change Mitigation and Adaptation

The body of research that links climate change mitigation to GI is by and large centered on the ability to achieve carbon sequestration. This refers to the processes of carbon dioxide capture and removal from the atmosphere for transferring and storing in the terrestrial biosphere and oceans (Brandão et al. 2013; Govindarajulu 2014; Paustian 2014). Several studies have shown that urban GI makes up carbon reservoirs (Fu et al. 2019; Zaher et al. 2020). For instance, Velasco and Roth (2010) describe how GI captures and stores CO_2 into the soil. Similarly, Brantley et al. (2014) provide evidence that roadside vegetation in cities absorb a black carbon called short-lived climate pollutants (SLCPs) (see Booth and Bellouin [2015] on climate impact of black carbon). Concerning informal settlements, studies show the significant contribution of urban agriculture to carbon sequestration (Martin et al. 2000; Simon 2016).

Subsequently, studies on climate change mitigation have broken the ground for activism and initiatives such as "farming the slums" (Buzby 2014) in post-industrial cities in the United States and "green my favela" (Rekow 2017) in informal settlements of Brazil. Psychologists study how climate change discourses mobilize citizens' engagement. Demuzere et al. (2014) explain how individuals have engaged in climate change mitigating actions and become "stewards of their environment" (p. 110). Krasny and Tidball (2009) frame such activist behavior as practices of environmental stewardship. These involve, for instance, engaging in community gardening, park management, or watershed restoration. In line with this, Swim et al. (2009) draw a general argumentative framework for this kind of actions and argue that urban GI can stimulate capacities for coping with climate change challenges by fighting obstacles of ignorance and uncertainty. Thus, interacting with GI can help individuals to gain awareness about the cause-and-effect relationships between their everyday practices and the environment. As a result, a growing number of young adults can shift high carbon-emitting practices by, for instance, adopting mobility alternatives to car use and reducing waste, food, and energy consumption (Eker et al. 2019).

While recognizing the significant contribution of these studies on informal settlements within the context of climate change, it is also evident that these types of bottom-up initiatives and activities in informal settlements have not been extensively examined. Thus, the factors that explain the emergence of GI in this context remain little known in the climate change literature.

On the climate change adaptation side, several studies have explored the ability of GI in coping with high temperatures, flooding, water pollution, and concerns of food security within the conceptual framework of resilience and disaster planning. Among policy makers and actors involved in shaping urban agendas, resilience is often grasped as "the mechanism by which to achieve sustainability" (Evans 2011, p. 223) and has progressively become an entrenched socio-ecological governance framework.

Concerning rising temperatures, there has also been a consensus that GI promotes evapotranspiration—water extracted by plants and lost through the leaves' stomata (Seneviratne 2012, p. 338)—and acts as a heat sink in urban spaces (Mohajerani et al. 2017; Saaroni et al. 2018). Gill et al. (2007) explain how the alteration of vegetated land into impervious surface-cover inhibits evaporative cooling and evapotranspiration. "Evaporative cooling refers to the cooling effect produced when water evaporates… Evaporative cooling is the most inexpensive way to cool air" (Bucklin et al. 2009, p. 2). Besides thermal comfort, evapotranspiration is also associated with reduced energy consumption patterns—linked to acclimatization systems use (Yu and Hien 2006)—which also relates to mitigation from cuts in carbon emissions. Thus, GI provides adaptation capabilities to anticipated higher temperatures associated with climate change.

Also, plenty of evidence has shown that GI helps cities in managing stormwater runoff (Li et al. 2019). Managing water runoff involves addressing issues of flooding (Demuzere et al. 2014; Venkataramanan et al. 2019), soil erosion/low fertility (Guo

et al. 2019; Ventura et al. 2004), degradation of watersheds (Pank 2013), and groundwater pollution (Djémin et al. 2016; Farrugia et al. 2013). Water runoff on impervious surfaces occurs significantly faster than on vegetated surfaces (Jacobson 2011), for which flooding is more likely to affect urbanized areas. Armson et al. (2013) have compared the runoff behavior on asphalt surfaces, urban tree plots, and amenity grass such as the one used in urban parks and sports turf (e.g., football pitches). Their study revealed that (1) asphalt surfaces are by far the highest enablers of water runoff; (2) trees reduce near 60% of asphalt's water runoff; and (3) amenity grass captures almost all the rainfall with minimum water runoff. These findings are the keys in planning for flood control in cities.

Lastly, research shows that GI supports long-term food security in urban areas. It is anticipated that climate change will affect the output of crops worldwide and consequently divert the dynamics of global food markets. And thus, urban agriculture is often debated as a source of food resilience (Barthel et al. 2015; Baruti and Johansson 2020). Therefore, urban agriculture is regarded as a climate change adaptation strategy since it reduces the local dependence on global food systems. The literature is packed with records of food supply crises due to past economic, political, and environmental calamities (Jowett 1991; Vanhaute 2011). However, although issues of food security seem crucial within climate change debates, these have been rarely addressed in the urban planning literature. In the informal settlements' context, Allen et al. (2006) studied farming practices in cities of Colombia. In absence of sanitation infrastructures, farmers sometimes use wastewater for irrigation. Therefore, attempts to promote food security in informal settlements, if not well managed, can cause health hazards to farmers and consumers.

For this study, one limitation of the climate change literature is that it falls short in delivering a broad understanding of the practices and social structures in which GIs are embedded. Therefore, it does not indicate how to engage communities marginalized from institutionalized urban processes. Instead, it seems to conceive GI as something autonomous and unrelated to wider social systems. Also, while the existing literature addresses the vulnerability of GIs to changing climate (Lemieux and Scott 2005; Reynolds et al. 2019), this knowledge has been rarely considered when planning for GI allocation and preservation, especially in informal settlements. Moreover, what motivates people who reside in informal settlements to produce and sustain GI is little understood. Therefore, the aim to integrate residents of informal settlements in a broader, citywide policy of mitigation and adaptation remains unexplored in climate change research. This is the key aspect and at the same time a knowledge gap that this study attempts to address.

8.2.1 Green Infrastructure in Informal Settlements

GI is a growing topic of interest in the field of climate change. However, while efforts for mitigation and adaptation could explain to some degree the allocation of GI in a formal context of infrastructure provision, it is unlikely that this would be the case

in informal settlements. In the formal spaces of the city, Govindarajulu (2014) has identified four prevailing frames for GI planning: (1) the proportion of urban land covered with green space, (2) securing ecosystems to preserve the urban biodiversity, (3) the connectivity among green spaces, and (4) people's access to green space. Municipal authorities are often responsible for coordinating the supply and maintenance of GI (Harrington and Hsu 2018), which often comprises managed green areas such as "remnant woodlands, gardens, parks, bridleways, railway and road verges, cycle paths, golf courses, sports grounds, street trees, and derelict land with invasive plants both privately and publicly owned" (Douglas 2012, p. 388). Also, the criteria for GI allocation have often involved aims of space beautification, property value enhancement, public health and recreation (Young 2010). Most recently, balancing the supply and demand of ecosystem services (ES) (Andersson-Sköld et al. 2018) and attempting climate change adaptation (Dittrich et al. 2019) have supported the discourse behind GI allocation. About the latter, the Urban Forest Effects Model (Nowak et al. 2006), and more recently, the work of Huera-Lucero et al. (2020) have provided elements to estimate the capacity of green space to store and sequestrate carbon and plan accordingly.

These perspectives have been little relevant to address GI in informal settlements, where much of the literature seems to assume vegetation-covered areas as unplanned and unmanaged (Madureira et al. 2011; Roy et al. 2018). For example, in informal settlements of African cities, the term GI has been used to refer to nearby sources of timber for construction and heating fuel (Epule et al. 2014), and of medicinal plants (Davoren 2009). Likewise, GI can refer to the green landscape surrounding informal settlements because it is an often source of raw water (Phukan 2014), supports temperature moderation (Oluwafeyikemi and Julie 2015), or functions as windstorm sheltering (Adelekan 2012). Moreover, municipal authorities and governments are often unable and unwilling to deal with land title disputes (Hill et al. 2014) and higher "costs of doing" in informal settlements, when compared to rather planned areas (Benna 2019; Foster and Briceño-Garmendia 2009), which inhibits providing these settings with green space in the same way it is provided in the formal realm. In this milieu of uncertainty, the way GI emerges and transforms, and the role it plays in informal settlements is an important subject of inquiry that can cast light on how to engage informal settlements in climate action.

Thus, from the literature, it seems that the degree to which a GI is perceived as managed is what conceptually distinguishes a GI of the core city from one of informal settlements. Also, the literature often puts emphasis on how residents of informal settlements consume their surrounding green landscapes, rather than on how these are produced and maintained. Therefore, vegetation-covered areas that are planned and maintained in informal settlements remain little understood.

Alternatively, understanding the bottom-up approach through which residents of informal settlements achieve infrastructure can provide insight about how self-organized efforts in creating GI at the local level help adapt to changing climatic conditions. McFarlane and Vasudevan (2014) refer to informal settlements' infrastructure as "informal infrastructures" (pp. 257–258). These infrastructures often emerge from the combination of materials and abilities available at hand, to connect

residents of informal settlements with the formal spaces of the city and to produce continuity throughout the urban space. In other words, informal infrastructures play the role of anchoring the urban life into informal settlements. The concept of informal infrastructure can help to examine how GI aid residents of informal settlements to connect and flow between their communities and the core city. Thereafter, in this chapter, I will refer to managed and visibly maintained vegetation-covered areas in informal settlements as informal green infrastructure (IGI).

8.3 The Approach for Tracing IGIs

The study aims at understanding of how IGIs emerge and transform as potential enablers of climate change mitigation and adaptation action in informal settlements. As implied in the previous section, infrastructures in informal settlements seldom emerge and transform because of the direct input of local governments. Instead, they are the outcome of spontaneity and improvisation, which are constrained by difficult and changing social and environmental conditions. For this reason, identifying the causal factors that trigger the emergence and transformation of IGIs is a complex task. It involves tracing a multiplicity of materials, actors, networks, practices, and circumstances, and then fitting them together in a puzzle-like fashion. Methods used to research the infrastructure of informal settlements fits this purpose (McFarlane 2008; Simone 2008). Thus, the study addresses IGIs from an everyday practices' perspective, which entails investigating the embeddedness of IGIs in the everydayness of people who reside in informal settlements.

To select the IGIs on which to focus, the study relied on preliminary observations of informal settlements of Quito, to experience the place and observe people, natural surroundings, and infrastructural resources. Quito city makes a suitable case study for several reasons. To begin, the city is located in Latin America, which is the world's most urbanized region. According to the World Economic Forum, about 85% of Latin Americans live in cities. In the last four decades, Quito has featured fast-growing population and urbanization, both formal and informal. Quito has a population of 2.8 million,[2] half of which live in the nearly 800 informal settlements (Castello-Starkoff and Cueva-Ortiz 2012).

To consider a space worthy of inclusion as IGI from simple observation, a twofold criterion had to be met: (1) the spatial patterns and shapes had to reflect a reconfiguration of the green landscape after which the soil surface remained covered with vegetation or at least pervious; and (2) the space had to be used consistently by the communities in same way(s). The first criterion is what entitles these spaces to be called green. The second criterion, on the other hand, partially grants infrastructure status to these spaces.

Based on this inclusion criteria, three categories of IGIs were selected for exploration: community allotments, footpaths, and football pitches. During the preliminary

[2] https://www.ecuadorencifras.gob.ec/proyecciones-poblacionales.

exploration of informal settlements, these were green spaces often well-preserved, functional, and actively used, which inspired a set of questions: how these spaces are produced, how do they support the everyday lives of people in informal settlements, how are they maintained and what triggers their transformation. Contrariwise, rarely found community parks, although technically green spaces of informal settlements, were not considered for this study. This is because, in line with Jorgensen and Anthopoulou (2007), these are often poorly maintained and constitute spaces of avoidance due to pollution and the presence of miscreants.

To explore these IGIs, fieldwork is conducted in seven informal settlements in two visits that add up to a total of six months, between October 2016 and January 2018. The informal settlements are located in the vicinities *Quitumbe*, *Guamaní, La Argelia, Ciudadela del Ejército*, *La Pulida*, *Guápulo,* and *La Roldós,* as shown in Fig. 8.1. Raw data consisted of field notes, photographs, and audio-recorded conversations, obtained through participatory observations, 30 in depth interviews with residents of informal settlements, community leaders, community health workers and municipal servants, and about 40 short interviews "on the go" while users were using the IGIs (12 on community allotments, 18 on footpaths, and 10 on football pitches). Data analysis was iteratively performed during and after the fieldwork. This consisted of the iterative examination of field notes and interview transcripts to discover themes and conceptual relationships. The voices of the participants were privileged in this process. Additionally, a systematic review of secondary data was conducted, which involved analyzing content of technical reports, newspaper articles, and government documents concerning the informal settlements in Quito.

Fig. 8.1 Case study—Informal settlements of Quito (Google, n.d.)

8.4 The Informal Settlements Context in Quito

An understanding of IGIs requires unfolding the context. Contextual characteristics of a place deliver meaning to everyday practices and allow the emergence of IGIs as enablers for some of those practices. The context also helps understand the structural challenges that threaten the preservation of IGIs. Informal settlements in Quito often entails settlers paying land traffickers for the privilege of occupying and exploiting a plot without a lawful property title. In most cases, these plots are distant from the central corridors and disconnected from the conventional urban amenities. To cope with related shortages, novel settlers not only alter the surrounding green landscapes with precarious housing, but also for infrastructural purposes. Infrastructure is here conceptualized as networked systems to support consistent practices and allow the circulation of matter, people, and resources (Larkin 2013; Rankin 2009).

Quito is located in the Andes Mountains, 2800 m above the sea. The city is surrounded by mountains, volcanoes, and ravines. Informal settlements sit on the flanks of volcano Pichincha and surrounding mountains, which are inhospitable terrains with limited technical feasibility for implementing conventional urban infrastructure. Difficulties relate to the transporting of materials, mobility of workers and equipment, and the technological challenges that involve building in this context. This makes conventional infrastructure provision in informal settlements far costlier than in the core city. Moreover, informal settlements often emerge near a ravine to secure water provision. The initial forms of landscape alteration for infrastructural purposes relate, precisely, to practices of accessing water and forming trails for commuting (Gómez-Salazar & Cuvi, 2016). However, ravines are also sources of flooding and pollution in informal settlements. In part, this is due to the lack of sanitation infrastructure and waste collection services, which is often fulfilled by disposing solid waste and wastewater on the ravines.

Regarding the people involved, informal settlements host communities historically segregated by both race and income/labor supply. Residents of informal settlements often perform informal jobs, or, if formal, these are occupations in the lowest compensation range in the core city. Their permanency and spatial development rely on organized collective action to mobilize resources and have authorities attend to their demands. They are often organized in housing cooperatives (saving and credit schemes for buying land and building or improving their houses), infrastructure improvement committees, women organizations, and sports leagues. The practice of social organization facilitates community leaders to engage with politicians in clientelist exchange of votes for favors. These practices have been functional to regularize land tenure or improvise infrastructure and equipment.

In sum, residing in informal settlements of Quito involves restricted access to services, income opportunities, markets to source everyday survival needs, and the threat to health problems, violence, and eviction. IGIs, which are unintendedly green, emerge as an approach to deal with the above restrictions rather than inspired on climate change considerations. Yet, the study of IGIs can provide clues on what

can be done to support their reproduction and thereby expand managed vegetation-covered lands in informal settlements for the sake of climate change mitigation and adaptation. In the following sections, I introduce the typologies of IGIs explored, and explain how IGIs emerged to support everyday practices and deal with shortages in informal settlements in Quito.

8.4.1 Community Allotments: Climate Change Mitigation and Gender

Urban community allotments (UCAs) in informal settlements of Quito have emerged on deep slopes, often unoccupied land, or on contested spaces intended for housing construction. Here, groups of neighbors and acquaintances, being women for the most part (8 in every 10 people), engage with non-governmental organizations (NGOs) and civil society groups in the co-production of the space for food growing, which is most often organic, and the consumption and trading of excess produce. While gender was not meant to be the focus of this study, the prevalent presence of women in UCAs raises questions about their unique roles in the spatial transformation of informal settlements, and about gender issues in climate change. Typically, NGOs provide technical knowledge and resources, civil society groups act as promoters to connect NGOs with informal settlements and articulate resource mobilization, and local residents are the workforce and responsible for the production of the space. Local residents contribute to the formation of UCAs through collective labor arrangements in the form of *mingas* (Erasmus 1956).

Considering the variety of actors involved, the production of UCAs in informal settlements of Quito can be understood from the perspective of urban entrepreneurialism (McFarlane 2012). This concept views the urban space from a business perspective (Jessop 1993) and covers approaches to persuade investors to allocate funds and resources locally (Jonas et al. 2015). McFarlane (2012) applied this concept in the urban informality realm by putting forward the potential of the poor as entrepreneurial subjects, which often involves NGOs and development agencies (e.g. regional development banks) (Stein and Castillo 2005; Tomlinson 2015). Typically, producing entrepreneurialism in informal settlements involves competing to attract highly fought-over funds intended to address issues such as extreme poverty, women's empowerment, or environmental restoration. In informal settlements of Quito, NGOs and civil society groups have played a crucial role in articulating efforts and mobilizing resources for the development of UCAs.

Following the informal creation of, typically, a women's association, NGOs and the new farmers arrange a *minga* to clean and prepare the land for planting. Most of the time the cleaning implies intensive human labor with the help of simple instruments such as rakes, machetes, and weeding tools, which are often provided by the NGOs. Then comes the planting stage. NGOs supply the seeds at the beginning. Yet, as UCAs develop, a collaborative network emerges with other UCAs, which gives shape to a

social and trading network for exchanging seeds, produce, and materials. After the harvesting, the produce is stored in nearby stockrooms and shared among farmers. NGOs often help in introducing the practice of sharing and trading the excess, often by vending it at farmers markets in the city. The articulation and mobilization of resources around the everyday practices of UCAs shape the governance of the spaces, within informal settlements, which remain green and relevant for climate change action.

Furthermore, by involving themselves in UCAs, farmers develop new social networks, which enhance their agency in several domains. For instance, in acquiring fresh food, adopting new eating habits, reducing their reliance on debt with shopkeepers to access food, and bringing income for their families. These are all motivations to engage in the continuous transformation of the space into a fertile ecosystem for growing food, which resonate with climate change concerns of soil permeability and food security. Lastly, women in informal settlements, in most cases, undertake household chores such as looking after children and elders, taking children to and from school, shopping for groceries, preparing food, or taking household members to healthcare facilities. UCAs prompt the emergence of social networks that support them in sharing resources and accomplishing these everyday domestic chores. This resonates with Simone (2004, p. 407) in that UCAs, as infrastructures, support "energy being more efficiently deployed."

8.4.2 Footpaths as Climate Responsive Mobility Infrastructure of Informal Settlements

The green landscape surrounding informal settlements constitutes a platform for the production of a network of footpaths for the mobility of people and objects. These footpaths are IGIs that facilitate access to other mobility infrastructure such as roads and means of public transport, which residents of informal settlements use to reach everyday destinations. Footpaths are green because they support non-motorized means of transport, while in most cases, the soil on which they develop remain pervious. Nonetheless, the footpaths are not fixed elements on the landscape, but instead transform and disappear in harmony with emerging land use patterns and transport practices in the core city. Likewise, in terms of functionality, footpaths are sensitive to the ecological context, meaning that the more polluted the environment the less suitable they are for mobility. Inadequate mobility infrastructure is problematic for residents of informal settlements, which are often located far from the grid that concentrates most urban resources. This situation exposes them to road accidents (Beard et al. 2016) and restrain their ability to access to schools, jobs, health services, and ordinary resources (Basile and Ehlenz 2020).

Footpaths in informal settlements can be understood from the perspective of transport-related social exclusion by Uteng (2009). This perspective focuses on restraining factors that can challenge socially and spatially excluded individuals

to accomplish every trip to the core city. These factors can be, for instance, cultural, infrastructural, technological, or financial. For example, the road luminosity or having money for transport fares can affect the decision on which route to take. Thus, mobility for residents of informal settlements is much a matter of knowledge and the ability to combine modes of transport and routes to everyday destinations. In this regard, addressing the intersection between mobility and climate change in the context of informal settlements should consider all the possible combinations of mobility aids at hand.

Commuting away from home is an everyday practice in the informal settlements of Quito, at least for school-aged and working adults. For instance, in *La Roldós*, residents estimate that half of their population travels to the city every day. Demoraes et al. (2004) conducted a survey in 1998, which estimated that going to work, doing paperwork, and going to school together accounted for 70% of the trips that residents of informal settlements perform to the core city every day. Most of these trips have a walkable section, which is when the footpaths become essential. Moreover, the networks of footpaths connect by means of stairs and bridges that the residents improvise with elements of the landscape. For example, it is common to find rickety bridges made out of tree trunks to connect the banks of a ravine and cut steps on the dirt slopes. These latter provide important mobility support, considering that the terrain is featured by slopes, ravines, and is irregular throughout (Fig. 8.2).

Although precarious, footpaths in informal settlements play a crucial role in the everyday life of their residents. This is why residents engage continuously in preserving and enhancing footpaths, in both extension and functionality, by spreading stones, or strengthening bridges connections and decks. This continuous preserving and improving shapes the governance of the footpaths. In line with Mitullah and Opiyo (2017), these footpaths are meant to connect to other mobility infrastructures, such as bus stops, stations, paved pavements, bridges, and main roads, and thereby

Fig. 8.2 Footpaths and mobility infrastructure in *La Pulida* (Northwest of Quito)

insert pedestrians into the city's mobility system. This is how footpaths, which emerge informally, integrate into the wider mobility network of the city. Moreover, all the participants interviewed for this study stated that using the footpaths save time and money when compared to alternatively taking a bus. For informal settlements on the lower parts of the slopes, such as near *Ciudadela del Ejército*, footpaths make it possible to connect to pavements on main roads and reach a trolleybus station in 20 min.

However, while the footpaths support walking, which is of interest for climate change mitigation due to the reduced reliance on carbon for transportation, their preservation and development is continuously threatened. For example, the emergence of new gated communities and informal settlements block and leave irrelevant existing footpaths and motivate the developing of new ones. Similarly, changes in land use, or the relocation of bus stops or trolleybus stations, also leave footpaths irrelevant. This dynamic put informal settlements in constant isolation and diversion of everyday practices of commuting. Furthermore, walking on these footpaths involve facing risks such as landslides, flooding, forest fires, or getting lost when surrounding vegetation is abundant. When it rains, commuting time increases in ways hard to predict and there is always the chance of falling on the slippery slopes down to the ravines. Yet, this case has shown that despite the difficulties involved, residents of informal settlements develop and preserve their own approach to zero-carbon infrastructure for mobility.

8.4.3 Pitches as IGIs: Community Empowerment While Managing Stormwater Runoff

Football pitches are widely present in informal settlements of Quito (Fig. 8.3). These are IGIs that typically emerge as improvised arrangements of dirt and shrub-remnant surfaces to fulfill the demand of residents, especially males, for space to practice sports for leisure. Since land traffickers rarely save space for pitches at the time of the informal settlement occupation, residents manage to make up for the required area by sharing temporal space with what is meant for streets and sometimes sacrificing part of their unexploited housing plots. The permanence and enhancement of pitches require the input and continuous labor of organized social structures. These structures develop from spontaneous friendships forged through football playing and eventually become the local teams. With the pitch and a bunch of teams emerge a league, which is a local organization that in the beginning articulate the maintaining and enhancing of the pitch and arrange the football games. But later, the league also adopts leadership roles that are functional to achieve their community development agenda beyond the pitch. Thus, pitches are important spaces of informal settlements because they support users in developing careers, income opportunities, leisure, and community development.

Fig. 8.3 Football pitch in *Guamaní* (South of Quito)

Pitches have been nearly absent in the GI debate. This is an important omission considering that pitches are prevalent self-maintained green spaces in informal settlements. This sheds light on how to engage informal settlements in climate change adaptation efforts. Following the allocation of space for the pitch, founding a club involves entrepreneurial skills. Unlike UCAs, which emerge with inputs of NGOs and other external actors, the football clubs develop exclusively from the neighborhood. The initial process demands resources, knowledge, and bureaucratic steps for registering in the local leagues, and eventually, in any of the citywide associations of leagues. In such situation of resource scarcity, it demands entrepreneurial talents for sourcing and stocking the kits, which involves a search for sponsors. The preferred ones are novice vote-seeking politicians in times of elections. These politicians are later functional to achieve land titles and basic infrastructures in informal settlements.

Furthermore, pitches configure practices of informal economy and thereby support income generation. Pitches provide a marketplace for "right of pitch" (5–25 USD per match), for informal vendors of drinks, ice balls, sweets, football accessories, cigarettes and local food, and for referees. Also, pitches provide a platform for bets, which give rigor to the games and engage players with audiences in guarding fair play. Moreover, from the leagues in informal settlements, younger players have achieved entry in professional leagues locally and abroad. Thus, these informal infrastructures function as incubator of professional football players. Similarly, local league leaders have achieved wider political representations. That is the case, for example,

of former congressman René Caza, who was leader of league *Los Libertadores* in the south of Quito. The above are all reasons to preserve and enhance the pitches space continuously.

8.5 Conclusion

The examination of IGIs has shown that the endowment and maintenance of green spaces in Quito is not the exclusive domain of state-centric top-down mechanisms. IGIs are green spaces that their users produce and maintain autonomously, with no formal planning. This is crucial knowledge when attempting to effect greener urban areas in restricted circumstances of funding. IGIs emerge to cope with limitations of everyday life in informal settlements. They result from residents organizing to take control of the unbuilt spaces and make them functional to their needs by connecting informal settlements to the core city. About this, UCAs bring together NGOs, civil society groups, and residents to eventually interplay in the citywide food networks and create income for households in informal settlements. Footpaths connect informal settlements among themselves and with the core city's mobility networks. Last, pitches become nodes in a network where players, spectators, vendors, and money connect and circulate. For all types of IGIs, the networks they embed themselves into shape their governance mechanism and become their supporting backbones and drivers of preservation and transformation.

Concerning empirical contributions, this study has shown that informality produces landscape transformation in still-green ways. The IGIs examined make up processes of transformation that resist the expansion of impervious surfaces. This provides some lessons to address climate change in the spatial context of urban informality. In these regards, the examination of UCAs resonate the works of Martin et al. (2000) and Simon (2016) on the contribution of urban agriculture to climate change mitigation, and that of Baruti and Johanson (2020) on food resilience. Similarly, besides supporting zero-carbon mobility, in line with Swim et al. (2009), footpaths create awareness among their users on how pollution can threaten their mobility capabilities. Likewise, the pitches can support in managing stormwater runoff (Armson et al. 2013). What was unclear until now was how these managed vegetation-covered spaces could emerge and be preserved in such context of resource scarceness and environmental issues.

Finally, as for a practical implication, this study provides clues on what causes the emergence and disappearance of IGIs. This is desirable when planning for greenspace and climate action in cities of the Global South. The findings can suggest that policies of food quality (organic) and trading at municipal scale impact the production and reproduction of UCAs. Likewise, transport policy in the city could integrate footpaths in the mobility networks and impact the scope of utility walking as a mainstream element of mobility. Similarly, promoting citywide participation in sports encounters can influence the spatial scope and features of pitches in informal settlements.

References

Adelekan IO (2012) Vulnerability to wind hazards in the traditional city of Ibadan Nigeria. Environ Urbanization 24(2):597–617

Allen A, Dávila JD, Hofmann P (2006) Governance of water and sanitation services for the peri-urban poor: A framework for understanding and action in metropolitan regions. The Development Planning Unit, University College London, London

Andersson-Sköld Y, Klingberg J, Gunnarsson B, Cullinane K, Gustafsson I, Hedblom M, Knez I, Lindberg F, Sang ÅO, Pleijel H, Thorsson P, Thorsson S (2018) A framework for assessing urban greenery's effects and valuing its ecosystem services. J Environ Manage 205:274–285

Armson D, Stringer P, Ennos A (2013) The effect of street trees and amenity grass on urban surface water runoff in Manchester UK. Urban For Urban Greening 12(3):282–286

Barthel S, Parker J, Ernstson H (2015) Food and green space in cities: A resilience lens on gardens and urban environmental movements. Urban Stud 52(7):1321–1338

Baruti MM, Johansson E (2020) Urbanites' thermal perception in informal settlements of warm-humid Dar es Salaam Tanzania. Urban Clim 31:100564

Basile P, Ehlenz MM (2020) Examining responses to informality in the Global South: a framework for community land trusts and informal settlements. Habitat Int 96:102108

Beard VA, Mahendra A, Westphal MI (2016) Towards a more equal city: framing the challenges and opportunities. Growth 2015:2030

Benna UG (2019) Transformative entrepreneurs and urban development deficit in Africa: the case of Dangote group of companies. In: Optimizing regional development through transformative urbanization. IGI Global, pp 94–117

Booth B, Bellouin N (2015) Black carbon and atmospheric feedbacks. Nature 519(7542):167–168

Brandão M, Levasseur A, Kirschbaum MU, Weidema BP, Cowie AL, Jørgensen SV, Hauschild MZ, Pennington DW, Chomkhamsri K (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. Inter J Life Cycle Assess 18(1):230–240

Brantley HL, Hagler GSW, Deshmukh JP, Baldauf RW (2014) Field assessment of the effects of roadside vegetation on near-road black carbon and particulate matter. Sci Total Environ 468–469:120–129

Bucklin R, Jacob J, Mather F, Leary J, Naas I (2009) Tunnel ventilation of broiler houses. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida PS-46

Buzby K (2014) Farming the slums: using eminent domain and urban agriculture to rebuild Baltimore's blighted neighborhoods. William & Mary Environ Law Policy Rev 38:479

Castello-Starkoff P, Cueva-Ortiz S (2012) Lotización irregular en Quito: Impunidad y conflictividad social [Irregular lotization in Quito: Impunity and social conflict]. In: Erazo-Espinosa J (ed) Dimensiones del hábitat popular latinoamericano (Instituto de la Ciudad). Flacso-Sede Ecuador, pp 465–482

Choudhary BK, Tripathi AK, Rai J (2019) Can 'poor' cities breathe: responses to climate change in low-income countries. Urban Clim 27:403–411

Davoren E (2009) Plant diversity patterns of a settlement in the North-West Province, South Africa. North-West University, Potchefstroom Campus

Demoraes F, Bondoux F, Souris M, Hidalgo N (2004) Innovaciones tecnológicas aplicadas al transporte colectivo en Quito. Optimización en la evaluación de la demanda con GPS y SIG [Technological innovations applied to mass transport in Quito. Optimization of demand assessment with GPS and GIS]. Bulletin de l'Institut Français d'études Andines 33(1):193–212.

Demuzere M, Orru K, Heidrich O, Olazabal E, Geneletti D, Orru H, Bhave AG, Mittal N, Feliu E, Faehnle M (2014) Mitigating and adapting to climate change: Multi-functional and multi-scale assessment of green urban infrastructure. J Environ Manage 146:107–115

Dittrich R, Butler A, Ball T, Wreford A, Moran D (2019) Making real options analysis more accessible for climate change adaptation. An application to afforestation as a flood management measure in the Scottish Borders. J Environ Manage 245:338–347

Djémin JÉ, Kouamé JK, Deh KS, Abinan AT, Jourda JP (2016) Contribution of the sensitivity analysis in groundwater vulnerability assessing using the DRASTIC method: Application to groundwater in Dabou region (southern of Côte d'Ivoire). J Environ Prot 7(01):129

Douglas I (2012) Urban ecology and urban ecosystems: understanding the links to human health and well-being. Curr Opin Environ Sustain 4(4):385–392

Eker S, Reese G, Obersteiner M (2019) Modelling the drivers of a widespread shift to sustainable diets. Nat Sustain 2(8):725–735

Epule ET, Peng C, Lepage L, Chen Z (2014) Enabling conditions for successful greening of public spaces: The case of Touroua, Cameroon Based on Perceptions. Small-Scale For 2(13):143–161

Erasmus CJ (1956) Culture structure and process: the occurrence and disappearance of reciprocal farm labor. Southwest J Anthropol 12(4):444–469

Evans JP (2011) Resilience, ecology and adaptation in the experimental city. Trans Inst Br Geogr 36(2):223–237

Farrugia S, Hudson MD, McCulloch L (2013) An evaluation of flood control and urban cooling ecosystem services delivered by urban green infrastructure. Inter J Biodivers Sci, Ecosyst Serv Manag 9(2):136–145

Foster V, Briceño-Garmendia CM (2009) Africa's infrastructure: a time for transformation. The World Bank.

Fu D, Bu B, Wu J, Singh RP (2019) Investigation on the carbon sequestration capacity of vegetation along a heavy traffic load expressway. J Environ Manage 241:549–557

Gill SE, Handley JF, Ennos AR, Pauleit S (2007) Adapting cities for climate change: the role of the green infrastructure. Built Environ 33(1):115–133

Gómez-Salazar A, Cuvi N (2016) Asentamientos informales y medio ambiente en Quito [Informal settlements and environment in Quito]. Áreas. Revista Internacional de Ciencias Sociales, 35: Historia ambiental en Europa y América Latina: miradas cruzadas, 101–119.

Google (n.d.) [Google Maps, Informal settlements of Quito]. Retrieved February 7, 2021, from https://www.google.com/maps/d/edit?mid=1llnTTlw8HB1jJFc-ajy3iB54lKcdN6ax&usp=sharing

Govindarajulu D (2014) Urban green space planning for climate adaptation in Indian cities. Urban Clim 10:35–41

Guo Y, Peng C, Zhu Q, Wang M, Wang H, Peng S, He H (2019) Modelling the impacts of climate and land use changes on soil water erosion: Model applications, limitations and future challenges. J Environ Manage 250:109403

Harrington E, Hsu D (2018) Roles for government and other sectors in the governance of green infrastructure in the U.S. Environ Sci Policy 88:104–115

Hill A, Hühner T, Kreibich V, Lindner C (2014) Dar es Salaam, megacity of tomorrow: Informal urban expansion and the provision of technical infrastructure. In: Megacities. Springer, pp 165–177

Huera-Lucero T, Salas-Ruiz A, Changoluisa D, Bravo-Medina C (2020) Towards sustainable urban planning for Puyo (Ecuador): Amazon forest landscape as potential green infrastructure. Sustainability 12(11):4768

IPCC (2008) Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report (No. 1; p. 104). Intergovernmental Panel on Climate Change. Retrieved from https://bit.ly/3hCH1s3

IPCC (2018) Global research and action agenda on cities and climate change science. Cities and Climate Change Science Conference, CA: Edmonton.

Jacobson CR (2011) Identification and quantification of the hydrological impacts of imperviousness in urban catchments: a review. J Environ Manage 92(6):1438–1448

Jain M, Knieling J, Taubenböck H (2015) Urban transformation in the National Capital Territory of Delhi, India: the emergence and growth of slums? Habitat Int 48:87–96

Jessop B (1993) Towards a Schumpeterian workfare state? Preliminary remarks on post-Fordist political economy. Stud Polit Econ 40(1):7–39
Jonas AE, McCann E, Thomas M (2015) Urban geography: a critical introduction. Wiley.
Jorgensen A, Anthopoulou A (2007) Enjoyment and fear in urban woodlands. Does age make a difference? Urban For Urban Greening 6(4):267–278. https://doi.org/10.1016/j.ufug.2007.05.004
Jowett AJ (1991) The demographic responses to famine: the case of China 1958–61. GeoJournal 23(2):135–146
Krasny ME, Tidball KG (2009) Applying a resilience systems framework to urban environmental education. Environ Educ Res 15(4):465–482
Larkin B (2013) The politics and poetics of infrastructure. Annu Rev Anthropol 42:327–343
Lemieux CJ, Scott DJ (2005) Climate change, biodiversity conservation and protected area planning in Canada. Canadian Geographer/Le Géographe Canadien 49(4):384–397
Li F, Liu Y, Engel BA, Chen J, Sun H (2019) Green infrastructure practices simulation of the impacts of land use on surface runoff: case study in Ecorse River watershed, Michigan. J Environ Manage 233:603–611
Lindley S, Pauleit S, Yeshitela K, Cilliers S, Shackleton C (2018) Rethinking urban green infrastructure and ecosystem services from the perspective of sub-Saharan African cities. Landsc Urban Plan 180:328–338
Lwasa S, Mugagga F, Wahab B, Simon D, Connors J, Griffith C (2014) Urban and peri-urban agriculture and forestry: Transcending poverty alleviation to climate change mitigation and adaptation. Urban Adapt Clim/Environ Change: Gov, Policy Plann 7:92–106
Madureira H, Andresen T, Monteiro A (2011) Green structure and planning evolution in Porto. Urban For Urban Greening 10(2):141–149
Malakoff D, Wigginton N, Fahrenkamp-Uppenbrink J, Wible B (2016) Rise of the urban planet. Science 80:272
Martin A, Oudwater N, Meadows K (2000) Urban agriculture and the livelihoods of the poor in Southern Africa: Case studies from Cape Town and Pretoria, South Africa and Harare. Zimbabwe
McFarlane C (2008) Governing the contaminated city: infrastructure and sanitation in colonial and post-colonial Bombay. Int J Urban Reg Res 32(2):415–435
McFarlane C (2012) The entrepreneurial slum: Civil society, mobility and the co-production of urban development. Urban Stud 49(13):2795–2816
McFarlane C, Vasudevan A (2014) Informal infrastructures. In: Adey P, Bissell D, Hannam K, Merriman P, Sheller M (eds) Handbook of Mobilities. Routledge, pp 256–264
Mell I (2015) Green infrastructure planning: policy and objectives. In: Sinnett D, Smith N, Burgess S (eds) Handbook on Green Infrastructure. Planning, Design and Implementation. Edward Elgar Publishing Inc., p 496
Mitullah W, Opiyo R (2017) Non-motorized transport infrastructure provision on selected roads in Nairobi. In: Mitullah WV, Vanderschuren M, Khayesi M (eds) Non-Motorized Transport Integration into Urban Transport Planning in Africa. Taylor&Francis, pp 90–111
Mohajerani A, Bakaric J, Jeffrey-Bailey T (2017) The urban heat island effect, its causes, and mitigation, with reference to the thermal properties of asphalt concrete. J Environ Manage 197:522–538
Nowak DJ, Crane DE, Stevens JC (2006) Air pollution removal by urban trees and shrubs in the United States. Urban For Urban Greening 4(3):115–123
Nzengya DM (2018) Improving water service to the urban poor through delegated management: Lessons from the city of Kisumu Kenya. Devel Policy Rev 36(2):190–202
Oluwafeyikemi A, Julie G (2015) Evaluating the impact of vertical greening systems on thermal comfort in low income residences in Lagos, Nigeria. Procedia Eng 118:420–433
Pank TE (2013) U.S. Patent No. 8,591,732. U.S. Patent and Trademark Office, Washington, DC
Paustian K (2014) Carbon Sequestration in Soil and Vegetation and Greenhouse Gases Emissions Reduction. In: Freedman B (ed) Global Environmental Change. Springer, Netherlands, pp 399–406

Phukan DK (2014) Levels of some basic amenities in the slums and their impacts on ecology: a case study of Jorhat City, Assam. Inter J Sci Res 3(1):71–74
Rankin WJ (2009) Infrastructure and the international governance of economic development, 1950–1965. In: Auger J-F, Bouma JJ, Künneke R (eds) Internationalization of infrastructures. Economics of Infrastructures, p 61
Rekow L (2017) Urban agriculture in the Manguinhos favela of Rio de Janeiro: laying the groundwork for a greener future. In: Leal Filho W, Pociovalisteanu DM, Al-Amin A (eds) Sustainable Economic Development. Springer, pp 155–185
Reynolds HL, Brandt L, Fischer BC, Hardiman BS, Moxley DJ, Sandweiss E, Speer J, Fei S (2019) Implications of climate change for managing urban green infrastructure: an Indiana, US case study. Clim Change, 1–18.
Roy M, Shemdoe R, Hulme D, Mwageni N, Gough A (2018) Climate change and declining levels of green structures: Life in informal settlements of Dar es Salaam, Tanzania. Landsc Urban Plan 180:282–293
Saaroni H, Amorim JH, Hiemstra JA, Pearlmutter D (2018) Urban Green Infrastructure as a tool for urban heat mitigation: survey of research methodologies and findings across different climatic regions. Urban Clim 24:94–110
Seneviratne SI (2012) Historical drought trends revisited. Nature 491(7424):338–339
Sikder SK, Asadzadeh A, Kuusaana E, Mallick B, Koetter T (2015) Stakeholders participation for urban climate resilience: A case of informal settlements regularization in Khulna City, Bangladesh. J Urban Reg Anal VII(1):5–20
Simon D (2016) Rethinking sustainable cities: accessible, green and fair. Policy Press.
Simone A (2004) People as infrastructure: intersecting fragments in Johannesburg. Publ Cult 16(3):407–429
Simone A (2008) Emergency democracy and the "governing composite". Soc Text 26(2 95):13–33.
Stein A, Castillo L (2005) Innovative financing for low-income housing improvement: Lessons from programmes in Central America. Environ Urban 17(1):47–66
Swim J, Clayton S, Doherty T, Gifford R, Howard G, Reser J, Stern P, Weber E (2009) Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges. American Psychological Association, Washington
Thorn J, Thornton TF, Helfgott A (2015) Autonomous adaptation to global environmental change in peri-urban settlements: Evidence of a growing culture of innovation and revitalisation in Mathare Valley Slums, Nairobi. Glob Environ Chang 31:121–131
Tomlinson R (2015) Best practice' in development planning: products, processes, and networks. Int Dev Plan Rev 37(2):119
UN (2018) 68% of the world population projected to live in urban areas by 2050, says UN, May 16. Retrieved November 12, 2020 from https://bit.ly/32yNj5D
Uteng T (2009) Gender, ethnicity, and constrained mobility: Insights into the resultant social exclusion. Environ Plan A 41(5):1055–1071
Vanhaute E (2011) From famine to food crisis: What history can teach us about local and global subsistence crises. J Peasant Stud 38(1):47–65
Velasco E, Roth M (2010) Cities as Net Sources of CO2: Review of Atmospheric CO2 Exchange in Urban Environments Measured by Eddy Covariance Technique. Geogr Compass 4(9):1238–1259
Venkataramanan V, Packman AI, Peters DR, Lopez D, McCuskey DJ, McDonald RI, Miller WM, Young SL (2019) A systematic review of the human health and social well-being outcomes of green infrastructure for stormwater and flood management. J Environ Manage 246:868–880
Ventura F, Rossi Pisa P, Vicari A (2004) Effect of land use on soil erosion in a small watershed of Emilia-Romagna Region. Ital J Agron 8(1):29–36
Young RF (2010) Managing municipal green space for ecosystem services. Urban For Urban Greening 9(4):313–321
Yu C, Hien WN (2006) Thermal benefits of city parks. Energy Build 38(2):105–120

Zaher H, Sabir M, Benjelloun H, Paul-Igor H (2020) Effect of forest land use change on carbohydrates, physical soil quality and carbon stocks in Moroccan cedar area. J Environ Manage 254:109544

Ignacio Loor received his Ph.D. in Human Geography from the University of Manchester, United Kingdom in 2020. He also received a Master of International Business Administration and a BSc in Economics. He is currently Head of the Research Department at Universidad San Gregorio de Portoviejo, Ecuador. His research focuses on urban sustainable development. His interests include informal settlements' infrastructure, green infrastructure in the context of informal urbanization, and transitions toward zero-carbon cities.

Chapter 9
Co-designing Local Climate Action: A Methodological Framework from a Democratic Perspective

Anlı Ataöv and Ender Peker

Abstract Tackling climate change is a complex phenomenon which calls for the involvement of different institutions and various actors from different disciplines. The synergies and conflicts among the mitigation and adaptation dimensions of climate change also brings an extra complexity to this challenge. In response to this complexity, this chapter proposes a methodological framework aiming at catalyzing action in democratic planning of climate-responsive cities through the involvement of all interest groups. Departing from democracy theories, the chapter, first, draws the frame of climate action as a democratic act. Then, it elaborates on the significance of participation and action in planning for climate change. The chapter finally proposes a process of co-designing local climate action from a democratic perspective as an opportunity for the society to liberate and take control of the future. It suggests harmonizing scientific knowledge with need-driven and local-specific knowledge. It also underlines critical issues in climate change such as the equal participation of interest groups, their commitment to the process as active and aware citizens, and the generation of shared decisions toward a collective action.

Keywords Local climate action · Participation · Democracy · Climate justice · Methodology

9.1 Introduction

Climate action is composed of a combination of numerous issues and tasks, sometimes interdependent to each other, other times independent from one another, to be planned, designed, and implemented. In general terms, climate action deals strategically with mitigation and adaptation. Relatively, mitigation is mainly associated

A. Ataöv (✉)
Middle East Technical University, Ankara, Turkey
e-mail: ataov@metu.edu.tr

E. Peker
British Institute at Ankara (BIAA), Ankara, Turkey
e-mail: ender.peker@biaa.ac.uk

E. Peker and A. Ataöv (eds.), *Governance of Climate Responsive Cities*, The Urban Book Series, https://doi.org/10.1007/978-3-030-73399-5_9

with decreasing greenhouse gas emissions by reducing fossil fuel consumption and, by protecting and increasing open and green spaces functioning as carbon sinks in both inner cities and the outer areas. It is also closely linked to the preservation of natural and agricultural land that exists as unified ecosystems in the surrounding of the built environment. Adaptation is often associated with adjusting to changing climatic conditions through precautions in line with local fragilities and risks. This includes the cyclical use of natural resources, the forestation of large land around cities, the construction of natural-based infrastructures, and the use of blue-green systems.

Besides the value of formulating strategic knowledge on climate change, two common shortcomings are experienced in practice. *First*, the implementation of argumentative concepts on climate change is often not translated into actions. This stems from different factors such as the competition of prioritizing and agenda setting (Naustdalslid 2011), the awareness of decision-makers and the general public (Burgess et al. 1998; Kollmus and Agyeman 2002), stand-alone adaptation and mitigation strategies disconnected to each other (Grafakos et al. 2018), and distorted governance dynamics that disable efficient action (Adger et al. 2009a). *Second*, some people are left more vulnerable to the effects of climate crises than the others due to their disadvantageous locations and conditions in cities, and thereby, interventions and responses to cope with climate change do not reach everyone equally. This inequality makes particular groups such as children, pregnant women, older adults, impoverished people, and refugees more vulnerable to the health effects of climate change (Balbus and Malina 2009), water inaccessibility (Thomas and Twyman 2005), and food insecurity (Bohle et al. 1994). The rights of vulnerable groups are often not represented from the beginning of decision-making processes to the implementation of coping-strategy decisions and actions. These two shortcomings raise the need for generating decisions through democratic processes, providing equal opportunity for people to take part, using the collective experience as an opportunity to learn and raise awareness about the climate change phenomenon, taking necessary actions with all involved actors, and applying effective ways of managing the consequences of mitigation and adaptation measures for all people across different fields and in different geographic areas. Governing all these, then, becomes a domain that should be taken into account carefully in any responsive attempt against climate change.

In simple terms, governance in climate change involves the moderation of a wide array of mechanisms ranging from informal bottom-up cooperation to enactments of national laws and regulations (Knieling and Leal Filho 2013). It requires the coordination of multivariate components in a process that involves a variety of actors. This is essential to integrate diverse opinions with decisions, to foster the commitment of interest groups, and consequently, to catalyze shared action. Taking this as a point of departure, this chapter argues that climate change governance calls for a multidisciplinary approach and a guarantor mechanism for the full engagement of diverse groups in decision-making, and the implementation of actions to make a change in real-life processes both in the built environment and in public awareness.

When considered from action and human-right perspectives, climate change governance should rely on the generation of climate-responsive decisions, the integration of knowledge from various disciplines with decisions, their implementation and follow-up through collaboration and democratic dialogue from local to national between governments, non-governmental organizations, the private sector, and the general public. This suggests, on the one hand, the moderation of a decision-making process in a participatory democratic way so that everyone can be given the chance to lead the change. On the other hand, it implies the integration of climate change decisions with existing plans across different scales so that measures for implementing climate-responsive goals for cities can be set socially and spatially. Climate change is surely a phenomenon that addresses a variety of issues, context-based and scale-mattered, which cannot be handled with one single democracy formula. Though, in any intervention in this regard, it is essential to set a bottom-up agenda and an approach with sensitivity to communities' real-life experiences. Besides the impacts of climate change, the effects of climate action on the environment and the people should also be taken into account. Inclusiveness of all is often not practically possible but democratic attempts aim at maximizing engagement to a greater extent. When this is achieved, inclusiveness does not always guarantee the generation of best outcomes either. Sometimes the engagement of a few key actor groups for specific issues in fact leads to more effective solutions. Thus, climate action processes should be adaptive to these dynamics and managed accordingly.

Respectively, this chapter discusses climate change governance within the general context of democratic theories and the significance of participation and action, adapted to socio-political challenges in achieving climate-responsive cities. It also presents how the process of climate action planning can be co-designed and moderated so that it ensures democratic dialogue between actors and also integrates scientific, political, and local knowledge in the local spatial practices.

9.2 Coping with Climate Change as a Democratic Act

The coping efforts with climate change should touch everyone. Thus, from the governance point of view, democratization of decision-making processes and equal representation of all interest groups in local climate action efforts can be a starting point. One particular significance of this is associated with the human-rights issue. Today's philosophical arguments and discussions in planning also highlight the importance of this issue. The concept of "all should participate," the civil society and the participation forces are viewed as the principal vehicles in democratic decision-making. In general terms, democracy is defined as an equal distribution of power to make collective decisions (Greenwood and Levin 1998; Warren 1996, 2002).

Existing models of democracy entitle different political roles of civil society, varying degrees of participation, intersubjective constructs, system allowances, and impacts on individuals (He 2002; Stokes 2002). Among these models, the elitist

democracy and liberal minimalism involve constitutional mechanisms for representativeness and rely on the majority rule. This is limited to who gains and who loses, and excludes, by nature, the ones who are not included in the winner group. On the other side, participatory democracy emphasizes the direct participation of people in decision-making but it does not elaborate on the degrees of participation (Bobbio 1987). In line with this, both civic republicanism and deliberative democracy stress active citizenship but their focus varies. While civic republican view emphasizes the individual's capacity to actively participate, deliberative democracy highlights a collectively acting citizenry through public deliberation and dialogue (Flyvbjerg 2002; Huxley and Yiftachel 2000). Like deliberative democracy, the pluralist approach also puts emphasis on agreements but it is criticized for becoming a means among large organizations because they exclude people affected by decisions (Bobbio 1987). Development democracy focuses on personal development and sees participation and deliberation as a means to achieve that (Flyvbjerg 2002).

These models surely contribute to the understanding of different ways of approaching democratic thinking at the abstract level. Moreover, most of them are discussed in the context of formal political institutions. Warren (2002) suggests the application of different models of democracy at different scales. He asserts that the political affairs at the national level can be handled through representation whereas participatory democratic principles can be practically more easily adapted to social and economic processes. This argument recognizes the state as a control structure establishing constitutional mechanisms and enacting legitimate laws for participation but sees the community as the social power responding to the state through equal participation of politically capable individuals. Studies in action research (e.g., Argyris et al. 1985; Ataöv 2007a; Babüroğlu 1996; Bradbury and Reason 2001; Cook and Brown 1999; Dewey 1991; Emery 1999; Greenwood and Levin 1998; Gustavsen 1992; Heron 1996; Schön 1987) conducted with a focus on the democratization of human systems such as work life, education, planning, and community development reinforce Warren's argument. Climate responsiveness also requires planning where human systems can practically provide opportunities for equal participation in decision-making and its governance in collaboration with actors from government, regional, and local institutions (Peker and Ataöv 2021, Chap. 3).

Fischer (2017) questions what model of democracy can be practically meaningful when environmental consequences of the climate crisis are socio-politically experienced. He introduces environmental democracy and eco-authoritarianism as two fundamentally opposing views with respect to democracy in environmental decision-making. This somewhat contradicts Warren's complementary view of representative and participatory democracy models. Environmental democracy stresses the central role of citizens, eco-authoritarianism defends the superiority of political and scientific elites. In the former, democratic participation is seen as a salient condition for achieving climate-responsive cities. In the latter, he refers more to the politically functioning nature of the state in dealing with environmental issues. The governments often choose not to impose large-scale environmental changes because their impact will not be felt in the short run (Held and Fane-Hervey 2011). Also, experts tend to activate environmental "guardianship" to secure ecological survival in the

face of climate crisis (Dahl 1989). This is based on the argument that economic activities and population growth result in such a pressure on the environment that it should be saved from the top (Fiorino 2018; Heilbroner 1974). A similar orientation is seen in association with climate securitization that attempts to meet requirements of national economic security and defense (Burnell 2012). Politicians are sometimes forced to adopt policies representing the interests of selected groups (Olson 1982; Shearman and Smith 2007). This is particularly observed in strong lobbies of mitigation strategies at the state level representing particular actor groups that shape political decision-making in their pursuit of economic interests such as in renewable energy. Other times, democratic processes support the proliferation of small and well-organized groups whose politicized argumentations block the decision-making process (Ataöv et al. 2019; Midlarsky 1998).

This chapter asserts that democracy is an essential component in tackling the climate crisis. However, democracy can also function in a limited way when the climate crisis is addressed only at the state level. When it is imposed this way, democratic acts often rely on the power of a few groups to decide on regulations, frameworks, policies, and implementers. The climate crisis involves multi-scale, multi-component, and multi-actor issues that need to be managed simultaneously and dynamically in a historical time perspective and as a change process. This calls the application of different democracy models in support of each other. This, in turn, implies the conduct of democracy practices in a way they are interconnected and flexible.

For instance, at the national level, governments, as representatives of the majority, can commit to global agreements to stop global warming but to formulate region-specific regulations and establish connections with existing geographies and with different political ecologies within a country (Burnell 2012). At the local level, democratic governance that takes into account social and political experimentation can play an essential role in response to climate change. The governance quality with open and transparent flow of information can be improved by the support of civil society organizations promoting climate action (Fiorino 2018). Burnell promotes six values of taking such a stand. They include (i) the contribution of democracies on placing high value on human life, (ii) opportunities for taking a broader range of social interests, (iii) the ability to take action on environmental concerns, (iv) the accountability of governments on the basis of how well they perform, (v) the delegation in search of feasible solutions, and (vi) the society's cooperation in implementing tough decisions.

Democracies should be applied with integrity not only in terms of the active involvement of all groups but also in terms of the consideration of a wide range of issues, the generation of relevant knowledge and its actionability. Climate change responsiveness requires the planning and implementation of future steps and the construction of shared reasoning. One effective way to do this is through democratic participation on the basis of equality (Stokes 2002; Pateman 1970) and shared action (Ataöv 2006). Previous studies show that facilitating a process for dialogue and collective decision-making helps achieve that (Ataöv et al. 2019; Cohen 1998; Elster 1993; Forester 1999; Healey 1997, 2004).

9.3 Participation as a Salient Condition in Any Act

The position of this chapter views participation as an essential element in achieving any democratic process. Thus, climate responsiveness should also rely on participation. To seek contextually meaningful and working solutions, social reconstruction processes should be conceptualized upon the principles of participation and democratization. Considerations of people's participation are not new. Since the 1930s, people's feelings (Pindur et al. 1995), their capacity to take on responsibilities (Glew et al. 1995; Tannenbaum and Massarik 1950), communication and coordination between people (Cheney et al. 1998; Clegg 1983) have been highlighted with reference to participation in decision-making. The planning paradigms after the 1960s also put emphasis on the inclusion of people with respect to how they are treated as users with a focus on their preferences or as subjects to be informed (Ataöv 2007b).

In the 1970s, the philosophical discussions of Arnstein (1969) and Pateman (1970) clarified the definition of participation and its relation to democracy. Arnstein, originally an educator, whose writings made an impact in many areas of research, such as geography, urban planning, public policy, health, and sociology, defined the highest level of participation as the control of citizens on decisions. Pateman, a political scientist and educator, known for her contribution to democratic and feminist political theories, equated "full participation" with democracy, and asserted that only this implies an equal power of say. These philosophical recognitions were first transformed into an advocacy movement in planning to defend the interests of the poor community groups, and the environmental causes against the established powers (Davidoff 1965/2003). This significantly contributed to the rise of the notion of participation in planning, but it did not rely on the provision of equal opportunities to the broad group of people who demand justice. In pursuit of this, after the 1980s, many planning theories focused on people's active involvement to enhance democratic decision-making. The participatory paradigm implied an emphasis on active citizenship through the delegation of new responsibilities between institutions, and a new structure of governing the process. Philosophical discussions on resilience in planning also highlighted the value of bringing diverse opinions into discussion (Folke 2006; Gero et al. 2011), considered people as an invaluable source of knowledge (Bahadur et al. 2010; Paton 2006; O'Brien et al. 2010), and claimed proactive engagement to enhance awareness (Burnside-Lawry and Carvalho 2016; Henly-Shepard et al. 2015; Luis et al. 2016).

In a parallel debate, in the context of climate change, concerns are also expressed about the accountability of climate policies and the legitimacy of decision-making over the protection of global commons (Gupta 2010; Bulkeley et al. 2013). In climate change planning, scholars address the participation within the context of unequal distribution of projected climate impacts and differing structural and institutional capacities to adapt (Anguelovski and Carmin 2011; Aylett 2010; Barrett 2013; Hughes 2013). This particularly becomes visible in climate adaptation efforts at the local scale (Bulkeley et al. 2013). It appears as a discussion of justice within the

scope of climate change politics in reference to unbalanced interests and place-based vulnerabilities (Bulkeley and Newell 2010; Giddens 2009; Grubb 1995; Marino and Ribot 2012; Trell and van Geet 2019). It is conceptualized as a division of responsibilities on a fair basis in response to a shared problem whose implications are of concern to current and future generations (Caney 2005, Grubb 1995). The argument lies under who gains and who loses. Although the socio-political consequences of climate change support this argument, this, however, implies a conceptual polarization of the society and highlights the need for advocating the vulnerable groups' rights in climate action planning.

In general speaking, finding working solutions should be the responsibility of all including the affected and the ones who cause climate change because it is a shared problem that calls for shared action to overcome. Paavola and Adger (2006) propose "equal participation for all" as the principle of fairness in climate action planning. Perceived fairness of outcomes is inextricably linked to perceived fairness of processes (Gross 2007). This argument contributes to addressing climate action planning as a collaborative decision-making process, provided with enabling institutional and legislative structure. The focus on democratic dialogue assigns an agency structure to the civil society, governing the process and delegating new responsibilities to the government, local authorities, and planners. Facilitating climate action planning through participation also helps develop awareness which may consequently transform behavior and thereby, in the long run, make cities more resilient to climate change impacts (Duerden 2004; Iturriza et al. 2020; King 2010).

More specifically, depending on the issue at stake, the level of participation and actors involved can change. Communities' perception, assessment, and acceptance often determine the participation strategies to pursue in climate action planning (Desouza and Flanery 2013; Folke et al. 2005). For instance, housing retrofitting for carbon reduction addressing issues, such as energy consumption, building installation, material, and construction techniques, involves end-users, the private sector, and local authorities. Cycling and green network planning, including the matters of engineering, design, empowerment and public awareness, calls collaboration between mainly local authorities, the central government, and civil organizations. Renewable energy development that requires large financial investments set the private sector and the government as key actors. Among these strategies, what is common is that technological innovations, claimed to be more responsive to climate change, often embrace a top-down approach with the involvement of financially powerful groups and avoid social priorities. These strategies call the integration of the social component so that they are applicable in practice. Participation is a medium to combine the technical and social aspects of climate action. However, participation should not be taken instrumentally in support of the technical development of climate action. Rather such instrumental approaches to participation can in fact cause considerable harm to the private sector and community relationships (Aitken et al. 2016). Participation should be set as an aim to connect all components and actors together.

9.4 Action as an Ultimate Force for Making the Plan Happen

In today's climate-responsive planning processes, local authorities are the key actors authorized to take an action in reference to plan decisions. Decision-making is often done by only the decision-making power. When other interest groups are involved, they often do not have that power in practice. They raise their voice and make suggestions but action is taken with or without the consideration of expressed opinions. However, it is action which builds up the power of communities (Ataöv 2006). One way to overcome unequal distribution of the authority of action is to engage interest groups in the planning of climate-responsive cities in such a way that they can take control over their destiny through realizing life-changing actions. When the aim is set to alter the initial situation in the direction of a self-managing and liberated state, climate action planning and socially constructed realities should be integrated. In such processes, all conclusions should re-enter into the process as inputs to foster new action rather than to develop self-repetitive rhetorics (Gustavsen et al. 2001).

There are three prerequisites to achieve that. The first is the mobilization of interest groups to take a proactive position. Without waiting for the plan decisions to be implemented, local residents can often find and implement contextually adaptive solutions such as transforming a vacant land into a shared open space (Loor 2021, Chap. 8). When locals do not engage actively in reproducing their place, other groups who are often politically more powerful may dominate what the future should be. This can, in turn, result in a vicious circle which may inactivate locals, and no collective action can be taken. Moreover, decisions may be irrelevant to local interests. Another prerequisite is to generate actionable knowledge so that the abstraction of strategies can be translated into practice. This means to identify the steps of action and the means to implement them in reference to relevant objectives. The last prerequisite is to closely integrate co-generated decisions with existing local plans so that they can be accredited to spatial responses and receive funding for implementation.

One resulting benefit of co-designing climate action is the commitment to the implementation of decisions (Adger et al. 2009b; Cloutier et al. 2015). Establishing platforms that function as dialogue settings, networking, and communication channels can enhance commitment. The other resulting benefit of shared action is learning (Armitage et al. 2008). This is particularly essential in creating climate-responsive communities because climate change is not something whose effect is experienced right away. Without experiencing, the discourse about the effect is not convincing. Thus, plans should socially be constructed in a mutual learning process so that it also becomes an opportunity for increasing awareness. In such processes, communities collectively reflect, critically think, actively construct meaning, and make value judgements (Dewey 1991). Iterative cycles of reflection and action create settings for knowing through practice (Bradbury and Reason 2001; Cook and Brown 1999; Greenwood and Levin 1998).

9.5 Process as a Methodological Framework for Participation and Action

Climate action planning should be treated as a reflexive and dialogue-based process that generates knowledge through participation and action. This requires pursuing a methodological strategy that provides a context-dependent approach and methods enabling planning through practice. Given the conditions of active citizenry and enabling mechanism for participation (Ataöv 2007a), this chapter argues that if the process is powerful enough, then the diversity of views can be celebrated through broad participation to build up a shared agreement. In such a process, individuals can work together, learn from each other, and collectively seek solutions to embrace climate change.

Planning practices are often primarily shaped on the basis of assumptions about social processes. Plans are often created and put into practice based on planners' detailed work in reference to those assumptions. This normally leads to a major gap between plan decisions and social realities. Research in planning helps explain those realities, however, it often takes a photo of a static moment in time, and theory is produced out of that picture. Research explains events taking place as a result of action and reaction between objects, functions, or persons. This relies on direct causal relationships. Although today's planning research is more sensitive to contextual conditions of real-life processes, practice and research still remain as separate activities in planning. Each constructs its own split between language and meaning.

Practice and research on climate change should be orchestrated in the climate action planning process. This can allow co-designing future knowledge as part of social processes. When planning is treated that way, it retains implications for changing the physical, social, and political practice of the urban environment to become responsive to climate change. Action Research (AR) provides a powerful methodology to do that. This is particularly needed in seeking contextually meaningful solutions that are responsive to climate change while empowering involved actors to become aware and determined to take control of their cities. AR can provide an in-depth understanding of social constructs and catalyze societies to transform on the basis of their own constructs. Through AR, power relations can be mobilized, the implementation of decisions can be enhanced, and democratic dialogue in concert with worthwhile human purpose can be fostered (Reason and Bradbury 2001). While the ultimate goal of taking this epistemological position in climate change is the democratization of societies through searching for mitigation and adaptation solutions, such a process, built on a collective experience, can also help construct a working governance mechanism in practice.

Three points of AR are crucial in its application in co-designing climate action. First, scientific knowledge should be extracted from within the same course of planning practice. The research element of climate change should imply the engagement in action in order to understand social systems. Second, the action purpose should refer to managing a system of action through co-generative plan making. Third, democratic dialogue and participation should set the ground for any action. Taking

these as a point of departure, the methodological framework of co-designing climate action consists of two components: (i) mobilization of actors and (ii) the design of a participatory climate action planning process.

9.5.1 Mobilization of Actors

Climate action relies on the development and implementation of strategies and policies through concerted efforts of diverse actors across multiple scales (Agrawal 2010). In the process of combating climate change, different groups can take different responsibilities. However, several studies indicate that the public sector takes over-responsibility for local adaptation and they are expected to maintain dialogue and cooperation with all other actor groups (Geaves and Penning-Rowsell 2016; Wamsler 2016). Whoever takes the leadership of the plan also becomes overwhelmed by the responsibilities required for making the plan. Local governments are often authorized to prepare and implement climate action plans. However, responsibilities can shift to other actors such as the private sector and citizens, which consequently increases the participation and deliberation (Klein et al. 2018).

Different issues call for different combinations of actors to take charge. "Who can lead the process" and "who can involve" mainly rely on the type and scale of action, contextual dynamics, local vulnerabilities and necessities, and available opportunities to support the action. For instance, in a city scale climate action planning, academia can take the catalyzing role (Berruti and Palestino 2021—Chap. 4), in a neighborhood scale, the community can initiate design and construction of paths, sport fields, and community gardens in combating climate change (Loor 2021—Chap. 8), and local authorities can take the responsibility of leading community resilient design activities in urban open spaces (Gaete-Cruz 2021—Chap. 7). These examples differ with respect to scales of interventions, the actions taken, and actors involved but they all share an inclusive and adaptive approach to the emerging socio-political character of the place and allow actors to naturally self-organize, some to take the leadership in planning and action.

Considering the diversity of climate change interventions, these responsibilities should be identified as a first step and shared by different actor groups in climate action planning. One group of actors includes urban dwellers who are affected by climate change but also who reinforce climate change with their behavior. Second, there are organizations including universities, research centers, non-governmental organizations, and professional associations which can contribute to raising awareness about climate change in societies. Another one involves the government and local authorities that evaluate the situation of the urban, rural, natural, social, and production areas in terms of climate change, make institutional and legal arrangements and implement decisions. In addition to these, there might be local and regional environmental councils and commissions with particular authorities in local environmental practices, and city councils representing non-governmental organizations which can express communities' interests as inputs to decisions and, when needed, which can

take actions to change existing situations. The last group of actors represents the private sector, which has the financial capacity to lead technological development and to enable implementations of decisions.

9.5.2 *Process Design of Participatory Climate Action Planning*

The climate action requires a process design of thinking, planning, and implementing beyond the ongoing mental exercise of global and national strategy and policy making. Preparing an action plan should be structured in a way that provides opportunities for participation and action, and hence, change, learning, and empowerment.

This process should be facilitated systematically through stages. Each phase should aim for a specific objective about the kinds of shared ideas to be generated. Studies (Ataöv et al. 2019; Cloutier et al. 2015; Şahin Güçhan et al. 2017) that applied such participatory action planning processes lay emphasis on experience-based knowledge produced in reference to socio-political realities and also on the scientific evidence. In light of this, this chapter suggests a climate action planning process composed of three sub-processes adaptively integrated to each other and managed simultaneously. This includes (i) scientific and (ii) socio-political knowledge generation as well as (iii) knowledge dissemination and community awareness (Fig. 9.1).

According to this process design, the scientific knowledge generation involves a series of actions by experts that aim at understanding, assessing, and planning the spatial, quantitative, qualitative, and intersubjective data related to natural, physical, and social issues. The multidimensional information of cities requires storing and making sense of the collected data, classifying and structuring them in such a way that shows their spatial and social relations specific to their contexts. In this process, different digital tools can be used as decision support systems allowing to question and interpret existing knowledge in different ways.

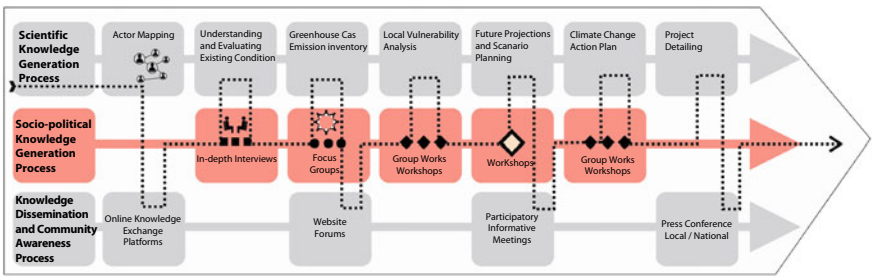

Fig. 9.1 Co-designing local climate action plan (Adapted from Peker and Ataöv [2020])

The generation of socio-political knowledge, the middle line of the process design, is done dialogically and collectively together with institutions and the community. A variety of participatory methods and techniques such as focus groups, workshops, search conferences can be applied that allow the formation of inter-institutional dialogue and the creation of shared meaning. The facilitation of this process requires taking local specificities as a point of departure. This view highlights the local knowledge blending experience and beliefs, and being embedded with cultural and social values (Gadgil et al. 2003). Furthermore, local actors can identify linkages among changes within the system and provide local expertise and baseline information not available elsewhere (Folke et al. 2003).

In parallel to all these, in the third sub-process, a series of steps can be taken to disseminate the generated knowledge, to raise community awareness, and to change behaviour. Some of these activities can include the organization of seminars, conferences, online platforms and press conferences, the allocation of posters at visible parts and sections of cities such as billboards on busy streets, signage at metro stations and in public buses, and presentations at radio and television channels. Climate-combatting programs and campaigns can also be developed at local universities.

According to the process design, the knowledge produced in one sub-process always gets re-formulated in sync with the knowledge generated in the other sub-process. These sub-processes work by continuously nurturing each other in a reflexive and cyclical manner. This allows integrating both scientific inventories and actor analyses to understand a system so that the complex relationship between components becomes apparent (Ataöv et al. 2019; Gallopín 2006). This sees combining different types of knowledge as a critical factor required during periods of rapid change.

In this respect, the flow and blending of knowledge coming from all sources (scientific and local) and revealing the co-generated reasoning constitute a must for the facilitation of the co-designing climate action process. Accordingly, all these sub-processes can be coordinated to pursue seven major phases: (1) creating the actor map; (2) understanding the existing situation; (3) predicting the future scenarios; (4) developing the climate action plan; (5) detailing projects; (6) finalizing the plan; (7) institutionalizing actor commitment and governance mechanism (Peker and Ataöv 2020).

The actor map can be composed of members and representatives of local authorities, the central government, commissions and agencies, civil organizations, platforms, professional chambers, city councils, universities, private firms and companies, media, and citizens. The composition of actors can be designed in reference to contextual dynamics to be explored during the mobilization of actors.

Before searching the ways of responding to climate change, all physical, environmental, and social components of cities need to be understood. This requires the preparation of emission inventories and the identification of urban fragilities which help set the priorities for primary interventions. On the basis of current situation assessment, future predictions are done according to climatic characteristics, and future scenarios such as water rise in seaside towns, snowfall in mountain cities, and temperature increase in continental geographies are developed.

Analyses, synthesis, and future scenarios form the ground of future decisions on climate action. Designing the future can pursue a strategic approach. At this stage, it is salient that decisions are detailed in such a way that they can be easily put into action. This involves the identification of action steps, funding sources, the timeline and institutions which are committed to implement them. It is also essential that decisions are generated within working groups and associated to spatial plan decisions at both central and local levels.

Detailing decisions in actionable terms and ensuring actors to be involved in the implementation phase of decisions help construct a multi-governance mechanism that is self-organized and self-regulated. Thus, once all decisions are formulated, prioritized, and detailed, and after the involved institutions commit to the realization of each action, protocols are signed to strengthen institutional do-ability of climate action plans.

9.6 Final Words

Climate action is about real-life matters, thus, it automatically calls the involvement of numerous disciplines from humanities to engineering. Moreover, it heavily relies on political processes at various scales from global to local. Everyone faces the impacts of climate change sooner or later but the degree of impact varies. Lots of actions are planned to be taken, however, the complex requirements of climate change make climate action planning a fuzzy process whose governance also becomes a challenge.

Planning draws a boundary and time frame to climate action by focusing on its specific parts at specific scales, dealing with issues such as blue and green infrastructure, low carbon transportation, and forestry. It provides tangible areas of intervention particularly at the local scale. This is because climate change is severely felt at this scale and "who is affected" should become the subject of the local action. The impacts such as flooding, drought, and water shortage, which directly touch on social life, also trigger people to search for coping mechanisms. This search does not necessarily aim at creating the most advanced technologies as in industrial activities but it is concerned with generating solutions that are meaningful for the localities.

When the process of planning is managed with the involvement of people, it also allows the formation of a governance mechanism necessary to realize the complex systems of climate action. No one can oppose a governance mechanism which systematically expands itself to include relevant institutions and the civil society. This implies the operation of an open system, which means being open to interaction, learning, development, progress, and creativity, and taking necessary steps to achieve those.

The methodological framework suggested here values the democratic prerequisites of climate action. This framework takes a "from-within" life perspective and intends to undertake all components and actors together to create a setting for all to engage, exchange, and change. It highlights the importance of socio-political dimension with its inherited potential for producing working outcomes. It does not

claim to meet the adaptation and mitigation targets one hundred percent but it aims at obtaining maximum benefit from the process spatially and socially, and hence, environmentally with an ultimate goal of becoming responsive to climate change.

Acknowledgements We would like to thank Prof. Dr. Ayda Eraydın and Prof. Dr. İlhan Tekeli for their valuable review and comments which have significantly helped the chapter improve. We also would like to thank Oktay Şekercisoy for his review and proofreading.

References

Adger WN, Lorenzoni I, O'Brien KL (eds) (2009a) Adapting to climate change: thresholds, values, governance. Cambridge University Press, Cambridge

Adger WN, Dessai S, Goulden M, Hulme M, Lorenzoni I, Nelson DR, Naess LO, Wolf J, Wreford A (2009b) Are there social limits to adaptation to climate change? Clim Change 93:335–354

Agrawal A (2010) Local institutions and adaptation to climate change. In: Mearns R, Norton A (eds) Social dimensions of climate change: equity and vulnerability in a warming world. The World Bank, Washington, DC, pp 173–197

Aitken M, Haggett C, Rudolph D (2016) Practices and rationales of community engagement with wind farms: awareness raising, consultation, empowerment. Plann Theory & Practice 17(4):557–576

Anguelovski I, Carmin J (2011) Something borrowed, everything new: innovation and institutionalization in urban climate governance. Curr Opin Environ Sustainability 3:169–175

Armitage D, Marschke M, Plummer R (2008) Adaptive co-management and the paradox of learning. Global Environ Change 18(1):86–98

Argyris C, Putnam R, McClain Smith D (1985) Action science: concepts, methods, and skills for research and intervention. Jossey-Bass, San Francisco

Arnstein SR (1969) A ladder of citizen participation. J Am Inst Planners 35:216–224

Ataöv T (2006) Democracy, values and institutions: the essentials vs. the formality. Paper presented at the *World Symposiumon* '*The Prospects for Democracy*'. New York

Ataöv A (2007a) Democracy to become reality: participatory planning through action research. Habitat Int 31(3–4):333–344

Ataöv A (2007b) The changing role of social scientists in urban planning: to become a proactive participant in research. J Fac Archite 24(1):139–152

Ataöv A, Bilgin Altınöz AG, Güçhan Şahin N (2019) Engaging in politics: managing power through action research. In: Eraydın A, Frey K (eds) Politics and conflicts in governance and planning. Cambridge, UK: Routledge, pp 75–92

Aylett A (2010) Participatory planning, justice, and climate change in Durban, South Africa. Environ Plann A 42(1):99–115

Babüroğlu O (1996) Searching for a program in national participation: an action research experiment in Turkey. In: Toulmin S, Gustavsen B (eds) Beyond theory: changing organizations through participation. John Benjamins, Amsterdam/Philadelphia, pp 119–136

Bahadur A, Ibrahim M, Tanner T (2010) The resilience renaissance? Unpacking of resilience for tackling climate change and disasters (Strengthening Climate Resilience Discussion Paper 1). Institute of Development Studies, Brighton

Balbus JM, Malina C (2009) Identifying vulnerable subpopulations for climate change health effects in the United States. J Occupational Environ Med 51(1):33–37

Barrett S (2013) Local level climate justice? Adaptation finance and vulnerability reduction. Global Environ Change 23:1819–1829

Berruti G, Palestino MF (2021) Exploring the governance of Naples, Italy, through a climate responsive approach. In: Peker E, Ataöv A (eds) Governance of climate responsive cities. The Urban Book Series, Springer, Switzerland
Bohle HG, Downing TE, Watts MJ (1994) Climate change and social vulnerability: toward a sociology and geography of food insecurity. Global Environ Change 4(1):37–48
Bobbio N (1987) The future of democracy. Univ. of Minnesota Press, Minneapolis
Burnell P (2012) Democracy, democratization and climate change: complex relationships. Democratization 19(5):813–842
Bulkeley H, Betsill MM (2013) Revisiting the urban politics of climate change. Environ Politics 22(1):136–154
Bulkeley H, Carmin J, Castán Broto V, Edwards GAS, Fuller S (2013) Climate justice and global cities: Mapping the emerging discourses. Global Environ Change 23:914–925
Bulkeley H, Newell P (2010) Governing climate change (global institutions). Routledge, Abingdon and New York
Burgess J, Harrison C, Filius P (1998) Environmental communication and the cultural politics of environmental citizenship. Environ Plann A 30:1445–1460
Bradbury H, Reason P (2001) Conclusion: Broadening the Bandwidth of validity: issues and choicepoints for improving the quality of action research. In: Reason P, Bradbury H (eds) Handbook of action research. Sage, London, pp 447–456
Burnside-Lawry J, Carvalho L (2016) A stakeholder approach to building community resilience: awareness to implementation. Inter J Disaster Resilience in the Built Environ 7(1):4–25
Caney S (2005) Cosmopolitan justice, responsibility, and global climate change. Leiden J Inter Law 18:747–775
Cheney G, Straub J, Speirs-Glebe L, Stohl C, DeGooyer D, Whalen S, Carlone D et al. (1998) Democracy, participation, and communication at work: A multi-disciplinary review. In: Roloff ME (ed), Communication yearbook 21. Sage, Thousand Oaks, CA, pp 35–91
Clegg S (1983) Organizational democracy, power and participation. In: Crouch C, Heller F (eds) Organizational democracy and political processes. John Wiley, New York, pp 3–34
Cloutier G, Joerin F, Dubois C, Labarthe M, Legay C, Viens D (2015) Planning adaptation based on local actors' knowledge and participation: a climate governance experiment. Clim Policy 15(4):458–474
Cohen J (1998) Democracy and liberty. In: Elster J (ed) Deliberative democracy. Cambridge University, Cambridge, pp 185–231
Cook SDN, Brown JS (1999) Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing. Organization Sci 10(4):381–400
Dahl R (1989) Democracy and its critics. Yale University Press, New Haven, CT
Davidoff P (1965/2003) Advocacy and pluralism in planning. In: Campbell S, Fainstein SS (eds) Readings in planning theory. Blackwell, Oxford, UK, pp 210–223
Desouza KC, Flanery TH (2013) Designing, planning, and managing resilient cities: a conceptual framework. Cities 35:89–99
Dewey J (1991) Logic: the theory of inquiry. Southern Illinois University Press, Carbondale
Duerden F (2004) Translating climate change impacts at the community level. Arctic 57(2):204–212
Elster J (ed) (1993) Deliberative democracy. Cambridge University, Cambridge
Emery M (1999) Searching: the theory and practice of making cultural change. John Benjamins, Amsterdam
Fiorino DJ (2018) Can democracy handle climate change?. Polity Press, Cambridge
Fischer F (2017) Climate crisis and the democratic prospect: participatory governance in sustainable communities. Oxford University Press, Oxford, UK
Flyvbjerg B (2002) Bringing power to planning research: one researcher's praxis story. J Plann Educ. Res 21(4):353–366
Folke C (2006) Resilience: The emergence of a perspective for social-ecological systems analyses. Global Environ Change 16(3):253–267

Folke C, Colding J, Berkes F (2003) Synthesis: building resilience and adaptive capacity in social–ecological systems. In: Berkes F, Colding J, Folke C (eds) Navigating social-ecological systems: building resilience for complexity and change. Cambridge University, Cambridge, UK, pp 352–387

Folke C, Hahn T, Olsson P, Norberg J (2005) Adaptive governance of social-ecological systems. Annual Rev Environ and Resour 30:441–473

Forester JF (1999) The deliberative practitioner: encouraging participatory planning processes. MIT Press, Boston

Gadgil M, Olsson P, Berkes F, Folke C (2003) Exploring the role of local ecological knowledge in ecosystem management: three case studies. In: Berkes F, Folke C, Colding J (eds) Navigating social-ecological systems: building resilience for complexity and change. Cambridge University Press, Cambridge, pp 189–209

Gaete-Cruz M, Ersoy A, Czischke D, Van Bueren E (2021) How co-design of public space contributes to strengthening resilience: Lessons from two Chilean cases. In: Peker E, Ataöv A (eds) Governance of climate responsive cities. Urban Book Series, Springer, Switzerland

Gallopín GC (2006) Linkages between vulnerability, resilience, and adaptive capacity. Global Environ Change 16(3):293–303

Geaves LH, Penning-Rowsell EC (2016) Flood risk management as a public or a private good, and the implications for stakeholder engagement. Environ Sci Policy 55:281–291

Gero A, Méheux K, Dominey-Howes D (2011) Integrating community based disaster risk reduction and climate change adaptation: Examples from the Pacific. Nat Hazards and Earth Syst Sci 11:101–113

Giddens A (2009) Politics of climate change. Polity Press, Cambridge

Glew DJ, O'Leary-Kelly AM, Griffin FW, Van Fleet DD (1995) Participation in organisations: A preview of the issues and proposed framework for future analysis. J Manag 21(3):395–421

Grafakos S, Pacteau C, Delgado M, Landauer, M, Lucon O, Driscoll P (2018) Integrating mitigation and adaptation: Opportunities and challenges. In Rosenzweig C, Solecki WD, Romero-Lankao P, Mehrotra S, Dhakal S, Ibrahim SA (eds) Climate change and cities: second assessment report of the urban climate change research network. Cambridge University Press, New York, pp 101–138

Greenwood DJ, Levin M (1998) Introduction to action research: social research for social change. Sage, Thousand Oaks, CA

Gross C (2007) Community perspectives of wind energy in Australia: the application of a justice and community fairness framework to increase social acceptance. Energy Policy 35(5):2727–2736

Grubb M (1995) Seeking fair weather: ethics and the international debate on climate change. International affairs 71(3):463–496

Gustavsen B (1992) Dialogue and development: theory of communication, action research and the restructuring of working life. Van Gorcum, Assen

Gupta A (2010) Transparency in global environmental governance: a coming of age? Global Environl Politics 10(3):1–7

Gustavsen B, Finne H, Oscarsson B (2001) Creating connectedness: the role of social research in innovation policy, vol 13. John Benjamins Publishing, Amsterdam, The Netherlands

He B (2002) Civil society and democracy. In: Carter A, Stokes G (eds) Democratic theory of today. Polity, Cambridge, pp 201–227

Healey P (1997) Collaborative planning: shaping places in fragmented societies. Macmillan, London

Healey P (2004) Creativity and urban governance. Policy Studies 25(2):97–102

Heilbroner R (1974) An inquiry into the human prospect. W. W. Norton, New York

Held D, Fane-Hervey A (2011) Democracy, climate change and global governance: democratic agency and the policemen ahead. In: Held D, Fane-Hervey A, Theros M (eds) The Governance of climate change: science, economics, politics & ethics. Polity Press, Cambridge, pp 89–110

Henly-Shepard S, Gray SA, Cox LC (2015) The use of participatory modeling to promote social learning and facilitate community disaster planning. Environ Sci Policy 45:109–122

Heron J (1996) Co-operative inquiry. Sage, London

Hughes S (2013) Justice in urban climate change adaptation: criteria and application to Delhi. Ecol Soc 18(4):48
Huxley M, Yiftachel O (2000) New paradigm or old myopia? Unsetting the communicative turn in planning theory. J Plann Educ Res 19 (4):333–342
Iturriza M, Labaka L, Ormazabal M, Borges M (2020) Awareness-development in the context of climate change resilience. Urban Climate 32:
King D (2010) Issues in identifying climate change adaptation within community hazard mitigation. Int J Emergency Manage 7(3–4):269–280
Klein J, Araos M, Karimo A, Heikkinen M, Ylä-Anttila T, Juhola S (2018) The role of the private sector and citizens in urban climate change adaptation: evidence from a global assessment of large cities. Global Environ Change 53:127–136
Knieling J, Leal Filho W (2013) Climate change governance: the challenge for politics and public administration, enterprises and civil society. In: Knielang J, Leal Filho W (eds) Climate change governance. Springer, Berlin, Heidelberg, pp 1–5
Kollmus A, Agyeman J (2002) Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? Environ Education Res 8(3):239–260
Lindblom CE (1990) Inquiry and change: the troubled attempt to understand and shape society. Yale University Press, New Haven, CT
Loor I (2021) Informal Green Infrastructure (IGI) and the pursuit of climate-responsive environments in Quito City. In: Peker E, Ataöv A (eds) Governance of climate responsive cities. The Urban Book Series, Springer, Switzerland
Luis S, Pinho L, Lima ML, Roseta-Palma C, Cardoso Martins F, Betâmio de Almeida A (2016) It is all about awareness? The normalisation of coastal risk. J Risk Res 19(6):810–826
Marino E, Ribot J (2012) Special issue introduction: adding insult to injury: climate change and the inequities of climate intervention. Global Environ Change 22(2):323–328
Midlarsky MI (1998) Democracy and the environment: an empirical assessment. J Peace Res 35(3):341–361
Naustdalslid J (2011) Climate change—the challenge of translating scientific knowledge into action. Inter J Sustainable Dev World Ecol 18(3):243–252
O'Brien G, O'Keefe P, Gadema Z, Swords J (2010) Approaching disaster management through social learning. Disaster Prevention and Manage 19(4):498–508
Olson M (1982) Rise and decline of nations: economic growth, stagflation, and social rigidities. Yale University Press, New Haven, CT
Paavola J, Adger NW (2006) Fair adaptation to climate change. Ecol Econom 56:594–609
Pateman C (1970) Participation and democratic theory. Cambridge University, Cambridge
Paton D (2006) Disaster resilience: integrating individual, community, institutional and environmental perspectives. In: Paton D, Johnston D (eds) Disaster resilience: an integrated approach. Charles C. Thomas, Springfield, IL, pp 249–264
Peker E, Ataöv A (2020) Belediyeler için İklim Değişikliği Rehberi. Institute of Urban Studies, Ankara
Peker E, Ataöv A (2021) Barriers to implementing local climate action plans in Turkey: searching for a potential way-out. In: Peker E, Ataöv A (eds) Governance of climate responsive cities. The Urban Book Series, Springer, Switzerland
Pindur W, Rogers SE, Kim PS (1995) The history of management: a global perspective. J Manag His 1(1):59–77
Reason P, Bradbury H (eds) (2001) Handbook of action research: participative inquiry and practice. Sage, London
Şahin Güçhan N, Bilgin Altınöz G, Ataöv A (2017) Kommagene Nemrut Yönetim Planı Ana Çerçevesi ve Yöntemi. In: Şahin Güçhan N (ed) Kommagene Nemrut Yönetim Planı. TC Kültür ve Turizm Bakanlığı – İstanbul 2010 Avrupa Kültür Başkenti Ajansı, Ankara, pp 11–35
Schön DA (1987) Educating the reflective practitioner. Jossey-Bass, San Francisco
Shearman DJ, Smith JW (2007) The climate change challenge and the failure of democracy. Greenwood Publishing Group

Stokes G (2002) Democracy and citizenship. In: Carter A, Stokes G (eds) Democratic theory of today. Polity Press, Cambridge, pp 23–51
Tannenbaum R, Massarik F (1950) Participation by subordinates in the managerial decision-making process. The Can J Econom Political Sci/Revue canadienne d'Economique et de Science Politique 16(3):408–418
Tekeli İ, Ataöv A (2017) Sürdürülebilir toplum ve yapılı çevre: stratejiler yelpazesi. Bilgi Üniversitesi Yayınları, İstanbul
Thomas DS, Twyman C (2005) Equity and justice in climate change adaptation amongst natural-resource-dependent societies. Global Environ Change 15(2):115–124
Trell EM, van Geet MT (2019) The governance of local urban climate adaptation: towards participation, collaboration and shared responsibilities. Plann Theory Practice 20(3):376–394
Wamsler C (2016) From risk governance to city-citizen collaboration: capitalizing on individual adaptation to climate change. Environ Policy Governance 26(3):184–204
Warren ME (1996) Deliberative democracy and authority. Am Political Sci Rev 90(1):46–60
Warren ME (2002) What can democratic participation mean today? Political Theory 30(5):677–701

Anlı Ataöv is a professor in the Department of City and Regional Planning at Middle East Technical University. She holds doctorate degrees in environmental aesthetics from the Ohio State University and in action research from the Norwegian University of Science and Technology in Norway. She worked as a planner, professor, researcher, and consultant for private, public, and national/international non-governmental organizations, institutions, and commissions in Turkey, the US, Norway, Denmark, and the UK. Her professional and academic practice and publications mainly focus on participatory planning and design, sustainability and social change, cultural/natural conservation planning and area management, people and environment, arts, and design.

Ender Peker is a post-doctoral research fellow at BIAA, specializing in climate- responsive urbanism, with a particular focus on the ways in which the built environment is co-designed by technical rules, regulations, and actors. He holds a PhD in Planning from the University of Reading, UK, and an MSc degree in Urban Design from Middle East Technical University. He worked as an urban designer, lecturer, researcher, and consultant for private and public institutions, and non-governmental organizations in Turkey, Germany, and the UK. His research inter-ests cut across (i) urban design and the built environment, (ii) climate responsive design and architecture, and (iii) participatory planning and governance.