

Resilient Cities

Re-thinking Urban Transformation

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Valentina Antonucci · Enrique Mendieta Márquez ·

Margarita Juárez Nájera ·

Alberto Cedeño Valdiviezo ·

Mariana Osorno Castro *Editors*

# Urban Resilience: Methodologies, Tools and Evaluation

Theory and Practice



Springer

# **Resilient Cities**

## **Re-thinking Urban Transformation**

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The RESILIENT CITIES book series aims to analyse the challenges faced by cities and provide an up-to-date body of knowledge, including a systematic collection of global cutting-edge best practices, fundamental to managing the urban transition toward resilience. The best practices will be collected and analysed following a common format, enabling the reader to understand the solutions adopted and clearly highlighting the parameters and possibilities for replication and up-scaling. The best practices are taken from a global city base including, Barcelona, Medellin, Adelaide, Copenhagen, Seoul, and Accra. The distinctiveness of the RESILIENT CITIES book series is its international dimension, coupled with a multidisciplinary and a cross sectorial approach. The RESILIENT CITIES book series will be a unique and fundamental resource for practitioners, policy makers and scientists involved in planning and governing the transition of cities. It presents the latest and up-to-date systematized information on research, practices and policies development, defining clear means and pathways for replication and up-scaling.

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# Foreword

Dear reader, the book you have in your hands, entitled *Urban Resilience: Methodologies, Tools and Evaluation*, is part of the Springer collection *RESILIENT CITIES: Re-thinking Urban Transformation*, which collects the initiatives of *Resurbe* program, which since 2014 has organized several international meetings (Spain, 2014; Colombia, 2015; Mexico, 2016 and Argentina 2016) with the intention of sharing and systematizing experiences and reflecting on the field of urban resilience, with a view to participating in the United Nations Conference on Housing and Sustainable Urban Development, *HABITAT III* that was held in Quito, Ecuador, from October 17 to 20, 2016.

Overpopulation, increasing urbanization, impoverishment and environmental deterioration represent current trends that we cannot fail to consider when we imagine the future of cities and with them, of humanity (since 2007, more than half of the world population lives in cities). At the same time, cities present various degrees of vulnerability to natural events (hurricanes, earthquakes, tsunamis, pandemics, among others) and human events (accidents and terrorism) that increasingly threaten their stability, as well as the life of their inhabitants and the integrity of its infrastructure.

We are experiencing a stage of history that Ulrich Beck (1986) identified as ‘The risk society’. How can we prepare for risk scenarios in which natural and human phenomena impacts, each time frequently and with increasingly destructive potential, to socioecosystems? With the firm intention of joining the effort to approximate viable answers to these questions, this book brings together various contributions that include conceptual reflections and practical experiences (casuistic) around the topic of urban resilience, with a particular emphasis towards its methodological aspects, the use of tools and evaluation.

The complexity and multidimensional nature that characterizes the phenomenon of urban resilience determine that its approach requires incorporating the perspective of its various actors and relevant disciplinary fields. In the two volumes that make up this book, the experiences of 56 authors are presented; each of them develops their work as part of a team in 32 different institutions, located in 15 countries (Argentina, Australia, Brazil, Colombia, Denmark, Germany, Greece, Holland,

Italy, Ireland, Mexico, Portugal, Spain, United Kingdom and United States of America), from 3 continents: (America, Europe and Oceania); their professional fields cover a wide range of disciplines from: (a) the natural sciences (agronomy, biochemistry, biotechnology, chemistry, ecology and environment, geography, human ecology, physics), (b) the social sciences and humanities (anthropology, communication, economics, sociology, history), (c) design and engineering disciplines (architecture, artificial intelligence, chemical, civil, computing, design, electronics, environmental, industrial, landscaping, territorial planning, public policy, regional development, structural, systems, town planning, telecommunications, transportation), as well as various fields of mathematics, applied statistics and operations research.

We are in debt, and say thanks: to all authors, for their dedication, commitment and motivation to share their experiences; to the organizers of the Series: Nicola Tollin, Jordy Morató and Ernesto Santibanez, for their great vision and capacity of convocation to promote this initiative; to the academic team: Valentina Antoniucci, Enrique Mendieta M., Margarita Juárez N., Alberto Cedeño V., without whose committed work this book would not have been possible; to Mariana Osorno C., for her valuable participation in the revision and adjustments during the final integration of the materials; and to Margaret Deignan, Marielle Klijn, Nagarajan Paramasivam and all Springer editorial team.

Being the city, the focus and frame of reference from which the different experiences of this book are developed, it is not surprising that in each of the chapters some lines are included to locate, size, and reflect on the urban phenomenon and its growing expansion on the planet. On the other hand, since resilience is the attribute of the urban that attracts and concentrates the attention of the authors, it is not surprising that several pages are devoted to presenting, defining, and contextualizing this important property of systems. It should be mentioned that the field of resilience – like that of urban sustainability to which it contributes – represents a theoretical-methodological territory under construction and continuous reconstruction. Both fields attract the attention of theorists and practitioners from very different perspectives around the world. This places us in front of a puzzle in process that continually receives new pieces (conceptual, theoretical, methodological, or casuistic) that must be valued and accommodated until the field is consolidated.

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# Preface<sup>1</sup>

According to the World Bank, more than half of the global population lives in cities, and it is expected to increase to two thirds by 2050. This dynamic by itself increases the challenges and complexity of urban regions, and the overall instability of climate adds new threats, many of which remain poorly understood.

Urban resilience is currently an open research field, for which there is no consensus or mainstreamed approach yet; it is thereby necessary to build new conceptual approaches, rethinking the principles of urban resilience including ontological, epistemological, methodological, and axiological assumptions. The crisis of sustainability and resilience for cities presents the following complications: (a) multiple and diverse systems with a complex interaction, (b) multiple dimensions and levels of analysis, (c) multiple stakeholders and institutions which have different worldviews. Transition to urban sustainability requires new strategies, decision support systems, methodologies, tools, and evaluation procedures for multi-level governance, as well as integration of risk management, mitigation, and adaptation, within a self-adaptive, proactive, and participatory frame. Thereby, a transdisciplinary systemic approach for urban resilience, in the wider frame of sustainability paradigm, is needed to implement synergic transformative actions.

There is a need to increase the knowledge base and strengthen the science-policy interaction, to properly assess the urban-regional metabolism and increase the socioecological sustainability and resilience for face global challenges, there is a need to enrich the knowledge base and strengthen the science-policy interaction. The co-creation of an accessible and transparent base of knowledge can lead to a better understanding of the urban socio-ecosystems' strength and weaknesses, as well as to raise awareness of its diversity, creativity, and social capital.

There are currently no consistent sets of indicators able to fully tackle the multi-dimensionality of urban resilience; thereby, it is necessary to further develop

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<sup>1</sup> This preface takes, as starting point, the call with which those of us who make up the initial team – Luis Jiménez Herrero, Josep Pont Vidal, Astrid Rocuts, Elena Perez Laguela, Jocelyn Parada Ayala and Octavio González Castillo – gave shape to the book initiative and summoned to those who now are the authors of this book. We express our appreciation to all of them and say with satisfaction that the initiative that we promoted together has come to fruition.

resilience indicators and prospective models, which can reinforce risk management and generate opportunities. Urban resilience evaluation depends on a coherent understanding of the underlying concept of risk and the socioecological interactions of urban and regional systems, which rely on natural capital to implement nature-based solutions.

Measurements and evaluation tools, including new information technologies, geographic and conceptual information systems, are essential to assess the impacts, risks and vulnerabilities derived of climate change. Resilience and disaster risk reduction assessment should be part of any comprehensive urban sustainability strategies. This volume compiles conceptual works and case studies related which methodologies, tools and evaluation frameworks that are deemed useful to guide urban transition towards resilience and sustainability. The topics with which the authors were summoned were:

- T1: Urban resilience approaches and paradigms.* Given the uncertainty and risks associated with global change and climate change that cities and regions face, the concept of urban resilience arises to address systemic challenges and guide the urbanization process within the paradigm of sustainability.
- T2: Complex systems methodologies for urban resilience and sustainability, including multi, inter and transdisciplinary approaches.* A systemic vision and inter/trans-disciplinary approaches for urban resilience are necessary to complement 'normal science' and to implement synergic transformative actions. Conceptual advances in inter/transdisciplinary approaches are central to analysing urban sustainability and resilience, and to develop solutions to the complex problems of urban systems.
- T3: Tools, indicators, and modelling for urban resilience.* This topic aims at advancing the measurement and evaluation systems of urban resilience and sustainability through the development of indicators and dynamic models that better reflect the complex interactions and the relations of cities and regions. The base of knowledge should be increased to boost the 'science-policy interface' in decision-making. This also includes new approaches to development indicators, as well as forward-looking models to assess urban resilience policies and support governance systems at the bioregional level.
- T4: Geographic information systems and conceptual information systems.* Cartography allows the development of maps and information systems guiding both geographic and conceptual exploration that can facilitate the communication among experts, in the frame of complex and multidimensional contexts, while enabling the identification of conceptual regions that have not been explored or developed yet.
- T5: New approaches in evaluation in context of urban resilience.* Conventional approaches for evaluation do not appear to be contributing sufficiently to the

achievement of urban resilience, thereby it is necessary to build a conceptual platform based on a new set of ontological, gnoseological and axiological assumptions that can facilitate the development of the new approaches of urban resilience.

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# Introduction

It is through a constant interaction with the environment that the human being is continually getting to know, reflecting, intervening, and adapting the environment, and himself, to the reality that surrounds him. That's the way human beings create and recreate their conceptual world – that of ideas and thoughts – and draw bridges between this and the ‘real world’ that surrounds them. Regarding the formalization and construction of these conceptual-theoretical-methodological frameworks, belonging to the conceptual world, González-Castillo (2008, p. 129) states:

*Personal knowledge represents the minimum functional unit of the individual thought born from cognitive research; it is a set of statements (constructs, definitions, and propositions) with a representative function from some part of the real world. When knowledge is publicly verified it becomes recognized as theory ... Personal procedure is the minimum functional unit of individual thought born from the design of intervention. It defines the sequence of activities to be carried out to achieve an end. When a procedure is publicly validated it becomes recognized as a methodology ... personal reflection is the minimum functional unit of individual thought born from reflective introspection, which is considered as a set of statements (constructs, definitions, and propositions) with function representative of a part of the conceptual world. When she is publicly recognized, she becomes considered a reflexive.*

According to Javier Navarro, the idea of casuistry is applicable in all those contexts in which an attempt is made to understand a global situation based on some specific cases that are illustrative. For Miller, casuistry is a genre of research that addresses specific problems, their correct interpretation, and their reasonable resolution. For her part, Guerra-Palmero M.J. (2013, p. 10 and 13) affirm:

*New casuistry does not offer recipes, but defends the need for analysing, pondering and estimating circumstances... because every rule to get along with the complexities of the human requires exceptions ... if not, at least, of a certain work of interpretation that takes into account the concrete details and the demands of the context, a certain hermeneutic that makes the application of the principles more flexible to adapt them to the diverse cases. The procedure will be to locate in the case in question a set of cases with which it maintains similarities. Analogous cases, by proximity, will illuminate the case study in a kind of search for precedents. By using the analogy, both differences and similarities will be determined. These linking cases are the essence of casuistic proceeding, as opposed to the isolated consideration that seeks references directly in the principles. In this way of*

*proceeding, a series of type-cases or paradigmatic cases are accumulated that serve to learn, deliberate and gradually systematize the analytical experience. This systematization of paradigmatic cases allows us to point to a series of relevant maxims and rules.*

In each chapter of this book, the reader will find a particular amalgam of conceptual, theoretical, methodological, and casuistic contributions around urban resilience with an emphasis on its instruments, methodological and evaluation aspects.

Although each chapter harmonizes with the whole that makes up the book, they also maintain their individuality and are self-contained. For this reason, readers may decide to start their reading through any of the chapters and continue with that freedom for the rest of the book. However, if you decide to follow the order in which they are presented, you will find a natural progression:

- *Chapters 1 and 2* introduce us to the notion of urban resilience, as well as the various approaches that have emerged to approximate the phenomenon.
- In *Chapters 3, 4 and 5* case studies are offered, each from a different perspective (landscape architecture, urban planning, and urban sociology).
- *Chapters 6 and 7* deepen the knowledge of urban resilience, establishing both its differentiation with respect to other areas of regional resilience, and its link with concepts such as ‘balance’, ‘stability’ and ‘sustainability’, ‘fragility’ and ‘antifragility’.
- Finally, *Chapters 8, 9, and 10* take up the case study to study the phenomenon of resilience at three different levels: urban socio-ecosystem, county, and eco-neighbourhood.

The following is a brief description of the context for each of the ten chapters that make up this first volume of the book.

*Chapter 1: Searching a Resilient City: A Study About Theoretical-Conceptual Joins Between Smart City and Urban Resilience.* From the perspective of urban planning, the authors place us in front of the current trend to use more and more technology, particularly ICT (hardware and software), to attend to the daily and emerging needs in cities. The authors question: what relationship exists between the ‘smart city’ and ‘resilient city’ models? Does advancing in the direction of the first necessarily imply moving in the direction of the second? How different conceptual approaches to smart cities contribute to enrich the debate on the improvement of urban resilience? Looking for answers to these questions, the authors identify, through an extensive bibliographic review, the root or founding concepts in both fields for then submit them to a conceptual correlation study. This is how the authors invite us to reflect on (a) whether one concept contains or complements the other? (b) the points of closeness and distance between them and (c) the need to conceive new concepts in urban planning: theories and models. The authors issue a warning about the great diversity of approaches (academic, institutional and market) that converge in the definition and deployment of both concepts. By locating it as a field in which economic and political interests compete, the authors invite us not to lose sight of the fact that the ultimate goal must be people’s ‘quality of life’ and not to be carried away by superficial and fashionable definitions derived from a reductionist

tendency that overestimates the role of technology (technocentrism) for the design and operation of cities. As the reading progresses, the chapter explores and reveals the semantic field of many of the terms through which, later, the various authors of the book will gradually develop the theoretical-methodological field of urban resilience.

Chapter 2: *Framing 'Resilient City': Systemic Versus Community Focussed Interpretations of Urban Climatic Resilience*. Using the notion of 'paradigm', the author seeks to make explicit what characterizes, and at the same time makes different, two approaches that aim to guide urban resilience: (a) systemic: engineering perspective oriented by urban infrastructure and (b) communitarian: sociological perspective, oriented by culture and of social action patterns. The chapter begins by contextualizing the risks for the urban environment associated with climate change and then introduces the notion of resilience as useful to face it. However, it warns us that being a multi-factorial and complex property, the implementation of actions that seek to increase resilience has the potential to impact, positively or with collateral damage, the daily life of citizens, as well as various urban dimensions (aesthetic, spatial, of infrastructure, economic and business, among others). To characterize both paradigms the authors initiate a reflection aimed at answering the following questions: What is the problem? For whom is this a problem? What are the most important causes of this problem? What important values are being threatened? What should be done and by whom? Throughout the chapter, it will be clear that different paradigms will lead to the selection of different aspects of a perceived reality and promote particular definition of the problems, causal interpretations, moral evaluations, and action recommendations for solving problems. It is due to this power implicit in the paradigms that when they are unconsciously used by the various urban actors and agents, the negotiation can lead to a 'dialogue of the deaf' in which the most powerful or persuasive actors impose their points of view and particular interests. The author concludes by inviting us to use both 'frames' in an eclectic and dynamic way, maximizing synergy and reducing disadvantages among them in each city intervention particular situation.

Chapter 3: *Townscape Catalogues Toward Urban Resilience and Sustainability*. The authors place their reflection in a scenario in which urban planning and its agents are affected by deficiencies and limitations that have made it difficult to stop and reverse current trends in which the carrying capacity in socio-ecosystems is continually exceeded by impacts of the activity of the human being. This lack or inadequacy of urban planning threatens the landscape image and, therefore, endangers cultural-natural heritage and environmental balance. Against this background, the Townscape Catalogue is presented as an urban planning-management instrument developed with an orientation towards caring for the environment and well-being of the citizenry. Assuming a transdisciplinary view of the complex systems, the analysis of the landscape is taken as the core framework for integrating various sources of information: field observation, aerial photography, satellite analysis, historical documentation, socio-environmental statistics, surveys, and interviews. The Townscape Catalogue is developed in three stages: diagnosis, characterization, and evaluation; in these, the urban landscape is studied through its tangible and

intangible components, assessing its value, dynamics, and quality condition, which allows to classify its various regions as vulnerable, protected or with opportunity and consequently propose actions for its preservation, recuperation, and enhancement. In this way, the Catalogue may entail a path to the construction of ‘flexibility and resilience patterns’ of a part of the city; ‘buffer’ sectors for the recovery, mediation, and endurance of systemic urban impacts; and the detection of landscape components which are apt to articulating the organic operation of flexible urban areas. This is how the Townscape Catalogue becomes a tool for the analysis and feedback between instances of designs and transformation of the city. The initiative is illustrated through the case study of Suquía River in Córdoba, Argentina.

Chapter 4: *Building Resilient and Sustainable Cities Starting from the Urban Transport System*. As the chapter progresses, the underlying complexity of urban resilience phenomena is showing by the authors: the complex nature of operations that support daily life in urban systems not only generates the potential for unforeseeable failures and cascading effects, but it also creates unexpected opportunities for acts of disturbance, as well as terrorism. Given this scenario, an interdisciplinary experience is presented that, under the ‘resilience engineering’ approach and the use of ICT, proposed the design and implementation of an information management system that supports decision making, in real time, to strengthen resilience of the Urban Transport System (UTS) in Florence, Italy. In the words of the authors, currently UTS have to cope with significant vulnerabilities: ageing infrastructure; multiple relevant dimensions, actors, metrics, and decision makers; increasing concentration of populations; interdependencies among the physical and cyber infrastructures; multimodal transport stations with potentially hazardous facilities; growing threats of climate change and terrorism. The challenges to UTS resilience reside then in the ability to monitor and control the available resources and the capacities to coping with performance variability, in expected and unexpected scenarios. The Application Framework is aimed at defining indicators (operationalize resilience parameters), create guidelines, methods, and tools to manage the phases of urban resilience, namely: preparation, reaction, adaptation, and learning. To achieve this, it is necessary to implement models, algorithms, and rules for data mining and analysis; predict network evolution; learn and anticipate events that could lead to a failure and communicate those to the monitoring and actuation components, thus ensuring an adequate response (following predefined guidelines) to disturbances. The case of UTS on Florence, Italy, generously illustrates the complicated reliance that urban resilience has on the infrastructure that supports and provides services to the city.

Chapter 5: *Creating a Resilient City: A Community Focused Approach in Bogota, Colombia*. The author changes the ‘systemic’ approach, dominant in previous chapters, and places us in front of a “community” one, from which he approaches urban resilience with an ethnographic, holistic, and transdisciplinary perspective. Taking as a starting point a general notion of resilience: ‘Ability of a biological being, system, structure, person, or community, to positively adapt and bounce back despite significant threat or stress’ the author presents the case of two vulnerable

communities in the city of Bogotá, Colombia: (a) the community of a Lesbians, Gays, Bisexuals and Transgender (LGBT) Care Centre, and (b) a community served by the District Institute of the Arts (IDARTE). In both cases, the results of contrasting the discourse analysis of the public policy document “Plan de Desarrollo, 2012–2016: Bogotá Humana” against a series of semi-structured interviews applied to diverse stakeholders are shown. The chapter emphasizes the fact that although vulnerable groups are subject to environmental risks such as those associated with climate change, they are also exposed to the onslaught of disease, marginalization, rejection, discrimination, and isolation, as well as intolerance, violence, and indifference. Looking answers for the question: how government can build the necessary tools to contribute community resilience? the author applies a series of ethnographic techniques such as participatory observation, interview, and discourse analysis with the intention of identifying and promoting public policies that increase the level of security, wellness, and resilience of vulnerable groups in urban areas. The author concludes that participation culture, community integration, funding, and social programs are factors that strengthen the community resilience of these groups, while poverty, iniquity, disarticulation, and social indifference are factors that weaken it.

Chapter 6: *Resilience and Sustainability in Urban Socioecosystems: A Conceptual Reflection*. This chapter seeks to put the urban phenomenon, as well as the search for its resilience and sustainability, in the context of the current civilizational crisis. The deep causes of the crisis have their roots in the history of the Anthropocene and extend its branches to the 4.5 million years of the humanization process followed by the homo genus. Although the biological and cultural progress achieved by humans is surprising, in what we can consider as only an ‘instant’ in the history of planet Earth, the progressive appearance of phenomena such as pollution, loss of species, global warming, hunger, disease, poverty and violence has emerged as anomalies of a civilizing model and triggered, since the middle of the twentieth century, an awareness of deterioration as the ‘other side’ of the development coin. The magnitude of the human impact on the planet makes it no longer possible to follow the path of development without taking control of its counterpart of deterioration. To face the crisis and transform it into an opportunity, the human being must accept the challenge of reviewing those models of thoughts and paradigms that from his ‘conceptual world’ (noosphere, social imaginary, worldview, culture) have guided him in his cognitive approach, reflection, and intervention on the ‘real world’. The rest of the chapter flows to answer the questions: What purposes has urban development served, under an anthropocentric approach? What new purposes should aspire to serve if development assumed a socioecocentric approach, oriented towards the resilience and sustainability of socio-ecosystems (wild, rural, and urban)? The author invites us to make the local and global crisis the starting point for the construction of a new development approach, one in which the final beneficiary for the development should be the socioecosystems. To achieve this, the author concludes, it will be necessary to first change our cognitive and intervention approaches, as well as design novel methodologies and instruments to assess resilience and sustainability in socioecosystems.



Chapter 7: *System Approach to Resilience-Based Design: Political Decisions and Steps Towards Antifragility*. The chapter begins with a warning from its authors: variability and randomness are rules and not the exception in everyday life... it is better to live and deal with it, and try to take advantage by using, in a contingent way, various strategies. A review of catastrophic events that took place during the first two decades of the twenty-first century has shown us the fragility that urban systems have in the face of extreme phenomena of both natural and anthropogenic origin. Frequency and magnitude of these catastrophic events have contributed to making evident the need for improving models and tools for evaluating and managing “performance” and “resilience” of urban systems. Nevertheless, one issue remains to be solved: there are no standards, and the needed metrics are difficult to implement. Facing this challenge, authors’ motivation is to help advisers and experts in decision-making of public policies to address the consideration of the different risks that influence resilience in urban areas and therefore in well-being of society. With this statement, the authors begin a search for new paradigms of urban design and planning. They found that the innovative concept of antifragility (Taleb, 2012) – the ability of a system to benefit from the variability of the environment when the latter goes beyond a certain pre-established threshold – has the potential to contribute to facing urban threats or risks. Based on this powerful concept, the authors provide insight, framework, and a set of good practices advises on: (a) system modelling —hazard categories (independent, interacting, and chains of hazards) and time horizons for the analysis (historical, previous, during, aftermath, and log run)—; (b) political decision representation; and (c) data collection. Along with antifragility, the chapter explores other innovative trends as well as emerging instruments in the field of urban design.

Chapter 8: *An Integrated Methodological Framework to Assess Urban Resilience*. Assuming precautionary principle, the authors question the ability of the ‘normal’ (disciplinary oriented view of the positivist science) model to, by itself, approximate and face the complexity that characterizes today to the risks and challenges facing humanity. Instead, they promote ‘post-normal’ (sustainability sciences) model as a complementary alternative. In such direction, they propose a systemic framework to assess resilience in urban and other types of socio-ecological systems that combine the use of indicators, thresholds, dynamic simulation, as well as the assessment of policies, scenarios, and effects of uncertainty. The pretention of the approach proposed is overcome limitations of conventional Decision Support Systems (DSS) and traditional risk analysis that frequently are based on the assigning of weights to each criterion, which are then combined into mixed indexes to find an optimal solution. The approach proposed avoids the use of indexes mixing non-reducible dimensions and, instead, keeps track of the positive and negative effects of each policy or scenario on environmental, economic, social, and institutional factors within the urban concerned as well as their interactions with other local or global socio-ecological systems involved. The establishment of threshold values for each indicator provides a way to identify and assigned the lowest priority – even reject – those policies that would exceed the concerned resilience thresholds. The participation of involved actors, particularly in the first stage (definition of

objectives and indicators) and in the final stage (assessment of policies and scenarios), is essential to build confidence in the indicators system and to increase the stewardship of policy makers and stakeholders in the achievement of the objectives. To support and illustrate proposal, three practical cases are presented: (a) Galapagos Islands, (b) Murcia City and its periurban agro-ecosystem, and (c) Fuerteventura (Biosphere Reserve).

Chapter 9: *Sustainable and Resilience Descriptors for the Xochimilco-Tláhuac Lacustrine Area at México City*. The chapter present a case study that highlights the methodological relevance of build a 'powerful gradient' between (a) description of the current problematic scenario (diagnosis) and (b) goal image or idealized scenario designed for the study-intervention system. The 'gradient' creates a creative potential to identify strategies capable of moving system either: (a) away from the problematic situation (resilience and sustainability low profile) or (b) closer to the idealized situation (resilience and sustainability high profile). The study took place in a polygon located between Xochimilco and Tláhuac, two counts of Mexico City: floodable conservation area that since 1987 takes part of the World Heritage by UNESCO. The polygon is also part of the 'Green Horseshoe', a rural-urban transition region, shaped like half-belt green that borders the southern part of the Metropolitan Zone of the Valley of Mexico, one of the ten largest, complex, and populous urban areas in the world. The project was part of the program Sustainable Integral Metropolitan Zone that in the first decade of the twenty-first century was led by the Ministry of Urban Development and Housing of the Government of Mexico City and integrated an interdisciplinary group of researchers from the Autonomous Metropolitan University with the objective of design and evaluate future scenarios for the Polygon. Based on the Plus Planning Cycle methodology, which integrates experiences from 38 cities and regions affiliated with The Plus Network, the authors developed descriptors, grouped into five types of environments: natural, built, economic, social and government, which were initially used as a framework to describe the current situation and the prospective image of the polygon, to subsequently develop action guides aimed at leading the polygon towards a scenario of resilience and sustainability.

Chapter 10: *Eco-neighbourhoods as a Form of Urban Resilience*. The chapter describes how eco-neighbourhoods began to emerge with the global push for sustainable development in the 1990s and highlights their contribution to urban resilience. The author recovers the criticisms of Jane Jacobs, who in his book *Death and Life of Great American Cities* (1961) wrote about the mistakes of modern urban planning, that have turned neighbourhoods of cheap housing into a place of crime and social despair, and claims that they undoubtedly, in the motivations of the crime there is a substrate of deep and complicated social pressures. Eco-neighbourhoods, state the author, represent a possibility of a resilient and sustainable city, and could provide an example for local governments as well as for inhabitants in the metropolitan areas. As the chapter advances, the author develops concepts as eco-efficiency, habitable city, bioclimatic urbanism, eco-urbanism, eco-neighbourhoods, resilience, and sustainable city. At the same time, an extensive historical review is presented, as well as the description of internationally renowned

eco-neighbourhoods, among others: Puchenau Garden City in Linz, Austria; Solar Village No. 3 in Pefki-Lykovryssi, Athens, Greece; Le ZAC du Raquet in Doai, France; Viikki in Helsinki, Finland; Vauban in Freiburg, Germany; Bedzed in England. As the casuistry is presented, a broad set of principles, criteria, instruments, and factors that act ‘for’ or ‘against’ resilience and urban sustainability are revealed. In concordance with Ester Higuera, and many other pioneers on the subject, the author mentions the following actions implemented in ecological neighbourhoods: closing the cycles of matter and energy; promote identity and social participation; the rehabilitation of the built and cultural heritage; compact and flexible design; connect public spaces to infrastructure; guarantee safe, friendly, and healthy public spaces; and give preference to sustainable mobility.

Finally, we want to share with you, dear reader, that the motivation that led the different authors of this book to share their experiences with you is not satisfied with the presentation of these, but rather aspires to motivate you to start your own search and commitment towards a resilient and sustainable urban development.

February 5, 2021

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