MULTIADAPTIVE PLACES FOR MULTIRISK RESILIENCE

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INDICE/CONTENTS

Forewords
Marichela Sepe, 5

Introduction
Marichela Sepe, 9

Part 1 - Risk, Resilience and Adaptation

Marichela Sepe, Contemporary Risks, 17

Candida Cuturi, Multiple risks and Risk assessment in urban areas. Focus on public space, 23

Marichela Sepe, Multiresilience and multiadaptation, 43

Part 2 - Tools, Methodologies, and Strategies

Marichela Sepe, Multiadaptation Place Design Method, 57

Marichela Sepe, Indexes for Multirisk Places, 65

Giuseppe Mazzeo, Considerations about the Use of Multicriteria Methodology for the Urban Risk Analysis, 73

Giuseppe Mazzeo, Environmental Data of Urban Systems: From Risk Indicators to Planning Indicators, 91

Alberto Romolini, Linda Meleo, Michele Sances, Participatory governance in the digitalization process of a smart and resilient city, 107

Part 3 - Case Studies

Marichela Sepe, Cittaducale and Leonessa, 145

Candida Cuturi, Naples, 173

Francesco Andreottola, Luigi Esposito, Luigi Guadalupi, Aversa, 195

Marichela Sepe, Copenhagen, 221

Marichela Sepe, New York, 251

Guidelines for Multirisk Places
Marichela Sepe, 279

Forewords[1]

Marichela Sepe[*]

This book originates from the PRIN 2020 research project (1) – Sustainable Modelling of Materials, Structures and Urban Spaces Including Economic-Legal Implications (SUMMA), a scientific investigation aimed at systematically deepening the understanding of the complex dynamics that sustain the concepts of resilience and adaptation across the different disciplines that address these themes. The research conducted by the *Urban Impact* unit, initially conceived with a primary focus on seismic risk, progressively expanded its analytical scope, evolving toward a holistic perspective capable of encompassing a broader set of interconnected risks. This expansion made it possible to overcome a merely defensive interpretation of resilience, redirecting it instead toward a dynamic and transformative vision.

The methodological choice not to restrict the investigation exclusively to seismic risk matured from the earliest stages of formulating the research question. It soon became evident that the threats weighing upon terri-

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[1] This work was carried out with the financial support of the Italian Ministry of University and Research (MUR) within the framework of the PRIN2020 Project No. 20209F3A37.

tories and communities cannot be analysed in a sectoral or fragmented manner. Natural phenomena, processes of environmental degradation, and dynamics of cultural and social identity erosion, together with the inaccessibility of places, poor liveability, and urban health issues, frequently interact in a synergistic and cumulative way, producing complex and multidimensional risk scenarios. Consequently, it became necessary to adopt an integrated and cross-disciplinary approach, capable of grasping the full spectrum of vulnerabilities and of analysing their mutual interdependencies. This perspective has made it possible to redefine the very concept of crisis, including not only those arising from natural events such as earthquakes, floods, and phenomena associated with climate change, but also those generated by conditions of poor environmental health and reduced urban liveability, by processes of territorial marginalisation, and, just as significantly, by the loss of place identity. Risks, therefore, have not been interpreted merely as expressions of objective and measurable factors, but rather as outcomes of complex dynamics that also include subjective dimensions, such as individual and collective perceptions, lived experiences, and social representations—elements that contribute to defining both the fragility and the resilience capacity of a given territory.

Building upon this theoretical framework, the research progressively shifted its focus toward the analysis of combined and simultaneous risks, highlighting how the coexistence of heterogeneous threats can generate cumulative and long-lasting effects that are often difficult to mitigate through sectoral strategies. At the same time, a concept of particular relevance emerged: risk should not be conceived exclusively as a condition to be defended against, as an external entity to be contained or neutralised; rather, it can and should be interpreted as a transformative opportunity. Addressing risk thus becomes an occasion to develop strategies for the protection and enhancement of territories and to construct new forms of sustainable adaptation.

An additional methodological aspect of major significance accompanies this vision: the need to consider the role of perception among the users of the spaces under investigation. Risk analysis cannot be limited to the technical-scientific measurement of threats; it must also include an understanding of how such risks are experienced, narrated, and internalised by local communities. The perception of the causes of risk, together with the awareness of the qualities and potential of the territory—whether tangible, such as physical resources and infrastructures, or intangible, such as

cultural heritage and collective memory—constitute essential factors for the development of what may be defined as a conscious form of resilience.

The principal contribution of this research is predominantly qualitative. It focuses primarily on open public spaces, recognised as essential components of the urban and territorial structure. Public spaces are, indeed, places of social interaction, cultural sedimentation, and ecological connection, where resilience may emerge, be strengthened, or, conversely, weakened. They constitute laboratories for the experimentation of new practices of adaptation, social cohesion, and inclusive governance, capable of translating resilience from an abstract principle into a tangible and evolving process within the urban fabric.

Introduction

Marichela Sepe

This volume takes shape within the framework of the PRIN 2020 research project[1] – Sustainable Modelling of Materials, Structures and Urban Spaces Including Economic-Legal Implications (SUMMA), a scientific initiative aimed at systematically and interdisciplinarily analysing the complex dynamics underpinning the concepts of urban resilience and adaptation

[1] The project was developed by five Research Units, coordinated by Valentina Salomoni (University of Padua), with the following responsibilities assigned to each Unit: Valentina Salomoni (University of Padua) Annalisa Maria Greco (University of Catania), Marichela Sepe (National Research Council of Italy, with a subsequent agreement with Sapienza Università di Roma), Illa Sabbatelli (San Raffaele Telematic University of Rome), and Aguinaldo Fraddosio (Polytechnic University of Bari).
The whole project aimed to integrate multidisciplinary expertise to develop reliable analytical and numerical models capable of predicting the behaviour up to collapse of the main construction materials, both traditional and innovative, while also considering interactions with the urban, economic, and legal context.
RU1 investigated the durability of concrete elements using non-local theories and fractional approaches. RU2 developed a simplified inelastic model for multi-storey reinforced concrete buildings, suitable for large-scale seismic assessment. RU3 analysed multiple risks affecting territories, proposing methodologies and guidelines for urban resilience. RU4 evaluated the economic and legal impacts of predictive models in reconstruction and regeneration processes. RU5 applied nonlinear acoustic techniques and advanced models for damage identification and collapse mechanism analysis, with particular focus on historic masonry structures.

(Davoudi, Brooks, & Mehmood, 2013; Vale & Campanella, 2005). The investigation carried out by the Urban Impact research unit was initially conceived with a specific focus on seismic risk; however, over the course of its development, it progressively expanded its theoretical and operational scope, evolving into a holistic research path capable of exploring the interrelations among multiple categories of risk and a wide range of factors – not only environmental, but also social, cultural, economic, urban, anthropogenic, identity-related, and health-related (Jabareen, 2013; Bohland, Davoudi, & Lawrence, 2019). This broadening has made it possible to articulate a more comprehensive and integrated vision of urban resilience, overcoming the notion of a merely emergency-based response and steering the research toward a dynamic, adaptive, and regenerative paradigm (Zolli & Healey, 2012; Borsekova & Nijkamp, 2019). Within this framework, resilience is not conceived as the simple restoration of a pre-crisis state, but rather as an opportunity to rethink and regenerate places, enhancing their intrinsic qualities and fostering a sustainable balance among safety, social well-being, and environmental protection (Banica, Kourtit, & Nijkamp, 2020; Sepe, 2020, 2023).

The main objectives of the Urban Impact Unit (ISMed-CNR) have focused on defining and mapping risks and their potential overlaps within the study sites, identifying areas most vulnerable to the simultaneous presence of multiple risks, designing and testing innovative methodologies for the analysis and transformation of these spaces, and developing operational guidelines aimed at resilience and adaptation in multirisk urban and territorial contexts (De Roo & Porter, 2007; De Roo, Yamu, & Zuidema, 2020). In order to frame the research themes within a holistic and integrated perspective, first reference was made to two fundamental conceptual frameworks of contemporary international policy: the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development (United Nations, 2015; UN Department of Economic and Social Affairs – Sustainable Development, 2015) and the New Urban Agenda adopted by UN-Habitat (United Nations, 2017).

Resilience represents a transversal and foundational principle of the 2030 Agenda. Although it does not appear as an autonomous goal, it is deeply intertwined with the overall structure of the Sustainable Development Goals, since the capacity of individuals, communities, institutions, and ecosystems to withstand, adapt, and transform in the face of environmental, economic, and social crises constitutes an indispensable condition for achieving equitable, inclusive, and long-lasting development (United Nations, 2015). The Agenda adopts a systemic view of

resilience, understanding it not merely as a reaction to shocks but as a structural mechanism aimed at strengthening sustainability and territorial cohesion at all scales (Davoudi et al., 2013; Banica et al., 2020). In this sense, several SDGs explicitly refer to resilience: Goal 1 ("No Poverty," target 1.5) calls for strengthening the resilience of vulnerable populations to disasters; Goal 2 ("Zero Hunger," target 2.4) promotes resilient agricultural practices and sustainable food production systems; Goal 9 ("Industry, Innovation and Infrastructure," target 9.1) urges the construction of reliable, sustainable, and resilient infrastructure; Goal 11 ("Sustainable Cities and Communities," target 11.b) encourages integrated urban policies for mitigation and adaptation to climate change; and Goal 13 ("Climate Action," target 13.1) places resilience and adaptive capacity at the centre of global climate strategies. Furthermore, other goals—such as Goal 3 ("Good Health and Well-being"), Goal 4 ("Quality Education"), and Goals 8 and 12 ("Decent Work and Economic Growth" and "Responsible Consumption and Production")—implicitly reinforce the systemic dimension of resilience through the promotion of circular and adaptive economic models (Desouza & Flanery, 2013).

The methodological approach adopted by this research is equally rooted in the principles of the New Urban Agenda (United Nations, 2017), a programmatic document of the United Nations that sets forth a vision of sustainable and resilient urban development consistent with the objectives of the 2030 Agenda. The New Urban Agenda acknowledges that cities and human settlements today face unprecedented challenges—natural and human-made disasters, climate change, unsustainable consumption and production patterns, biodiversity loss, and growing pressures on ecosystems—and identifies resilience as a systemic capacity for adaptation, prevention, and transformation (Vale & Campanella, 2005; Jabareen, 2013). In particular, paragraph 67 commits States to promoting the creation and maintenance of well-connected networks of green, safe, accessible, and multifunctional public spaces, in order to enhance urban resilience to disasters and the impacts of climate change, while improving health, social cohesion, and the quality of the urban environment (Gehl, 2010; Carmona, 2019). Paragraph 111, in turn, extends this vision to the housing sector, urging the adoption of effective regulatory frameworks that include resilient building codes and planning instruments designed to ensure safety, accessibility, energy efficiency, and sustainability, while countering speculation and urban marginalisation (United Nations, 2017).

In light of these theoretical frameworks, the research has developed two key concepts—multiresilience and multiadaptation—which are essential

to interpreting contexts characterised by interactions among multiple, overlapping risks (Borsekova & Nijkamp, 2019). These concepts promote an inter-scalar, interdisciplinary, and place-based approach, aimed at constructing adaptive strategies that are both context-specific and integrated (De Roo & Porter, 2007). In this direction, the original Multiadaptation Place Design Method (Sepe, 2022) was ideated as a nine-phase protocol conceived to analyse and design adaptation and regeneration strategies in multirisk areas. This methodology has been tested in several urban contexts — including the historic centres of Naples, Aversa, Cittaducale, and Leonessa; the waterfronts of New York; and the public spaces of Copenhagen and New York — allowing the refinement of the method and the development of guidelines for multiadaptation based on two key principles: flexibility, understood as the ability to adapt to different types and scales of risk, and specificity, understood as the need to tailor each intervention to the unique characteristics of the local context (Sepe, 2013; Sepe, 2023).

The research process also led to the definition of different kinds of indices. As regards those related to the Multiadaptation Place Design Method, the MRPI – MultiResilience Place Index and MPI – Multiadaptation Place Index were ideated to measure the capacity of a place exposed to multiple risks to maintain or restore a dynamic balance, while simultaneously enhancing its identity and regenerative qualities (Sepe, 2022). Both MRPI and MPI represent the synthesis of the methodological approach developed, providing operational tools for both assessing the level of resilience and adaptive capacity of a territory and for guiding urban planning and management decisions.

This volume thus constitutes the outcome of a comprehensive and interdisciplinary research process that seeks to transcend the traditional conception of risk as a mere threat, reinterpreting it instead as an opportunity for innovation and transformation (Zolli & Healey, 2012; Banica et al., 2020). In this sense, risk becomes a catalyst for design reflection and a lever for urban regeneration, capable of generating new equilibriums between safety, quality of life, environmental sustainability, and social cohesion. The text is structured into three main sections and a concluding part dedicated to guidelines: the first, *Risks, Resilience and Adaptation*, introduces the theoretical foundations of multiresilience and multiadaptation; the second, *Tools, Methodologies and Strategies*, explores the methods developed during the research, such as the Multiadaptation Place Design Method and related indexes, and a smart governance model; the third, *Case Studies*, presents the applications across different urban contexts. The final section presents the principles for multiresilient and multiadaptive design, offering operational

guidelines for the development of urban strategies in multirisk contexts. These principles have been conceived as flexible and dynamic operational tools, capable of continuous evolution in response to the changing configuration of risk systems and the transformation of local communities' modes of response and adaptation.

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