Urban and Territorial Resilience. Urbanism Facing Crisis

Silvio Cristiano
Department of Architecture, Università degli Studi di Firenze, Florence, Italy
silvio.cristiano@unifi.it
orcid.org/0000-0002-8817-4229

Isabella Trabucco
Department of Architecture, Università degli Studi di Firenze, Florence, Italy
isabella.trabucco@unifi.it
orcid.org/0009-0007-8009-6362

Libera Amenta
Department of Architecture, Università degli Studi di Napoli Federico II, Naples, Italy
libera.amenta@unina.it
orcid.org/0000-0002-0885-2326

Ilaria Cazzola
Interuniv. Dept. of Regional & Urban Studies & Planning, Politecnico di Torino, Turin, Italy
ilaria.cazzola@polito.it
orcid.org/0009-0002-1826-1295

Benedetta Giudice
Interuniv. Dept. of Regional & Urban Studies & Planning, Politecnico di Torino, Turin, Italy
benedetta.giudice@polito.it
orcid.org/0000-0001-5289-3590

Carlo Pisano
Department of Architecture, Università degli Studi di Firenze, Florence, Italy
carlo.pisano@unifi.it
orcid.org/0000-0001-8082-789X

Michelangelo Russo
Department of Architecture, Università degli Studi di Napoli Federico II, Naples, Italy
russomic@unina.it
orcid.org/0000-0003-4799-2505

Daniele Vettorato
Institute for Renewable Energy, EURAC, Bolzano, Italy
daniele.vettorato@eurac.edu
orcid.org/0000-0002-5482-1723

Federica Vingelli
Department of Architecture, Università degli Studi di Napoli Federico II, Naples, Italy
federica.vingelli@unina.it
orcid.org/0000-0002-7884-2510

Angioletta Voghera
Interuniv. Dept. of Regional & Urban Studies & Planning, Politecnico di Torino, Turin, Italy
angioletta.voghera@polito.it
orcid.org/0000-0002-0166-3303

DOI: 10.36253/contest-16978

keywords
urban and metropolitan settlements
climate mitigation and adaptation
spatial multi-risk
spatial resilience
landscapes
urban and regional sustainability

1. Urbanism Facing *Crises* and Multi-Risks

Cities and landscapes are undergoing an ever increasing number of often intertwined crises, which urbanism and territorial governance are called to fully understand and to timely and effectively address, in order to protect – in advance and/or in the midst of an emergency – the health and the sound operation of the spatial systems in which human and non-human societies can only live and flourish, i.e. the ecosystems upon which everything

Cities and landscapes are undergoing an ever increasing number of often intertwined crises, which urbanism and territorial governance are called to fully understand and to timely and effectively address, in order to protect – in advance and/or in the midst of an emergency – the health and the sound operation

of the spatial systems in which human and non-human societies can only live and flourish, i.e. the ecosystems upon which everything depends: the ecological, the social, and the economic spheres, and with them the cultural, the political, etcetera. Spatial multi-risk has been the core of the scientific activities taking place within the Spoke number 5 "Urban and metropolitan settlements" of the extended partnership project "RETURN – multi-Risk sciEnce for resilienT commUnities undeR a chaNging climate". This special issue brings together studies and perspectives from those scientific activities, connected projects, and topic-relevant parallel studies, expanding much beyond the original idea to collect the proceedings of the special session "Urban and territorial resilience: from measuring to building planning solutions", organised by most of this issue's Guest Editors (Amenta, Cazzola, Cristiano, Giudice, Trabucco, & Vingelli) within the 63rd Congress of the European Regional Science Association (Terceira, Portugal, 26–30 August 2024).

depends: the ecological, the social, and the economic spheres, and with them the cultural, the political, etcetera. Spatial systems can be seen as the hybrid constellation of infrastructural, ecological and socio-political that sustains human-habitability on Earth; yet, non-human life often adapts and reorganises itself even when such systems fail (cfr. Ahern, 2011, and Holling, 1973). Revealing this asymmetry, calls for an humbler stance towards spatial governance and practice – one that looks at ecosystems not just as support to humans and their activities (however apparently not even so widespread) but also sees urban processes as connected and unavoidably dependent on ecological systems and their processes. More catastrophic events were recorded in the first twenty years of the 21st century compared to the previous two decades (UNDRR, 2020). Matched with problematic spatial choices over time, the ongoing climate crisis is bringing more and more disasters, with other existing crises (ecological, energy, resources, socio-economic, geo-political, etc.) standing out as relevant while trying to anticipate and handle them (Cristiano, 2022a; 2022b), both as additional causes and as crucial factors in addressing them over time (Trabucco & Cristiano, in this issue). The "problematic spatial choices" are those planning decisions, land-use policies, design decisions that tend to amplify hazards by constraining the adaptive capacities of the landscapes and ecosystems wherein they are enacted. Resilience (Holling, 1973, and espe-

cially its spatial declination (Davoudi, 2013), is conceived as a useful concept for dealing with the current crises, such as the climate one (Davoudi *et al.*, 2013), but not limited to that, and the related exposure to risks. However, too often resilience is still used as a vague concept, and requires a deep understanding of its spatial implications by framing it as a dynamic and transformative process that requires (much more than just technical) innovation and adaptability, especially in an uncertain century of interconnected crises. This special issue of *CONTESTI. Città, territori, progetti* was originally aimed at collecting the outcomes of the special session "Urban and territorial resilience: from measuring to building planning solutions", organised and chaired by some of the Guest Editors of this special issue on the occasion of the 63rd Congress of the European Regional Science Association (ERSA), held in Terceira, Portugal, in 26–30 August 2024. The entire special issue was conceived and developed within the Extended Partnership project funded by the European Union's *Next-GenerationEU* "RETURN – multi-Risk sciEnce for resilienT commUnities undeR a chaNging climate", Spoke TS1 "Urban and Metropolitan Settlements", whose research agenda focuses on the integration of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) within spatial planning and design, where Disaster Risk Management (DRM) is interpreted as a circular, systemic process linking prevention, preparedness, response, and recovery, and requiring multi-level governance as well as place-based and multi-risk approaches. The original idea of elaborating the ERSA special session proceedings was actually expanded while getting to this publication, by refining the works, submitting them to anonymous peers, and also bringing together researches and perspectives from other scientific activities within RETURN and connected projects, as well as topic-relevant parallel studies. From its conceptualisation through to its , the present special issue has aimed at contributing to a more comprehensive understanding of spatial resilience and at providing valuable insights for developing practical solutions in the current climate crisis. In particular, the issue has sought to explore methods and tools to evaluate the effectiveness of adaptation and mitigation strategies in enhancing territorial resilience in multi-risk contexts and to define a better quality of life for local communities; to clarify the concept of urban and territorial resilience, deepening the mutual influences between resilience and other concepts; to showcase case studies attempting to build resilient territorial systems; to identify and test metrics to provide a comprehensive understanding of strengths and weaknesses within the territorial system through the research and collection of progress, response, and efficiency indicators capable of measuring resilience while facing multiple crises and multiple risks. As a matter of fact, on top of climate-related threats, the collected papers show how spatial resilience

must contend with intertwined risks – environmental, technological, metabolic, and socio-spatial ones, thus highlighting the plurality of critical conditions that shape contemporary territories (i.e. case studies such as Terra dei Fuochi, Bagnoli-Coroglio, the Campi Flegrei cultural landscapes, Ostiense's energy poverty conditions, or the brownfield palingenesis analysed in this issue). Finally, this special issue confirms that long-sighted urban, metropolitan, and regional resilience is undergoing a profound epistemological shift, moving away from engineering-based and sectoral interpretations toward ecological, socio-technical and metabolic frameworks (see e.g. contributions by Brunetta *et al.*, Amenta *et al.*, De Martino *et al.*). This shift calls for new ontologies of urban systems, and related adequate cautious urban planning and design choices, capable of engaging with cycles, thresholds, uncertainties, and the non-linear dynamics of socio-ecological assemblages, so as to consciously avoid spatial collapse and timely prevent and mitigate disasters here and now.

2. Urban and Territorial Resilience: theoretical contributions

The theoretical contributions collected in the "Essay" section of this special issue delineate the complex and evolving landscape of urban and territorial resilience, a field marked by continuous conceptual and operational transformation. The special issue investigates the increasingly necessary convergence between Disaster Risk Reduction and Climate Change Adaptation, a nexus that demands innovative policy frameworks and territorially situated forms of intervention. Collectively, the contributions reveal a discipline undergoing a profound epistemological reconfiguration, one that questions established paradigms and advances a more ecological, systemic, and situated understanding of resilience (Brunetta & Voghera, 2023).

The opening contribution, the review by **Trabucco and Cristiano**, underscores that many contemporary approaches to spatial resilience are still constrained by sectoral and engineering-oriented models that struggle to engage with socio-spatial dynamics and the complexity of planning practices. These approaches often rely heavily on technical performance metrics that lead to a fragmented and reductionist understanding of resilience. Against this backdrop, **Ranzato** advocates for a radical shift in perspective by inviting us to "embrace disruption". In this interpretation, disruption and infrastructural anomalies (such as the urban lakes and connected spontaneous ecosystems produced by technical errors in Brussels and Rome) become epistemic openings that reveal latent dimensions of the contemporary city, such as non-human agencies and neglected ecological relations. From this viewpoint, resilience becomes the ability to coexist with uncertainty and to recognise the generative potential embedded in conditions that are usually considered marginal or problematic.

The community dimension, developed in **Daniel**'s contribution, emerges as a second critical axis. Her work on citizen science shows how practices such as citizen-generated data, participatory risk perception, and collaborative adaptation enable communities to operate as genuine social infrastructures of resilience. These processes challenge top-down governance models and counter the technocratic fragmentation identified earlier, demonstrating the democratic and transformative potential of co-produced knowledge. Despite the persistent limitations in participation, Daniel proves that co-produced and situated knowledge, rooted in everyday practices, are essential to resilient spatial systems. In this way, her contribution challenges top-down governance models and counters the technocratic fragmentation identified by Trabucco and Cristiano.

A third strand concerns methodological innovation. **Ridolfi *et al.*** reconceptualise risk as an opportunity for design, presenting the "L methodology", which integrates multi-level strategic frameworks with multi-risk territorial diagnoses. Their work shows how risk can function as an interpretative matrix capable of revealing vulnerabilities, orienting decisions, and structuring adaptive strategies. This approach displaces the notion of territory as a passive support, instead positioning it as a dynamic assemblage whose hydrological, ecological, and metabolic processes actively shape risks and opportunities. Building on this perspective, **Amenta *et al.*** introduce the concept of metabolic risk. Their framework shows how marginal, abandoned or contaminated spaces act as metabolic agents, accumulating fragilities while also embedding latent regenerative potential. Using multidimensional indicators and co-creation processes, they demonstrate how these "waste" territories can become laboratories for circular and resilience-oriented transformations. A related contribution by **De Martino *et al.*** centres water as an active territorial agent. Their framework for multi-risk territories proposes water-adaptive (amphibious) approaches that require new design languages capable of engaging with cycles, thresholds, and instability. Their urban laboratories demonstrate how adaptive scenarios, perceptual mapping, and co-design practices can generate innovative territorialities.

Temporal framings of risk are elaborated by **Clemente and Puzone**, who insist that resilience be articulated across all phases of the risk cycle: prevention, preparedness, response, and recovery. While this orientation on structured temporal strategies may appear in contrast with Ranzato's valorisation of unpredictability and disruption, both ultimately converge on a processual understanding of resilience: crises are neither interruptions nor isolated events, but rather components of iterative and open-ended trajectories that demand both openness to contingency and the construction of tools to steer it over time. Finally, **Pisano** emphasises the epistemic role of design. Drawing on the experiences of the "Prato Ready" Laboratories, he argues that design should be understood not merely as a means

for producing spatial or technical solutions, but as a cognitive and reflective device capable of generating knowledge, surfacing tacit processes, and interrogating complex spatial dynamics. Pisano's perspective, emerging out of the educational approaches by a wider team of Florence's faculty members, resonates with the experimental, iterative, and speculative logics that recur across the special issue – from Ranzato's revalorisation of disruptions to De Martino *et al.*'s water-responsive approaches, from Ridolfi *et al.*'s multi-risk reading to Daniel's co-production of knowledge.

Taken together, these contributions articulate a significant paradigm shift. Urban and overall spatial resilience emerges not as a linear or technocratic response to risk, but rather as an open, iterative, transdisciplinary, and deeply territorial process (Brunetta *et al.*, 2019). It weaves together ecological dynamics, socio-spatial practices, and heterogeneous epistemologies, transforming crises from objects of mitigation into generative conditions for reimagining how territories are inhabited, designed, and governed amidst ongoing transformations – be the latter chosen or not.

3. Urban and Territorial Resilience: case-based contributions

Building upon the critical reconceptualisation of resilience articulated in the "Essays" section, the Research section stands as its methodological and empirical testing ground. This section gathers contributions that shift the focus of the debate from the conceptual framing of resilience to its effective measurement and implementation, proposing and testing methodologies, tools, and planning solutions within real territorial contexts and ongoing research. The selection of the articles presented in this section has been guided by the search for rigorous case studies that, far from being limited to a mere description of risk scenarios, could offer operational approaches for building resilience in contemporary territories.

The gathered contributions investigate and test a diversity of territorial conditions, using diverse and appropriate scales of study. Cases range from dense, historic centres, such as Rome or Turin, to peri-urban and coastal areas, and large former industrial areas. Indeed, the section contributes to the aim of the special issue - providing insights for practical solutions in the current risk condition – specifically by understanding and measuring impacts on the territorial and communities' metabolism and form (Wachsmuth, 2012; Bahers, 2022). While shared threats, such as climate change and natural hazards, affect all examined territories; nonetheless, their specific manifestation is highly context-specific, demanding a multi-scalar and systemic perspective for comprehensive understanding. At the local scale of historic centres, the focus sharpens on climate justice impacts among vulnerable populations, suggesting the development of more effective participatory approaches. Conversely, at the territorial scale, strategic development opportunities clearly emerge, linked to multi-level governance and the closure of urban metabolic

cycles in a circular perspective (Amenta *et al*., 2022). This framing elevates the significance of landscape, "green and blue infrastructure", and natural cycles, generating a necessary dialectic that places human and non-human communities in tension, mediating between emergency risk regimes and the pursuit of everyday comfort in contemporary cities (Wu, 2013).

The methodological and operational focus of this section converges into three principal research streams. These streams not only help harmonise the current body of work but can also pave the way for future advancements in territorial resilience, providing a robust framework for multi-risk and context-based studies:

1. **Developing methodologies and indicators for planning**: a first portion of these contributions concentrates on the measurement and mapping of resilience, providing analytical tools that effectively translate the concept into actionable territorial governance. Foremost, the work by **Vingelli *et al.*** addresses the need for a more inclusive approach, moving beyond purely economic metrics. They propose a methodological framework for the identification and evaluation of Non-Economic Loss and Damage (NELD). This research extends the NELD concept typically tied solely to climate risk, offering critical instruments to recognise the intangible dimensions of loss within multi-risk urban regeneration contexts. Consistent with the goal of operationalising resilience, **Cazzola *et al.*** develop a spatial indicator approach to map urban resilience responses across five key dimensions in Turin, delivering a holistic and multi-dimensional assessment. Complementarily, **Brunetta *et al.*** propose a methodological framework that defines Local Resilience Units based on urban proximity. This offers a practical and scalable planning tool that overcomes operational limitations, firmly anchoring resilience to a defined and local scale of intervention.
2. **Governance, Spatial Justice, and socio-climatic vulnerability:** while methodologically grounded in the study of urban form and space, these papers primarily address the political and social dimension of risk, highlighting how interconnected crises translate into socio-spatial inequalities that severely stress the adaptive capacity of communities. **Del Duca *et al.*** conduct a climate risk analysis focused on Urban Heat Islands, specifically addressing the impact on Urban Health in the Florence Plain. Similarly, **Panella** explores the relationship between adaptive climates and energy poverty (Ostiense, Rome), critiquing the technological rationalism of comfort and demonstrating how climate risk translates into socio-economic inequality at both the domestic and urban scales. Managing such complexity necessitates a paradigm shift in governance and design processes. **Bruno *et al.*** examine the integration of spatial analysis and participatory processes to enhance climate change resilience emphasising the crucial role of local action and robust governance. Finally, **Guida and Bocchino** tackle

the management of areas exposed to latent and declared risks such as environmental contamination and social disruption. Their work introduces the concept of "Malleable Territories" and proposes regenerative solutions that demand adaptive and innovative planning capable of embracing contextual uncertainty and dynamism in metropolitan areas.

3. **Environmental Regeneration, Design, and Landscapes at Risk**: the final set of contributions concentrates on the active and transformative role of design and landscape as a tangible response to risk. **Isola *et al.*** analyse the function of Urban Green Infrastructures and the provision of ecosystem services (e.g., flood control) in Cagliari, providing a methodology to quantify the benefits of Nature-Based Solutions in risk mitigation. A complementary perspective is offered by **Piccirillo *et al.***, who reflect on the potential for spontaneous regeneration - rewilding (Pereira & Navarro, 2015) - of brownfields, framing these sites as experimental laboratories for environmental justice and community engagement in transformation processes. The concept of risk is also extended to cultural heritage: **Castigliano *et al.*** employ resilience as a unifying concept to connect cultural heritage preservation with landscape ecology. They invite a rethinking of cultural landscapes not as static "silent ruins," but as dynamic systems capable of adaptation. Concluding the section, **Di Palma *et al.*** bring the focus back to the central role of architectural and urban design within "landscapes at risk," suggesting a form of design that acts as a mediator between the built environment and environmental dynamics, promoting new forms of spatial equilibrium as a tangible response to crises.

The contributions in the Research section clearly suggest that building urban and territorial resilience cannot be reduced to a mere technical-quantitative exercise. The commitment to identify and measure the socio-spatial dimension of risk – from quantifying intangible loss to mapping vulnerability differentials (such as Urban Heat Islands and energy poverty) – reveals a strong and necessary orientation toward spatial justice as the fundamental prerequisite for an effective crisis response.

In this framework, the essential role of public space, landscape, and the environment emerges forcefully. Nature-Based Solutions are consequently presented not as mere allusive procedures, but are grounded in concrete significance through innovative and pertinent design approaches. Design is thus reframed not simply as a technical exercise, but as a critical lever for developing universally accessible solutions capable of strengthening both social cohesion and ecosystem relationships within the urban metabolism. The selection of complex case studies validates this critical stance. The empirical evidence collected casts a powerful bridge toward the next section, underscoring the necessity for policies, design

and evaluation instruments that fully grasp the utility and the transformative force in this context-based and multi-risk perspective.

4. The significance of this special issue in operationally pursue Urban and Territorial Resilience

Beyond the specific contexts and methodologies explored, this issue points toward a broader research and action agenda. The (re) conceptualisation of resilience as a spatial, socio-ecological and more-than-human process, demands experimental frameworks capable of linking disaster risk reduction, climate adaptation, spatial-climate justice and ecological regeneration in situated and diacronic manners. Several research trajectories – including those developed within the RETURN project and by the Guest Editors – are already developing and testing such approaches. Rather than offering definitive answers, the gathered contributions suggest that operationalising urban and territorial resilience means working with living territories, multispecies assemblages, where urbanism – facing crisis (and hopefully not *contributing to* those crises) – is called to sustain those living environments and entities that populate them within changing and uncertain times. In this sense, this issue is not an endpoint, but an invitation to further experimentation and testing across territories, scales, and disciplinary boundaries. The contributions that are part of the present special issue will hopefully serve as theoretical and practical examples and sources of inspiration for scientists, professional practitioners, and public administrations genuinely seeking to enhance spatial resilience in their respective contexts. The next operational editorial, in Italian, strives to link the contents, learnings, and meta-learning associated with this special issue starting from a critical reading and interpretation of an ongoing urban transformation debate in Rome, Italy, exhibiting multiple risk and resilience dilemmas.

Attributions

Concept and structure: S.C & I.T.; section 1: first draft by S.C., editing by D.V. & I.T., review by I.T., C.P. & S.C.; section 2: first draft by I.C., editing and review by I.T., B.G., S.C. & A.V.; section 3: first draft by F.V., editing and review by I.T., L.A. & M.R.; section 4: I.T. & S.C.; overall coordination, editing, and review: S.C.; fund acquisition: S.C., B.G., C.P., M.R., A.V.

Acknowledgements

This publication is an outcome of the activities carried out within the RETURN Extended Partnership and received funding from the European Union Next-GenerationEU (Italian National Recovery and Resilience Plan – NRRP, Mission 4, Component 2, Investment 1.3 – D.D. 1243 2/8/2022, PE0000005).

References

Ahern, J. (2011). From fail-safe to safe-to-fail: Sustainability and resilience in the new urban world. *Landscape and Urban Planning, 100(4)*, 341–343

Amenta, L., Russo, M. & van Timmeren, A. (2022). *Regenerative Territories: Dimensions of Circularity for Healthy Metabolisms* (pp. 1-27). Springer Nature.

Bahers, J.B., Athanassiadis A., Perrotti D., & Kampelmann S. (2022). The place of space in urban metabolism research: Towards a spatial turn? A review and future agenda. *Landscape and Urban Planning, 221*: 104376.

Brunetta, G., Ceravolo, R., Barbieri, C., Borghini, A., Carlo, F D., Mela, A., Beltramo, S., Longhi, A., Lucia, G D., Ferraris, S., Pezzoli, A., Quagliolo, C., Salata, S., & Voghera, A. (2019). Territorial Resilience: Toward a Proactive Meaning for Spatial Planning. *Sustainability*, 11: 2286. https://doi.org/10.3390/su11082286

Brunetta G. & Voghera A. (2023). Post-pandemic Challenges. The Role of Local Governance for Territorial Resilience, In: Brunetta G., Lombardi P., Voghera A., *Post Un-Lock. From Territorial Vulnerabilities to Local Resilience*, The Urban Book Series, Springer, 2023, Cham, ISBN 978-3-031-33893-9, pp. 3-9, https://dx.doi.org/10.1007/978-3-031-33894-6_1.

Cristiano, S. (2022a). *Human settlements in a tough century: some thoughts on urban and regional livelihood supply, morphologies, governance, and power.* In: Moccia, F.D., & Sepe, M. (a cura di). XIII Giornata internazionale di studi INU "Oltre il futuro: emergenze, rischi, sfide, transizioni, opportunità" – 13th INU international study day "Beyond the future: emergencies, risks, challenges, transitions, and opportunities". *Urbanistica Informazioni, 306 s.i.*, novembre-dicembre 2022, ISSN n. 0392-5005, pp. 710–712.

Cristiano, S. (2022b). Advances in the Sustainability and Resilience Interface at the Urban and Regional Levels: Sciences, Plans, Policies, and Actions for the Next Challenging Decades. *Sustainability,* call for special issue. www.mdpi.com/journal/sustainability/special_issues/sustainability_resilience_urban

Davoudi, S. (2013). On resilience. *DisP-The Planning Review*, *49*(1), 4-5.

Davoudi, S., Brooks, E., & Mehmood, A. (2013). Evolutionary resilience and strategies for climate adaptation. *Planning Practice & Research*, *28*(3), 307-322.

Holling, C.S. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics, Volume 4*, pp. 1-23.

Pereira, H.M., & Navarro, L.M. (2015) Rewilding European Landscapes, Earth and Environmental Science, XXI, 227, Springer, https://doi.org/10.1007/978-3-319-12039-3

UNDRR – United Nations Office for Disaster Risk Reduction (2020). *Sendai Framework for Disaster Risk Reduction 2015–2030*.

Wachsmuth, D. (2012). Three ecologies: urban metabolism and the society-nature opposition. The Sociological Quarterly, 53(4), 506-523.

Wu, J. (2013). Landscape sustainability science: Ecosystem services and human well-being in changing landscapes. *Landscape Ecology 28*, 999–1023.