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Disasterville

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Preface by Beniamino Murgante

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To Andrea,
for his love, patience, and support.

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Preface
Emergency urbanism, what role for spatial planning?

by *Beniamino Murgante*

In the late 1960s, the decline of positivism led to a loss of faith in humanity's ability to rationally understand and predict the phenomena of our world, marking the end of the modernist movement in architecture and the golden age of urban planning. This resulted in a new era of urbanism characterised by the emergence of complexity as a new paradigm for managing cities. In this new era, uncertainty and risk coexist, making traditional deterministic approaches to urban planning and design unsuitable for addressing contemporary urban issues effectively.

These issues include prioritising economic growth over community health and well-being and worsening territorial imbalances worldwide. Rapid urbanisation and contraction processes have made urban areas more vulnerable to hazards, increasing the number and severity of slow- and rapid-onset urban disasters. With natural hazards such as droughts, earthquakes, hurricanes, floods, and wildfires becoming more frequent and compounded, the risks and uncertainties faced by cities are pervasive and pose significant challenges to decision-makers and town planners.

Recent events such as the 2023 Turkey-Syria earthquake and the São Paulo floods in Brazil have highlighted the immense challenge faced by emergency responders and planners of rebuilding cities and communities destroyed or severely damaged by disasters without adequate support to guide decision-making.

In light of these circumstances, emergency urbanism emerges as a crucial discipline in emergency management that can help develop and implement effective strategies and solutions to prepare for, and sustainably recover from, urban disasters. By harnessing a diverse array of spatial planning and design strategies, emergency urbanism aids in responding to sudden, unexpected urban crises, such as disasters stemming from natural hazards, conflicts, and pandemics. Its focus lies in the rapid deployment

of adaptive or temporary solutions to address the urgent needs of affected populations. While emergency urbanism can be considered a component of emergency management, it is more accurately understood as a specialised approach within this broader field, wherein spatial planning assumes a crucial role.

Emergency management and spatial planning are thus closely related, with spatial planning playing a critical role in reducing the risk and impact of disasters in urban areas. Since emergency urbanism is part of emergency management, this implies that spatial planning can play an important role in this area as well. Spatial planning involves infrastructure development and the management of land use and environmental resources to achieve sustainable development goals. Concurrently, emergency management involves identifying, assessing, and mitigating potential hazards and risks to minimise the impact of disasters on communities and infrastructure. Effective spatial planning, therefore, can help reduce disaster risk by preventing the development of high-risk areas, ensuring that infrastructure and buildings are designed and constructed to withstand potential hazards, and promoting the development of disaster-resilient communities. Furthermore, it can support an efficient and coordinated disaster response by facilitating the delivery of emergency services, providing access to essential resources, and enabling the rapid recovery and reconstruction of affected areas.

In emergency management, the lack of spatial data availability has been a significant problem in the past. However, the recent years' widespread usage of electronic devices containing geo-referenced information has led to an abundance of spatial data. Various sources have contributed to this wealth of data, including volunteered geographic information activities such as OpenStreetMap and Wikimapia, public initiatives like open data, spatial data infrastructures and geo-portals, as well as market-oriented projects like Google Earth and Bing Maps. These sources have generated more data than needed and, in some cases, have yet to improve decision-making efficiency around technical issues. While the availability of geographical data has soared, this has yet to be fully coupled with increased knowledge to support spatial decisions. The paradox underpinning this significant shift in our civilization is that although we have near-boundless access to information and data, we still struggle to utilise it effectively, as noted by Castels (2009).

This issue appears particularly evident when attempting to generate scenarios using models, as making accurate projections, as quantum physicist Niels Bohr famously observed, is an inherently complex task, especially when it comes to making predictions about the future.

In this book Pezzica reminds us about all these issues, while underscoring the importance of spatial data in emergency management. This crucial aspect has also been highlighted by Saganeiti *et al.* (2017), placing emphasis on the importance of volunteered geographic information – a matter which is closely examined in the latter part of the book. In this way, Pezzica's work connects to recent studies by Saganeiti *et al.* (2020) and Vona *et al.* (2017), which have examined the data produced in damage surveys for building recovery scenarios.

Since the challenges of emergency urbanism are complex and multifaceted, coping with them requires an in-depth understanding of the interplay between social, economic, and environmental factors in cities and the ability to deal with unpredictable shocks rapidly and effectively. To this end, emergency management considerations must be incorporated into spatial planning.

This calls for the collaboration of multiple stakeholders, including government agencies, non-governmental organisations, community organisations, local groups and authorities, and private sector entities. It may also involve using innovative technologies and design solutions to address the specific challenges posed by different types of emergencies. In all cases, the development of comprehensive disaster management plans that integrate spatial data and analysis to identify high-risk areas, assess vulnerabilities, and prioritise mitigation and response efforts, represents an essential aspect of this incorporation.

By effectively combining emergency management and spatial planning, resilient and sustainable communities can be built, capable of withstanding and recovering from emergencies. However, achieving this outcome requires a proactive approach to planning, as demonstrated in two recent studies (Murgante *et al.*, 2021, Murgante *et al.*, 2022). In these studies, we discussed the domains of functionality and dysfunctionality within a system under two hypothetical scenarios: the business-as-usual scenario and the scenario with prevention measures. These domains were described in our 2022 article as being separated by a horizontal axis, representing time; which forms a base model to plot the system's behaviour over time, highlighting key transitions. Before the occurrence of an extreme intensity event, both scenarios were represented as horizontal segments operating within the functional domain, as the needs demanded by society can be satisfied. Subsequently, we used two vertical parabolas with positive concavity (and the vertex located in the dysfunctional domain) to describe the system's rapid decline in functionality, until the system's state moves into the dysfunctionality sector. At this point, two possibilities arise: either

the system collapses because it fails to react to the extreme event, or the system's response allows for a gradual resumption of the functionality, resulting in an upward trend in the curve. However, even in the latter case, the instants marking the system's return to the functionality sector, which signify the end of the recovery period, vary between the two scenarios due to differences in the system's initial state. Consequently, the duration of this recovery period depends on the system's initial state, and, therefore, on the considered scenario. Notably, we observed that the functionality recovery time is shorter in the scenario when prevention measures are implemented, emphasising the importance of such measures in enhancing the system's resilience.

It is quite evident that planning for functionality recovery in a shorter time is an essential aspect of emergency management, as the swift restoration of critical infrastructure and services can help minimise the negative impact of disasters on communities. As pointed out also by Pezzica in this book, several strategies can be employed to achieve this goal, including:

- Pre-disaster planning, that is the development of plans that identify critical infrastructure, services, and resources that need to be restored quickly and can help to prioritize recovery efforts.
- Collaborative partnerships, established with relevant stakeholders to better coordinate and streamline recovery efforts.
- Flexible infrastructure, designed with change in mind is key to ensure that infrastructure can adapt to varying conditions, expediting the restoration of critical services and resources.
- Resilient design, achieved by incorporating resilient design principles into infrastructure development, to help reduce the likelihood of damage and minimise downtime during disasters.
- Recovery efforts' prioritisation, based on the criticality of functions and the availability of resources, to sequence recovery activities and develop a recovery schedule that outlines the order of these activities.
- Use of technology, to identify and quickly respond to infrastructure disruptions, for instance by leveraging real-time monitoring systems and GIS mapping.
- Recovery plans' testing, to ensure that proposals are effective and efficient. This includes conducting regular drills and simulations to identify any gaps in the recovery plans.
- Continuous improvement, via the constant review of recovery plans based on lessons learned from previous disasters and changing conditions.

Overall, adopting a proactive approach and prioritising collaboration, flexibility, and resilience, is crucial in planning for functionality recovery

within a shorter timeframe. By taking these steps, communities can minimise the impact of disasters and recover more quickly.

This work discusses these problems by providing insights into the design and implementation of effective urban emergency management interventions, using formal methods to foster deliberation. Formal methods can provide a systematic approach to decision-making and enhanced analytical capacities, aiding collaboration, and communication among stakeholders. Consequently, they can effectively support technical decision-making under conditions of uncertainty.

By avoiding a separation between process and product, as well as between urban design and planning, which aligns with Camilla Pezzica's multidisciplinary academic background, this book offers us a unique perspective on the critical role of formal methods in emergency urbanism. Pezzica not only provides valuable insights into their application in disaster-prone cities, which she boldly refers to as *disaster cities*, but also draws on real-world case studies and the latest research to offer an important initial contribution in this area. This includes a broad overview of the critical role of specific approaches and methods in advancing evidence-based practices for reducing urban disaster risk.

1. Introduction

1.1. Learning from the past, L'Aquila as an illustrative case

On the 6th of April 2019 the world stopped to remember the hundreds of victims of the devastating earthquake which took by surprise the city of L'Aquila, Italy, at 3.32 in the morning in 2009. The 10th anniversary of the tragedy was not only an occasion to commemorate the event, thank those who helped, and send solidarity messages to the people who were directly affected by the disaster. For many, the anniversary was also an occasion to collectively reflect on what happened on April 6, 2009, what led to that tragic outcome, what was done afterwards in L'Aquila, and what lessons we learnt in 10 years.

The public debate was alive and heated that day. Academics, prominent personalities, politicians, professional experts, and the general public engaged in a broad discussion in person and on television, radio, and social media. These voices contributed to the narrative of the disaster 10 years later and helped building an important record of collective memory around the post-disaster recovery process. The documentaries produced by the media for the occasion, among which "L'Aquila, 03:32 – The forgotten generation" by the Rai (Italian state broadcaster), set the tone, showing that L'Aquila was still a long way from achieving a full recovery, reconstruction, and re-development after the disaster. A variety of opinions, plus different aspirations and sentiments emerged from this spontaneous and uncoordinated public confrontation.

Some preferred to focus mainly on positive aspects. Their messages promoted the territory of L'Aquila and its local products, praised the resourcefulness and courage of local people, pointed at signs of recovery, in some cases showing pictures of those areas where the reconstruction

had been completed. Others, on the contrary, expressed criticism towards politicians for failing to fulfil their initial commitments to expedite the reconstruction, for mishandling the crisis, and, more importantly, for neglecting the needs of the people in L'Aquila (Valent, 2019). In commemorating the event, people shared their lived experiences and personal views. This included first-hand accounts from those affected by previous earthquake disasters, such as the 1980 Irpinia earthquake, which became known for its indiscriminate demolitions and the construction of the so-called "fake towns" (D. Alexander, 1984). These individuals expressed concerns that, even after several decades, the necessary lessons had not been learnt.

Contreras *et al.* (2022) highlight that a negative sentiment towards the post-disaster recovery of L'Aquila prevailed at the time of the 10th disaster anniversary. The unfinished reconstruction was clearly an important contributing factor but not the sole one. The public was also grimly aware of the shortcomings in L'Aquila's post-disaster recovery strategy and in its implementation, as evidenced by references to the scientific discourse which unfolded during the first ten years since the earthquake, expressing criticism about the process. Indeed, the scientific debate around the experience of L'Aquila is as much alive today as it was at the time of the anniversary.

What did we learn from this experience? One thing is that arbitrary urban planning choices based on top-down political decisions made during an emergency are bound to fail. These decisions are usually made from a position of authority, with little regards for contextual factors and the needs and capacities of those affected by the disaster.

In the literature, as well as in the public debate, a main point of controversy are the "new towns": temporary housing settlements made of permanent multi-storey structures which were built by the Italian government to respond to the post-disaster urban housing crisis (fig. 1). The new towns are costly, yet underperforming, high-density residential developments built on farmland and conservation land, distant up to 17 km from L'Aquila city centre. They are spatially segregated (Cutini, 2013), lacking convenient access to services and quality public spaces (Contreras *et al.*, 2017). Moreover, the new towns have suffered a rapid process of physical deterioration (D.E. Alexander, 2019). In light of these facts, they are now widely considered a negative example of disaster capitalism which produces peripheral non-places (Ciccaglione, 2017). In retrospect, Alexander (2019, p. 284) calls the project "a grandiose failure, and destined to be so right from its conception". Teti (2012) also points out that the framing of the new towns as modern settlements offering better living spaces than the old urban fabric, contributed to delegitimise the urban reconstruction efforts.

Furthermore, they hindered the recovery of local communities as they eroded individuals' living habits and their relationship with places, as well as their idea of the city.

The places of L'Aquila were more than just physical spaces; they were the result of a long stratification process, in which human ties were established with the city, its physical components, and its people. Their meaning was created collectively, conveyed through symbols, and remained vivid in the memories of people ten years later. However, the reconstruction and recovery plans for L'Aquila did not adequately consider these aspects, leading many to argue that efforts focused on reconstructing buildings and physical infrastructure rather than the city or its community as a whole (fig. 2). According to Teti (2012), for instance, L'Aquila has never been the same since the 2009 earthquake disaster.

The construction of the new towns ultimately wasted precious resources and slowed down the sustainable recovery process in a fragile urban context that was neither particularly economically vibrant nor highly strategic even prior to the disaster. In fact, L'Aquila has never been a significant hub in the global economic network. However, as many residents recalled on the 10th anniversary of its destruction, the city possessed a strong identity and character: a quality that L'Aquila shares with many non-global European cities and towns.

Fig. 1 - The new town of "Sant'Antonio" in L'Aquila, 2020

Fig. 2 - L'Aquila city centre, 2020

1.2. Unlocking opportunities for positive change

The experience of L'Aquila and other disaster events calls for a more comprehensive and proactive approach to urban emergency management. Achieving this requires better integration of disaster risk reduction actions into peacetime planning and prioritising the strengthening of a city's physical and social infrastructure in disaster recovery plans to prepare for future hazards. Since recovery capacity is contingent on the unique context and nature of the disaster, there is an urgent need to engage in discussions about emergency management approaches, post-disaster recovery planning, and the outcomes of interventions and processes involved. Nevertheless, it should be noted that the coexistence of risk and uncertainty poses a significant challenge to emergency urbanism.

In the face of an increasing number of severe hazards, the planning of contemporary cities is continuously put to the test. The book's title, "Disasterville", explicitly draws attention to the vulnerable nature of these cities, highlighting their inherent exposure to disasters and the need to incorporate contingency measures into their planning. The term "Disasterville" denotes a condition where risk and its inadequate consideration intersect, which particularly applies to *disaster cities.* These cities exist in a precar-

ious equilibrium and are pervaded by the perception of risk, impacting various facets of urban life.

Addressing the challenges faced by these cities requires decisions related to disaster preparedness, mitigation, recovery, reconstruction, and re-development to be guided by sustainable development objectives outlined in the United Nations' 2015-2030 Agenda for Sustainable Development (2015). However, there is still limited understanding of the factors that can escalate moderate stresses into large-scale disasters (D.E. Alexander, 2019), raising questions about how to implement sustainable development objectives in practice.

Against this background, the book presents a carefully curated overview of the current state of research on planning sustainable post-disaster urban transitions, highlighting recent advancements that hold promise for shaping better urban futures. While this line of inquiry is relatively new, the growing body of literature in the field demonstrates that the scientific community shares an ambition to learn from past disasters and capitalise on opportunities for positive change.

The book explores this subject by focusing on the three interrelated issues of disaster risk, decision-making, and data analytics. Although it does not attempt to provide an exhaustive compendium of all existing research on the topic, it covers a valuable range of approaches and methods which can advance disaster risk reduction practices in emergency urbanism.

In addition to political support and more inclusive governance structures and policies, urban designers and planners require access to various information, forming a reliable basis to support their technical assessments. This book therefore adopts a particular focus on the application of formal methods and digital tools, which can aid in understanding, safeguarding, planning, and designing, disaster cities.

The rationale for this focus is rooted in the belief that formal methods and digital tools can play a vital role in facilitating deliberation in managing emergencies. Certain themes, such as space and place, are emphasised more than others as they are central to technical decision-making related to post-disaster recovery planning. For instance, urban models and simulations used in scenario-based assessments can help determine the probable impact of spatial planning choices on social cohesion and economic productivity. Nevertheless, the book argues that for these formal methods and tools to be effective, they must account for human factors, enable the inclusion of people's perspectives, and avoid a technocratic approach in their application.

To better illustrate concepts and operational methods, the book draws on applied examples from recent earthquake disasters in Italy, with a particular emphasis on the 2016-2017 Central Italy earthquakes. This disaster event affected an area of approximately 8,000 km^2 spread across four regional administrations, which is populated by numerous small and medium-sized towns with aging populations and limited job opportunities, that are spatially segregated and subjected to an ongoing shrinking process. This represents a meaningful case study, where the destruction of numerous residential and public buildings, coupled with a partially short-sighted emergency response, further hastened the decline of the disaster-impacted settlements (Rotondo *et al.*, 2020). This provides an interesting ground to support the book's narrative and demonstrate the potential and limitations of different approaches and methods in relation to specific decision-making tasks. Additionally, the example is not only relevant to Italy but to Europe and other countries populated by relatively small urban centres which have gone through cycles of expansion and contraction over the course of several centuries.

The book is made of six chapters. Chapter 2 provides the background of the research presented in this book and introduces key theoretical concepts and principles to contextualise it. It will introduce the definition of risk within the field of urban emergency management, clarifying key determinants and challenges, plus the role of emergency urbanism in addressing them. This serves as the foundation for framing the disaster city as the materialisation of three parallel urban processes, resulting in three distinct cities. Towards the end, the chapter highlights the significance of temporary housing in disaster city planning and argues for its consideration. The majority of the applied examples presented in this book, hence, address temporary housing issues, although most of the approaches and methods presented in the book can be used to support post-disaster recovery planning and emergency management more broadly.

Decision-making challenges and critical issues are discussed in detail in Chapter 3, building the case for the use of formal methods and tools in urban design and planning. Overall, the chapter provides a critical foundation for understanding the components of technical decision-making in emergency and highlights the need to address existing challenges rigorously and effectively.

The chapter provides an overview of the experiences of both developed and developing countries in dealing with disasters caused by natural hazards, with a focus on the specific challenges faced by decision-

makers at various levels. For reasons of consistency and to keep the narrative better in focus, the discussions do not cover research on man-made disasters, climate change, or informal housing, as these topics fall outside the scope of the book. The chapter specifically highlights gaps in the planning and implementation of post-disaster housing assistance programs and argues for further research investments in the development of decision-support systems that are fit-for-purpose. In the last section it introduces business process modelling as a method to increase experts' accountability, enhance strategic planning, and foster lessons learning after urban disasters. This and the following parts of the book emphasise the role of modelling and scenario-based assessments in aiding emergency management, covering topics such as process simulation and spatial analysis.

Chapter 4 emphasises the significance of taking the human factor into account when planning and designing the spaces of disaster cities. It argues for the adoption of the configurational approach in the spatial reorganisation of such cities to recentre the proposals on people and communities. The chapter highlights the importance of understanding the social logic of space, including its past, present, and future dimensions, when intervening in a crisis context. It also discusses how urban form, as the physical manifestation of socio-economic urban dynamics, can contribute to achieving a developmental and resilient recovery after urban disasters. The theoretical discussion is further enriched by the introduction of a practical analysis framework, accompanied by a range of associated configurational indices.

Chapter 5 opens with a general discussion on the use of data and data analytics for disaster cities' planning. It then delves into the role that individuals and communities can play in this process, highlighting the potential benefits of harvesting data from citizens in the aftermath of a disaster to enable positive synergies in technical decision-making and enhancing disaster risk governance. Particularly, the chapter argues in favour of using this data as inputs in configurational analysis workflows. It concludes by exploring the concept of disaster city digital twinning and speculating on its use in planning disaster cities that are people-smart.

Finally, Chapter 6 of this book presents a comprehensive summary of the topics and key research findings, followed by a discussion on how to coordinate the different approaches and methods illustrated throughout the book to address existing gaps in the delivery of quality emergency management services. It presents conclusive remarks on planning disaster cities, with a particular focus on managing urban perturbations and spatial

changes while also providing a glimpse into promising futures, research opportunities and directions.

This reading will therefore interest many individuals, including urban planners, emergency responders, civil protection actors, policymakers, designers, researchers, and students.

2. *Disaster cities*

2.1. Cities at risk

Many contemporary cities are at risk, struggling due to structural conditions of fragility which have materialised as a result of decades-long mechanisms of inadequate planning and risk governance. This situation has been exacerbated by asymmetrical spatial development and economic growth, ecological imbalances, social inequalities, and political instability. Instead of being attributed to a single cause, risk has been increasingly perceived as a pervasive and immanent condition of our times. The language of risk has permeated both academic and public discourse, imbuing terms such as 'sustainability', 'resilience', 'regeneration' and 'risk' itself with a multitude of meanings that reflect the different and changing priorities, concerns, and perspectives of individuals and society in the 21st century. Beck (1992) characterises the late modern society as a "risk society", one that grapples with a complex urban landscape where cities exist in a state of unstable, hence dynamic equilibrium that is continuously tested by hazards and latent self-destructive tendencies.

Currently, over half of the world's population (56.2%) lives in urban areas, which account for only 3% of the planet's surface. Yet, these areas are responsible for roughly 60-80% of global energy consumption and 70% of global carbon emissions as reported by UN-Habitat (2020). Among urban inhabitants, 20% live in vulnerable housing conditions, lacking access to safe water and essential utilities, and often residing in slums over which looms the spectre of past and future disasters. As exemplified in fig. 1, this dire situation is likely to worsen in the coming decades, as rapid urbanisation trends in Asia and Africa drive up the number of people

living in precarious conditions in areas exposed to a mounting number of climate-related hazards. This is a prime example of the heightened risk of urban disasters, which can result in life loss, injury, damage, or destruction of assets.

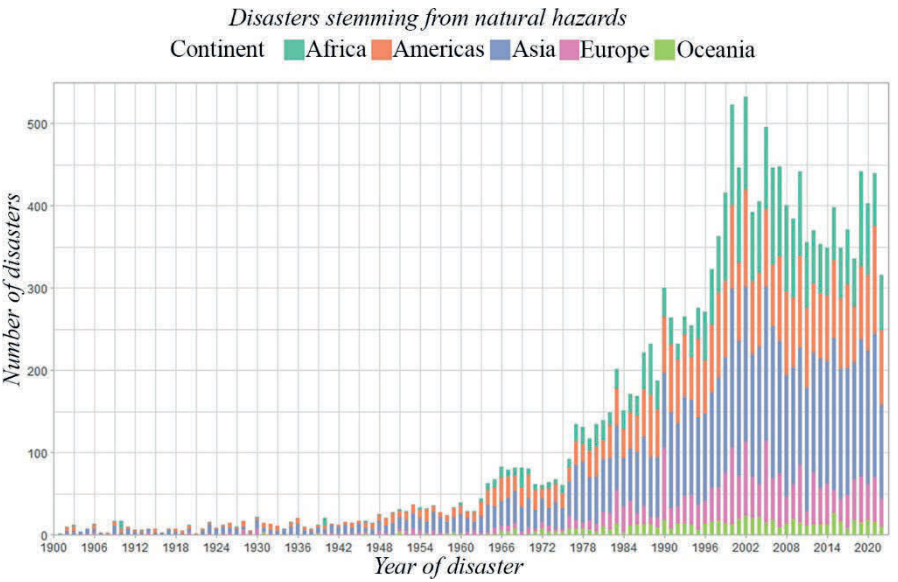

Fig. 1 - Number of disasters from natural hazards by continent from 1900 to 2022. Author's elaboration of EM-DAT data in R studio. Data source: EM-DAT: The Emergency Events Database – Université Catholique de Louvain (UCL) – CRED

The primary cause of these disasters and their associated losses (mostly human in poorer countries and material in richer ones) is the limited capacity of cities to reduce risks, cope with, and respond to, hazards. The determinants of disaster risk and the contexts in which urban disasters occur are complex, dynamic, and subject to change at global, national, and local levels. The definition of urban disaster risk, hence, substantially expands the more traditional engineering framing of risk as the combined result of the probability (likelihood) of a systems' failure and the magnitude of its consequences (impact). Instead, it considers disaster risk to be linked to urban vulnerability elements, rooted in social relations, culture, political ideology, economic power etc. which are spatially and temporally stratified. Some researchers therefore argue that disaster risk should be regarded as the natural result of development

under the current state of affairs, rather than as an element of disruption for development (Chmutina *et al.*, 2021). In other words, disasters materialise enduring flaws in development processes. They reflect the presence of gaps hindering the achievement of the Sustainable Development Goals (SDGs) outlined in the Sustainable Development agenda 2015-2030 (United Nations, 2015), besides weaknesses in the roadmap to equitable growth and prosperity traced by the New Urban Agenda[1] (United Nations, 2017), tab. 1.

Therefore, disaster risk is calculated as a probabilistic function of hazard, exposure, vulnerability, and capacity (UNDRR, 2022). In this definition, exposure accounts for the location of people, infrastructure, and assets in areas prone to hazards. Vulnerability caters for those factors or processes (of physical, social, economic, and environmental nature) that contribute to increase the potential impacts of hazards on individuals, communities, assets, or systems. Capacity, instead, measures the ability of individuals, organisations, communities, or societies to self-protect and recover by considering a combination of all their strengths and resources. These include existing infrastructures and institutions, human capital (e.g., knowledge and skills), and collective attributes (e.g., social bonds, leadership, and management).

Such a framing of risk reverses the common hazard-centric paradigm, recognising that disasters are not a tragic fatality, imputable to the punctual manifestation of unforeseeable external stressors (i.e., hazards which can occur more or less frequently and be of a greater or lesser magnitude). Specifically, it clarifies that disasters stem from flawed decisions about society, the economy, the environment, and space, including in disaster recovery and reconstruction and post-disaster development. The expression 'natural disaster' is therefore to be considered paradoxical, albeit still widely used in practice (Chmutina & von Meding, 2019). Furthermore, this framing establishes a causal link between disaster risk and broader issues of justice (social and spatial), since the consequences of disasters often hit the poor, and particularly the global poor, the hardest as they are more vulnerable than others (e.g., based on class, ethnicity, gender etc.). Hence, the dimension of equity, and the levelling up of systemic territorial imbalances, appear critical for enabling Disaster Risk Reduction (DRR).

1. Summary of Habitat III: the UN Conference on housing and sustainable urban development held after the adoption of the SDGs. Its focus are cities, their planning and management, plus their key role for sustainable development.

Although disaster risk reduction has gained popularity as a global paradigm – with Google searches peaking at four times the volume since 2020 (fig. 2) – significant work remains to be done to translate existing frameworks into effective actions. While steps were taken in the right direction by the 2015-2030 Sendai Framework for Disaster Risk Reduction (UNDRR, 2015), further efforts are required to operationalise its rhetoric (tab. 2). In fact, the framework aims to enhance international cooperation, facilitate access to multi-hazard information and assessments, and encourage inclusive and risk-informed decision-making. However, research has revealed that disaster risk reduction indicators in SDGs primarily measure disaster impact or the national-level implementation of disaster risk reduction strategies (Wisner, 2020). Additionally, there is a disconnect between indicators used in these two frameworks to measure progress.

For example, although SDG 11 (Sustainable cities and communities; a blueprint for making cities inclusive, safe, resilient, and sustainable) has specific targets related to disaster loss and number of cities with DRR policies and operational plans (11.5[2] and 11.b[3]), the Sendai framework has not yet integrated these indicators into its progress monitoring. The lack of alignment between these two frameworks represents a missed opportunity to advance disaster risk reduction and promote a more holistic approach to emergency management that is closely linked to sustainable development. Reports on SDG 11 could provide valuable insights into areas of vulnerability in cities, such as inadequate housing, public open spaces, and transportation, that can inform effective disaster risk reduction strategies. Failing to bridge the gap between the Sendai framework and SDGs progress indicators, conversely, may inadvertently compromise advancement and even create new risks.

2. Its indicators consider the number of deaths, missing and affected people per 100,000 population and the direct economic loss from disasters in relation to the Global Gross Domestic Product (GDP).

3. This considers the number of countries that adopt and implement national strategies in line with the Sendai framework and that of local governments that adopt and implement local strategies in line with the national ones.

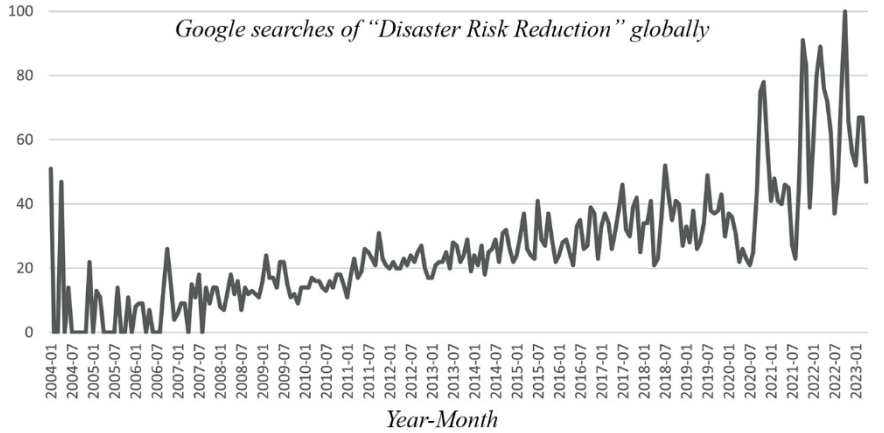

Fig. 2 – Line plot of Google Trends' global search data for "Disaster Risk Reduction" across all search categories[4]*. The numbers in the plot represent search interest relative to the highest point on the chart at any given time between January 2004 and 2023*

Tab. 1 – Transformative commitments for sustainable urban development – Environmentally sustainable and resilient urban development. The new urban agenda: (United Nations, 2017)

Point 64	Recognises the vulnerability of urban settlements to natural hazards.
Point 65	Commits to supporting the adoption of DRR strategies and to performing periodical assessments of disaster risk while protecting well-being through environmentally sound urban and territorial planning.
Point 77	Commits to strengthening urban resilience, e.g., by developing quality infrastructure and through spatial planning. It also commits to mainstreaming holistic and data informed DRR and disaster risk management to reduce risk and enable a rapid recovery from the effects of hazards, among others. Additionally, it seeks to promote the construction of resilient and resource efficient infrastructure.
Point 78	Commits to supporting inclusive proactive, rather than reactive approaches to DRR, including public risk-awareness building, while ensuring a timely and effective humanitarian assistance considerate of BBB principles. The objective is to integrate resilience-building, spatial measures, lessons-learned etc. in post-disaster planning.

4. When search interest is analysed by region, the top three countries result the Philippines (Southeast Asia), Zimbabwe (Southern Africa), and Fiji (South Pacific Ocean).

Tab. 2 - Sendai Framework for Disaster Risk Reduction, priorities for action

Pr. 1	Understanding disaster risk (in terms of vulnerability, capacity, people and assets' exposure, and external factors) to improve, among others, risk assessment and response.
Pr. 2	Strengthening disaster risk governance to manage disaster risk, at different levels (e.g., national, regional etc.) to foster preparedness, recovery, and others.
Pr. 3	Investing in disaster risk reduction for resilience, by enhancing the economic, social, health and cultural resilience of people and their assets, as well as environmental resilience.
Pr. 4	Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction. This requires acting in advance, but also recognises that post-disaster decisions are critical to BBB and should integrate DRR principles in development planning.

Given the current context, it is imperative that cities worldwide take active steps to safeguard the well-being of both current and future generations. As highlighted by Golubchikov (2020), this requires them to be the driving force behind transformative change, which can be achieved by making transformative commitments towards sustainable and resilient urban development. As a matter of fact, while acknowledging that future shocks cannot be fully predicted in advance, cities have a responsibility to create value for everyone, leaving no one behind. Achieving better integration of unplanned contingencies in urban development planning is vital to this end, as emphasized by Borsekova & Nijkamp (2019). Reductionist approaches to disaster risk reduction should therefore be avoided, by developing policies and promoting investments that consider disaster preparedness, response, and reconstruction as multidimensional, temporal, and mutually inclusive disaster phases. This entails taking a risk-informed approach to urban development planning and emergency management.

Despite the persistent gap in understanding and managing urban perturbations can prevent positive opportunities from materialising, some researchers argue that appropriate disaster response mechanisms and projects can be a blessing in disguise, generating long-term benefits for the economy, society, and the environment and may lead to resilience-building and urban renewal. In this regard, the Building Back Better emergency management principle, introduced by Kennedy *et al.* (2008) and later codified in Priority 4 of the Sendai Framework for Disaster Risk Reduction, does not signify a mere a return to an initial, often undesirable, state of things. Instead, it should be viewed as an effort to find a

new and improved equilibrium for a disaster-affected area through deliberate spatial planning and policymaking during recovery, reconstruction and beyond, which consider issues of equity and fairness, as well as livelihood, safety, and security.

Building Back Better also suggests that urban crises are the ultimate test for gauging the effectiveness of pre-existing housing policies and laws as well as of pre-existing organisational and public urban planning structures (Bolin & Stanford, 1991; Inam, 2013; Johnson *et al.*, 2006). Therefore, the manifestation of a disaster indicates the need for a more comprehensive approach to, and improvements around, risk assessment, disaster response (both in terms of tools and policies), community engagement, and institutions' preparedness and attitude. To sum up, more and better efforts should be placed on understanding risk, preparing cities to mitigate the effects of future hazards, and implement evidence-based policies and practices for the planning of disaster cities.

2.2. The three post-disaster cities

Given that risk and its perception are pervasive in contemporary urban life, almost all existing human settlements can be viewed as disaster cities. Each facing various degrees of success in surviving past turbulences, responding to existing shocks, or preparing for future disasters.

In this book, I will distinguish between three main disaster cities which come to life at different stages when a disaster strikes. This categorisation is intended to provide a heuristic devise to the reader that serves as a useful tool to guide the narrative, facilitate problems' contextualisation, and describe the application and refinement of approaches and methods to problems' resolution; mirroring a longstanding tradition in the field of emergency management research (Scamporrino, 2013) and practice. However, it is important to note that this distinction inevitably simplifies the complex reality of urban emergencies, as disaster management processes appear to blend into one another (Neal, 1997). As a matter of fact, the three types of disaster cities described in what follows originate from the materialisation of a disaster event, are not mutually exclusive and can overlap in varying ways at different times. Therefore, caution should be exercised in applying the categorisation, diagrammatically illustrated in fig. 3, to avoid overly deterministic assumptions about emergency management and to ensure that multiple perspectives are taken into account.

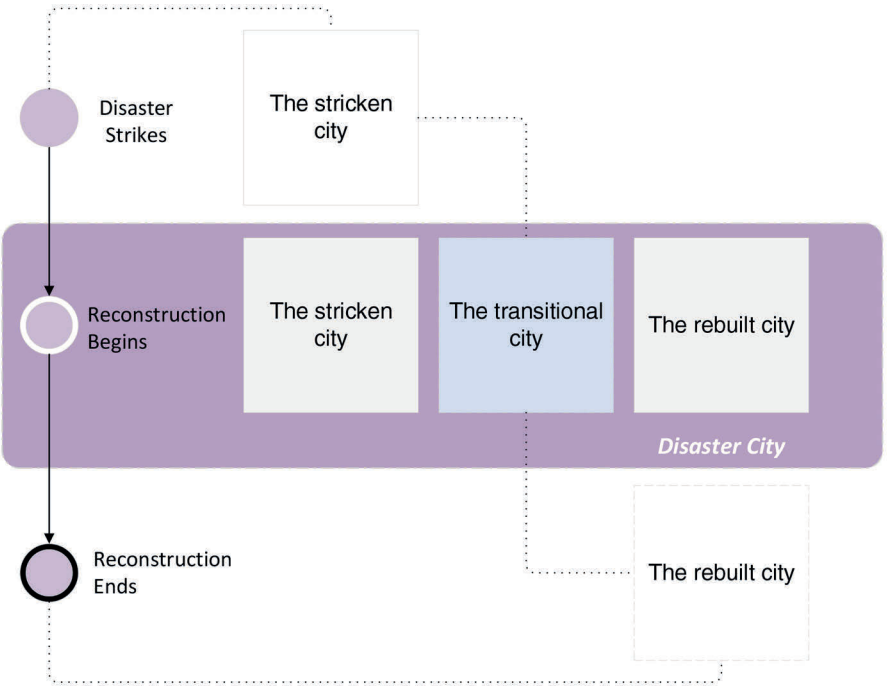

Fig. 3 - The three post-disaster cities

The ***stricken city*** is the first of the three disaster cities described in this section. This city determines the original context for the planning of disaster recovery and reconstruction operations and, in some extreme cases, is largely damaged, destroyed or even permanently lost. Amidst the ruins and rubble, it represents the tangible memory of the city that existed before the disaster and populates the places of memory. Although the pre-disaster city form may not always be desirable due to its vulnerabilities, the public open spaces and buildings which survive in the *stricken city*, have an intelligible morphology that is well-known by local communities. However, the *stricken city* is also characterised by a new set of social and spatial relationships that are determined by the disaster.

The characteristics of the *stricken city* differ from those of the future ***rebuilt city***, which may take on a similar or different form with relationships located elsewhere. The *rebuilt city* may never materialise and, for some time after a disaster strikes, may only exist on paper, being fragmented and dynamically changing in the collective imagination due to the differing expectations of stakeholders. In fact, the future and potential