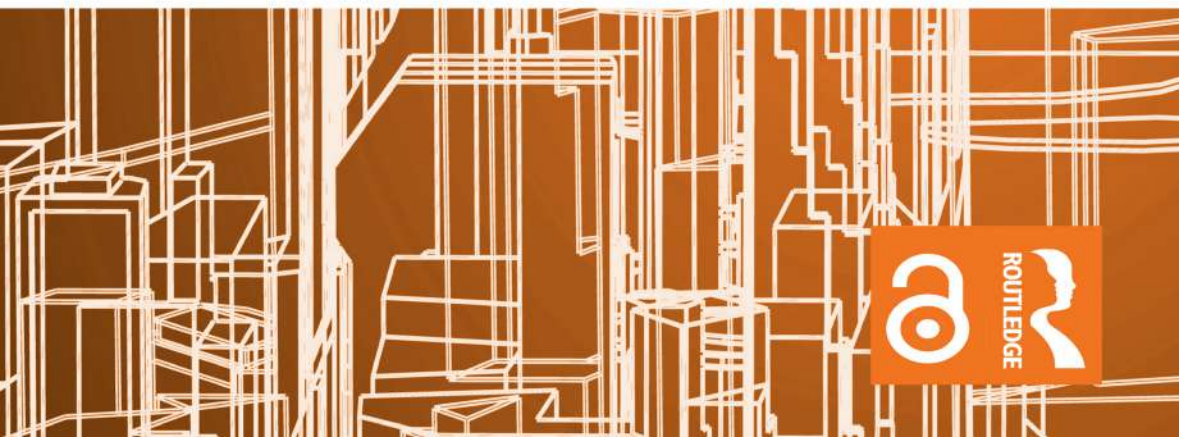
REAL ESTATE AND SUSTAINABLE CRISIS MANAGEMENT IN URBAN ENVIRONMENTS

CHALLENGES AND SOLUTIONS FOR RESILIENT CITIES

Edited by
Saija Toivonen, Sirkka Heinonen, Ira Verma,
Raúl Castaño-Rosa, and Sara Wilkinson



Real Estate and Sustainable Crisis Management in Urban Environments

The aim of this book is to promote the dynamic resilience of societies by identifying, analysing and exemplifying the role of space and land use in both anticipated and unanticipated primary and secondary crisis situations.

The book brings together the expertise of a unique team of researchers and methods from fields of futures studies, land use planning, social sustainability and wellbeing, architecture, spatial planning, design and real estate economics, and presents a novel understanding of the direct and indirect impacts of possible crises in the space and land use context. It goes on to discuss the concept of resilience and exemplifies potential solutions and offers a holistic and forward-looking approach for crisis management through a lens of social sustainability and wellbeing, making an important contribution to the promotion of wellbeing in the built environment, especially in terms of land and residential space and building use.

This book does not only identify barriers and successful incentives in resilient crisis management but also discusses the role of different stakeholders (e.g., households, office workers, real estate owners, space occupants, firms, the public sector etc.) in crisis management. Finally, international case studies aiming to tackle the challenging landscape of future threats are presented, along with novel tools to support the development of future policies, regulations, and management practices in the built environment, which can increase the dynamic resilience of societies.

Overall, this book is essential reading for decision-makers in the public and private sectors, urban developers, space and spatial designers, architects, planners, community stakeholders, real estate investors, facility managers and crisis and corporate responsibility managers.

Saija Toivonen works as an assistant professor in Future Real Estate at the Department of Built Environment at Aalto University, Finland with a wide range of topics concerning the future real estate market environment. Her special interest is combining the future dimension into real estate market research, and she has been applying methods of futures studies in the real estate and built environment context for nearly 20 years. Her research scope includes themes such as the future development of space- and land-related preferences, and the different forces of change including both megatrends, weak signals and wild cards, and the resulting real estate market dynamics. Her studies are aiming to develop solutions and

strategies towards a more future conscious, sustainable and resilient real estate sector. Toivonen acts also as the Chair of the Finnish Association for Real Estate Valuation and as a board member of the Property Valuation Board of the Finland Chamber of Commerce which supervises the performance of authorized real estate appraisers in Finland. Saija is the consortium leader of the research project RESCUE and leads the work package which focuses on crisis identification and analysing their direct and indirect impacts.

Professor Emerita Sirkka Heinonen has been with Finland Futures Research Centre (FFRC), University of Turku as professor of Futures Studies since 2007. Previously she was Chief Research Scientist at VTT Technical Research Centre of Finland since 1979. She holds a PhD degree from Helsinki University, with 40 years of research and teaching experience in futures studies, especially technology foresight and innovations, urban and rural futures, sustainable information society, media and journalism, and renewable energy and lifestyles. She is a Member of the Club of Rome (2005–), Co-Chair of the Helsinki Node of the Millennium Project (2001–), Guest Professor at the University of Science and Technology of China (USTC 2013–), Member of the Academy of Technical Sciences (2014–), and President (2012–2015), Vice-President (2016–) and Honorary Member (2020–) of the Finnish Society for Futures Studies. She is also a member of the board of editors for six scientific journals. She is member of the Chilean Council of Foresight and Strategy and of the Philippine Futures Thinking Society. She has developed specific futures methodologies/processes such as Futures Clinique, Creative Foresight Space, Pioneer Analysis.

Ira Verma (D.Sc. in Architecture) Senior Scientist, works in the RESCUE project in a work package focusing on how crises related to the built environment affect the social sustainability and wellbeing of people. The objective is to gain further understanding for improving community resilience. She has nearly 20 years of work experience of research and project management in the Research Group for Health and Wellbeing Architecture, SOTERA, at the Department of Architecture, Aalto University. She has been involved in various national and international projects related to housing for older people, user-centred design and Universal Design. Her doctoral dissertation was on these topics (Verma, I. 2019. *Housing design for all? The challenges of ageing in urban planning and housing design – The case of Helsinki*).

Raúl Castaño-Rosa is postdoctoral researcher in affordable and resilient housing at Tampere University and works on providing a better understanding on the key conditions to develop a more sustainable, affordable and resilient built environment through a human-centric approach. A major component of his work – and contribution to the field – has been to develop a novel model to assess the level of energy vulnerability (energy poverty) in residential buildings, supporting decision making toward a more sustainable, resilient, and affordable housing. Raúl is also actively involved in the ECIU University at the European level as Research Field Coordinator of the Resilient Communities of practices.

Sara Wilkinson is a chartered building surveyor and Australia's first female professor of property. Her transdisciplinary research program sits at the intersection of sustainability, urban development and transformation, with a focus on green cities and preparing our urban environments for the challenges of climate change and resilience. Current projects include development of a STAR (Sustainable Temporary Adaptive Reuse) Toolkit, a Bushfire Retrofit Housing Toolkit for older Australians, and the performance evaluation of hempcrete wall panels. Sara engages in transdisciplinary research with colleagues from engineering, science, health and business as well as built environment disciplines.

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Challenges and Solutions for Resilient Cities

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Foreword

Increasingly the term, "permacrisis" is used in our everyday language, and in 2022 was designated as word of the year by Collins Publishers. Its meaning, as a portmanteau, or combination, of "permanent" and "crisis", neatly sums up not only the continuing climate crisis and its growing detrimental impacts on humanity, but also the persistent economic aftershocks of COVID and ongoing major geopolitical disputes, for example, in the Ukraine and the Middle East. In this sense we could be forgiven for thinking that the there is no way out as we lurch from one crisis to another. However, the word "crisis", whilst involving challenges, also involves opportunities, especially in thinking positively and proactively about how we can tackle these global issues.

Of course, a common theme in all this is the role the built environment plays in our everyday lives and especially the ways in which real estate and land use can be better developed and managed to help deal with the crises that we face, particularly the climate crisis and its impacts. For example, according to Savills, in 2022, the total value of global real estate was estimated at $379.7 trillion, dwarfing global GDP by almost four times. With so much wealth and value tied up in global real estate, there is a clear need for commercial real estate managers and investors to avoid "stranded real estate assets", or properties that will be exposed to the risk of early obsolescence because they do not meet future regulatory efficiency and environmental standards, or the expectations of the market. For example, these types of buildings will become potentially less marketable and less valuable and may require costly refurbishment or retrofit measures and become much riskier. Also, with residential property an important source of both personal wealth and social wellbeing, flooding, wildfires and overheating are also potential sources of risk, not only to the buildings themselves, but also to the people that occupy them.

This important interdisciplinary-focused book is timely therefore because it shows how we can develop our ability to bounce back from the negative impacts of parallel crises and create more dynamic societal resilience through a proactive and sustainable approach to crisis management in real estate and land use. The authors also show how adaptation and mitigation strategies will be crucial in driving the transition to more resilient cities. Based on the RESCUE research project, the book offers practical and novel advice as to how we can protect and enhance the economic value of real estate whilst also maintaining social and environmental value.

RESCUE is a three-year interdisciplinary project funded by the Academy of Finland and led by Aalto University, Department of Built Environment and a key feature of the research and this book is how we need to cross and span disciplinary boundaries to prepare, adapt and mitigate for these crises, especially those concerned with environmental risk. The book therefore offers a "boundary spanning" approach through its focus on futures studies, architecture, land use and spatial planning and real estate economics. With international contributors from Finland, Australia, New Zealand and Sweden the authors show that it is still not too late to make a difference.

Time is running out, however, and the recent 2023 COP28 conference in Dubai showed the imperative of keeping global warming to within 1.5 degrees Celsius. Funding issues also remain, especially in the developing world, and it will be vital to ensure a just and sustainable transition across built environment scales from buildings through to neighbourhoods and across our urban areas. If we are to succeed in the challenges that humanity has itself created, then as real estate professionals and as individuals in driving change, we must be prepared to make sacrifices ("to walk the talk") and to recognise that by 2050 the world must be a very different, but a better, place to live for everyone. Failure is not an option: as Mahatma Gandhi said, "The future depends on what you do today." This timely and thought-provoking book helps us understand what we need to do to make a difference right now.

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Visiting Fellow/Research Associate, Kellogg College/Global Centre on Healthcare and Urbanisation (GCHU), University of Oxford

Preface

This book is based on the findings stemming from an interdisciplinary research project called RESCUE (Real Estate and Sustainable Crisis Management in Urban Environments) which was funded by the Research Council of Finland (project number 339549) 21.08.2020–30.11.2023. The RESCUE project has been a collaborative effort of bringing together scholars from the fields of futures studies, land use and spatial planning, social sustainability and wellbeing, architecture, design, real estate economics and crisis management. The overarching aim of this book is to view the role of real estate, space and land in both anticipated and unanticipated primary and secondary crisis situations. With these findings we demonstrate the important role of real estate as a powerful crisis management tool and to promote the dynamic resilience of future societies.

Since we started the RESCUE project, one crisis after another has hit our societies. Some of them were considered highly improbable just before they happened. Others have surprised us with their complex and far-reaching consequences. Despite the gloomy topic of this book, the purpose is not to frighten, but on the contrary, to give hope and empower everyone in the built environment, including householders, office workers, retail space occupants, real estate owners, urban developers, space and spatial designers, architects, planners, community stakeholders, facility, crisis and corporate responsibility managers and the public sector. Therefore, with this book we propose that resilience can, and should, be built by acknowledging all the different levels of the built environment. This means that there are suitable tasks for everyone, including you. The fear of a threat is not as bad, if you know that you are prepared.

We hope that this book will open up new avenues for resilience discussion and foster long-term planning and imaginative projections in the field of real estate. We believe that by acknowledging the crises already experienced, and by imagining the possible future threats and their direct and indirect impacts yet unexperienced, we can learn and build holistic resilient futures together.

23 January 2024
by the editors
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Sara Wilkinson

Glossary

Adaptive Cycle A metaphor and theoretical tool for thinking and studying the dynamics of ecosystems, focusing on the linkages between system organization, processes, and resilience (Resilience Alliance 2023b).

Anticipatory Resilience "A futures-oriented knowledge system that intentionally addresses uncertain precarious events and explores alternative, desirable future states" (Muñoz-Erickson et al. 2021, abstract).

Black Swan An unpredictable and an extremely rare event with severe consequences (Taleb & Blyth 2011).

Built Environment "Human-made building and infrastructure stocks that constitute the physical, natural, economic, social and cultural capital, i.e., urban fabric forming complex socio-technical systems with different time constants, actors and institutional regimes" (Bosher et al. 2016, p. 119).

Capability "A feature, ability, faculty, or process that can be developed or improved. A capability is a collaborative process that can be deployed and through which individual competencies and abilities can be applied and exploited" (Business Process Incubator 2016).

Capacity "An ability to do something or the amount something can hold" (Vocabulary.com 2023).

Crisis "A decisive turning point for better or worse with the distinct possibility of a highly undesirable outcome" (Merriam-Webster 2023).

Crisis Management Planning, organization, coordination and implementation of anticipation, prevention, action and learning amidst crises (Drennan et al. 2014).

Crisis Management Cycle A visual framework to present the pre-crisis, during-crisis and post-crisis phases of crisis management (Pursiainen 2017).

Disaster "A serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of affected society to cope using only its own resources. Disasters are often classified according to their cause (natural or human-made)" (UN 1992).

Disaster Risk "The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity" (UNDRR 2023).

Ecosystem A single environment and every living (biotic) organism and non-living (abiotic) factor that is contained within it or characterizes it. An ecosystem embodies every aspect of a single habitat, including all interactions between its different elements (Biology Dictionary 2019).

Existentialist Risk "A possible event with an adverse outcome that would either annihilate Earth originating intelligent life or permanently and drastically curtail its potential" (Bostrom 2002, p. 2).

Foresight "Foresight is the disciplined analysis of alternative futures. Foresight aims to support policymakers in making better-informed decisions, having considered future eventualities, scenarios and outcomes" (European Commission 2023).

Hazard A dangerous phenomenon, substance, human activity, or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (UNISDR 2009 in EUR-OPA 2012).

Institution "Humanly devised constraints that structure political, economic, and social interaction. Can be informal (e.g., taboos, customs, and codes of conduct) or formal (constitution, laws, property rights)" (North 1991, p. 97).

Land Use Planning "The systematic assessment of land and water potential, alternatives for land use and economic and social conditions, in order to select and adopt the best land use options" (FAO 1993 in Metternicht 2017, p. 9).

Preparedness: "Activities ensuring that all tasks can continue with minimum interruptions and that the required exceptional measures can be performed during disruptions occurring in normal conditions and during emergencies. Preparedness measures include contingency planning, continuity management, advance preparations, training, and preparedness exercises" (Sanastokeskus Tsk 2017, p. 37).

Real Estate The land along with any permanent improvements attached to the land, whether natural or human-made – including water, trees, minerals, buildings, homes, fences, and bridges (Chen 2021).

Real Estate Development A change of land use and/or a new or altered building in a process which combines land, labour, materials, and finance (Cadman & Topping 1995, p. 2).

Regenerative Enabling social and ecological systems to maintain a healthy state and to evolve (Brown et al. 2018).

Regenerative Development In built projects, stakeholder processes and inhabitation are collectively focused on enhancing life in all its manifestations – human, other species, ecological systems – through an enduring responsibility of stewardship (Brown et al. 2018).

Regenerative Design Holistic approach to support mutually beneficial co-evolution of human and natural systems. Includes engagement of all the key stakeholders and processes to the place and relies on continuous learning and feedback so that all the aspects of the system are an integral part of the co-evolutionary process (Brown et al. 2018).

Resilience The capacity of a system to absorb, endure and overcome shocks, perturbation, stress and disturbances and adapt, learn, retain and/or develop its structures, values, processes and feedbacks (Holling 1973; Resilient Cities Network 2023).

Response The reactive action in times of adversities including e.g., emergency working, operational deployment of resources and communications (Drennan et al. 2014).

Risk "The chance of something happening that will have an impact on objectives; often specified as an event or set of circumstances and the consequences (both positive and negative) that will flow from this" (Drennan et al. 2014, p. 2).

Risk Management "The processes involved in managing risk in order to achieve objectives, by maximizing potential opportunities and minimizing potential adverse effects" (Drennan et al. 2014, p. 2).

Social-Ecological System "Complex, integrated systems in which humans are part of nature" (Berkes & Folke 1998 in Resilience Alliance 2023a).

Strategic Foresight "Foresight aiming to pose key questions that might have gone unasked in developing a strategy, and to reveal and challenge potentially fatal assumptions and expectations built into current policies and plans" (OECD 2023).

Sustainable Limiting impact i.e., the balance point in which we give back as much as we take (Brown et al. 2018).

Sustainable Development "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987, p. 8).

Sustainability Transition "A radical transformation towards a sustainable society, as a response to a number of persistent problems confronting contemporary modern societies" (Grin et al. 2010, p. 1 in Ehnert et al. 2018).

Systems Thinking "A set of synergistic analytic skills used to improve the capability of identifying and understanding systems (and their interconnected parts as a whole), predicting their behaviours, and devising modifications to them in order to produce desired" (adapted from Arnold & Wade 2015).

Threat "An adverse possible event or trajectory" (Sanastokeskus Tsk 2017, p. 40).

Urban Area A built-up human agglomeration with high population and infrastructure density (Brockerhoff 2000).

Urban Metabolism The technical and socio-economic flows and processes (e.g., materials, social networks and energy) within a city (Kennedy 2007).

Urban Planning A form of collective decision-making and a planning process to steer how land, land use, spatial morphologies, resource use and social interactions take place within the defined spatial context (Levy 2016).

Urban Renewal/Urban Regeneration "A comprehensive scheme to redress a complex of urban problems, including unsanitary, deficient, or obsolete housing; inadequate transportation, sanitation, and other services and facilities; haphazard land use; traffic congestion; and the sociological correlates of urban decay, such as crime" (Britannica 2023).

Urban Resilience "The capacity of a city's systems, businesses, institutions, communities, and individuals to survive, adapt, and grow, no matter what chronic stresses and acute shocks they experience" (Resilient Cities Network 2023).

VUCA World Volatility, Uncertainty, Complexity, Ambiguity – world where society is highly interconnected and complex set of sub-systems, in which threats and possible crises are challenging to anticipate (Davoudi 2012; Heinonen 2017).

Wild Card Usually low-probability events with considerable consequence (Mehrabanfar 2014).

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1 Introduction to Crises, Crisis Management and Resilience in the Built Environment

Lassi Tähtinen

Background

Throughout the 21st century, societies have experienced various crises, ranging from rapidly escalating terrorist attacks and natural hazards to slowly developing environmental degradation and climate change. Only in 2022, the Emergency Event Database EM-DAT recorded 387 natural hazards and disasters globally, with a death toll of 30,704 lives, 185 million affected individuals, and economic losses of US$ 223.8 billion (Centre for Research on the Epidemiology of Disasters 2023). In the increasingly interconnected VUCA (Volatility, Uncertainty, Complexity, Ambiguity) world, threats are challenging to anticipate, and potential crises can emerge across different societal systems (Davoudi et al. 2012; Heinonen et al. 2017). Thus, the United Nations Office for Disaster Risk Reduction (UNDRR) and the World Economic Forum (WEF) emphasize that future crises will be even more frequent and more difficult to manage due to their systemic nature (UNDRR 2022; WEF 2023). Hence, crisis management and resilience development have become central elements in policymaking (Coaffee et al. 2018; UNDRR 2023; Wardekker et al. 2020).

Concurrently, urbanization continues and recent studies have highlighted the role of cities and built environment (BE) in crisis management and resilience development (Chelleri 2012; Hassler and Kohler 2014). This is supported also by various resilience initiatives, such as the Resilient Cities Network by the Rockefeller Foundation and Making Cities Resilient 2030 by the UNDRR. Thus, urban planners and real estate developers and investors play a central role in steering the development of our societies, holding considerable power on if and how the BE works best to safeguard us from the future crises.

This chapter is an introduction to the core concepts that will be discussed in the following chapters of this book. It will delve into three main concepts: crisis, crisis management, and resilience, providing clarifying examples to explain their basic theories. Furthermore, it will provide a general overview on how these concepts apply to the BE context, examining the existing literature's understanding of crisis management and resilience and the practical implications for their implementation. Finally, concluding remarks will be made.

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On Crises, Crisis Management, and Resilience

Crises

Crisis, a term frequently encountered in the news, political rhetoric, and everyday conversations, encompasses diverse phenomena, ranging from rising national debt, earthquakes, wars, and financial crashes to famine, climate change, and personal challenges. The word's usage varies depending on the speaker's perspective, be it a politician, psychologist, or news agency. While many conceptual crisis studies exist in the literature (see e.g., Boin & Lagadec 2000; Koselleck 2006; Kouzmin 2008), a single universal definition for this phenomenon is yet to exist. Furthermore, the word's interchangeable use with terms such as emergency, incident, catastrophe, and disaster contributes to the blurriness of the term (Pursiainen 2017). In real-life cases, this ambiguity and subjectivity becomes evident through powerful narratives, media coverage, and conflicting information, leading to misconceptions and polarization (Boin 2009; Millar & Heath 2004). Such strong rhetoric can be employed to create urgency for one's agenda or to seize more power (Drennan et al. 2014). For example, during the COVID-19 pandemic, framing the situation varied from a health crisis to a crisis of free will depending on one's ideological and political standpoints.

An ongoing debate exists over whether crises can be defined in a positivist manner or if they are always interpretative (McConnell & Drennan 2006). Still, despite the term's fuzzy nature, certain typical characteristics are worth considering. A crisis has been defined in various ways, such as "the turning point for better or worse in an acute disease or fever," "the decisive moment," "an unstable or crucial time or state of affairs in which a decisive change is impending," and "a situation that has reached a critical phase" (Merriam-Webster 2023). Drennan et al. (2014) describe crisis as "a set of circumstances in which individuals, institutions, or societies face threats beyond the norms of routine day-to-day functioning, but the significance and impact of these circumstances will vary according to individual perceptions" (p. 2). 't Hart (1993, p. 39 in Boin & McConnell 2007) views crisis as "a breakdown of familiar symbolic frameworks that legitimizes the pre-existing socio-political order." Crises are also often accompanied by risks, but they differ from risks in three key conditions (Drennan et al. 2014): 1) they include severe threats (while risks can be minor or even positive), 2) they involve high levels of uncertainty (whereas risks are usually based on probabilistic or deterministic assessments), and 3) they require urgent action (while risks can be tolerated without urgency). In general, a crisis refers to a critical turning point, and whether sudden or slowly evolving, crises are always complex. In addition, crises can be of exogenous or endogenous origin, emerging outside or within the system. For example, an armed conflict between countries A and B disrupting international trade and politics can be counted as exogenous crisis to a country C, whereas corruption charges against the government of country C escalating as a reputational crisis is an endogenous one.

Crises are often perceived as sudden or surprising events, such as wild cards or black swans (Pearson & Clair 1998; Petersen 1999; Heinonen 2013). Wild cards are low-probability, high-impact events with sweeping consequences, while black

swans are extremely unpredictable events with catastrophic impacts (Taleb & Blyth 2011; Higgins 2013). Wild cards generally surprise everyone because social systems cannot effectively respond to them in a timely manner (Petersen 1999). However, the level of surprise is a subjective indicator (Steinmueller 2003). Reflecting on COVID-19, Haley et al. (2021) argue that the crisis was not an accident but a result of complex interactions among social, political, technological, and cultural variables that were misunderstood and mismanaged by governments. According to Kelman (2020), all crises can be considered human-made due to the lack of preparedness.

Despite the elusiveness of the term itself, crises can be differentiated from each other with various frameworks. In their literature review, Williams et al. (2017) divided crisis conceptualizations into crisis as an event (emphasis on sudden disruptive nature of crises and their aftermath) and crisis as a process (emphasis on crises' development in space and time). Drennan et al. (2014) on the other hand present a more comprehensive typology of 14 categories (Table 1.1), in which they divide crises based on the following eight characteristics (pp. 20–24):

1 **Crisis epicentre(s):** The heart of the phenomenon and where the heat of the crisis is most strongly felt. One crisis can focus on one or multiple epicentres, which can shape the perceptions and narratives of the crisis. These include individuals, policies, institutions, societies, cross-societies, technology, and the geophysical realm.
2 **Speed of arrival:** The speed at which a crisis escalates. This can vary from years to several minutes and is crucial element shaping the perceptions and responses to the crisis.
3 **Degree of predictability:** The considerations of whether there are warning signs of the possible crisis or if it will be a total surprise or if it is something "inevitable."
4 **Extent of preparedness:** The degree of preparedness of authorities before the crisis escalates. This is highly affected by the perceptions of authorities on what is a crisis and what are its impacts.
5 **Degree of intentionality to cause a crisis:** The consideration of how deliberate the act that causes the crisis is or creates conditions for it to escalate.
6 **Degree of complexity:** Perception of how predictable of a trajectory the crisis escalation follows. It can be very linear and predictable, or it can be interconnected, crossing many policy spheres (e.g., transport, environment, public health).
7 **Degree of politicization:** The extent which the crisis becomes politicized. Depending on the sensitivity of the policy area(s) that the crisis touches, it can shape the language that is used by analysts and protagonists to indicate the extent to which the crisis is delegitimizing social and political values that are considered important.
8 **Degree of persistence after the acute stage:** The extent of the legacy after its escalation. These can have various time horizons and dimensions from psychological impacts to victims' families to changing institutional agendas and new policies.

Table 1.1 Crisis Typology (adapted from Drennan et al. 2014, pp. 25–27)

Crisis Type	*Description*
Sudden crises	High speed of arrival, any epicentre is possible, e.g., hostages taken, terrorist attacks, power blackout.
Fast-burning crises	High speed of arrival, low persistence after the acute stage, any epicentre possible but more likely to be individual, policy, institution, societal, or industrial/technological, e.g., heatwaves, water contamination episodes
Creeping crises	Any epicentre possible but especially societal. Particular emphasis on low speed of arrival, high predictability, and low level of preparedness, e.g., climate change, obesity, ageing population.
Long-shadow crises	Any epicentre is possible, but it is particularly likely to be at societal level; high level of persistence after the acute stage, e.g., race riots in major cities, nuclear meltdowns.
Agenda-setting crises	Epicentre most likely to be at individual, policy, institutional, societal, industrial/technological levels, with high level of politicization and high levels of persistence after the acute stage, e.g., mass shootings, major budget shortfalls.
Mismanaged crises	Epicentre most likely to be individual, policy, and institutional, with emphasis on low level of preparedness and high level of adverse politicization, e.g., any crisis attracting substantial criticism for ineffective crisis management.
Manufactured crises	Emphasis on high level of intent to cause a crisis. Epicentre most likely to be policy or institutional, e.g., any crisis where there is an accusation of creating and/or inflating the threat to one of critical proportions.
Policy fiascos/disasters	Epicentre is likely to be policy (and at times individual and institutional) with an emphasis on a high level of predictability and high degree of politicization, e.g., any substantive policy where the repercussions of apparent substantial failure to meet policy goals attract high levels of adverse politicization for policy makers and accusations of "they should have seen it coming" and the near inevitability of failure.
Technological crises	Epicentre is technological although it may also spread to policy, institutional, societal, and even cross-societal levels. Emphasis will often be on high levels of complexity, e.g., failure in critical IT infrastructure.
Transboundary crises	Epicentre is cross-societal, although it made also encompass other epicentres, particularly policy, institutional, societal, technological, and geophysical. Emphasis also on high level of complexity, e.g., pandemics, economic meltdowns.
Mega crises	All epicentres are possible but emphasis likely to be on societal, cross-societal, technological, and geophysical. Emphasis also likely to be on high level of complexity and high level of politicization, e.g., global internet failure.
Natural disasters	Epicentre is geophysical although it can spread to all other epicentres. There is high emphasis on natural causes and no intentionality to cause harm. Debates will also revolve around speed of arrival, degree of predictability, and level of preparedness, e.g., tsunamis, bushfires, earthquakes, mudslides
Accidents	Epicentres tend to involve aspects of technology although they may also be societal. Emphasis is on little or no intentionality to cause failure, e.g., major chemical spillages, "friendly fire" in times of war
Emergencies	Emphasis on individual and institutional epicentres, with high speed of arrival, high degree of predictability, and high level of preparedness, e.g., fires, road crashes.

As this chapter shows, almost any phenomenon can turn into a crisis (see also Tähtinen et al. 2024). The lack of common definition can create challenges for finding a common ground in crisis management (Lalonde & Roux-Dufort 2013 in Pursiainen 2017), but there is still a sort of consensus about the general characteristics of crises. They create time pressure and challenge the existing institutional and functional settings. Depending on the response, crises can lead to the collapse or transformation of entire systems, resulting in eradication of the system's potential or a new beginning. Modern crises are also noted to be non-linear and transboundary (crossing geographical and sectoral borders) with unknown origins and remedies, necessitating collaboration and innovative thinking to manage them (Pursiainen 2017; Boin 2019; Koselleck 2006; Pearson & Clair 1998). Recent examples of widely acknowledged crises are COVID-19 and the Russian invasion of Ukraine, both considered slowly developing crises that escalated relatively rapidly. These crises couldn't be addressed by single decision-making bodies or in a single country as they disrupted multiple societal systems from international trade to political and food systems. In both crises, many supply chains collapsed entirely, and the Russian aggression accelerated the transformation of European security systems, with countries like Finland and Sweden applying to join NATO.

Crisis Management

Despite the theoretical ambiguity surrounding crises, their real impact on organizations, communities, and individuals cannot be ignored. In today's VUCA world, crisis management is imperative as crises can emerge from all over society, cross sectoral and geographical borders, and compound with each other (e.g., Pescaroli & Alexander 2018). Managing through crises can be a matter of life and death, destroying one while creating a window of opportunity for another to emerge stronger or take advance of the crisis. As Winston Churchill famously put it: "Never let a good crisis go to waste." Take for example the creation of the European Union after WWII. Despite facing criticism, the EU has effectively maintained peace and fostered collaboration in a historically war-prone region. Also, during the COVID-19 pandemic, certain organizations adapted to physical distancing through agile work policies and digital maturity, while households with local or onsite energy production capability were less affected by the energy crisis triggered by the Russian invasion of Ukraine.

The literature on crisis management is extensive and fragmented, spanning multiple disciplines such as political science, business studies, organization studies, military studies, psychology, behavioral science, environmental sciences, and engineering (Bundy et al. 2017; Drennan et al. 2014). According to the Cambridge Dictionary (2023), crisis management involves "the actions that are taken to deal with an emergency or difficult situation in an organized way." Whipp (2003) views crisis management as a dimension of change management, specifically dealing with the most extreme forms of change. Pursiainen (2017) associates crisis management with the International Organization of Standardization (ISO) 9000 standards, focusing on the overall quality of management. In general, crisis management entails planning, organizing, coordinating, and implementing anticipation, prevention,

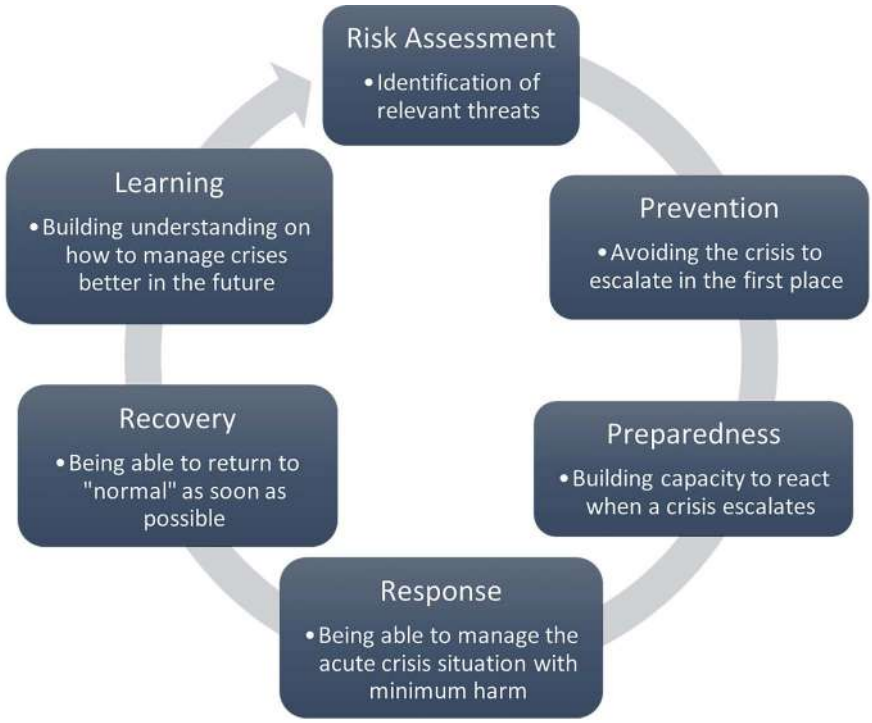

Figure 1.1 The Crisis Management Cycle (adapted from Pursiainen 2017)

action, and learning during crises (Boin et al. 2005; Drennan et al. 2014). It can be broken down into three overlapping and interrelated phases: pre-crisis, during-crisis, and post-crisis. These phases encompass risk assessments, prevention, preparedness, planning, response, recovery, and learning, as depicted in the Crisis Management Cycle (Figure 1.1) (Boin & McConnell 2007; Pursiainen 2017). While the phases are not strictly sequential, they form a holistic cycle in the crisis management process. For instance, distinguishing between pre-crisis, during-crisis, and post-crisis phases may be clearer in the case of natural disasters such as an earthquake than in creeping crises such as ageing population, but the cycle represents the core elements to navigate through crises effectively.

An ideal way to deal with crises would be to prevent them from happening in the first place. However, preventing a specific crisis requires understanding its source and dynamics (Boin & McConnell 2007) and predicting the exact nature of the next crisis is impossible. It could be a crisis already experienced in the past or an entirely new phenomenon. Even a crisis known from before could behave totally differently in today's world and rapid societal and technological advancements continuously introduce new forms of threats. Sociologist Ulrich Beck labelled the whole modern society based on this ubiquitous emergence of threats in his seminal work *Risk Society* (1992), while Charles Perrow (1984) highlighted

in his work *Normal Accidents* that technological progress can lead to increasing complexity and more severe everyday risks. More recently, Nick Bostrom's *The Vulnerable World Hypothesis* (2017) follows the same thematic as he discusses how rapid scientific and technological advancements, along with growing individual capacity, can give rise to existential risks in fields like artificial intelligence, synthetic biology, and weapons of mass destruction. Consequently, fully managing such uncertainty and unknown threats becomes practically impossible, and thus the need for adaptive capacity to deal with uncertainty, change, and unknown threats becomes evident.

Resilience – Adaptive Capacity to Evade Threats

The term resilience, though often considered a buzzword, can be traced back at least to the 19th century in the field of engineering, where it referred to an object's ability to endure stress and return to its normal state (Hassler & Kohler 2014; Lade 2020). However, the concept has evolved significantly and is now employed across various disciplines such as psychology, physics, engineering, ecology, economics, crisis management, sustainability sciences, and medicine (Hassler & Kohler 2014; Oliver et al. 2013; Vernon 2004). A major advancement in the concept came from theoretical ecologist C.S. Holling in 1973, who introduced the idea of non-linear ecosystem dynamics (Gunderson 2000; Gunderson et al. 2012). Holling argued that complex systems can have multiple equilibria, and instead of a single "normal" state, there can be various stable states for a system. This threshold allows a system, like an ecosystem, to persist and absorb disturbances before transitioning into a new stable state or "new normal" (Holling 1973; Gunderson 2000). In the 21st century, resilience has been integrated into organizational strategies, disaster mitigation, policymaking, and national security plans (Oliver et al. 2013; Fath et al. 2015). There are different conceptual variations, such as anticipatory resilience, community resilience, evolutionary resilience, organizational resilience, urban resilience, regional resilience, social-ecological resilience, and societal resilience. These variations are all based more or less on the initial idea of ecological resilience by C.S. Holling.

Although there is still ambiguity surrounding the concept, resilience generally refers to a system's adaptive capacity to anticipate, endure, absorb, transform, and recover from shocks and disturbances (Holling 1973; Cere et al. 2017; Meerow et al. 2016. According to UNDRR (2017 in UNDRR 2023), resilience is defined as "the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner." Two main approaches to resilience have been identified by Hassler and Kohler (2014): ecological resilience as a long-term design principle and engineering resilience as a functional, disciplinary model. The former focuses on unknown uses and adaptation, while the latter concentrates on tailored solutions for specific needs, sometimes leading to contradictory outcomes. For example, a resilient timber production system may ensure efficient, constant, and predictable wood provision, but a monoculture forest design can disrupt its long-term capacity to resist, recover, and adapt to forest fires or pathogenic diseases.

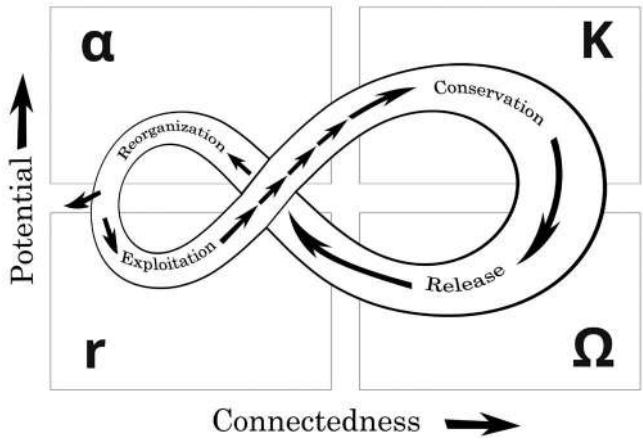

Figure 1.2 Adaptive Cycle (adapted from Allen & Holling 2010, p. 4)

A key aspect of all resilient systems is their adaptive cyclical nature, well-represented by the Adaptive Cycle heuristic framework (Figure 1.2). This framework illustrates how complex systems such as ecosystems, societies, or cultures evolve and transform after crossing their threshold or tipping point for disturbances.

The Adaptive Cycle was first introduced by C.S. Holling as a part of his work on ecological resilience. The framework was later elaborated by e.g. Lance Gunderson, who highlighted that adaptive cycles operate at multiple interconnected scales (see Panarchy theory by Gunderson & Holling 2002). Walker et al. (2004) and Folke et al. (2010) then adapted the framework to social-ecological systems. Regardless of the context, the Adaptive Cycle framework consists of four phases demonstrating the dynamics of complex systems (Figure 1.3): 1) Exploitation/Growth; 2) Equilibrium/Conservation; 3) Collapse/Release; and 4) Reorganization.

The transition between the first two phases (r to K) is known as the fore loop, characterized by slow, predictable, and incremental growth and accumulation. On the other hand, the other two phases (Ω to α), referred to as the back loop, are quick, unpredictable, and critically transformative (Holling & Gunderson 2002; Allen & Holling 2010). The Y-axis represents the dimension of potential for accumulated resources, while the X-axis denotes the dimension of connectedness between variables and internal controlling processes (Holling & Gunderson 2002). Low connectedness indicates loosely connected elements influenced by external variability, while high connectedness refers to aggregated elements whose behavior is dominated by inward relations among the aggregates, mediating the influence of external variability (Gunderson & Holling 2001 in Allen & Holling 2010, p. 4).

Crisis Management and Resilience in the Built Environment

For thousands of years, BEs have provided shelter and supported different functions in society including political and social interaction and trade of goods and services. The construction and planning of BEs are ongoing processes, and once they

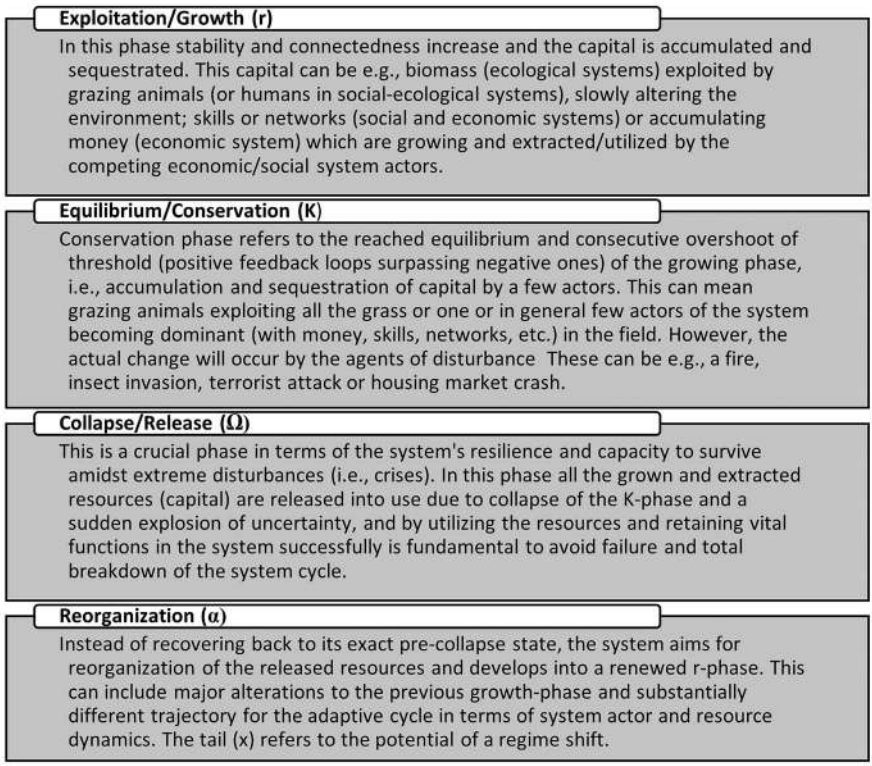

Figure 1.3 The Four Phases of the Adaptive Cycle (adapted from Allen & Holling 2010)

are built, their physical form and land use patterns remain fixed for generations (see Schauppenlehner-Kloyber & Penker 2014; Toivonen 2021). Hence urban planners have long considered risks such as natural hazards and armed conflicts. Past crises like Hurricane Katrina in 2004 and the Tohoku Earthquake (and subsequent nuclear accident) in 2011 have shown that developing crisis management capability and resilience in the BE still requires effort.

Cities and urban BEs are complex social-technical systems, which makes them susceptible to various crises and crisis impacts (Davoudi et al. 2012). When a natural hazard or a missile strike hits densely populated urban areas, the impacts on human life, socio-economic system, and BE can be severe (The European Commission 2018). For example, Tähtinen et al. (2023) identified 23 impact themes which can affect the hard and soft elements of BEs. Hard elements refer to physical structures, materials, and spaces whereas the soft elements consist of institutions, values (economic, cultural, etc.), and immaterial capacities such as knowledge or supply of electricity. This multidimensional nature of BE creates challenges for crisis management and currently there is limited information available on urban and BE crisis management. However, it is plausible to consider that urban crisis management refers to general crisis management but within an urban setting. Often

the focus seems to be on the role of public sector actors such as municipal risk managers and emergency services' capability to anticipate and react to e.g., natural hazards or terrorist attacks.

Coupled with ongoing urbanization, urban resilience has been an emergent topic in the 21st century and there is a growing body of academic literature, reports, and policy papers using terms like "resilient city" and "urban resilience." According to the OECD (2023), "Resilient cities are cities that can absorb, recover, and prepare for future shocks (economic, environmental, social & institutional). Resilient cities promote sustainable development, well-being, and inclusive growth." They identify four measurable areas that drive resilience in cities (Figure 1.4). Similar themes are found in the widely used City Resilience Index by Arup (2014). The European Commission (2023) views a resilient city as one that maintains continuity of services and functions during any shock or stress while safeguarding and enhancing people's lives. They stress that a resilient city prepares for and responds to all hazards, whether with sudden or slow onset, expected or unexpected. UN-HABITAT (2023) defines urban resilience as "the measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability." BE resilience follows a similar thematic. Lee Bosher (n.d.) refers to built-in resilience, which he defines as "a quality of a built environment's capability (in physical, institutional, economic, and social terms) to keep adapting to existing and emergent threats" (in Hassler & Kohler 2014, p. 123). Overall, resilience in the urban and BE context aligns with the concept of social-ecological systems resilience, which, in turn, is rooted in C.S. Holling's idea of ecological resilience.

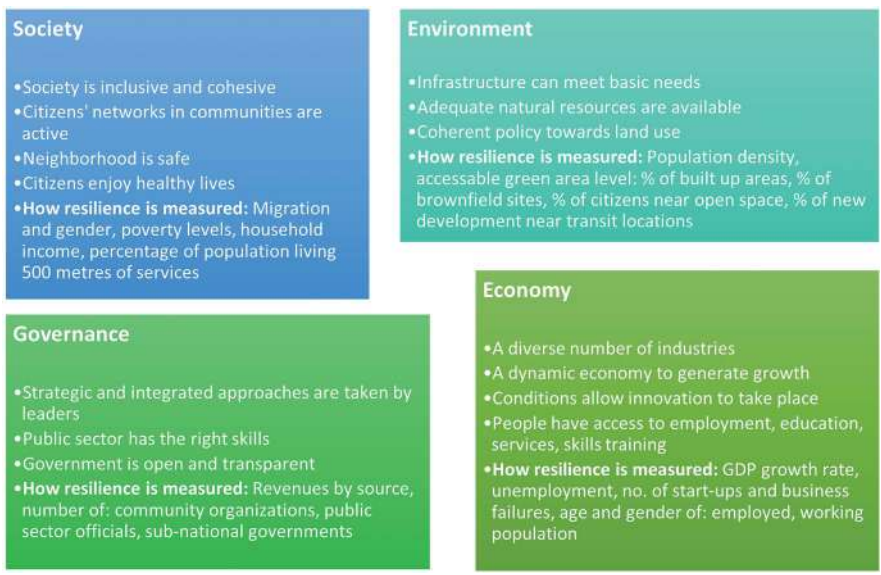

Figure 1.4 Four Areas that Drive Urban Resilience (adapted from OECD 2023)

Actors and Implementation

Cities and BEs consist of complex networks of actors, which can be roughly divided into three groups: 1) public organizations, 2) private organizations, and 3) dwellers/households and communities. In addition to the context dependence, crisis management and resilience practices between these groups have the same basic principles but differ to some degree. The rhetoric may vary, including crisis management, risk management, emergency management, security, resilience, and preparedness, but ultimately, they all pertain to crisis management and resilience development.

The public sector plays a significant role in BE crisis management due to its involvement in land use planning and broader institutional urban development. A social contract exists between citizens and the public sector, where the latter protects the citizens in exchange for loyalty and obedience (Chandrasekar et al. 2021). Compared to the private sector, public sector risk managers need to pay even more attention to social and political risks and consider a wide variety of stakeholders (Drennan et al. 2014). On the other hand, private BE actors, such as constructors, real estate investors/owners, and developers, hold considerable influence over how BEs are shaped. As they usually operate for-profit, their crisis management aims to secure core operations and maintain continuous cash flows. Overall, crisis management in both public and private organizations follows the basics of the crisis management cycle. They conduct risk assessments, prepare for how to react and recover in case of crises, and learn iteratively from others and themselves. Land use planning, specialist preparedness personnel (e.g., resilience officers, risk managers, and chiefs of preparedness), knowledge networks (e.g., The Resilient Cities Network or Urban Resilience Hub by UN-HABITAT), emergency drills, and regulations like building codes contribute to the further development of urban resilience and crisis management capability in the BE. At the dweller and household level, resilience and crisis management have a slightly different nature, relying more on individuals' and communities' material and immaterial resources and psychosocial capacity to cope with uncertainty, stress, and shocks (Rashidfarokhi & Danivska 2023).

There are different thematic frameworks and guidelines to steer the implementation of resilience in the BE. For example, in their City Resilience Framework, Arup (2014) listed seven qualities that resilience should possess: Reflectivity, Robustness, Redundancy, Flexibility, Resourcefulness, Inclusiveness, and Integration. Castano-Rosa et al. (2022) synthesised similar themes in their view on resilience attributes of urban BE resilience implementation. However, practical implementation of resilience in urban BEs is challenging due to the ambiguous conceptual nature of resilience, the complex real-life characteristics it entails, and the extensive multidimensional demands set by the various principle-based, normative frameworks aiming for holism (Hardaker et al. 2022; Shamsuddin 2020; Therrien et al. 2020; Wardekker et al. 2020). Nonetheless, Krishnan et al. (2023) recognized several ways to realize these principles through planning responses (Table 1.2).

Table 1.2. Resilience Principles and Planning Responses (adapted from Krishnan et al. 2023)

Resilience Principles	*Planning Action*
1. *Adaptivity*	Adaptive renewal, rezoning
2. *Buffer*	Green roof, retention parks
3. *Redundancy*	Multiple routes, backup resources
4. *Diversity*	Mixed land use, building typologies
5. *Flexibility*	Spaces for expansion, open-ended functions
6. *Multifuntionality*	Water squares, parking garages
7. *Multiscalarity*	Interscalar measures & coordination
8. *Robustness*	Upgrading/reinforcing dikes, highways
9. *Self-organization*	Community response, use of open spaces

Also in practice, crisis management and resilience development can require extensive resources. Being prepared for diverse types of crises necessitates continuous planning and iterative development of capabilities and capacity. However, in smaller public and private organizations, individual households, or many communities, this may not be feasible, and often vulnerable groups such as low-income households are most affected by crises (Our World in Data 2023). Even with vast resources, efficiently managing crises with zero damage, casualties, or disruption is nearly impossible. Moreover, resourcefulness, especially in the organizational context, often translates to a larger organization with more departments, functions, teams, offices, relationships, and technology, resulting in increased complexity. In complex systems such as cities, states, and organizations, crisis management often relies on critical infrastructure protection (see e.g., Boin & McConnell 2007). Critical infrastructure refers to functions crucial for the system to function properly. For a city, these can include logistics, energy systems, leadership, healthcare and emergency services, ICT, and economic functions, whereas for example for a state, this also includes the military. Meanwhile, private organizations focus on securing core business functions and continuity of operations through ICT, organization, and critical personnel.

As discussed in the resilience sub-section of this chapter, resilience can sometimes be viewed as a self-contradictory concept, and there are also more critical perspectives on urban and BE resilience. The conventional approach to crisis management and resilience development in BEs has been criticized for being too focused on specific types of crises, mainly natural hazards and their immediate impacts (see e.g., Rashidfarokhi & Danivska 2023; Tähtinen et al. 2023). Chelleri (2012) on the other hand points out that the emphasis in resilience development has heavily centered on climate change and natural hazards. Additionally, the World Bank Group (2016) considers that especially in low- and middle-income countries BE institutions such as building regulation and land management fail to include different stakeholders in their resilience-capacity development. Furthermore, Vale

(2014) raises essential questions about whose resilience we are actually developing and for what purpose. Who gets to decide on the priorities and actions? These questions highlight some of the complexities that cities and BEs present in the context of resilience development.

Despite the significant challenges, many actions and initiatives are undertaken to manage crises better and to enhance resilience. Well-recognized threats are aimed to be avoided by preventing them in the first place. For example, destructive impacts of floods are mitigated with engineering and nature-based solutions or by restricting construction in flood-prone areas based on flood risk assessments. Building codes set specific safety guidance and requirements for various situations, such as building fire safety, and organizations conduct regular evacuation simulations (Tähtinen 2022). Installing impact-resistant glass can prevent exploding or imploding windows, locating buildings' power centers upstairs can protect them from storm-surge elevation, and siting and shading can reduce heat gain (Urban Land Institute 2015). In addition, there are resilience officers, preparedness and risk managers, and emergency specialists who develop strategic and operational plans for proactive and reactive capacity to act in case of a possible crisis. The practical implementation of resilience in urban BEs will be discussed in more detail through various cases in chapters seven and eight of this book, but Table 1.3 shows a few case examples of initiatives aiming to develop resilience in BEs. It is difficult to show specifically which types of crises (see Drennan et al. 2014) these initiatives address, but the focus seems to be on natural disasters and creeping crises such as climate change and inequality. The Delta Works in The Netherlands is clearly developed to build robustness and buffer for floods whereas the Resilient Cities Network addresses

Table 1.3 Case Examples of Resilience Development in the Built Environment

Name & Location	*Description*	*Addressed resilience principles (Krishnan et al. 2023)*
The Delta Works/ The Netherlands	A series of dams, sluices, storm surge barriers, and a system of drainage ditches, canals, pumping stations, and dikes to protect the Dutch coastline from the North Sea.	Adaptivity, Buffer, Redundancy, Robustness
The Resilient Cities Network (Formerly 100 Resilient Cities)/ Global	A global initiative, which enabled cities to hire a Chief Resilience Officer (CRO), develop a resilience strategy, access pro bono services from private sector and NGO partners, and share ideas, innovation, and knowledge through the global network of CROs.	Varies between projects, but in general adaptivity
Nature Urbaine (NU Paris)/ Paris	A 14,000m^2 rooftop farm. By utilizing vacant spaces, organic waste, waste heat, etc., produces 200kg of fruits and vegetables per day.	Adaptivity, Redundancy, Flexibility, Self-organization

(*Continued*)

Table 1.3 (Continued)

Name & Location	*Description*	*Addressed resilience principles (Krishnan et al. 2023)*
Japan's Building Regulation for Disaster Risk Management/ Japan	Incrementally developed legal framework, building code and quality assurance mechanisms to develop more resilience for buildings through their full life-cycles including (1) planning, (2) design, (3) construction of new buildings, and (4) maintenance or retrofit of existing buildings.	Adaptivity, Diversity, Robustness
Building community-driven vertical greening systems for people living on less than £1 a day/ Lagos, Nigeria	Interior vertical greening system (VGS) prototypes installed by low-income residents of Lagos to grow and produce herbs and medical plants and to cool indoor temperature.	Adaptivity, Redundancy, Flexibility, Multi-functionality
South Florida Resort/ Florida, US	Institutional investor-owned resort and conference center went through multiple resilience development actions, including relocation of electrical infrastructure above storm-surge level, hurricane-resistant windows and doors, backup power generators, water storage tank, and disaster recovery plan.	Adaptivity, Redundancy, Robustness

"all kinds of shocks and stressors" and has numerous different projects in various cities, making it more a platform for resilience capacity-development for whichever threats member cities prioritize. Interestingly, when examining these cases from the resilience principles point of view, it can be seen that a single initiative can meet multiple principles, but still address only a very limited number of threats.

Conclusions

In this chapter, we gained our first understanding of crises, crisis management, and resilience, and explored their general implications and specific applications in cities and BE. In today's urbanizing and interconnected VUCA world, resilience and the capacity to manage uncertainty and crises are crucial. Crises can arise from various parts of societal systems, affecting and amplifying one another. The phases of the crisis management cycle, including risk assessment, prevention, preparedness, reaction, recovery, and learning, are used to manage crises.

Resilience, on the other hand, represents a built-in feature of systems like cities, buildings, or neighbourhoods. A resilient BE can withstand sudden shocks and long-term stress through anticipation, preparedness, agility, adaptability, participation, diversity, redundancy, robustness, restoration, and learning. However,

implementing holistic crisis management and resilience development is challenging in practice due to the complexity of both potential crises and the BE itself. Nevertheless, the topic is continuously evolving, and new strategies and practical solutions are being developed constantly. The following chapters will delve into more precise perspectives to build a comprehensive understanding of the complex topic of resilience in the BE.

Practical Recommendations

- Expand risk assessments to include potential threats beyond common risks through reading news from different industries and by using media sources from different countries and continents and follow available intelligence and future and foresight reports.
- Identify your strengths and vulnerabilities in very different kinds of crises and plan how to secure people and continuity of critical functions such as food, water, waste and wastewater, heating, electricity, ICT, logistics, healthcare, and organizational core operations.
- Design indoor and outdoor spaces for multiple functions and options to reserve space and alternative spaces for storage and community activities.
- Brief landlords, asset and facility managers, and tenants before, during, and after a crisis and define clear responsibilities with well-rehearsed contingency plans; Keep up-to-date contact details for key crisis management personnel available.

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2 Crises and Wellbeing: The Potential of the Built Environment

Ira Verma

Introduction

The changes around us occur at different paces of time: some phenomena are evolving slowly (shrinking, ageing, global warming), and some may culminate suddenly in crises (earthquake, floods, war, etc.). It seems to be equally difficult to be prepared for both kinds of crises. Moreover, the impact of crises related to e.g., the health and social environment like pandemics may have a devastating impact on urban life. These crises are experienced at individual and community levels affecting people's wellbeing. Floods, fires, and landslides may turn into disasters destroying the built environment, people's homes, and infrastructure. Aldrich and Meyer (2015) observed that responses to climate actions related to the built environment have mainly been strengthening physical infrastructure and updating building codes. They argue that any of the responses limited only to physical infrastructure will not be able to fully reduce risks or eliminate vulnerability. Similarly, housing construction for older adults focuses on fire safety regulations, sometimes ignoring the role of the community in resilience. During our study, we collected the experiences of people who have personal experience of hazards in the built environment and have been displaced temporarily or permanently from their homes. These hazards were related to forest and building fires, as well as landslides, causing property damage and loss of services and livelihoods (Fig. 2.1). Semi-structured interviews enabled us to gain further knowledge on home loss, self-perceived wellbeing, and feeling of safety. The interview questions were related to the meaning of home and community in the context of a crisis in the built environment.

The research question was: Which factors in the built environment can support people's perceived wellbeing in these crises?

The results of the interviews emphasize the importance of community and peer support during and after crises. Moreover, cooperation across municipal sectors with local stakeholders and residents can decrease the vulnerability of certain population groups. Cutter et al. (2003) argue that the roots of social vulnerability are in people's limited access to political power and social capital, as well as in the physical characteristics of individuals and of the built environment: building stock and age, and the type and density of infrastructure. The vulnerability can refer to individuals or groups of people, their housing environment, urban systems, and places

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Figure 2.1 Building fire in a senior housing complex. (Photograph by a resident, anonymous)

on various scales. Pineda and Corburn (2020) argue that the disability or vulnerability is not caused by the person but by the system. According to them, policies, land use planning, architecture, and infrastructure may limit people in using their capacities. In this study, older adults living in a senior housing complex that caught fire were interviewed. The results of this study confirm previous findings showing that enhancing community building, improving housing quality, and an inclusive urban environment have an important role in preparedness for hazardous life events as well as in the recovery process. The ability to cope and overcome crises is related to many interacting factors: the built environment, the socio-economic environment, and people's individual resources. Proactive measures to reduce vulnerability in general and to strengthen communities' and individuals' capacities to overcome such crises are needed.

Megatrends Affecting Wellbeing

Urbanization

Globally, the majority of people live in cities. In Europe, in 2015, the share of people living in cities was 72%, and it continues to increase (Vandecasteele et al. 2019, p. 25). The concentration of people in densely built urban areas makes cities vulnerable to natural hazards, social conflicts, and health risks like infectious disease. Cities are largely affected and many lives can be lost in disasters. At the same, the preparedness for hazards in terms of technology and infrastructure is generally greater in urbanized areas. Moreover, after natural hazards, due to better economic

resilience, the rebuilding process may start sooner and be quicker in cities than in remote areas. Cutter et al. (2016) found that the challenges in resilience are different in urban and rural places. Urban areas have a more resilient economic structure and infrastructure, whereas the strength of rural areas may be strong community capital. Therefore, the efforts to improve disaster resilience must be adapted to the local context.

In natural hazards, only rarely is the whole city affected or destroyed. People can be displaced within the city, there are spaces for temporary shelter and housing as well as people available for help and support. Practical help and assistance from neighbors, family, and peers play a crucial role in crises and post-disaster recovery. This is especially true for vulnerable population groups, older adults, children, and people with disabilities who are the most affected and are over-presented as victims of natural hazards (ESCAP and UNISDR 2012, p. 37) and fires (Gjøsund et al. 2016). Older adults interviewed for this study considered support from neighbors and family as the preferred option. They appreciated the help from organizations and the municipality but were hesitant to accept assistance from people they called "strangers". There are, however, an increasing number of people of all ages who live alone and have no family or relatives nearby. This may add to the need for formal help and assistance through various organizations and associations. Therefore, preparedness for hazards should be carried out with the collaboration of local stakeholders.

The overall objective of urban planning is to provide a good living environment for all citizens. A socially inclusive approach and age-friendly design are promoted in many cities. Urban development projects have also been successful in improving people's lives: overcrowded neighborhoods or deteriorating housing have been rebuilt and the standards of housing have been improved. The Human Rights Council (2018) states that human rights and environmental protection are interdependent:

> A safe, clean, healthy and sustainable environment is necessary for the full enjoyment of human rights, including the rights to life, to the highest attainable standard of physical and mental health, to an adequate standard of living.

The urban renewal process, like any changes in the built environment, has an impact on peoples' experiences of the space. In densification and urban renewal processes, the mental images proposed by Lynch (1964) – existing in the minds of the people who experience the city – may no longer be recognizable. Older adults who remain living in their familiar surroundings, *districts*, live through change and may experience the loss of their visual *landmarks* and *edges*. Due to densification and modifications people lose their favorite walking paths and see the *nodes* of the city move further away. This may affect the residential satisfaction of people and increase the residential mobility of those who can afford housing choices. Others may feel stuck in place.

Mouratidis and Andersen (2023) observed that newly densified neighborhoods can lead to moving intentions because they have not been able to fulfill the expectations of residents in terms of the built environment. Densification may lack design

considerations and development of public spaces, parks, greenery, amenities, and building design. Moreover, urban renewal processes can cause gentrification which may lead to an unwanted move from one's housing due to increased rents. Natural hazards can lead to similar results when homes are destroyed, and a decent and affordable dwelling may be hard to find. Those who have less resources are the most exposed to the negative effects of hazards and may not be able to choose their living environment. Their physical and social environment is transformed. The older people interviewed for this study felt unrooted and sad about the disintegration of their familiar community. They pointed out that the building or rebuilding process of a community takes time and requires physical spaces for interaction.

Sustainable development goals have steered cities towards densification of urbanized areas. It has both advantages and disadvantages. Urbanization is a risk for increased inequalities within countries as urbanized areas are developing, and rural areas lose population. Many areas in Europe are ageing and shrinking whereas only a few big cities are growing. Both young people and older adults move to cities near services and social life. Interviews in this study revealed that for older adults age-friendly housing and facilities as well as access to services were pull factors for moving to the senior housing complex. Shrinking areas may lack suitable housing and services for them. This may decrease housing satisfaction leading to increased housing mobility towards cities. Homes and other buildings remain underused or vacant and deteriorate the image and experience of the place.

The literature review by Berghauser Pont et al. (2021) showed that positive impacts of densification are reported in studies related to public infrastructure, transport, and economics. Economic activity increases wealth and people living in high-density areas have better access to public, commercial, and health services as well as public transport. On the other hand, densification and concentration of services may lead to the closing of small neighborhood retail and service spaces. This makes distance to services longer and may decrease accessibility of services for the most vulnerable population groups leading to negative changes in their social environment and social capital. Social capital is an important resource for communities, and it can be a buffer against negative life events. Mixed land use, accessible facilities, and green environment play a significant role in community building, which is an important resource for resilience in crises. Therefore, it is critical to enhance livable, equitable, and inclusive urban densification.

Climate Change

Climate change and global warming have many negative effects on people's well-being, affecting both physical and mental health. Negative effects have an impact, especially on the most vulnerable people: small children, people with poor health, and older adults. Place of residency and its urban form are meaningful for these population groups who spend most of their time at home and in the immediate surroundings. Moreover, air pollution, noise, and extreme temperatures are unevenly distributed within cities, leading to health inequities. The urban form, height of buildings, street networks, and open spaces affect the air flows and temperatures

Figure 2.2 Trees provide shelter from sun and have a cooling effect. Older adults gather in the parks to socialize. (Photograph by the author)

locally. People's adaption to different temperatures varies locally and individually. However, people living in dense urban areas with little green infrastructure and high temperatures have a higher risk of mortality and morbidity than those living in greener areas with lower temperatures (Schinasi et al. 2018). Green areas promote physical and mental health and contribute to community capital (Fig. 2.2). People who have more resources can choose their place of living and move to areas with urban green spaces, low car traffic, and less pollution.

Anxiety, insecurity, and trauma caused by climate change have been related especially to children and youth. It can cause feelings of disempowerment and disengagement (Brophy et al. 2023). At the same, extreme heatwaves increase admissions to hospitals and affect especially older adults. High temperatures are an increased health-related risk and increase the need for healthcare services. Some individuals are more vulnerable to natural hazards resulting from climate change. Vulnerable population groups are exposed to danger during heavy rains, flooding, fires, and storms due to their functional capacity and dependence on others. Physical and sensory impairments, chronic illness, and mental health may limit people's ability to act and evacuate. Information about preparedness for crises can be poor, and refugees and migrants may have language barriers to accessing it.

Environmental effects of high densification are found for the most part to be negative (Berghauser Pont et al. 2021). Housing density together with low permeability

of surfaces correlates for example with an increased risk of flooding and increased absorbed temperatures. People living in densely built urban areas may suffer from "heat island" effects. Similarly, the lack of trees and green infrastructure leads to higher temperatures. People may try to manage increasing temperatures by changing their behavior. They may change their daily rhythm and avoid going out during the hottest hours of the day if possible and stay in the shade of trees or air-conditioned spaces when available. Both extreme heat and cold weather are health risks affecting especially older people and people with chronic conditions. In extreme cold weather, people look for shelter indoors. Due to the shortage of electricity and the high price of energy, not everyone can afford to warm or cool their houses. This may again increase health disparities among people.

Most people are aware of climate change and the risk of natural hazards. However, they often consider that the risks do not affect their immediate surroundings. Local memory and knowledge of hazards are increasing the willingness and ability to prepare and respond to climate change. Previous personal experiences of hazards increase people's belief that there is a probability of having more natural hazards near one's home. In the past, natural hazards, such as earthquakes and landslides, as well as wars, pandemics, and economic crises may have led to the abandonment or destruction of entire communities. Learning from previous events can help to reduce vulnerability. It is important to consider the general resilience of communities in a wider way and choose adaptation strategies to particular crises that do not result in becoming less resilient to others (Miller et al. 2010).

Climate actions are a potential way to reduce existing inequalities within cities. Providing affordable housing with proper insulation, as well as heating and energy-saving solutions, may reduce the overall costs of living. Improving the quality and accessibility of housing and renovations related to indoor air and temperature have a positive impact on people's health. Moreover, adding green infrastructure in areas that are suffering from noise and air pollution can improve the living environment and residents' wellbeing.

Emerging Crises for Urban Life

Impacts on Physical and Mental Health

Unsuitable living environments, densely built cities, and crowded urban spaces are favorable habitats for pandemics. Historically, pandemics have led to improvements in the built environment – cities, houses, and healthcare buildings – leading to more healthy people. They have contributed to the invention of better water and sewage systems, and waste management. Moreover, architects have learned to use the healing effects of natural light, fresh air, and nature in building design. Hussein (2022) observed that historical pandemics have led to the planning of wider streets, the construction of specified healthcare facilities, the improvement of housing, and the development of new building materials.

Our daily living environment also affects our health in terms of encouraging daily physical and social activity behavior. Sedentary life and loneliness are fatal

to people. The need for social distancing during COVID-19 increased the understanding of the importance of open public spaces and the green environment for wellbeing. Access to open spaces and parks gave people a brief relief from lockdown. Poortinga et al. (2021) found that nearby public green spaces were particularly important for those who did not have access to private gardens. Public green areas were enabling the promotion of subjective wellbeing and physical and mental health during lockdown.

Social isolation during the COVID-19 pandemic had many detrimental consequences for people's wellbeing. The restricted access to public spaces, schools, and healthcare facilities may have long-term negative outcomes on mental health. Poor mental health and low perceived wellbeing reduce resilience to different crises. Völker (2023) found that during COVID-19 people focused on strong social ties, contacts with their close family and relatives, while weak ties, mixing with the neighborhood, declined. This may have increased the feeling of loneliness of those who live alone. Students and young people who lost their income due to lockdown may have returned to their parental home feeling a loss of independence. Evandrou et al. (2021) found that those people, especially young adults, whose living arrangements had changed during the COVID-19 pandemic had a higher likelihood of reporting increased stress than those whose living arrangements remained unchanged.

The pandemic has permanently affected the ways and places of working. For place-independent jobs, remote working has become a norm and the number of multilocal people has increased. Multilocal working had already been increasing before the pandemic. Di Marino et al. (2018) found that places that have been traditionally used for leisure time, such as summer cottages, become temporary or more permanent workplaces for some. They found that a few employers have enhanced remote working and multilocality by installing broadband technology in their workers' homes or second homes. Moreover, many municipalities have invested in digital networks. Due to the requirements for social distancing, the pandemic affected the use of non-traditional and multifunctional spaces, such as libraries, coffee places, and co-working spaces for work.

Pandemics differ from other hazards as the built environment and housing is not destroyed. Most people were not displaced and they did not lose their homes, instead, they were isolated within their homes from the rest of the community. This may have affected their feeling of home. Roschel et al. (2020) point out a significant proportion of COVID-19 associated deaths in people with the oldest age cohorts. Social isolation and physical inactivity were further deteriorating their health. Many of these frail people live together in assisted living which makes these places more vulnerable to pandemics. Restriction of visiting and group activities led to physical inactivity, which causes loss of muscle mass and strength. Isolation has a very negative impact on older residents' mental wellbeing as well.

The COVID-19 pandemic raised the importance of the social environment and the role of communal spaces and nature within the city. In June 2023 the European Commission launched a new initiative and funding program putting people and their mental health first.[1]

Potential of Urban Spaces in Crises

Importance of Cultural Heritage and Community

The urban environment is part of our cultural heritage and much of the national wealth is in the built environment. Climate change and international conflicts may pose a risk of losing our wealth and cultural heritage. Adopting the Hague Convention (UNESCO 1954), 134 countries agreed to safeguard and preserve cultural property during armed conflicts. However, the infrastructure, cultural buildings, and people's homes are destroyed in these conflicts. The government resolution for a Cultural Heritage Strategy in Finland recognizes the importance of cultural heritage to one's wellbeing, resilience, and recovery from crises. Culture bridges people together and is a resource for a sustainable future. A rich cultural heritage and shared values enhance crisis resilience as part of the community's comprehensive security (Mattila 2023, p. 14). However, during military conflicts, cultural heritage may be deliberately destroyed and replaced.

Adalgeirsdottir (2021) points out that it is important to understand the sociocultural aspects of local communities for recovery to be successful. A holistic understanding of traditions and customs should be taken into consideration in the rebuilding of the physical environment. People living through community loss need to be included in the urban rebuilding process. The community rebuilding process needs physical spaces for people to meet and socialize. The older adults interviewed in this project experienced sadness at the loss of their senior community and their relationships due to the building fire. They were also disappointed that the restoration process of their homes was carried out without their participation.

Immigrants feel the loss of their homeland and their cultural traditions (Gitterman & Knight 2019). In the process of building temporary shelters for immigrants and housing for displaced people, the need for common use and public spaces is important. This enables them to maintain or create new social connections with their peers. Similarly, older adults reported that the lack of common use spaces was slowing down the rebuilding of their disintegrated community after the fire. Félix et al. (2015) argue that even in a temporary location, a house is more than the physical space. It helps people to feel socially integrated and have a sense of belonging. It is a source of pride and cultural identity. Temporary accommodation actively contributes to helping people overcome the feeling of insecurity caused by the hazard and gradually regain their lives. Urban functions need to be planned from the beginning of the rebuilding process even in temporary shelters. Small shops, cafés, and other places for gatherings are important to support community building. Allowing people who have faced crises to take action to improve their environment and to be active makes them feel in control of their life. Flexible construction will allow residents to adjust the built environment to their needs.

Flexible Use of Public Spaces

The urban environment and the social context affect one's wellbeing and health. Feelings of inclusion and safety are integral parts of life satisfaction. The social

environment and the possibility of mobility are key characteristics of personal wellbeing. Koohsari et al. (2015) argue that a public open space can play different roles. It may be a space for physical activity, a destination to be active and socialize, and a route to a destination. Public open spaces, such as parks and green spaces near housing, are built environment features that provide the possibility to be physically active and meet people. They can enhance social activities, and consequently, community building, which is an important factor for resilience. Urban space can support the community both in daily activities and during natural hazards. Inclusive approaches to urban design and community building are important in improving preparedness for all life hazards. Inclusive communities are built for all citizen groups, regardless of their age, disability, and cultural background. They include the design of the built environment and access to services and information. Cutter (2008) refers to places where people live and work:

> Vulnerability manifests itself geographically in the form of hazardous places (floodplains, remnant waste sites); thus, spatial solutions are required, especially when comparing the relative levels of vulnerability between places or between different groups of people who live or work in those places.

Several studies have found that mixed land use and local services are associated with social capital (e.g., Aldrich & Meyer 2015). Public spaces like libraries and commercial centers have a role in building resilience, for example as cooling centers in extreme heatwaves. They provide rescue for those at health risk due to hot temperatures. Local facilities have also a role as places for the first rescue in building fires, storms, and floods, for example (Fig. 2.3). Older people interviewed in this study were evacuated in a school and library building near the senior housing complex. It was used as the center for assistance and information provided by various organizations. Air-conditioned public spaces can also provide shelter from wildfire smoke pollution. Indoor air filtration can provide shelter, especially for those who suffer from breathing difficulties due to asthma or another similar lung disease (Wheeler et al. 2021). Staying indoors and keeping doors and windows closed can reduce exposure to smoke for short periods, but it is less effective over several days or weeks of reduced air quality.

In hazards not only buildings but the number of people in the buildings is a relevant factor for evacuation. People distribution in cities varies during time and space. Urban density may become a risk factor in emergencies. Housing areas are most crowded and vulnerable at nighttime. Anhorn and Khazai (2015) consider an extreme case, where several high-rise apartment buildings around a single courtyard with only one exit point towards other courtyards before even reaching a road. Connection to the street through a series of courtyards and narrow passages makes evacuation difficult.

Access to healthcare facilities is important in crises. They should be built on sites with low risks of damage from natural hazards. A literature review by Fallah-Aliabadi et al. (2020) revealed that hospital building structural resilience, and infrastructure that enables the functions of the hospital, power, water, and

Figure 2.3 School building is used as temporary shelter for the country's internally displaced people in Ukraine. (Photograph by K. Adalgeirsdöttir)

cybersecurity, are relevant in crises. Moreover, they found that transport routes and access of patients and staff to the hospital are crucial. Collaboration with healthcare professionals, volunteer organizations, and local people increases resilience. Clear evacuation routes for emergencies and information for residents about the nearest public or semi-public buildings that are used for first rescue in fires, floods, heatwaves, and other hazards may help in the evacuation. The buildings that are used for first rescue need to be accessible to all and have good sanitary facilities and water supply.

Multifunctional Green Spaces

Urban nature offers public health benefits in terms of improved mental and physical health. The green environment also has an important role in absorbing rainwater and cooling the urban environment. Communities plan for better urban environments, thus increasing community wellbeing and possibilities for sports and leisure. This desire for an improved urban environment for citizens can be combined with risk management for natural hazards. Natural hazards can become drivers or opportunities for local transformation processes. Local stakeholders play a critical role in initiating and managing local transformation processes, acting as enablers or hindrances. Thaler et al. (2019) point out that local stakeholders or landowners can have different views on how to manage natural hazards. The conflicts between various stakeholders may become a barrier to successful

implementation. Therefore, local engagement, resources, and knowledge are important to successful results.

Community gardens may act as buffer zones for stressful life events as well as for fires. According to French et al. (2019), accessible open spaces such as parks, sports fields, parking areas, and streets have an important role during natural hazards and evacuation. They found that multifunctional open spaces in urban areas with access to water and sanitation are best adapted for evacuation and first shelter. Publicly owned open spaces that are not planned, and parks, gardens, and playgrounds are most suitable for shelter. The nearness of critical health facilities increases their suitability. Access to shelter and street networks is a major consideration in evacuations. In natural hazards like earthquakes or floods public open spaces and green spaces play a fundamental role in evacuation processes. The network of green spaces in cities and the connections between the green areas can become evacuation routes for people. They can also accommodate temporary shelters for local people. The use of urban open spaces varies during the day and people of different ages and abilities have different opportunities to evacuate and act.

People have unequal access to green spaces. Improving quality and access to green spaces in urban environments can lead to improved health outcomes, due to reduced levels of noise and temperatures. Moreover, improved access to urban green space can reduce health inequalities within a city and contribute to social cohesion, as green spaces are important for inclusion and community building (Ganzleben & Kazmierczak 2020).

Use of Underground Spaces

In some cities, underground parking is combined with other underground spaces that are used for rainwater retention and storage. Moreover, citywide networks of tunnels have been built to ensure electricity and communication connections during extreme weather. Underground transportation systems also have a role in building resilience (Admiraal & Cornaro 2020). Underground metro stations have been also used as spaces for rescue in military actions. They have accommodated-people in extreme heatwaves. However, underground spaces must be prepared for sea level rise and flooding. Evacuation may cause additional challenges because of difficulties in orientating underground. A clear indication of directions and evacuation routes is necessary.

As an example of underground construction, Finland has a long history of building civil defense shelters. They are mainly located in big cities, for example in apartment buildings, hospitals, schools, and other large public and commercial spaces. They can protect nearly all citizens against military actions. Before the war in Ukraine, the necessity of these shelters was put into question. They are still mandatory in most building projects. When not used as shelters, they are used as storage spaces, parking areas, or sports facilities. One of the largest civil defense shelters in Helsinki is used as a swimming pool. It is quarried in the natural bedrock, and in conflict situations has rescue space for 3800 persons.

Private Domestic Space

Home Environment

For most people, home is a safe and cozy shelter from the outside world. It is a personal space as well as a space shared with friends and other household members. Home is embedded with personal experiences and memories that are part of our identity. People can feel a sense of belongingness and attachment to a place, enhancing their self-identity and sense of wellbeing. When they are displaced or lose their home, they may feel grief from being uprooted from all that is familiar (Gitterman & Knight 2019). The experience of home may also deteriorate during periods of long illness or disability, and social isolation like COVID-19. Due to the changes in one's home environment, it may not feel safe, and people can feel the loss of control over the space. During the pandemic, the home environment may have turned into a working environment as domestic spaces were used to accommodate work and studies as well. Marco et al. (2022) observed that adaptability and flexibility as well as spaciousness helped people to cope with the "enforced togetherness" of lockdown. According to them, family members had to negotiate and adapt the use of available spaces for work while trying to maintain their wellbeing. They found that connectivity (digital and physical) inside and outside the home became important. During lockdown, the household composition may have also changed. Due to more severe restrictions for the oldest age cohorts, adult children may have decided to move to provide care for an older family member, or older people may have moved in with a younger relative for support.

The loss of a home can be experienced strongly with all unwanted moves. It can result from illness or sudden crises leading to a feeling of insecurity and loss of control. Studies by Elliott and Howell (2017) related to natural hazards revealed that disadvantaged people had more residential mobility after crises, as it was difficult to find affordable housing after crises due to increasing demand. Whereas those who have houses and good insurance rebuild their houses rather than relocate.

Similarly, Johnson and Carswell (2021) point out that unplanned moves seem to occur more often in lower-income populations. The moves can be caused by natural hazards or economic crises, for example. For a person or family, the emotional and psychological distress may be the same regardless of the cause of the crisis. During unplanned moves in crises, the negative experience of the new place of residence can delay the recovery from crises (Johnson & Carswell 2021). Older adults placed in care facilities and children placed in foster homes experience intense feelings of grief associated with the loss of home and family. In this study, due to a building fire, the older adults were displaced temporarily from their apartments that they considered their end-of-life homes. The building fire affected their sense of security and many of the residents did not return to the senior community after the renovation period. The most important loss they reported was the loss of their community.

Temporary Dwellings

Anhorn and Khazai (2015) found that shelter needs after crises can be divided into emergency shelter, temporary shelter, temporary housing, and permanent housing. In crises, people from non-usable, collapsed, or destroyed buildings but also from partly damaged and non-damaged buildings need shelter (Anhorn & Khazai 2015). In the RESCUE project we have observed cases where a fire, flooding, or landslide caused damage to people's homes, and they needed temporary dwellings. Renovation and rebuilding processes can take months or years. Some areas are destroyed and cannot be rebuilt. Even if one's home is not fully destroyed, people may own properties that have lost their value and are not livable or marketable. This may lead people in economic distress.

Many cities are currently trying to deal with refugees, immigrants, and displaced people due to natural hazards or armed conflicts. The lifecycle of a temporary shelter is short when compared to conventional buildings, ranging from some months to some years in most cases. Kuittinen and Winter (2015) found that the highest emissions are caused by shelters that have a short service life. They argue that shelter materials need to be cost-efficient and easy to transport and recyclable or without harmful emissions. If possible, local materials and space resources can be used as shelters.

Abandoned or vacant buildings within a city can offer an opportunity to provide temporary shelter and accommodation for people Fig. 2.4. Finding appropriate and affordable temporary housing and long-term solutions for these people is challenging. Hotels and motels are sometimes offered for short-term use. Until recent years, the urban form has been modified through constant demolition and rebuilding processes. Every building undergoes some changes and modifications throughout its lifecycle. Currently, many buildings in cities remain underused or vacant. These buildings may deteriorate the streetscapes, reduce the attractiveness of the built environment, and lead to vandalism. Often it is better to find temporary uses for vacant buildings instead of leaving them empty. If the buildings are well maintained, they are potential spatial resources in case of hazards and unplanned events. In many cities existing office and industrial buildings have been converted to housing. Temporary shelters and camps are often located far from the rest of the community. Displaced people and immigrants face problems with transport and social interaction, which are basic needs for integrating into the new environment and developing a sense of place attachment. Access to public social, cultural, and economic services enhances integration and community building for displaced people (Razavivand Fard & Mehan 2018, p. 191).

In many countries, the COVID-19 pandemic led to an increased use of second homes as shelters and places for low risk of infection for urban families. In Finland, people stayed overnight at their own or rental cottages almost twice as much as the year before the pandemic. They also purchased more second homes (Pitkänen et al. 2020). Second homes enable people to have an active lifestyle in a natural setting, increasing their wellbeing. Local people may invite displaced people to their homes or second homes. This will help people to integrate into the new community. Some shrinking areas have profited from the internal displacement and gained population.

Figure 2.4 Local buildings are repaired and renovated for temporary accommodation in Ukraine. (Photograph by K. Adalgeirsdöttir)

New people may generate activity and economic growth in the area. However, this also generated fear of urban dwellers spreading the virus and causing an extra burden on healthcare services in rural areas. Many second homes may still have factors that make them resilient: stoves for cooking and warming, wells for fresh water, and outdoor toilets. The Finnish outdoor toilet *Huussi* was presented at the Venice Biennale 2023 as a sustainable alternative to water-toilet-based sanitation systems.

Providing access to normal daily functions as part of the community will help people to overcome crises. Félix et al. (2015) point out that a house is one of the most important needs for people and essential for their wellbeing, providing conditions to live with protection, security, comfort, and privacy. During home loss, people need to move to shelters and temporary housing. Instead of providing short-term shelters the permanent reconstruction should start as soon as possible. It has been observed that the sooner the reconstruction starts the more reduced the future consequences will be.

Vulnerability and Resilience

Vulnerable Communities

Globally, most vulnerable people live in the most inappropriate housing conditions and are most affected by crises. Affordable housing is often located in areas where land value is low. The value of land can be low due to the risk of floods

or landslides. The quality of construction may vary within a country and a city. Buildings in cities and remote areas differ in materials, size, and construction details. Those areas that have more wealth can be more prepared for natural hazards like earthquakes. Need for rapid urbanization can lead to construction on unstable land. Cities are building on coastal areas even though the risk of sea level rise and flooding is well identified. In response to the risk, cities are proposing technical solutions, such as flood barriers and alert systems. Relying only on such technical advancements can make cities increasingly vulnerable to hazards.

In areas where people living there are strongly dependent on only one industry sector, tourism or forestry for example, the impact of natural hazards has a long-lasting effect. When people lose their housing and source of income, they may be forced to move. Crises that affect the whole nation like economic crises and wars may increase solidarity and the feeling of togetherness, leading to peer support and shared resources. Paradoxically, non-affected neighboring communities may have advantages. They may increase their economic activity, services, and housing due to people who are displaced. On the other hand, it is often the most vulnerable population groups that are displaced. Unsupported voluntary moves from affected areas may lead to increased mental, social, and health problems, as a result of community breakdown and loss of homes and income.

A study by Andersson and Hedman (2016) indicated that when crises affect the local economy and people, they increase income segregation and income inequality most in regions and neighborhoods that already had these issues before the crisis. On the other hand, Zwiers et al. (2016) found that crises can enhance social cohesion in disadvantaged neighborhoods when people are not able to move out. The residents may take increasing responsibility for their own neighborhood, take common actions, and feel close to each other, increasing social cohesion. Relocating the whole community after the crisis may help them to preserve the social ties that existed before the disaster (Shiba et al. 2020). The older adults interviewed for this study considered the disintegration of the community to be their biggest loss. They reported that they would have needed a common use space to meet and socialize to maintain their social ties during their stay in temporary housing.

Vulnerable Population Groups

Vulnerable people are defined as persons belonging to national or ethnic minorities, those living in extreme poverty, refugees, migrants, and displaced people. Moreover, age, sexual orientation, and gender identity may lead to vulnerability (United Nations n.d.). Individuals may experience vulnerability differently (Adger 2006). Older people, children, and those in poor health tend to be more adversely affected by environmental health hazards than the general population (Ganzleben & Kazmierczak 2020). People with disabilities are disproportionately affected by disasters. A UN report (2019a) argues that people with disabilities are not sufficiently taken into account or consulted in emergency management planning, and they are not aware of the crises management plan of their community. In crisis, people with disabilities may have difficulties evacuating and accessing basic services, like safe

drinking water and sanitation. They may also need rehabilitation and health services during and after crises (UN 2019, p. 240).

Adger (2006) describes vulnerability as susceptibility to harm due to environmental and social change and a low capacity to adapt. He finds two kinds of human-environment relations to vulnerability: "vulnerability as an outcome" and "contextual vulnerability". Vulnerability may be caused by socio-economic differences, age, and gender, where disadvantaged people and places are often excluded from decision-making and access to power and resources. People of lower socio-economic groups may live in areas with high traffic, air pollution, and noise.

> Poorer households tend to live in riskier areas in urban settlements, putting them at risk from flooding, disease and other chronic stresses.
>
> (Adger 2006)

When natural hazards occur people can lose their housing, belongings, as well as their source of income. Vulnerable people are the most affected by these losses. Natural hazards and other crises also increase the number of persons with impairments or aggravate their impairments. People may not have the financial, physical, or emotional resources to cope with the effects of crises. When housing stock in a community is reduced because of a natural hazard, it will increase the housing prices and rents. This development may force people to move from their community. This affects their social networks and support they may have in their old community.

There is some evidence that individuals experiencing anxiety or distress report a higher personal threat of hazards. Their response to the risks varies. A study by Agho et al. (2010) found that women self-report greater behavior changes related to health and environmental hazards and the prevalence of changed ways of living than males. Older adults who have experienced various hardships in their lives may have better psychological resilience but less physical and financial resources to cope with them. Gjøsund et al. (2016), in a study on fire security, found that there is a disproportionate loss of life among older nursing home residents. Due to age-related frailty, they have less resources to take an active role in crises and are dependent on others.

Conclusion: Building Resilience

Improvements and renovations related to accessibility, quality of public facilities, and open spaces enhance inclusive use of the built environment. They may increase the community's social capital which is a resource in crises. Open green spaces, public transportation, and shelters against extreme weather (cold and hot) protect against some of the effects of climate change. Local stakeholders should agree on the use of public facilities and large commercial spaces in crises. Designated spaces for first rescue with drinking water supply and sanitation as well as healthcare services should be accessible for all resident groups, including the most vulnerable. Inclusive design of the urban environment and buildings is a proactive

measure against crises, as natural hazards are likely to increase the number of people with disabilities.

Preparedness for natural hazards is a potential avenue for improving inclusivity, when the attention is put on the quality of the construction, housing affordability, and social inclusion. During the planning and reconstruction phases, the emphasis should be placed on the accessibility of the built environment, technology, and communication (UN 2019, p. 245). Access to the urban environment may also improve community social capital which is an important resource for community resilience and individuals coping in crises. Social capital can be a buffer against negative life events. In addition to resilient buildings and infrastructure we should prioritize community-building initiatives (Verma et al. 2023). Similarly, temporary housing and the urban rebuilding process should aim to provide opportunities for normal urban functions, including places for private and public life to overcome crises. However, the sustainable development goals encourage the reuse of the existing built environment for future purposes. Cities have many vacant and underused spaces and facilities that may be used for crisis management and preparedness. More flexible use of office buildings, public facilities, and vacant apartments can be considered in times of crisis. Instead of building temporary, for example, housing for those who are affected by crises, the existing built environment should be adapted for their use.

Natural hazards have many negative impacts on people's health and wellbeing. Some individuals are more vulnerable to extreme events because of low income, age, poor health, and disability. Inclusive planning and design of the urban environment may reduce the vulnerability of these resident groups as well as the population in general. Green buffer zones against noise and air pollution can reduce health inequities within cities and improve residents' wellbeing and resilience. As Miller et al. (2020) point out, vulnerability is not a static state, it is constantly evolving, and resilience can be improved. Measures to improve the safety and resilience of vulnerable people are measures that decrease their vulnerability, improve their quality of life in general, and build inclusive communities.

Practical Recommendations

- Enhance inclusive approach to urban environment and citizens
- Maintain and renovate existing housing stock with regard to safety and accessibility
- Increase flexibility and multiuse of public spaces, outdoors and indoors
- Agree on possibilities of temporary uses and adaptive uses of vacant spaces and buildings in crises
- Provide a network of green open spaces with fresh water and sanitary infrastructure in cities to increase wellbeing and resilience of people in natural hazards

Note

1 https://ec.europa.eu/commission/presscorner/detail/en/ip_23_3050

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3 Resilience by Whom and for Whom? Empowering Local Communities for Community-led Resilience-building

Anahita Rashidfarokhi

Introduction

In the face of ever-increasing crises, resilience has emerged as a critical concept in effective crisis management. Resilience can be defined as the capacity of social entities, including individuals and communities, to cope with, tolerate, absorb, and adjust to different crises (see e.g., Duckers 2017; Kwok et al. 2016; Saja et al. 2018). However, the process of defining, implementing, and evaluating resilience concepts and strategies has often been top-down, driven by external stakeholders while overlooking the perspectives and experiences of "people" who are directly affected by crises (Rashidfarokhi & Danivska 2023).

This chapter aims to contribute to addressing this gap by highlighting the significance of local communities' engagement in resilience-building processes and community-driven resilience in general. Community-driven resilience presents a shift towards more people-centred and contextually appropriate crisis management. Local communities have developed their own coping mechanisms and strategies over time, drawing upon their Indigenous knowledge, cultural heritage, social networks, and surrounding environment and ecosystem services (see e.g., UN ISDRs 2008). By recognising and integrating these community capitals, a more comprehensive understanding of the complexities and dynamics that shape resilience at the local level can be gained. This leads to formulating a more robust and holistic understanding and management of crises that are deeply grounded in unique socio-cultural and environmental contexts. Moreover, through the proactive involvement of local communities in crisis management planning processes, community ownership can be enhanced, and greater social cohesion can be fostered among its members.

Several participatory approaches exist to facilitate meaningful community involvement in resilience-building efforts. Meaningful participation refers to a process of decision-making that involves individuals or groups in a way that is engaging, empowering, and respectful of their knowledge, experience, and perspectives (Oliver et al. 2006). It is a collaborative approach that recognises the value of diverse perspectives and promotes inclusivity and equity. Meaningful participation can be tied to resilience in several ways, including the empowerment of individuals and communities by building their capacity to influence decisions that affect their ability to adapt or cope with changes (Ibid.). Meaningful participation can

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also promote inclusivity by ensuring that all voices are heard and valued (UNICEF 2018). This can help to build social cohesion and strengthen community resilience by fostering trust and a sense of community (Jewett et al. 2021). Meaningful participation involves building strong partnerships and collaboration between different stakeholders that are crucial for effective resilience-building, as it enables the pooling of resources, expertise, and support. By nurturing relationships based on trust, mutual understanding, and shared goals the gap between local communities and external stakeholders can be bridged (see e.g., Oliver et al. 2006).

Additionally, this chapter attempts to explore ways to bridge the gap between local resilience strategies and formal crisis management frameworks and plans. It investigates the challenges and opportunities that arise when integrating local perspectives into existing frameworks, exploring strategies for aligning and integrating the strengths of both local communities and formal institutions. By creating synergies between local strategies and formal frameworks, more cohesive and effective approaches to crisis management can be developed.

To achieve its aim, the chapter begins with understanding the significance of local knowledge and participatory approaches to resilience. It then explores practical strategies for effective communication and collaboration between local and external stakeholders, empowering local communities, and identifying community capitals. The chapter further investigates the contributions of active participation and the bridging of local and formal systems to resilience. Finally, the chaper concludes by synthesising these insights into a cohesive framework for fostering resilience through meaningful local engagement and collaboration.

Understanding Local Perspectives on Resilience

Importance of Local Knowledge and Context

In the pursuit of resilience-building knowledge, it is essential to recognise and incorporate local perspectives (Garcia et al. 2022). Local knowledge, experiences, and cultural context hold invaluable insights that shape a community's capacity to cope and adapt in the face of change. This section examines the importance of local knowledge and context in conceptualising and implementing resilience, along with highlighting the limitations of existing top-down approaches and the necessity for recognising the significance of community-driven resilience initiatives.

Significance of Local Knowledge, Experiences, and Context in Defining Resilience

Local knowledge, often referred to as Indigenous or traditional knowledge, is a repository of insights developed and evolved over time through direct and indirect interactions with various crises and their impacts (Ford et al. 2020). This knowledge is deeply rooted in the cultural, social, and ecological context of a community, making it uniquely relevant and adaptive to local challenges and changes. It plays a crucial role in community-led resilience-building, as it provides an enabling capacity for people to sustain their livelihoods and adapt to changing circumstances (Shava et al. 2009).

Existing literature extensively explores the significance of local knowledge in various aspects of resilience-building. This encompasses a broad spectrum, ranging from the identification and management of crisis-related risks to the planning and design of resilient structures. For instance, in a UNESCO report (Hiwasaki et al. 2014), the utilisation of local and Indigenous knowledge is elaborated upon, particularly in the context of hydro-meteorological disaster prediction. This includes the observation of animal behaviour, celestial phenomena, the natural environment, and the integration of traditional material culture. In another study examining the role of Indigenous knowledge in enhancing community flood resilience, it was discovered that traditional methods for managing water resources through temporary structures have been scientifically validated to alleviate drainage congestion and waterlogging issues in flood-prone areas (Chowdhooree 2019). Furthermore, a recent UNDRR report (2022) underscores the value of traditional building techniques and materials such as the use of traditional wooden construction to mitigate earthquake impacts and the incorporation of bamboo as a traditional construction material in India for enhancing flood resilience. These examples collectively underscore the vital role of local knowledge in informing resilience-building processes.

Limitations of Top-down Approaches and the Need for Community-driven Resilience Initiatives

Historically, resilience initiatives have predominantly been designed and implemented through top-down approaches, where decisions are made by external stakeholders and experts without full understanding and incorporation of traditional knowledge, risks, and vulnerabilities or the complexities of local communities (see for e.g., Sim et al. 2017; Pelling & High 2005). Top-down approaches, thus, have their limitations and may not always yield the expected outcomes. For instance, Béné et al. (2012) highlight the potential drawbacks of top-down approaches in fisheries management. The study discusses how these approaches often overlook the expertise of local fishers and their communities, resulting in a failure to address the specific challenges faced by these communities and thus hindering long-term resilience in the fisheries sector.

Considering the limitations of top-down models, there is an increasing need for integrating community-driven resilience initiatives that empower local stakeholders to actively participate in decision-making processes. Community-driven approaches enable a more bottom-up perspective, where local knowledge, context, and needs are integrated into the planning and implementation of resilience-building strategies (see e.g., Asian Development Bank 2018). Cote and Nightingale (2012) analysed the effectiveness of community-based natural resource management initiatives and advocated for their potential in enhancing resilience. The study reveals how such initiatives, when grounded in local knowledge and practices, can lead to increased adaptive capacity and improved livelihood outcomes for the communities involved.

Utilising participatory approaches proves useful in facilitating the understanding and incorporation of resilience from local perspectives, consequently fostering the development of inclusive, holistic, and contextually relevant resilience strategies (Bremer et al. 2017; Grabowskia et al. 2019; Kmoch et al. 2018).

Participatory Approaches in Resilience-Building

Participatory approaches play a key role in the co-creation of resilience-building strategies. This section introduces participatory methods that can be useful in this regard. Participatory methods include a range of activities and approaches that enable local community members to engage and influence decision-making processes, where their contributions influence and shape the outcomes (Institute of Development Studies 2023). These methods break down conventional hierarchies and power dynamics and foster a sense of belonging and ownership, ensuring that the end result of a decision-making process reflects the needs and concerns of various groups in a community.

In the context of resilience, participatory methods facilitate the co-creation of knowledge and strategies, allowing local communities to contribute their perspectives and experiences to the definition and implementation of resilience. In the following paragraphs, some of the most commonly used participatory methods in this context are described.

One such participatory approach is the Community-Based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL). CRiSTAL, developed by the International Institute for Sustainable Development (IISD), engages local communities in assessing their vulnerability to climate change and other forces of change. By involving community members in the process, the tool enhances their ownership of resilience-building initiatives and ensures that interventions are contextually appropriate and sustainable (IISD n.d.).

Another commonly used participatory tool is Community Mapping. This approach involves community members creating visual representations of their environment, resources, risks, and capacities. Community Mapping allows for the documentation of local knowledge and spatial information, providing a valuable foundation for understanding the dynamics of resilience within a specific context (Dunn et al. 2017). This method can encompass simple pen-and-paper techniques or leverage advanced participatory technologies, such as Soft GIS, for more comprehensive mapping and data collection.

One other effective tool is Participatory Scenario Planning. This method encourages communities to envision and collectively develop different future scenarios based on various potential challenges and opportunities. Participatory Scenario Planning allows for a deeper understanding of resilience pathways and potential interventions, fostering a sense of ownership over the future (Quinlan et al. 2016).

Participatory Video (PV) is also a powerful tool that enables communities to express their experiences and aspirations visually. PV has been successfully used in various resilience-related projects (see e.g., Haynes & Tanner, 2015), allowing community members to share their stories, knowledge, and adaptation strategies through self-created videos. PV not only fosters a sense of empowerment and ownership but also serves as a valuable advocacy tool, enabling communities to communicate their needs to decision-/policymakers and other external stakeholders.

Futures Workshop (see e.g., Jungk et al. 1987) is another participatory approach that can be used for community resilience-building through envisioning and planning for a resilient future. In the Futures Workshop participants collectively set goals, assess potential risks, identify local assets and resources, and develop tailored strategies

to enhance their resilience. They explore various scenarios, from anticipated challenges to unexpected crises, enabling them to prepare for a range of situations.

Participatory approaches in resilience-building lay the foundation for inclusive and collaborative processes. Such processes ensure that the outcomes are informed by both community knowledge and broader expertise from external stakeholders, thus fostering a culture of preparedness by enabling communities to take an active role in their own resilience-building efforts.

Facilitating Collaboration Among Stakeholders

Effective collaboration between local communities and external agencies, such as government bodies, non-governmental organisations (NGOs), and emergency responders, is essential for building resilience (IFRC 2020). This section explores challenges and opportunities for fostering collaboration between different stakeholders.

Challenges for Effective Collaboration Among Stakeholders

Language and cultural differences may hinder effective collaboration. External stakeholders should make efforts to engage with communities in their local language and consider cultural sensitivities to ensure meaningful interactions. Due to challenges in communication, local communities may not always be aware of the resources and support available from external stakeholders. Similarly, external stakeholders may not fully understand the challenges faced by the community. Bridging this information gap is critical for effective collaboration.

Power dynamics between external stakeholders and local communities can also create barriers to effective collaboration. It is essential to understand the power dynamics to address imbalances and ensure that decision-making processes are inclusive and participatory. Furthermore, external stakeholders often operate within specific institutional frameworks, timeframes, and budget constraints. This may limit the amount of time and resources available for engaging with communities, potentially hindering meaningful interactions. Finally, bureaucratic obstacles and institutional constraints within external agencies may impact their ability to fully engage with local communities.

Facilitating communication and interaction between local communities and external stakeholders is fundamental to co-create resilience. Those can be achieved by employing strategies that 1) foster trust and 2) strengthen partnerships between stakeholders. These two elements will be discussed in the following sections.

Opportunities for Effective Collaboration Among Stakeholders

Building Trust

Establishing trust is key to the pattern and degree of interaction between involved stakeholders in a process. Building trust requires mutual understanding and respect (Rashidfarokhi et al. 2018). Local stakeholders need to be assured that they have meaningful participation and influence in every stage of the decision-making process. Collaborative workshops, focus group discussions, and participatory decision-making processes are effective ways to achieve this aim.

Open and transparent communication channels can be helpful in building trust between external stakeholders and local communities, in which information, goals, and expectations of different interest parties are clearly conveyed. This can contribute to building mutual understanding and avoiding misinterpretations (Rashidfarokhi et al. 2018).

While external stakeholders bring their own knowledge and expertise to the process, they should recognise and acknowledge the local/Indigenous knowledge and practices and incorporate them into decision-making processes. By doing so, the co-learning between external agencies and local communities takes place and effective and adaptable resilience strategies will be co-created.

Strengthening Partnerships

Partnerships between people and the private and public sector play a crucial role in enhancing resilience-building due to their ability to combine diverse expertise, resources, and perspectives.

Strengthening partnerships among diverse stakeholders in resilience-building processes involves early engagement, transparent communication, clear delineation of roles and responsibilities, and a shared vision (see e.g., Gooding et al. 2022; OECD 2018; Zikargae et al. 2022). Inclusive decision-making, capacity building, and resource mobilisation are crucial components, alongside the flexibility to adapt strategies as needed (see e.g., Hurlbert et al. 2019; Leach et al. 2021; OECD 2020; United Nations Democracy Fund 2020). Establishing conflict resolution mechanisms, fostering knowledge sharing, and implementing robust monitoring and evaluation are essential (see e.g., Stepanova et al. 2020). Advocacy efforts, long-term commitment, and celebrating successes contribute to sustainable collaboration (see e.g., OECD 2006; United Nations 2008). Finally, documenting agreements, activities, and outcomes ensures transparency and accountability in the pursuit of more resilient communities and systems (see e.g., Carnegie Endowment for International Peace 2014).

Strengthened partnerships offer several advantages. First, they can enhance information exchange and resource pooling (see e.g., Public Health Informatics Institute 2023; Vatyan et al. 2023). External stakeholders bring technical expertise, financial resources, and broader networks to the field, complementing the local knowledge and resources of the community. Collaborative partnerships can also promote social inclusion (Tett 2005). In addition, by involving local communities with a special focus on marginalised groups, the decision-making process and outcomes are more likely to address the challenges and priorities of the community, thus increasing the chances of successful implementation (Rashidfarokhi et al. 2018).

Table 3.1 illustrates successful partnerships that address specific disaster resilience challenges in diverse contexts. They highlight the importance of engaging local communities, leveraging local knowledge, and collaborating with governmental and non-governmental partners to achieve meaningful outcomes and build resilience to disasters.

In this section, the dynamics and tools for fostering collaboration among diverse stakeholders were explored. Building on this foundation, the subsequent section

Table 3.1 Successful partnerships in resilience-building efforts

Case Study	*Partners*	*Context*	*Outcomes*	*Lessons Learned*
Community-Based Flood Early Warning Systems in Bangladesh (IFRC 2021)	Bangladesh RCS, IFRC, Climate Centre, Local Communities, Government Agencies	Frequent flooding and cyclone-prone areas; vulnerable communities	Timely flood warnings and community preparedness; Reduced casualties and property damage; Enhanced community resilience	• Engagement of local volunteers is crucial; • Collaboration with local agencies strengthens impact; • Empowering communities through knowledge sharing
Tsunami-Resilient Housing in Indonesia (Habitat for Humanity Indonesia 2019)	Indonesian Government, Habitat for Humanity, Local Communities	Coastal areas prone to tsunamis and earthquakes	Construction of tsunami-resistant houses; Integration of local building techniques; Enhanced safety for coastal communities	• Local knowledge is invaluable in design; • Government and NGO partnership for efficient functioning; • Building resilience against hazards
Child-centred disaster risk reduction programme (UNICEF Nepal 2019)	Nepali Government, UNICEF, Local Communities	Disaster Risk Reduction and Management	Children's resilience is enhanced through their improved preparedness capacities; Integrated and multi-sectoral approach to child-centred disaster risk reduction	• Partnership with governmental bodies and communities strengthened the programme; • Such programmes need ongoing support (institutional and financial)
Mangrove Reforestation in the Philippines (Department of Environment and Natural Resources 2013)	Department of Agriculture-Bureau of Fisheries and Aquatic Resources, Department of Environment and Natural Resources, Local government, Local Communities; Academia	Vulnerable coastal areas prone to storm surges	Mangrove reforestation to combat coastal erosion; Natural barrier against storms and typhoons; Enhanced coastal resilience to climate change	• Empowering communities in ecological restoration; • Balancing ecosystem preservation and disaster resilience

focuses on local communities and how they should be empowered to engage and take an active role in resilience-building processes.

Engaging People in Resilience-building

Empowering Local Communities in Resilience-building Processes

Empowering local communities throughout the various phases of resilience-building involves recognising their agency, knowledge, and capacity to address their specific vulnerabilities and needs.

During the preparedness phase, it is crucial to engage and empower communities proactively. This can be achieved through community-based educational activities and training sessions that equip members with essential skills, such as first aid, search and rescue, and effective disaster communication. Additionally, nurturing local leadership is vital; identifying and empowering community leaders who can take charge of disaster preparedness efforts and providing them with leadership training can have a significant impact. Communities should also be actively involved in conducting risk assessments to identify local vulnerabilities and assets, enabling the development of a targeted preparedness plan. Establishing early warning systems with the active participation of community members is another key element in this phase.

Community empowerment remains crucial in the emergency response phase. Communities should have access to and knowledge about existing community action plans that guide response efforts. Local leaders, empowered during the preparedness phase, can play a pivotal role in coordinating emergency response activities, including evacuations and the operation of emergency shelters. Effective communication within the community, facilitated through communication networks, is essential for sharing critical information and coordinating assistance efforts. Empowering communities in resource allocation decisions ensures that needs are prioritised, and resources are distributed fairly, encompassing essential supplies like food, water, and medical supplies. Additionally, providing psychosocial support to community members helps address trauma and emotional distress, fostering resilience.

Community empowerment is also essential during the recovery phase. Engaging communities in identifying their recovery priorities empowers them to take the lead in rebuilding homes, infrastructure, and livelihoods. Capacity-building initiatives should be offered to enhance community skills in construction, livelihood diversification, and sustainable recovery, enabling communities to restore their self-reliance. Promoting social cohesion within communities fosters collaboration, knowledge sharing, and mutual support during challenging times. Encouraging communities to engage with local authorities and organizations for advocacy and representation ensures their needs and rights are acknowledged in decision-making processes. Finally, communities should be encouraged to reflect on their experiences and lessons learned from the disaster, using this knowledge to improve future preparedness and resilience-building efforts.

Empowering communities throughout these phases not only enhances their immediate response capabilities but also strengthens their long-term resilience, enabling them to face future challenges with confidence and self-reliance. This

approach promotes a sense of ownership, community cohesion, and sustainability, ultimately contributing to more resilient and self-sufficient communities.

Identifying Community Capitals and Resources

Community empowerment not only catalyses resilience-building but also enriches the process of identifying the multifaceted community capital and resources that form the bedrock of community resilience. This section defines community capitals and resources and provides some methods to systematically identify both tangible and intangible capitals and resources, ranging from social networks and cultural heritage to physical resources and infrastructure.

Community capitals, similarly to social capital, are defined as norms and values that can be seen in social networks to form collaborative efforts of public-private-people partnerships to enhance community resilience (e.g. Kaltenbrunner & Renzl 2019; Melo Zurita et al. 2017). Community capitals can be divided into seven categories, including cultural capital (community worldviews), human capital (education, skills, health, etc.), social capital (mutual trust, reciprocity), political capital (ability to create and enforce rules and regulations), financial capital (income, assets), built capital (infrastructure and technology), and natural capital (natural resources and ecosystem services) (Flora & Flora 2013).

Identifying community capitals and resources involves conducting assessments and observations to understand the capacities, skills, and resources available within the community. Several methods can be employed for this purpose. For instance, community asset mapping helps identify the diverse resources within the community. This process involves engaging community members to collectively identify community capitals that can be mobilised during crises (Twig 2007). The other method is community surveys to gather information about the skills, expertise, and resources available within the community as well as their needs. Surveys can be helpful in identifying the community needs, people with specific training/education (e.g., medical professionals, search and rescue volunteers, etc.), and available equipment and tools (e.g., boats, vehicles) that can be valuable during crises (see e.g., University of Kansas 2023).

Local Knowledge Exchange through focus group discussions, interviews, and workshops with local experts, leaders, and community members also enhances understanding of the traditional practices, knowledge, skills, and coping mechanisms that have been historically employed during crises (see e.g., Telford & Cosgrave 2007). Finally, reviewing historical case studies of past crises or events in the area is useful in identifying how local individuals and communities responded and recovered. Lessons from these events can inform existing strategies (Comfort et al. 2012).

Meaningful Contributions to Resilience

Community participation is two-way, formed by the degree and pattern of interaction between local communities and external stakeholders (Rashidfarokhi et al. 2018). Such interaction is affected by various factors. This section discusses factors

that can encourage the meaningful participation of local communities in resilience initiatives and examines the impact of participatory resilience-building processes in the integration of local knowledge with formal resilience frameworks.

Encouraging Meaningful Participation in Resilience-building Processes

To promote meaningful participation, it is crucial to create environments and spaces that foster safety, inclusivity, and transparent communication.

Several strategies can be employed to encourage the meaningful participation of local individuals in resilience initiatives. For instance, education initiatives to increase awareness and understanding of resilience concepts can convince and encourage individuals to take an active role in decision-making processes. In addition, establishing accessible communication channels with local communities will ensure that information is disseminated in a language and format that is easily understood and accessed by all community members. Promoting two-way communication possibilities that imply active hearing of community concerns and feedback and addressing their questions will improve the meaningful participation of community members. Furthermore, the provision of an environment in which community members feel safe to express themselves and disagree while participating in collective activities is essential. Finally, collaboration with local leaders, community elders, and influential individuals to gain support for resilience initiatives can encourage broader community participation.

Initiatives born out of participatory decision-making processes are more likely to be holistic and sustainable. Community inputs offer unique insights into the challenges and opportunities for existing resilience strategies and ensure that strategies are contextually relevant and adapted to local realities (Adger et al. 2005). Furthermore, local individuals are more likely to invest in the decision-making outcomes and to continue supporting and maintaining the projects and efforts over the long term due to a sense of ownership and greater responsibility towards the process outcomes (Béné et al. 2012).

In essence, encouraging meaningful participation creates a reservoir of local knowledge and engagement. This reservoir if linked with formal resilience strategies allows it to flow into established frameworks, enhancing their effectiveness and adaptability. The following section explores the importance of linking local resilience strategies with official crisis management systems and examines ways to bridge the gap between the two.

Linking Local and Formal Resilience Systems

Local knowledge and practices are deeply rooted in the cultural, social, and environmental context of a community. Integrating local knowledge and practices with formal crisis management systems can lead to more effective and contextually relevant resilience strategies. For instance, as mentioned previously, local communities often have Indigenous methods for predicting and responding to hazards. Integrating these traditional early warning systems with formal meteorological data and

communication channels can enhance the overall accuracy and timeliness of alerts (Hermans et al. 2022). In addition, local individuals possess a deep understanding of the risks and vulnerabilities specific to their area. Incorporating community-based risk assessments into formal risk assessment frameworks can provide a more comprehensive and localised understanding of potential risks (Harvatt, et al., 2011. On the other hand, formal resilience systems encompass government agencies, emergency services, non-governmental organisations, and international bodies. These institutions bring resources, technical expertise, and structured coordination. They operate based on established protocols, regulations, and policies, making them essential for large-scale disaster management (see e.g., Chisty et al. 2022).

Bridging the gap between the two systems requires collaborative partnerships in the co-design and co-implementation of resilience initiatives, inclusive decision-making, and policy changes that develop guidelines for incorporating local knowledge into official planning and response frameworks. By embracing a combined approach, societies can harness the strengths of both formal and local systems, leading to more robust and adaptable resilience strategies.

Conclusion

This chapter has highlighted the significance of recognising community capitals and incorporating community engagement in strengthening community resilience. The distinct local knowledge and contexts emerge as essential elements. Likewise, the collaborative efforts between local communities and external entities, promoted through participatory methods, emerge as an effective approach, enhancing community agency as elaborated in earlier sections.

This chapter further emphasises the collaboration achieved through integrating diverse capitals in the pursuit of resilience. Fostering collective engagement and proactive involvement can catalyse a sense of belonging and community participation. Furthermore, the mutual integration of Indigenous community practices and institutional frameworks contributes to a more robust overall resilient system.

This study contributes both theoretically and practically to the discourse on local engagement, collaboration, and community-led resilience-building. Theoretically, it advances the understanding of the significance of local knowledge and participatory approaches in conceptualising and implementing resilience-building efforts. By examining the interplay between local perspectives and external stakeholders, the study sheds light on how trust, inclusive collaboration, and partnerships are built, fostering a deeper comprehension of the dynamics within resilience systems. Furthermore, it highlights the role of meaningful community involvement in crisis management planning, explaining how empowerment and resource identification contribute to enhanced community preparedness and response amidst crises. Practically, this study offers insights for policymakers and practitioners and provides them with pragmatic tools and methods to reinforce community resilience through meaningful participation.

Table 3.2 presents a comprehensive toolkit with a set of practical measures which can be used by practitioners to establish a structured approach to fostering

Table 3.2 Toolkit for community-led resilience-building

Element	*Objective*	*Practical measures*
Community Empowerment and Mobilisation	Encourage/empower community members to participate in decision-making processes.	**Community mobilisation workshops:** • Organise community awareness-raising workshops on the importance of resilience. • Organise workshops with community members to identify and map their strengths and challenges amidst crises. **Community leadership development:** • Identify and build trust with local leaders and influencers. • Train local leaders to enhance their skills as local trainers. **Community meetings:** • Conduct regular (formal/informal) community meetings to discuss resilience goals and plans. • Encourage participation and brainstorming by creating a safe environment in which their knowledge and identity is respected, and feedback mechanisms are provided.
Local Knowledge Integration and Recognition	Recognise and integrate local knowledge, traditions, and cultural practices into resilience planning.	**Local knowledge documentation:** • Arrange different types of meetings/gatherings where community members share traditional knowledge and practices. • Document these insights in a culturally sensitive manner. **Cultural heritage preservation:** • Define and support initiatives that preserve and promote local cultural heritage. • Organise storytelling and cultural events. **Local expert engagement:** • Identify and involve local experts and skilful members as facilitators in decision-making processes. • Ensure their knowledge informs resilience planning through consultative sessions.
Community-Led Risk Assessment and Planning	Collaboratively identify and mitigate local risks and vulnerabilities.	**Participatory risk assessments:** • Organise risk assessment workshops that combine scientific data with community knowledge. • Develop risk maps and vulnerability assessments together with community members and experts.

(*Continued*)

Table 3.2 (Continued)

Element	*Objective*	*Practical measures*
		Community resilience action plans: • Organise workshops and facilitate the creation of community-driven action plans. • Define roles, responsibilities, and timelines for actions together with the community members. **Risk communication training:** • Organise training sessions to train community members in risk communication to enhance their preparedness.
Capacity Building and Training	Enhance community members' skills and knowledge for crisis preparedness, response and recovery.	**Training workshops:** • Conduct training sessions and workshops on disaster preparedness, search and rescue, and first aid. • Offer educational classes for self-sufficiency during/after crises (food, water, and livelihood). **Simulations and drills:** • Organise disaster simulation exercises to prepare the community for real-life scenarios. • Practise evacuation plans and emergency response procedures. **Local community responsive team:** • Identify and form a responsive team (including community leaders, experts, and trained members) to be trained for leading disaster response efforts.
Multi-Stakeholder Collaboration and Partnerships	Form partnerships with local authorities, NGOs, private sector, and academia to enhance resilience.	**Stakeholder meetings:** • Host regular coordination meetings with all stakeholders to align strategies. **Joint projects:** • Collaborate on infrastructure projects, capacity-building programmes, and community-based initiatives. • Pool resources and expertise to maximise impact. **Community representation:** • Ensure community representation in decision-making bodies and committees.

(*Continued*)

Table 3.2 (Continued)

Element	*Objective*	*Practical measures*
Community Engagement and Feedback Mechanisms	Maintain ongoing engagement and gather community feedback.	**Regular community meetings:** • Organise regular monthly or quarterly community meetings to discuss progress and challenges in resilience planning. **Accessible feedback channels:** • Implement safe feedback mechanisms such as suggestion boxes, community hotlines, or digital platforms. • Respond quickly to feedback and provide updates on how the feedback is addressed. **Participatory monitoring:** • Organise workshop with community members to co-create evaluation criteria for impact assessment of initiatives. • Engage community members in monitoring and evaluating the projects.
Knowledge Sharing and Networking	Facilitate knowledge exchange within and between communities to enhance resilience.	**Learning workshops:** • Organise cross-community learning workshops and exchange visits. • Document and share best practices and experiences from each community through different communication channels. **Regional collaboration:** • Foster partnerships with regional networks and organisations to broaden learning opportunities. **Academic partnerships** • Collaborate with academic researchers to communicate and disseminate knowledge through rigorous scientific channels.

resilience through meaningful local engagement and collaboration. In support of practitioners, policymakers should also prioritise and design resilience policies that embed participatory approaches. In addition, public agencies should allocate financial and human resources for capacity-building initiatives that promote dialogue and collaboration between stakeholders. Finally, policies should be flexible and adaptable to accommodate varying contexts, interests, and circumstances, allowing for adjustment while adhering to broader resilience goals.

Investigation of local engagement, public-private-people partnerships, and resilience offers a range of avenues for future research. Longitudinal studies can explore the lasting impacts of sustained engagement with external stakeholders on

community resilience. Comparative analyses might also uncover context-specific elements shaping collaboration approaches in resilience-building efforts. The integration of technology and Indigenous knowledge presents opportunities to innovate in communication and strategy. Investigating community-led initiatives could reveal their impact on policy, collaboration dynamics, and overarching resilience frameworks. Additionally, researchers could assess the scalability and sustainability of successful models, explore participatory governance's role, develop comprehensive resilience metrics, examine institutional frameworks, and analyse the ethics and power dynamics inherent in collaborative efforts. These inquiries will not only contribute to academic literature but also guide practical approaches.

To conclude this chapter, let us take a moment to think about the important lessons gathered here. Understanding the local context, collaboration and interaction between different stakeholders, empowering community members, and blending different resources are all key to resilience. These elements, beyond the realm of this study, possess the power to effect real-world transformations, equipping societies to cope with forthcoming changes and transitions.

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4 A Mindshift Towards Futures Resilience and Anticipatory Urban Governance

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Introduction

> The road you take just forces you ahead, open snow fields let you choose your way.
> Aaro Hellaakoski (1946)[1]

How can futures be read, and how can we strengthen our 'futures resilience'? These are the cornerstones of futures studies and utilizing futures research in decision-making. Futures literacy refers to the ability to create and utilize systematic foresight information for present decisions (Miller 2018; Poli 2021; EFP 2023). This general ability would be useful for specific fields and purposes, for example, there is a need for urban planners to become more futures literate (Toivonen et al. 2021). Riel Miller (2018), who has anchored foresight work at UNESCO, has emphasized the ability to identify the potential futures inherent in the present moment – the role of detecting and understanding emergence. However, it is important to deepen this futures literacy to the next level, transforming it into futures resilience. By futures resilience, we mean the ability to survive crises, to anticipate crises, to navigate and learn from them, as well as the ability to renew one's activities, which emerges through this process. Futures resilience is not only about bouncing back and slipping back into the old state but fundamentally about assessing the situation, learning, renewing, and strengthening the focus on the future.[2]

We are living in a time of profound uncertainty. This profound uncertainty that affects the future stems from anticipated changes in climate as well as technological and socio-economic transitions already in motion, which implies that it is not enough to simply make 'best-guesses' about the state of the future (Maier et al. 2016). However, this is not new in the history of humanity (Nowotny 2015). Throughout history, the future has always contained significant uncertainties. Whether in the Stone Age or the Middle Ages, the mere survival of human life was constantly uncertain. Yet now, we have entered an era where uncertainties deepen, complexity grows as systems become more intricate, and the web of interdependencies and interconnectedness tightens its grip. For the first time in human history, we are now on the 'precipitous' edge (Ord 2020; Heinonen 2021d;

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Heinonen et al. 2022a), facing numerous existential risks. Ord argues that safeguarding the future of humanity is the key challenge of our time. Problematically, humanity lacks the maturity, coordination capability, and foresight expertise to avoid making mistakes from which we cannot recover. According to him, what we need above all is an ethical perspective: a re-evaluation of how we see the world and our role within it.

Preparing for the future must be continuous. It is not about isolated projects or concentrated efforts but a systematic, ongoing process of conscious and internalized awareness – an ongoing 'foresight mode'. This involves both mental and concrete preparation for what is to come. Cuhls (2016) speaks of mental time travel, and an active consideration of multiple futures. Successful preparation for the future, in turn, requires having tools and techniques, in other words, technologies, instruments, and methods that allow us to prepare for the future and any crises that come with it. Equipping for the future is the technical apparatus of mental preparedness, with the necessary knowledge, skills, and associated techniques.

The concept of futures resilience is introduced to emphasize the importance of foresight as a central component and characteristic of both futures literacy and resilience. In uncertain times, what matters is how we approach uncertainty. Uncertainties can never be completely dispelled, so the critical aspect becomes accepting them and having the capacity to face them. The goal is to avoid panicking or being paralyzed by uncertainty. Former President of Finland Mauno Koivisto once advised 'not to be provoked when provoked'. In the spirit of futures resilience, we encourage not panicking, even as crises tempt us, like sirens, to do exactly that. Futures resilience is not just about individual resilience but also a collective ability – about the sustainability of communities or networks (Rashidfarokhi & Danivska 2023). In becoming futures resilient, leveraging the resources of the entire network is worthwhile. The power of the community is important in any society, and harnessing it is a force through which we overcome crises.[3] When pondering the role of built environment in either improving or decreasing resilience of individuals and communities our aim is to draw attention to the dynamics of this interaction.

This chapter explores the concept of a futures-resilient city and how decision-makers should change their thinking to achieve this goal. The three-year RESCUE research project, funded by the Academy of Finland, delves into how the resilience of cities and the built environment can be created and enhanced. Coordinated by Aalto University, this multidisciplinary project combines futures studies, architecture, land use and regional planning, and real estate economics. The research work of the University of Turku's Finland Futures Research Centre focuses on utilizing foresight expertise to support decision-making, probing into policies, regulations, recommendations, and practices needed for the future.[4] In this chapter the characteristics of urban futures resilience are presented in the form of Top Ten theses or statements[5]. Each statement is briefly described and illustrated with vignettes – examples of radical innovation. Vignettes can be

understood as creative fictional prototypes for scenarios (Rishiart 2013) – brief flashes for narrative episodes.

As cities are the venues of everyday life and socio-technical change around the world and provoke imaginations of how our future lives could be (Collie 2011; Schmitt 2013; Simon & Leck 2015; Frantzeskaki et al. 2018; Dobraszcyk 2019; Scarascia-Mugnozza et al. 2023), the futures of cities have been and will continue to be one of the enduring themes of futures research in terms of content.[6] Urbanization is one of the increasing and most impactful megatrends. An essential aspect when exploring the futures of cities is firstly that cities not only grow but become increasingly complex socio-economic and socio-ecological systems. This perspective echoes the thinking of Michael Batty (2022). Cities are constantly defined by the fact that they are susceptible to crises; cities are the arena of crises. On the other hand, cities also overcome crises by generating innovative solutions. Cities can also be seen as microcosms of life, meaning they are not just buildings and infrastructure, but also people, spaces, activities, meanings, and the environment with all their interactions. At their best, cities have the ability to adapt to the psychological dynamics and routines of people. This is because urban dwellers have a need to experience their environment as meaningful. Otherwise, a city is merely living in a box. It is important for people to have a commitment to their own neighborhood, city, region, etc., as emphasized especially by Jane Jacobs (2016).

Governance Theses for a Futures-Resilient City and Decision-Making

Table 4.1 presents ten theses as statements of our perception of urban resilience in the future and one bonus thesis, which are considered important to recognize in governance efforts. After the table, each thesis is elaborated on in terms of its content. The theses are not intended to show any order of priority but rather to be addressed as a whole.

Table 4.1 Governance theses for a futures-resilient city

1. **Anticipatory Governance – Embracing Foresight Seriously and Systematically into Urban Planning and Administration**
2. **Embracing Systemic Analysis Instead of Siloed Approaches**
3. **Adopting a Collaborative Ecoregion Model – City as Part of Surrounding Countryside, Land, World...**
4. **Introducing Crisis Awareness as a Key Element of Futures Literacy**
5. **Cultivating Temporal Competence and Deepening Lifecycles**
6. **Integrating a Peer Society Mode**
7. **Understanding and Enabling the Multilocal Society Mode**
8. **Understanding Hybridization and Designing and Utilizing Hybrid Spaces**
9. **Increasing Experimentation – Leveraging Pilots**
10. **Setting the Bar Higher – Pursuing Leadership**

Bonus Thesis: Shaping Urban Planning/Development Futures

Thesis 1: Anticipatory Governance – Embracing Foresight Seriously and Systematically into Urban Planning and Administration

Anticipatory governance applies not only to cities but also to countries and companies, etc. In other words, anticipatory governance involves integrating foresight systematically and continuously into one's own activities, using a variety of foresight tools (Boston 2017).

In Finland, examples of governance utilizing foresight include the establishment of the Committee for the Future in 1993 and around the same time, the initiation of the government's process to produce futures reports by the Prime Minister's Office. As such practices are becoming more integrated into governance systems, this is also posing increasing questions about the epistemologies, conceptual approaches, and frameworks adopted by the stakeholders involved in such assessments and exercises, with an aim to make any type of future-oriented engagements more comprehensive and holistic (Jurgilevich 2021; Muiderman et al. 2022). Furthermore, it is noteworthy that globally, as more and more countries are interested in foresight (Heo & Seo 2021), strategic foresight is being taken seriously in a whole new way. For instance, foresight used to be practiced in various organizations scattered across different units, often with no knowledge of each other. However, now entities like the EU, OECD, and UN have elevated foresight to a central role. Even NATO is developing its strategic foresight process.

The EU has launched an annual strategic foresight report (European Commission 2023).[7] In addition to this, foresight training is also being provided to officials. The OECD Secretary-General's office has established a unit for strategic foresight, and an active foresight community has been established within governance. The UN Secretary-General's office and UNESCO have also distinguished themselves in foresight. The UN's foresight report *Our Common Agenda* (UN 2021) and its five foresight proposals have gained publicity, including evaluation by the Millennium Project (MP 2022). Several Finnish futurists also participated in the Delphi study described in the Millennium Project's evaluation report. Practices from the international arena are thus finding their way into Finland, even though Finland can be considered a pioneer. *Our Common* Agenda calls for global cooperation in inclusive networking and effective multilateralism, proposing a World Summit on the Future for 2024. Meanwhile, Finland's Committee for the Future launched the concept of a Futures Committees' World Conference and held its first international meeting in October 2022 in Helsinki (see the report on the event by the Committee of the Future 2022). Anticipatory governance as an umbrella concept is applicable to any administration but according to our view it is particularly appropriate when adapted to the urban governance context – planning and governing cities is inherently about building futures.

Thesis 2: Embracing Systemic Analysis Instead of Siloed Approaches

To prevent siloing, individuals, organizations, cities, and countries should develop peripheral vision (Day & Schoemaker 2006; Schoemaker 2019). This means looking beyond one's own sector and considering developments and areas outside one's own industry.

Figure 4.1 Vignette for experiential spaces for anticipatory governance.[8] In Cairo, the third assembly UN Committee for Strategic Threats had begun, a touring body of elected members that takes responsibility for deliberating and preparing for future global risks. This year had learned from past reluctances and incorporated experiential spaces on the themes to better engage and deliberate the long-term threats. (Photograph by Amos Taylor from Heureka facing disaster exhibition)

In urban planning, the land use, housing, and transport agreements (MAL)[9] focus on these three key urban functions as reflected together. In addition to this, other functions should also be considered. However, this is just the first step. The intention is to step out of the 'box' and open up the boundaries of thinking. The concept of *holobiont* from physics, posited as a socio-cultural interpretation by Ugo Bardi, a member of the Club of Rome, suggests that local community-based resource management could stabilize our entire economic system.[10]

Such phenomenon-based thinking that adopts a systems view and holistic approach encompasses different forms of knowledge, such as tacit knowledge, embodied knowledge, geographic information, and spatial information. The multidimensionality of knowledge could break sector boundaries. Entire concepts could also be rethought. Futures research often questions existing structures and institutions if they are found to be inadequate or dysfunctional. Thus, relevant considerations can be directed towards questions like: What is transportation? What is housing? What is a city?

An example of entrenched thinking and 'near-sightedness' toward the future, which emphasizes near- or medium-term outlooks, can be seen in transport

planners who predominantly have perceived cars as internal combustion engine vehicles, set firmly in the prevailing road infrastructure, without alternatives. Futures research encourages a longer-term and wider perspective. When aiming to reduce emissions from transportation, there are several opportunities for systemic and socio-technical change. What if the entire fleet of vehicles becomes electrified? How does current transportation planning and decision-making support electric vehicle use? How much can innovations in shared mobility assist in further sustainability shifts, for instance in modality shares? Not much, as the short-sightedness of current thinking only sees emissions-producing automobiles, with predefined usage rates and infrastructural options, and subsequent investment needs as a planning frame.

Moreover, debates on what constitutes equal treatment of different population groups is a case in point where the contentions of present needs and future considerations intertwine as alternative claims to environmental and social sustainability. A case in point is the construction of Kruunusillat in Helsinki, where a bridge is to be built only for light traffic and trams.[11] The existence of future generations' mobility needs, and the spectrum of potentially available new modes of transportation and emissions-free technologies, was not fully anticipated. Near-sightedness or a narrow set of considerations in current planning closes off futures (closed futures) – it prevents the versatile use of the bridge to serve all population groups. With an aging population, space could be reserved for emerging modes of transport – and their potential should not be limited a priori by restricted infrastructural solutions. Futures thinking encompasses systems thinking, as a range of possibilities, and makes black-and-white, either/or thinking an increasingly outdated approach. An example of an alternative action, as a 'silver bullet', is the claim of a city center tunnel. If future cars are hidden from plain sight as emissions-free electric vehicles, they would free up space on the street level for pedestrians, cycling, and light mobility. Despite obvious social, health, and environmental benefits, this solution has not been implemented due to high economic costs. Ultimately, the aim is to lower absolute transport volumes through far more effective and innovative transport systems. Otherwise, Finland and European societies will fail to decrease their energy use, and will continue to place increasing pressures on biodiversity, materials, nature, and energy demand (EEA 2023).

Thesis 3: Adopting a Collaborative Eco-Region Model – City as Part of Surrounding Countryside, Land, World...

In urban planning, the concept of bioregionalism can be utilized (Patrick Geddes 1854–1932). Bioregionalism is, in fact, a response to several problems that afflict cities. The relationship between the city and the countryside should be based on partnership, not either/or. Based on bioregionalism, cities should be seen as part of ecoregion wholes. This thesis is closely related to the previous thesis, which emphasizes a systemic perspective. According to Geddes, regional cultures adapt to the needs of local environments. However, the social and ecological conditions of the environment limit this adaptation process. Therefore, he emphasizes the

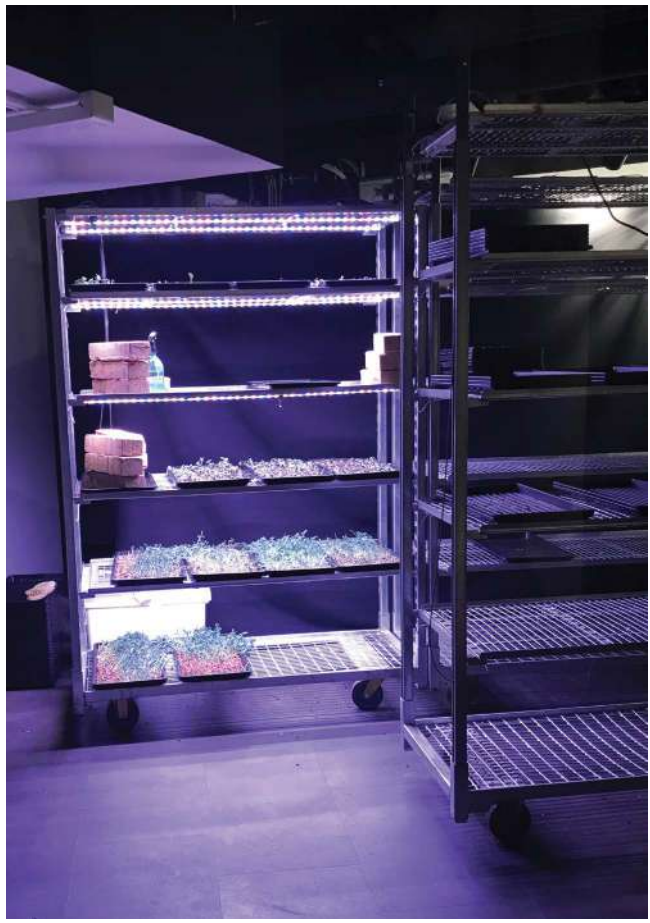


Figure 4.2 Vignette for a systemic and holistic view of urban space use. The city of Helsinki has for a number of years had a mayor of nightlife, the services and governance of urban nocturnal life. At first this was related to the growing nocturnal entertainment culture, but quickly transformed to encompass massive unutilized spaces and services, for example for indoor vertical farming. (Photograph by Amos Taylor)

importance of adapting local cultures to the specific features of the ecosystem. In a healthy ecoregion system, nature and culture are inseparable and mutually supportive. Geddes can be considered a pioneer in modern urban planning and regional planning. He introduced the term ‘conurbation’ to describe the larger city and the surrounding smaller cities and rural areas. Geddes also developed a theory of comprehensive ‘biopolis’, anticipating later explorations of eco-efficient urban regions (Welter 2002; Heinonen 2006).

An ecoregion as a whole is resilient during a larger external crisis, but if there is an interruption, the city’s resilience suffers. The city is dependent, among other

Figure 4.3 Vignette for ecoregional thinking. Bioregionalism focuses on the relationship between the city and the countryside that is based on a balanced stance. The concept of holistic ecological urban planning by Patrick Geddes (Welter 2002) fuses 'bio-psychosis' and 'psycho-biosis' into a synergy of facts and thoughts (dreams) as well as acts and deeds. Acts happen in places where people (=folk) work, i.e., have activities. (Photograph by Sirkka Heinonen)

things, on food coming from rural areas. If a natural disaster, civil war, power outage, etc., occurs, the link between the city and the countryside is at risk. Rural areas can sustain themselves for much longer. The relationship between rural areas and resilience is also apparent in the fact that those living in rural areas consider their resilience to be good (Heinonen & Toivonen 2021a).

For this reason, it is of primary importance for cities to develop their own self-sufficiency and security of supply. This can be represented by practices such as vertical farming, urban gardens, and urban forests/forested cities (*rus in urbe*), in addition to collaborative learning and innovation. This will not happen if there are information gaps and information asymmetry between stakeholders (Colebatch 2014). Stakeholders must be kept well informed. However, it is even more important to create a relationship among stakeholders from which real learning can occur. Innovative partnerships can even emerge from 'unusual' combinations or learning from alternative localities, as a move beyond or transforming sister city arrangements for cultural and commercial purposes: Helsinki-Hong Kong, Hanoi (Vietnam), Espoo-Entebbe (Uganda), Isfahan (Iran), Vantaa-Veracruz (Mexico)/ Valparaiso (Chile), Windhoek (Namibia), Kuusamo-Kerala (India), Kumasi

(Ghana), Canton (China). Already, cities are collaborating in networks, such as the C40 – a global network of mayors of the world's leading cities to confront the climate crisis. From seemingly distant partnerships and unorthodox designs, new innovations can be found.

Thesis 4: Introducing Crisis Awareness as a Key Element of Futures Literacy

Imagining, anticipating, dealing with, and learning from crises can be considered a central element of futures literacy. For example, in the aftermath of a pandemic, there is a risk of falling into the illusion of survival instead of delving deeply into the diverse learnings available from the crisis (Karjalainen et al. 2022a). However, this requires analysis and tracing of cause-and-effect relationships, the effects of implemented measures, and side effects. Especially for children and young people, isolation can, in the long term, manifest as trauma or other difficulties. The goal of learning from crises also involves the ability to 'peel' and process crises. This creates a continuous capacity to endure and scan crises. Crises have a dual nature: they are both threats and opportunities. Crisis awareness is also an absolute requirement for futures resilience.

In futures studies, the VUCA world, in which we already live (volatility + uncertainty + complexity + ambiguity), is often highlighted (Kaivo-oja & Lauraéus 2018; Kurki & Malmelin 2021). A similar concept, the TUNA framework, presents the world as at a stage of turbulence, uncertainty, novelties, and ambiguity (Ramirez & Wilkinson 2016). We cannot escape change and its resulting uncertainties, but we can try to understand them, develop resilience to overcome them, learn from them, and reorganize our actions.

In the post-pandemic, continuously surprising 'new normal', there is an emphasis on the need for individuals, organizations, cities, communities, and the entire public sector to anticipate and confront various risks. A variety of digital solutions can enhance our operational reliability and agility in responding to changes, but we have also come to realize the importance of physical structures such as the built environment and infrastructure and be realistic about underlying material flows. Future crisis management is not just about ensuring the agility of human and organizational functions and increasing resilience, but also about the ability of traditionally rigid, location-bound elements like private, semi-public, and public spaces to have flexibility and adapt to changing conditions. Special attention should be given to the interconnections of crises and their indirect effects (Heinonen & Toivonen 2021a).

Thesis 5: Cultivating Temporal Competence and Deepening Lifecycles

Time is a fundamental concept in futures studies. Whenever we talk about futures and their anticipation, time is a key factor. The future is one strand of the dynamic continuum of time dimensions. In future considerations, it is also crucial to think about the time span chosen for analysis—short, medium, or long term. Short time frames are mainly used outside of futures studies, for example, in market analyses.

Figure 4.4 Vignette for crisis literacy on an educational pathway towards urban resilience. As families are offered financial incentives to leave the overcrowded crisis-ridden urban areas, not only were decision-makers becoming savvy with acknowledging 'crisis literacy', but parents could seek advantages too. (Photograph by Amos Taylor from public street game Cuauhtémoc Centro, Mexico City) (Inspired by: www.theguardian.com/world/2023/jan/03/million-yen-per-child-to-leave-tokyo-japans-offer-to-families)

Long time frames can span 50, 100 years,[12] or even longer. What is time? It is not just a physical quantity but also a psychological and socio-cultural concept [13] According to the Chinese Taoist philosopher Lao Tzu, time is just a construct – 'if you say you don't have time for something, you just don't want to do it'. Time research as a separate discipline is exploring deeper depths—quantum mechanics is opening up new perspectives for the concept of time. What if there is no time? Or if time is always present in all its forms: are past, present, and future existence one and the same? There is even a logically impossible thought: What if the future is before the past or present in the time universe? This time conundrum can be further complicated by the endless possibilities of counterfactual futures.

In terms of urban planning, it is essential to stretch the planning horizon. It is also worth considering the overall coherence and suitability of short-, medium-, and long-term perspectives. Timeframes and dimensions can be seen as part of a whole. On the other hand, when a crisis strikes, quick action is necessary. When the longer-term situation has already been considered in advance via alternative events and scenarios, action can be quicker in a crisis.

Temporal competence could include the idea that buildings should be designed to be either short-lived in their location or very long-lasting in their place. It is important to note that the medium term is the worst possible option since it is just a compromise. However, this medium term is currently the prevailing construction style. In the short term, disposability and portability are essential, and they should be considered. In the long term, the focus should be on various spatial flexibility strategies. It is essential that the choice related to the timeframe is made at the beginning of a project, as it significantly influences the direction of the whole project. As a new proposition, the concept of mobile or modular construction can be considered, where the location of the building is not permanent, but the structure itself is.

On the other hand, one might also question why a building could not be designed to last at least 500 years, like medieval castles. This has been advocated, for example, by construction councilor Olli Lehtovuori.[14] He is also concerned that the current overly efficiency-focused housing construction, a predominant trend in Finland, might ruin past urban planning efforts. He believes that weakly justified, overly tall, and far more intensified housing construction included in zoning, as an outcome of excessive growth goals, could lead to the degradation of previously internationally praised green areas. According to Jussi Vuori of the New City architectural collective, in the future, buildings should be designed to be permanent – buildings cannot be dismantled anymore. New buildings should always be designed in a way that suits various future functions.

Thesis 6: Integrating a Peer Society Mode

The peer society mode or model refers to breaking down hierarchies and engaging in horizontal collaboration. Peers hear and listen to each other – the weight of a peer's voice is continuously growing. The central idea in this peer society thesis is to involve citizens more strongly in the planning process from the very beginning. Indications of such actions already exist. In urban planning, citizens have long been required to participate in the planning process. This has been done, for example, in Helsinki's planning, where several interaction planners operate. However, a crucial question remains as to what else is needed in addition to current actions. The concept of a peer society could bring forth what else is needed or could be done.

Peer network activity is linked to the prosumerist mode of operation, and this idea is closely related to various fields, including energy. This refers to the transformation of the consumer into a producer. A regular resident can produce their own electricity through rooftop solar panels. In the visions of new energy solutions and systems, the city has an increasingly important role as a clean energy producer, and a more efficient consumer of clean energy. However, the socio-cultural impacts of imagined changes are often overlooked. In addition to a technical-economic focus, energy can be approached from a socio-cultural perspective; it is part of lifestyle and people's values. The challenge of making maximal use of renewable energy can be amplified through the rise of the peer society, which builds support for the model of energy prosumerism (Heinonen & Karjalainen 2019a)[15].

Figure 4.5 Vignette for trees as infrastructure. As trees become infrastructure, they can be recognized for their vital environmental and wellbeing role for urban environments. This long view is reflected by the legacy of the Avant Garde artist Joseph Beuys whose dying wish was to create an artwork of streetside planted trees and rock, that would provide benefit future generations in his hometown of Kassel. A work he would never witness in full. The art and science of the long view of trees as infrastructure can be celebrated for its perennial benefits. (Photograph by Amos Taylor)

Members of peer networks are essentially both consumers and producers. Peer networks can provide a new foundation for experiencing meaning. With one's own production – whether it is energy, food, or services – the sense of meaningfulness in life might gain momentum. The concept of prosumerism was initially presented by Alvin Toffler in his book *Third Wave* (1980). It has even been proposed that an entire field of study – consumer behavior research – should be renamed to prosumer behavior research (Kotler 2010).

However, the peer society model also faces challenges. For instance, it can be argued that even though people can participate if they wish, representative participation might not be achieved. A key question is how to involve those who choose not to participate. The narrative of sustainable futures related to the peer society has been published in the Finland Futures Research Centre's Publications series (Heinonen & Karjalainen 2018; 2019a). Furthermore, in the RESCUE project's narrative, which emphasizes urban resilience, elements like peer learning are visible in homegrown food production. Alongside self-produced vegetables and various sources of protein, mushrooms, bacteria, yeasts, and algae are cultivated for

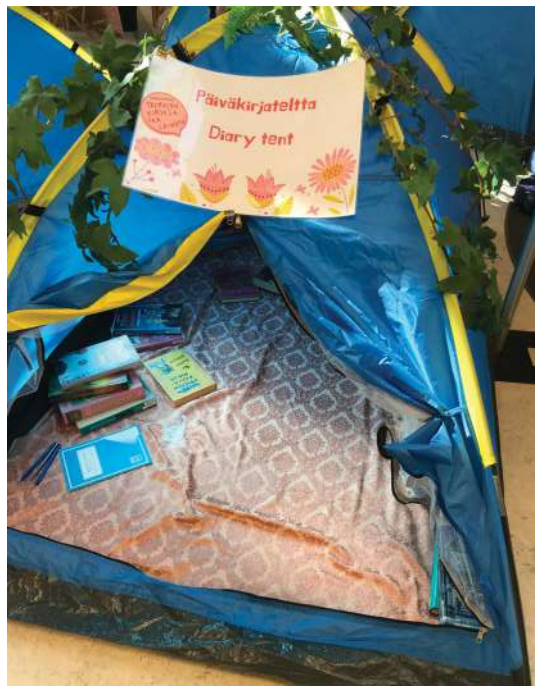


Figure 4.6 Vignette for peer-to-peer model, becoming a vehicle for inclusiveness. The complex crisis that society faces is reflected in the poor mental health affecting especially young people. Urban design aids through urban collectives, offering family-like support, and designing the city and its nature through matching needs and skills. Nature and youth can thrive in this way. https://oecdcogito.blog/2023/03/17/thriving-youth-in-cities-bringing-community-and-nature-to-life/ (Photograph by Amos Taylor from Stoa Culture Centre, Helsinki)

use in food preparation, energy generation, and waste management in households and shared spaces. Such collectively executed cultivation also strengthens community bonds (Heinonen et al. 2023).

Thesis 7: Understanding and Enabling the Multilocal Society Mode

Multilocality refers to the situation where work, housing, and leisure activities are increasingly spread across multiple locations. This model can be compared to the past, where people lived in the city and went to their cottage. However, the situation has changed in such a way that nowadays, periods spent at the cottage are extended, or parts of the year are spent abroad. The key accelerators and drivers of this phenomenon include digitalization, changes in work, increased leisure time, urbanization, and population aging. To account for multilocality in planning, there is a need for more accurately anticipated future population movement and service needs (Heinonen & Ruotsalainen 2011; Maununaho & Lilius 2022).

The multilocality phenomenon is also related to the sharing economy. Multilocality does not necessarily mean owning a residence or workspace in multiple places and towns, where time is then spent – living, vacationing, or working. Thanks to the sharing economy, it is easy to find rental apartments or Airbnb accommodations. A growing trend is the practice where people exchange their homes for a certain period, domestically or internationally. New service providers are also awakening to the new potentials of remote work, which became apparent during the pandemic when remote work was conducted in isolation within the home's confines. Now, some hotels are marketing special remote work packages for day use, where breaks can be utilized for various refreshment and exercise services. At its core, multilocality serves employee wellbeing and creativity and thereby supports efficiency. However, not everyone has the means or opportunities for multilocality on their own, which can lead to exclusivity. Multilocality can appear as purely a phenomenon of the mobile experience society. Therefore, societal discussion could focus on supporting diverse and sustainable multilocality through various measures and acknowledging the role of multilocality practitioners in supporting community resilience. For instance, in the event of a crisis in a certain area, the specialized knowledge of 'multilocal visitors' could be utilized in rescue operations.

Thesis 8: Understanding Hybridization and Designing and Utilizing Hybrid Spaces

Hybridization involves an age-old phenomenon: in biology, it refers to the fusion of two things or organisms. In mythology, a hybrid is a 'monstrosity', such as the snake-headed Hydra that elicited more fear than curious interest in ancient times. The concept of hybrid has also been applied in social sciences, arts, and cultural studies, referring to processes where separate practices and structures merge to create new forms and functions.

In futures studies, hybridization is intriguing because it draws attention to change. Can we better anticipate future changes by analyzing the types of hybridization

Figure 4.7 Vignette for multilocality also covering episodes of temporary use of urban spaces. The season had changed and it was time to leave the city as the first days of late autumn coolness arrived. City living was spread out over the few blocks of improvised spaces, that everyone became quickly accustomed to, dining, reading, and even sleeping in temporary structures that increasingly pop up each year. 'We live here!' was a slogan written throughout the district. (Inspired by: https://www.designboom.com/architecture/inflatable-bus-stops-reading-nooks-ulises-midjourney-04-11-2023/ https://floating-berlin.org/) (Photograph by Amos Taylor, Alusta Pavilion temporary construction Helsinki Design museum Yard 2023, by Maiju Suomi & Elina Koivisto)

emerging in society? Hybrids can be combinations of various attributes: physical + virtual/digital, public + private, natural + artificial, material + immaterial, and so on. Hybrids can also be combinations of different domains: science + art, technology + nature, humans + machines, science + religion, and more. Typically, hybrids combine different activities: work + residence, work + mobility, etc. Hybridization can also explore combinations of different roles: citizen + politician, consumer + producer, teacher + student, layperson + expert, and so forth. We have developed a preliminary typology of hybridization (Karjalainen et al. 2022b). An interesting question is also how hybridization can support community resilience and, on the other hand, to what extent it might increase risks and vulnerabilities.[16]

This thesis focuses on the merging of spaces and activities and their impacts. Architecturally, hybridity represents multifunctionality. There is also talk of building adaptability, where a space initially built for one purpose can be converted into another when needed. In hybridization, this adaptability is permanent, meaning that a space can host multiple elements and functions simultaneously or transform flexibly at intervals. In its ideal form, these combinations of spaces – various hybrids of offices, residential spaces, and public spaces – begin to realize the potential of the green and digital transition. However, it is noteworthy that this alone does not necessarily enhance resilience; it might even work counter to it. Hybridization is an intriguing yet relatively underutilized aspect of urban planning. It is recommended that public buildings are used for different purposes as well – for instance, schools used for unemployed workshops in the evenings, nursing homes providing practice spaces for young bands, etc. In terms of resilience, the versatility of spaces and the

Figure 4.8 Vignette for versatile hybrid spaces. A hybrid multifunctional space combined with an urban space. There can be a cafe and performancein the form of dance moments during the summertime. The use of this hybrid space is free but has to booked in advance. (Photography by Risto Sivonen, temporary dance pavilion at Desing Musem, Helsinki)

merging of functions can act as a buffer mechanism and a path to swift responses (Karjalainen et al. 2022b; Heinonen et al. 2022a; Heinonen 2022b).

Thesis 9: Increasing Experimentation – Leveraging Pilots

The recommendation of a culture of experimentation applies to urban planning, which has previously been declared an approved approach even within government administration. The purpose is to enhance experientiality, meaningfulness, wellbeing, multisensory experiences, as well as to attract related innovations. To diversify the monotonous urban landscape, bolder experiments and pilots are needed. Experiments can be designed and carried out to solve pressing problems or purely to test an idea, or to seek novelty. The risks are not significant since the experiment is limited in time and place. The experiences gained from experimentation, in turn, provide insights into future plans and choices about what to continue, modify, or discard. A fully fledged experimental attitude assists in identifying 'real' novelties (Poli 2017, 2). Experiments often involve testing something 'new' – new could mean an entirely novel solution, operational model, service, or way of thinking. New could also involve the reimagining of an old idea or a combination of the old and the new. Sensing the new requires curiosity towards the potential for change and the future in general. Since ancient times, Socrates asserted that an open, curious attitude and trying out new things are the path to achieving goodness. Novelty can also be found precisely in tolerating or observing differences. According to Turunen (2015), cities that have flourished are those that have understood foreign languages and cultures and embraced diversity. When the environment allows for freedom and foreign influences, the result can be a success story in economics, science, and art. Experimentation fundamentally involves learning, not just testing. Learning from mistakes is also important and should be embraced.

In the urban landscape, experiments enrich by making the cityscape more diverse. Floating buildings have been one experimental focus, and in some countries like the Netherlands, they have long been a part of everyday life, often in the form of floating houseboats. Finland has also begun experimenting with floating structures. An example designed for year-round living, assembled entirely on land and placed on concrete floats, is on display at the Loviisa housing fair. The harsh Finnish winter conditions impose special requirements on solutions for floating construction. Floating buildings are an example of the combination of the previous thesis of hybridization and experimentation: a floating residence combines the concepts of a ship and a house. The 'Lauttasauna' combines the concepts of a ferry and a sauna, serving as a popular recreational service. Hybrids often exhibit an exploratory nature and, with usage, offer experiences to further develop the respective concept. Floating construction has been a solution driven not so much by curiosity but by the necessity dictated by conditions. In Nigeria, there are entire floating building complexes on the outskirts of Lagos, where all activities take place on the water. Consequently, one should bear in mind that experimentations are culturally and geopolitically versatile and in need of contextualizing.

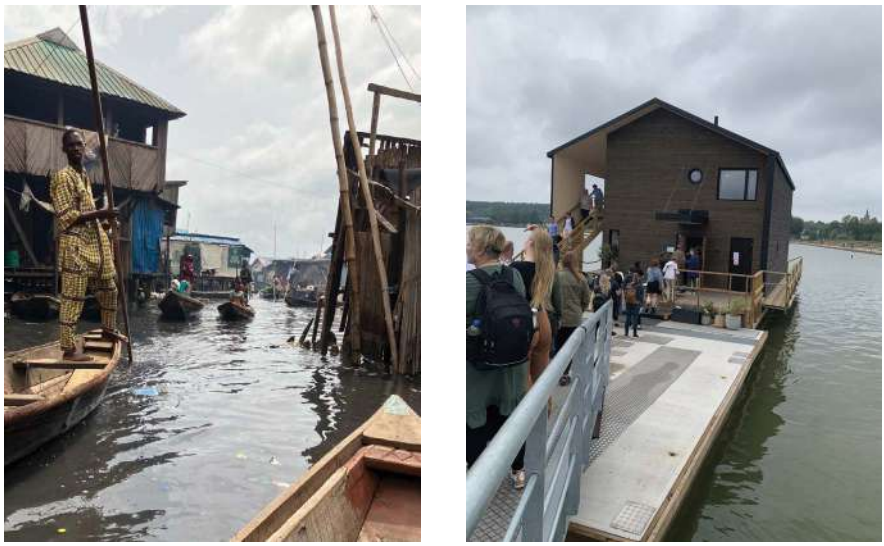


Figure 4.9 Vignette for floating buildings with different contexts. Floating buildings or communities have various origins and manifestations depending on the context. Floating urban scenery near Lagos in Nigeria where everything happens on floating structures for pressing reasons (flooding and lack of land). In Loviisa, small town in Finland, the floating building is on display and an experimental pilot – there's space reserved for ten such buildings altogether. (Photographs by Pasi Kokkonen and Sirkka Heinonen)

Thesis 10: Setting the Bar Higher – Pursuing Leadership

Internationally, Finnish urban planning is at an above-average level. However, this does not mean that the bar cannot be raised. In Finland, we have succeeded, at least for now, in preventing the emergence of closed, exclusive residential areas (gated communities).

A stronger pursuit of transformative leadership (Montuori & Donnelly 2017) could be aimed at envisioning a prosperous, pleasant, eco-smart city. In such a city, there are equal mobility opportunities for everyone, and there are enjoyable, green public spaces available for all age groups. Cities should also have a zero-tolerance approach to violence and crime. Additionally, there could be a competition for zero tolerance towards loneliness and exclusion.

Leadership is also a framework in futures studies where pioneers are identified and analyzed (Heinonen et al. 2017; Heinonen & Karjalainen 2019b; Heinonen et al. 2022b). Pioneers – whether they are cities, organizations, states, or individuals – are steps ahead of others in future scenarios. Just as weak signals are indications of emerging phenomena that may intensify and transform into trends, pioneers open up perspectives on possible futures. Leadership can be seen as shaking up entrenched mindsets and paving the way for alternative tomorrows. In this sense, pioneers are pathfinders and 'trailblazers of the unknown'. The world is not

Figure 4.10 Vignette for flexible and adaptive leadership. The professor felt very misunderstood for a long time, but was adamant that change needed to happen due to climate change. Day must become Night and Night must become Day for many workers, students, and citizens of the heat-trapped cities. Working during the cooler nights was the way forward. (Inspiration www.theguardian.com/environment/2021/jul/23/athens-appoints-chief-heat-officer-combat-climate-crisis) (Photograph by Amos Taylor Cuahtemoc Centro, Mexico City)

unchanging but in motion, and pioneers, as key players and catalysts of change, embody this movement.

In urban planning and strategies, it is worth consciously considering the type of leadership to pursue and concretely incorporating it into visions.

Bonus Thesis: Shaping Urban Planning/Development Futures

As a bonus thesis, we propose contemplating the futures of urban planning itself in addition to exploring the futures of cities. What kinds of futures can cities have during times of deep uncertainty and because ofclimate emergency? Specifically, how could urban planning evolve, bitten by the 'Socratic gadfly', gain energy to question current, not-so-effective practices and perspectives? At the same time, this

would strengthen long-term thinking and holistic examination that takes all population groups and biodiversity into account. Tools such as scenarios, identifying images of the future, and especially the Causal Layered Analysis (CLA) method (Inayatullah et al. 2023), could be used. In the CLA, as a specific foresight technique or rather conceived as a process, the essence of the city would be delved into and dissected on four levels: litany, causal relationships, worldviews, and metaphors.[17] Such foresight techniques can ideally be applied in futures workshops or futures cliniques (Heinonen & Ruotsalainen 2013). In the RESCUE project there have been six futures cliniques which are reported in separate documents. Three of them used the CLA method to test urban resilience of a crisis situation. By utilizing CLA, it is possible to drill deeper into the way uncertainties and their extreme forms reveal themselves, and affect our minds during crisis events. By setting people in simulated, novel situations, resilience can be assessed via experienced successes and failures. 'Foresight modes' are revealed by probing four layers: 1) indicating litanies, 2) paying attention to systemic structures, 3) weighing the influence of worldviews, and ideally 4) bringing to the fore myths and metaphors – deeper beliefs that influence sensing and behavior. The RESCUE project ran three

Figure 4.11 Buildings as biomimic structures or meaningful messages (Heinonen & Minkkinen 2016). The power of metaphors can transform perception of futures. Buildings, structures, and practices that mimic nature (biomimicry) encourage our thinking to become more forward-looking and more attentive to humans-nature-technology interaction. (Photograph by Sirkka Heinonen, Florida)

CLA workshops that engaged participants in an overwhelming situation after a geomagnetic storm had caused a power cut, the outcome of which was not known. The cities of Rovaniemi and Kotka, and the Tripla complex in Helsinki, all in Finland, are different in their location, demographics, and institutions.

Conclusions

This section concludes this chapter by claiming that the theses or statements for urban resilience, as presented in the previous sections, provide the key pillars both for anticipatory urban governance and for urban futures resilience. The statements can also be used as a checklist for urban planners and policymakers. They can also be utilized as material for stakeholder sessions and discussions, as well as be further elaborated at city, corporate, and citizen levels. To conclude, we also provide here insights from a futures clinique where both enabling and inhibiting factors of urban resilience were addressed[18]. Table 4.2 presents factors that could be considered

Table 4.2 Enablers and inhibiters of urban futures resilience

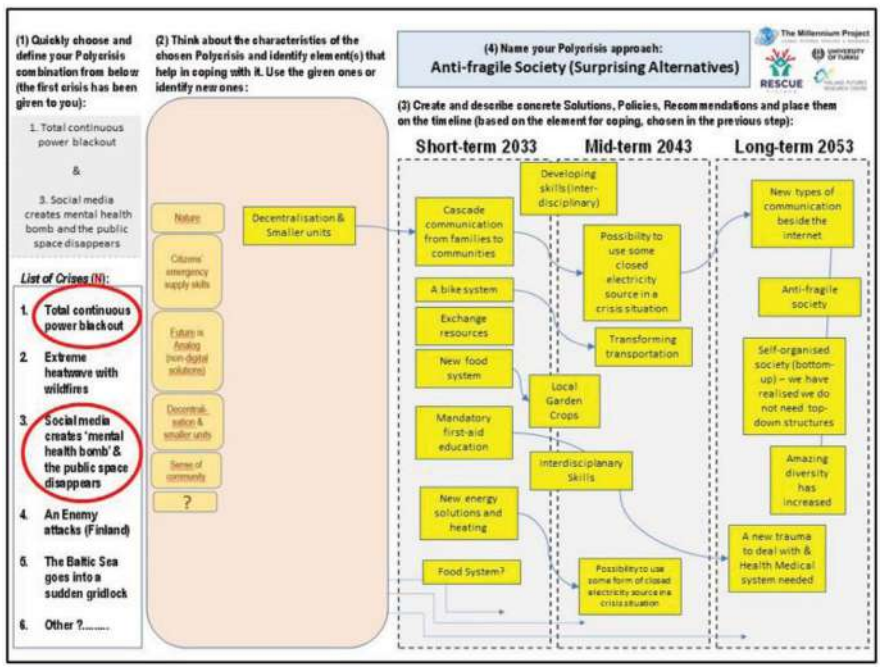
Enablers	*Inhibiters*
• Judgment capability, but on the other hand, courage and responsiveness. • Ability to use information correctly. • Built environment supporting alternative ways of thinking and acting. • Strengthening the relationship between the environment and humans as part of resilience. • The idea of mosaicism, to bridge the gap between cities and rural areas: a way to highlight the uniqueness and meanings of places and increase attractiveness. • Constructing the environment in such a way that people have a genuine choice between the rural and the urban; on the other hand, construction practices could enable merging of the two lifestyles (while reflecting digital worlds critically). • Residents' and individuals' opportunities to contemplate and voice what they want for the future (e.g., Meilahti, Helsinki), with resourcing • Renewal of thought patterns, for example, replacing extensive functionality and individualism with sense of community; values and ethics, which will hopefully deconstruct patterns of separation. • Flexibility in the application and emphasis on shared use of spaces.	• Underutilization of information when planning residential areas. • Forgetting ethical considerations in construction. • Inability to leverage grassroots actors' ideas. • Influence of external actors' interests on urban planning and making decisions that go against ideals. • Narrow economic assumptions • Doing things the same way as before. • Creative actors feel that bureaucracy is slow and new solutions are not accepted. • When the environment does not support interpersonal encounters, the result is loneliness and isolation. • Overlooking root causes of inequalities or even potential segregation • Lack of residents' ownership in their own cities. • Lack of strong channels of influence, even though technology enables various solutions. • Being too strongly locked into the idea that each property has only one purpose.

when strengthening the futures resilience of cities. These factors were identified in a futures clinique conducted within the RESCUE project.

Naturally, urban planners and policymakers are advised to strengthen the enablers and diminish the inhibiters for urban futures resilience. When tackling the question of policies that are needed for making cities more resilient, a guiding and illustrative timeline could also be set as a basis for a roadmap showing what policies are recommended and when. As a tentative roadmap for resilience policies Table 4.3 gives an example. This roadmap describes the situation where a crisis has taken place and a group of experts discusses in that context what would be needed for urban policy in three distinct time horizons. These insights were distilled from a futures clinique conducted in a Special Millennium project session during the FFRC Conference on 'Empowering Futures' in Turku 15 June 2023 (Heinonen et al. 2023b). The aim of this foresight exercise was to immerse in a crisis situation, i.e., in a polycrisis of a given crisis plus another crisis that the group chose to tackle and identify solutions and policies for not only surviving the crisis but also learning from it, and rethinking current practice.

The right-hand column of Table 4.3 shows a roadmap of three timelines: 2033, 2043, and 2053. Policies for giving an important role to education, new skills development, and communication are evident in the results. In addition, technical

Table 4.3 Policy roadmap as a result from immersing in a crisis situation of total electronic blackout combined with another crisis – 'mental health bomb created by social media' – in a futures Clinique



policies were also called for, for example, new energy solutions. The need for transformative policies – i.e., policies that push for systematic and thorough-going changes – were also identified.

Systemic structures, whether they are laws, policies, instructions, actor networks, collaborative/all-inclusive education, or training, were quickly seen necessary in the abovementioned CLA futures workshops, since in crises no one can survive alone. Preparedness requires foresight. There are events that can be knowingly prepared for, but resilience was found to also require adaptability, since crises do not occur in a planned manner. Agile and adapting behaviors of stakeholders in an event require activities beyond organizational boundaries. The ability to react involves tacit and embodied elements that cannot be trained for fully at the very moment when the emergency rapidly occurs. Resilience may also emerge from regional characteristics. For example, northern areas of Finland, i.e., Lapland, are known for their regional network that is built for reacting flexibly in even unforeseen incidents.

Practical Recommendations

- Ask urban planners to engage in continuous dialogue with citizens (open doors one day per month at city planning office and mayor's desk) and ask urban planners to live a certain period of time in the area they are planning or redesigning.
- Connect schools in cities with those in the surrounding rural areas via pupil/teacher exchange and study visits; equip urban space with public crisis escape rooms to rehearse real-life situations; and make histories of buildings visible in cityscape via touch screens on façade where the passers-by can have access to various stories concerning former uses and residents.
- Ask kindergarten children to design housing for senior citizens and ask for feedback from them. Open city hall for such exhibitions and allow temporary night galleries in them.
- Provide co-working spaces within libraries and cafeterias; ask companies to provide childcare or senior citizen care space inside their premises.
- Launch an annual competition for an urban design pilot and, based on the most votes, enable such a pilot, encouraging combining social innovation with technical innovation.

Notes

1 The Finnish original of the poem is as follows: *'Tietä käyden tien on vanki. Vapaa on vain umpihanki.'*, in the book *Huojuvat keulat* (1946). The poem is translated by Sirkka Heinonen. The poem is about the feeling of freedom that comes from exploring the unknown. The speaker compares the road to a prison because it limits your freedom of movement. The untrodden snowdrift, on the other hand, represents the unknown. It is a place where you can be free to explore and discover new things. The poem is a reminder that we should not be afraid to step off the beaten path and explore the unknown. There is beauty and freedom to be found in the unexpected. In the field of futures studies this relates to the idea of avoiding path-dependencies.

2 See the special issue of journal *Futura* 4/2021, edited by Sirkka Heinonen and Saija Toivonen, on crisis thinking and futures resilience.
3 This has repeatedly emerged in the future cliniques of the RESCUE project as well.
4 The research project RESCUE (Real Estate in Sustainable Crisis Management in Urban Environment), ongoing from 2021 to 2023, is led by Assistant Professor of Real Estate Economics Saija Toivonen from Aalto University.
5 Top Ten framework is a concept launched by Osmo Kuusi within the Finnish Society for Futures Studies. It consists of a seminar where some key experts are invited to give their own ten theses on the main theme chosen for the seminar, to be debated with the audience. The theses presented in this chapter are based on the presentation by Sirkka Heinonen in a Top Ten Seminar 'The Age of Deep Uncertainty' in February 2023 in Helsinki.
6 See, for example, *Futura*'s special issue 'Future, City, and Us' 1/2015.
7 The latest foresight report by the European Commission is titled *Towards a fair and Sustainable Europe 2050: Social and Economic Choices in Sustainability Transitions*.
8 Vignettes are like episodes or 'mininarratives' as illustration of an evocative phenomenon or practice.
9 The abbreviation MAL derives from the initials of the Finnish words for land use, housing, and transport.
10 See Bardi's interview in FFRC eBook 1/2023 *Constructive Conversations on Urban Resilience*.
11 A city should be designed as accessible to all – not just to young and healthy adults. Senior citizens, disabled people, families with children will be facing closed futures if the set of transport modes best serving them is narrowed down.
12 The 100-year timeframe was explored in the theme issue 1/2018 of *Futura* magazine titled 'Seuraavat 100 vuotta' (in English, the next 100 years) with guest editors Sirkka Heinonen, Matti Minkkinen, and Osmo Kuusi.
13 I conducted my licentiate thesis at the University of Helsinki on the topic *Time and the Future in Seneca's Works* (Heinonen 1990). In the preface of the publication, Pentti Malaska wrote as follows (translated from Finnish): 'Sirkka Heinonen's monograph highlights the integration of futures studies into other disciplines, emphasizing the comprehensive understanding of information for the sake of envisioning the future. The concepts of time and the future themselves and their significance naturally become subjects of contemplation in futures studies. Sirkka Heinonen's research opens up an intriguing connection between futures studies and ancient thought. The topic is important and timely, and significant for further research, especially nowadays, when, based on Prigoginean thinking, the concept of time is evolving or becoming liberated from the mechanical pendulum's "position time" to the "correlation time" of events.'
14 He is a retired Senior Adviser of Building at the Ministry of the Environment.
15 This work by Heinonen & Karjalainen (2019a), *Electrification in a Peer-to-Peer Society: A New Narrative for Sustainable Futures*, has also been published in Finnish (2018) and Spanish (2020).
16 Regarding living in differently shaped buildings, see also Mäkelä (2022).
17 In the RESCUE project, the CLA method has also been used to test crisis resilience in three futures cliniques: for Rovaniemi, Kotka, and the TRIPLA shopping center. The report on the results will be published in the FFRC eBook series.
18 Futures clinique held at Europe Hall (Eurooppasali) in Helsinki on 28 March 2023.

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5 How Can Housing Design and Transformation Promote Resilience to Different Crises?

Raúl Castaño-Rosa, Sofie Pelsmakers, and Heini Järventausta

Introduction

Our society has recently faced an increasing number of unexpected crises and disruptions such as war, pandemic, extreme heatwaves, heavy flooding, and forest fires around the world, and the probability of these and new crises and disruptions that will happen simultaneously is on the increase (Wheeler 2022). Crises and disruptions here refer to any rapid or permanent changes that affect the ability or capacity of humans or non-humans to exist and thrive in the urban system (Raúl Castaño-Rosa et al. 2022). Several disruptions relate to the climate crisis and, as part of its effort to mitigate the effects of this, the European Union (EU) aims to achieve a carbon neutral society by 2050, that is an economy with no greenhouse gas emissions (European Commission n.d.), with Finland aiming to achieve the target of carbon neutrality by 2035 (Finland's Climate Act 2022). To achieve this target, the EU has revised the Energy Performance of Buildings Directive (European Commission 2021) to ensure that all new buildings are zero-emission buildings (ZEB) by 2030; i.e., 'a building with a very high energy performance, with the very low amount of energy still required fully covered by energy from renewable sources and without on-site carbon emissions from fossil fuels' (European Green Deal: Commission Proposes to Boost Renovation and Decarbonisation of Buildings 2021). However, our research has found that adapting our building stock towards ZEB is not enough on its own (Pelsmakers, Nisonen, et al. 2022). Instead, building stock retrofitting must go hand-in-hand with an inclusive and equitable just transition to ensure that no one is left behind (either human or non-human). These are key principles that help foster resilient housing design.

Resilience is defined here as 'the ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability' (UN-Habitat 2022). In other words, resilient housing design and transformation promote the ability or capacity of a person, a building, the neighbourhood, the city, and the urban system it exists within to persist – even thrive – in the face of disruptions. Research on resilience in the built environment is extensive, where different frameworks, indexes, principles, and potential solutions to promote resilience of the built environment have been proposed (Shafiei Dastjerdi et al. 2021; Frantzeskaki 2019; Lak et al. 2020;

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Birchall & Bonnett 2021; Grafakos et al. 2020; Fastenrath et al. 2020; Phipps et al. 2021; Bush & Doyon 2019). However, due to the multidimensional complex nature of the problem, existing knowledge is presented by focusing on the technical, legislative, financial, and social barriers, making it difficult for different stakeholders to fully understand and implement resilient housing design in their day-to-day activities.

This chapter, based on key research findings as part of the Academy of Finland-funded RESCUE project (Real Estate and Sustainable Crisis Management in Urban Environment (RESCUE) n.d.) aims to provide a brief overview of the role housing design and transformation plays in both mitigating and adapting simultaneously to different crises' impacts and disruptions to support resident wellbeing (see e.g., Castaño-Rosa et al. 2024; Castaño-Rosa et al. 2022; Pelsmakers, Nisonen, et al. 2022; Sukanen et al. 2023; Lehtinen et al. 2024; Saarimaa & Pelsmakers 2020; Pelsmakers et al. 2021). Resilience cannot be achieved when focusing only on the design and transformation of the individual dwelling or housing block, but also depends on the wider surrounding living environment, such as the courtyard, characteristics of the nearby neighbourhood, presence of nature and non-humans (Castaño-Rosa et al. 2024; Castaño-Rosa et al. 2022; Pelsmakers, Nisonen, et al. 2022; Sukanen et al. 2023; Lehtinen et al. 2024; Saarimaa & Pelsmakers 2020; Pelsmakers et al. 2021).

This chapter first sets out the key principles for resilient housing design and transformation. This is followed by four subsections to explain simply and graphically how key resilience principles can be implemented at different scales (from macro to micro level through meso level). This section ends with two Finnish case studies where different aspects of the key resilient housing principles were implemented. Finally, concluding remarks and reflections for further considerations are provided.

Key Principles for Resilient Housing Design

Based on previous research see e.g., Castaño-Rosa et al. 2024; Castaño-Rosa et al. 2022; Pelsmakers, Nisonen, et al. 2022; Sukanen et al. 2023; Lehtinen et al. 2024; Saarimaa & Pelsmakers 2020; Pelsmakers et al. 2021), key principles that promote resilience in the built environment can be divided into four different infrastructures[1]: 1) green, 2) diverse and adaptable, (3) social, and (4) inclusive and equitable. Below, a brief introduction to how the four key resilient infrastructure principles are understood is provided:

- *Green infrastructure* refers to the presence of diverse green spaces that support flora and fauna, including woodlands, fields, hedgerows, and trees. They act as habitats for non-humans, while also supporting human connection to nature and social inclusivity, community resilience, and wellbeing. Green spaces can act as social infrastructure too.
- *Diverse and adaptable infrastructure* mean the development of interventions that are versatile (i.e., sufficient differentiation amongst spaces, uses, etc.; not

'one size fits all'). Similarly, diverse and adaptable spaces can be adapted to different and changing needs over people's life course or during different types of crises impacts or disruptions, including the impacts of the climate crisis, pandemic, etc.

- *Social infrastructure* refers to the design of spaces that create opportunities for people to interact with each other through everyday indoor or outdoor spaces as well as to share activities in the living environment. Implementing social infrastructure enables the creation of spaces that support individual wellbeing and community cohesion (e.g., social interactions that help reduce isolation, e.g., older adults). Overall, it is about designing accessible, diverse, and inclusive spaces for a diversity of people.
- *Inclusive and equitable infrastructure* ensures that inhabitants are part of democratic and participatory processes in the built environment, creating a feeling of ownership when responding to residents' needs in the urban development process.

Figure 5.1 graphically depicts the interconnection between the four key principles to promote resilient housing design and transformation, in which everything needs to be holistically connected to make sure no one is left behind.

Green Infrastructure

In this section, the green infrastructure principle is further explained by discussing the main solutions that can be used to promote resilience in the built environment from different scales (i.e., macro, meso, and micro level). The green infrastructure

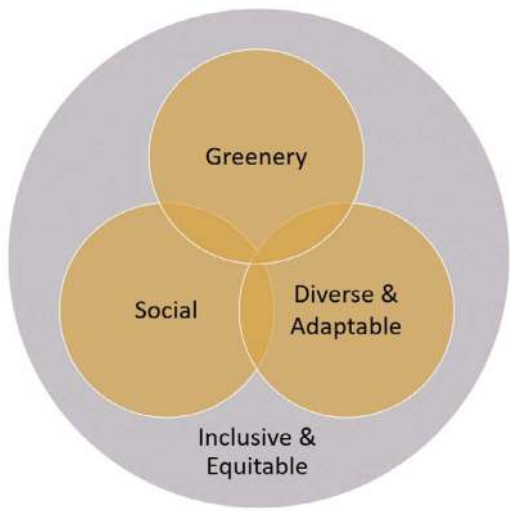

Figure 5.1 Key principles to promote resilient housing design and transformation (authors' own)

principle highlights the need to create diverse green spaces that support flora and fauna, including woodlands, fields, hedgerows, and trees (Danford et al. 2018). The potential benefits of green spaces for society have already been shown by many researchers across the world, for instance, increasing biodiversity and supporting social capital, health, and wellbeing (Chausson et al. 2020; Tidball et al. 2018; Frumkin et al. 2017). However, they need to be designed in a way that protects ecosystems and supports biodiversity (National Geographic Society 2022), supports residents' adaptive capacity, e.g., by providing cooling and shade to protect during heatwaves, floods, etc. (Africa et al. 2019), and supports human and non-human wel-being (Chelleri et al. 2015).

There are different ways of creating green spaces, depending on the location and scale. However, findings strongly suggest including them early on at the design phase to prioritise and integrate green infrastructures in resilient housing. Of course, including them at a later stage, by housing and built environment retrofitting, is possible; however, it will be more difficult and more expensive and risks impacting on sustainable performance (Castaño-Rosa et al. 2024). Figure 5.2 represents how to create different types of green spaces in the living environment to promote resilience from the macro to the meso level. To develop resilient housing, this needs to be designed and/or transformed from the top to the bottom level, (i.e., from the macro to the micro level), considering its impact at different scales (grassroots movement). For instance, restoring existing natural habitat by e.g., using trees, constructing wetlands, or recovering wastelands, can contribute to flood mitigation (Gooden & Pritzlaff 2021), housing market value increase, maintaining an affordable housing market value (Wolch et al. 2014), and a feeling of community (Dinić-Branković & Marković 2021). As depicted in Figure 5.2, implementing sustainable transport means, such as cycling or walking, is essential to make these spaces easily accessible for all. A 15-minute city approach, where residential areas and essential urban services are accessible within 15 minutes by cycling or walking, could help urban restoration to be more inclusive and equitable for residents (Pelsmakers, Donovan, et al. 2022). Provision of residential neighbourhood parks with playgrounds, social facilities, and sport areas can also promote physical and mental wellbeing (Castaño-Rosa et al. 2024). Similarly, edible urban commons and urban lawns (which can be placed in the backyard or in the front of the house), provide spaces for recreational purpose while creating habitat for non-human species (see Figure 5.2). Any collected rainwater can be used for landscape irrigation and other residential purposes.

Figure 5.3 illustrates how to better implement green infrastructure to promote resilient housing design and transformation at the micro level. This includes designing good indoor conditions to support residents' wellbeing, which can be achieved with vegetation, provision of balconies and windows to enable natural light, ventilation, visual connection to the environment, and views to the sky. Balconies play a key role in designing resilient housing; they connect the living areas of the home with the natural environment, provide space to relax, and connect with nature if part of the design (see Figure 5.3). However, the design of the balcony requires special attention if this covers the main windows or the only window in

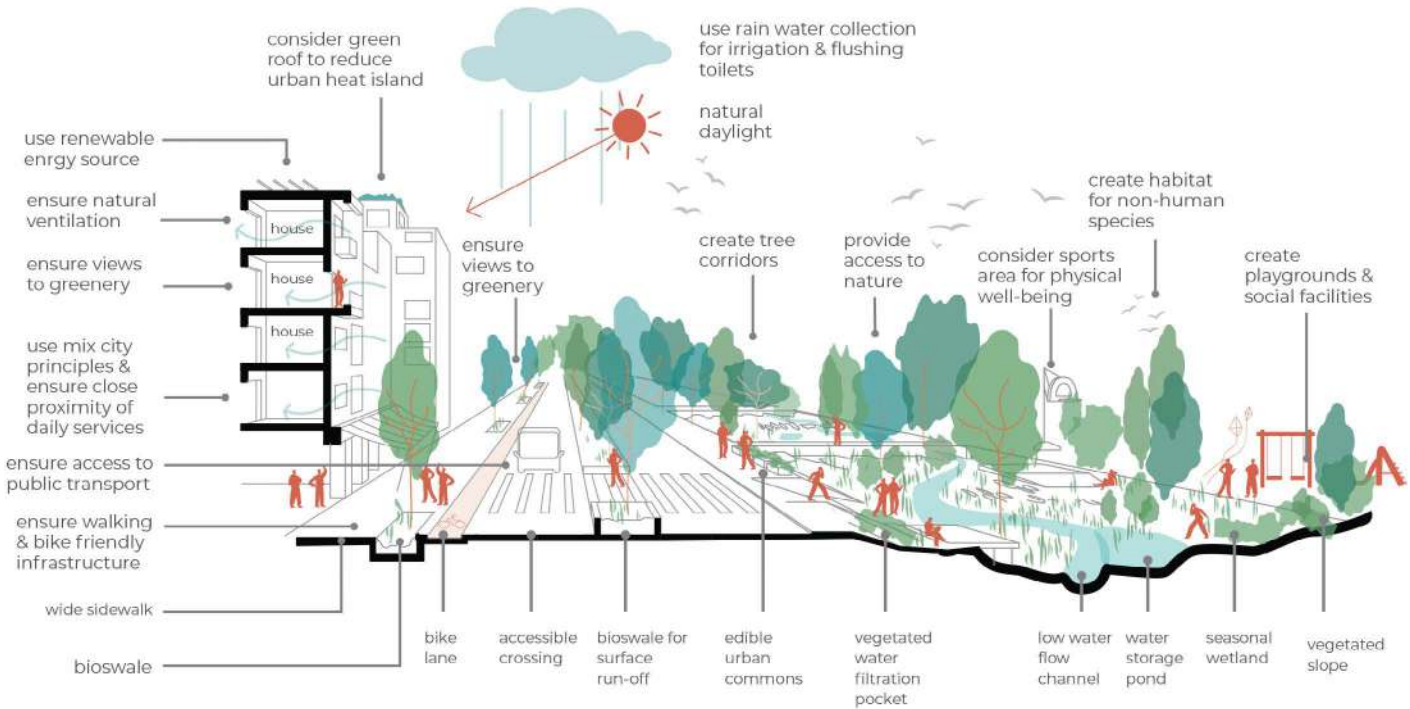

Figure 5.2 Green space implementation from macro to meso level; adapted from Pelsmakers, Donovan, et al. 2022

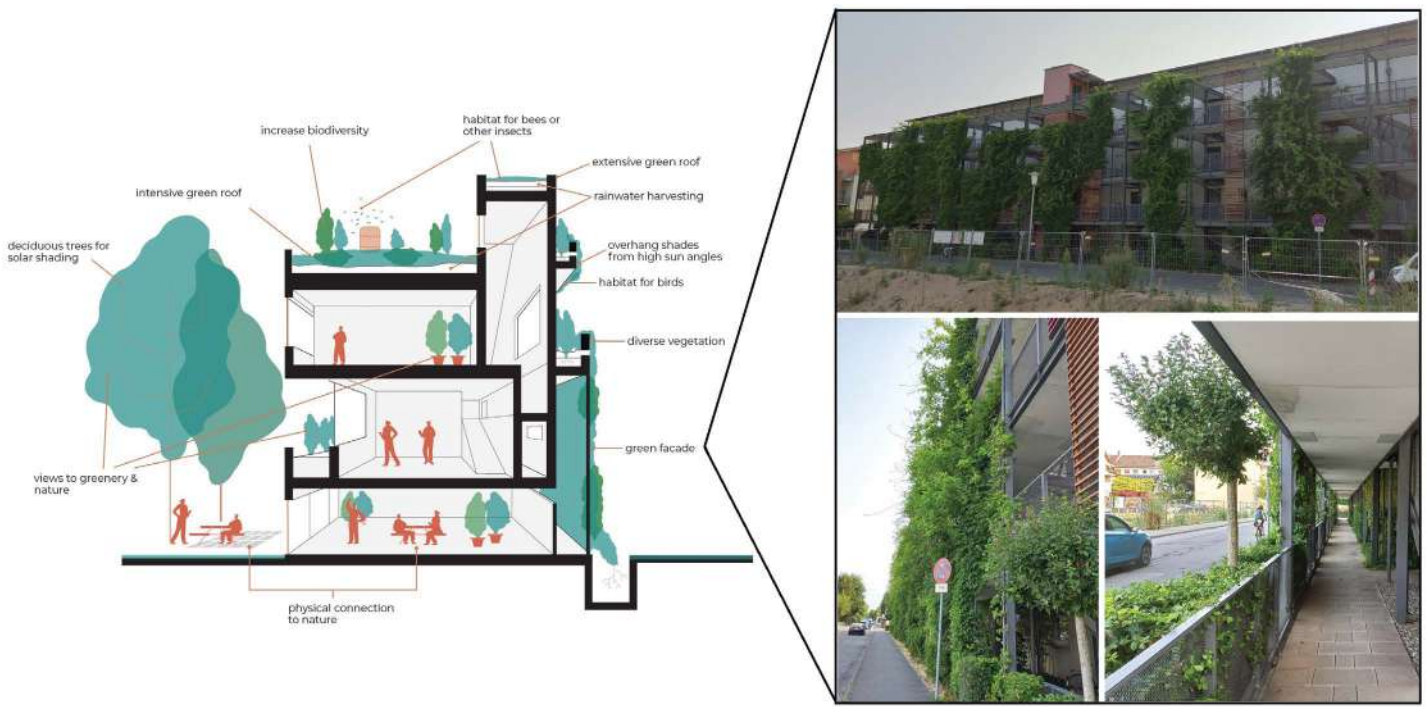

Figure 5.3 Green space implementation at micro level; adapted from Pelsmakers, Donovan, et al. 2022

the living space because this decreases natural light and the connection to the outside. Combining intensive and extensive green roofs in the built environment also has many benefits. For instance, as shown in Figure 5.3, intensive green roofs can be used by residents to socialise and grow food (as edible urban commons) while improving the energy efficiency of the house. On the other hand, extensive green roofs cannot be walked on, but they create habitats for local species and/or other insects and contribute to urban heat island reduction and improvement of outdoor environmental quality (Ziogou et al. 2018).

Green facades can be suitable solutions to provide shade from high sun angles in summertime and during heatwaves, increase biodiversity (e.g., create new habitats for birds), improve building energy efficiency, and contribute to urban heat island reduction. However, it is important to use diverse vegetation to ensure its long-term sustainability and to integrate rainwater harvesting for irrigation in periods of drought (Safikhani et al. 2014). Finally, green courtyards provide a lot of benefits for residents if designed properly, for instance, they provide space for recreation and physical activities, natural resources for self-sufficiency at a small scale, and an opportunity for rainwater collection to be used for watering the garden, a green wall, or a roof (Sofo & Sofo 2020). They also shade and cool outdoor spaces during heatwaves. In all cases, the need to use local plants that support local biodiversity and that work with local current and future predicted climatic conditions (including drought and flood tolerance), will ensure low maintenance costs and cost-efficient and affordable solutions. This is crucial so that residents will be able to maintain green infrastructure in the long term.

Finally, the implementation of these solutions needs to be (physically and visually) accessible, appealing for citizens to protect and appreciate them, and co-developed with stakeholders at different levels (e.g., residents, industry, municipality, policymakers, etc.) so that their needs and expectations can be met.

Diverse and Adaptable Infrastructure

The second principle, diverse and adaptable infrastructure, plays a key role in promoting resilience at different scales of the built environment (Castaño-Rosa et al. 2022). This leads to creation of spaces that are versatile (i.e., sufficient differentiation between spaces and their use, not 'one size fits all'), and that can be adapted to different and changing needs over the life course of residents or during different types of shocks or crises, including the impacts of the climate crisis or pandemic (Chester & Allenby 2021). Furthermore, designing and/or creating adaptable infrastructure enables easily making temporary or longer-lasting changes in the home and its external and shared community spaces, meaning that residents do not have to move out the home if their situation changes, creating a sense of community among residents (Sardeshpande et al. 2021). Similarly, it reduces transient communities and supports stability, diversity, and community building (i.e., social capital). In the end, infrastructure that is diverse and adaptable ensures building longevity if future needs of residents and society are met fully, reducing the risk of premature obsolesce and, consequently, its demolition. It is important to note that some of the

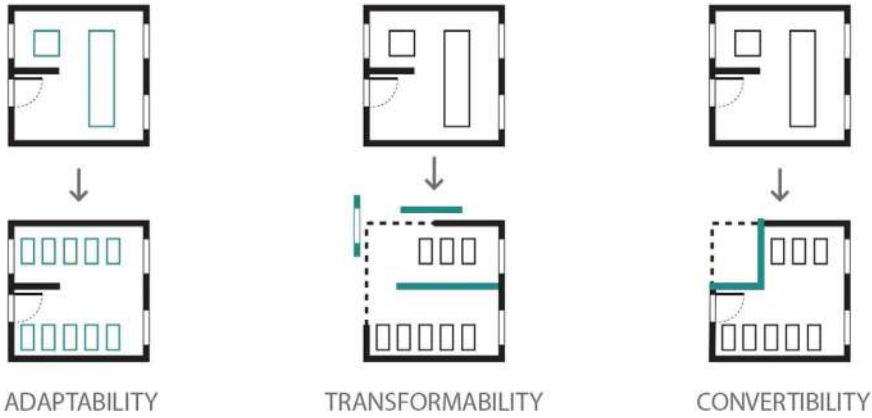

Figure 5.4 Graphical representation of adaptability, transformability, and convertibility strategies; adapted from Pelsmakers, Donovan, et al. 2022

green solutions presented in the previous section have already shown to be diverse and adaptable to different uses and at different scales, e.g., courtyards, urban edible commons (Castaño-Rosa et al. 2024).

Figure 5.4 highlights three key strategies to create diverse and adaptable spaces: 1) adaptability (the building can accommodate multiple functions without modifications), 2) transformability (the building can change without new construction), and 3) convertibility (after minor construction work, the building can change its functions).

It is essential to consider the importance of window positioning and provision of good daylight to create adaptable spaces (Saarimaa & Pelsmakers 2020). This will allow connection to the environment, view to the sky, access to daylight, and ventilation when the living space has been adapted (Lehtinen et al. 2024). Openings need to be distributed on more than one side, enabling different arrangements (Pelsmakers et al. 2021). Thus, we need to avoid dark and deep-plan living spaces (i.e., not deeper than twice the ceiling height if the window is on only one side); provide high ceiling levels to allow future accommodation of other functions; facilitate separations and/or combination of spaces as needed through the design of open spaces (Pelsmakers, Donovan, et al. 2022).

Considering different scales, a building is part of the natural environment and the material and structural system used to hold it in place may have a negative impact on the surrounding environment if its future use is not considered at the design and transformation phase. To mitigate this impact, designing and/or transforming taking into account disassembly principles needs to be part of the design process, where the building and its parts can be dismantled, relocated, and reused. This ensures circularity of materials, promoting long-lasting resource use and reducing waste.

These principles above are exemplified in Figure 5.5, which is affordable social housing in Lisbjerg Hill, in Aarhus, Denmark, by Vandkunsten Architects.

Figure 5.5 Affordable social housing in Aarhus from Vandkunsten Architects. (Photos from https://vandkunsten.com/en/projects/lisbjerg-wood)

The housing blocks are constructed in wood with reversibility and designed according to disassembly principles, and include climate-adapted approaches (e.g., passive strategies). The open plan has multiple openings that connect to the environment, providing access to natural light and hence enabling adaptation to changing use needs. The 'layering' used in the design enables easy accessibility for maintenance, replacement, and dismantling. Its multifunctional potential allows adjusting the size of different spaces to evolving user needs (e.g., rooms, common indoor or outdoor spaces, etc.), avoiding lock-in of unadaptable stranded assets.

In common with green infrastructure principles, diverse and adaptable infrastructure principles need to be included at the (re)design stage, when decisions are made. It may be difficult, more expensive, and unsustainable to make changes once the building is finished.

Social Infrastructure

The 'social' infrastructure principle means to consider the possibility of allocating shared 'get together' spaces within or near the home so that residents have opportunities to interact with each other. These spaces need to be easily accessible to all people in the community, considering not only physical accessibility but also visual and financial (i.e., people do not need to pay to use facilities or services). Social infrastructures should also be locally accessible within walking distances so that use of transport to reach facilities from the home is not necessary. Social infrastructure should therefore be pedestrian-oriented with access to high-quality green space, biodiverse environments, views of nature, and be nice to be in during different seasons (Pelsmakers, Nisonen, et al. 2022). Social infrastructure by itself cannot promote resilience but it needs to be developed in connection to the two previous principles, meaning that 'social' spaces should include green solutions (e.g., trees, plants, greenery), combining different species and supporting biodiversity, with diverse and adaptable spaces for a diversity of people. These social spaces improve wellbeing, reduce isolation, and are important for people who live alone (e.g., older adults) in particular. Thus, buildings and their surroundings need to be designed and transformed in a way that encourages and fosters interaction and connection with the natural environment, encouraging people to come together (Cavaye & Ross 2019).

Good strategies to promote social interactions, and hence individual and community resilience, include the design and transformation of neighbourhoods where activities are mixed-use, public spaces and building stock are diverse, and nearby services are easily accessible. For example, provision of playgrounds may promote residents with children to come together, but if there are various places with benches and summer shading, it can also help adults to go out and spend time with other residents (promoting intergenerational activities). This can be supported with outdoor spaces that support walking and connections to high-quality, biodiversity-diverse green areas, views of the surrounding neighbourhood, and a pleasant microclimate created by both covered and direct sunlit entrance areas and public spaces (Pelsmakers, Nisonen, et al. 2022).

Similarly, at the housing block scale, the way corridors are dimensioned and spatial features designed and/or transformed can limit the opportunities of residents to interact, meet with other residents, and/or spend time together. This way corridors can also contribute to the isolation of some residents from the rest of the community, for instance, those residents travelling with prams or wheelchairs. Overall, all community spaces in the building itself and the neighbourhood should be easily accessible in order to serve everyone. This can be fostered as easily as designing and/or creating a porch with a bench at the entrance, placing benches in corridors, courtyards, playgrounds, and providing spaces for outdoor activities in summer and shared common rooms that are pleasant to be in during winter.

Figure 5.6 graphically represents social infrastructures at different levels, i.e., from the building to the neighbourhood level.

Unfortunately, social infrastructures are rarely designed and created with generosity because they are seen as 'unproductive' and an 'inefficient' use of space (Cavaye & Ross 2019). However, in the pandemic, it was these spaces that contributed to resilience by supporting individual wellbeing and community cohesion (i.e., social interactions, care, and support during lockdown times) (França & Ornstein 2021).

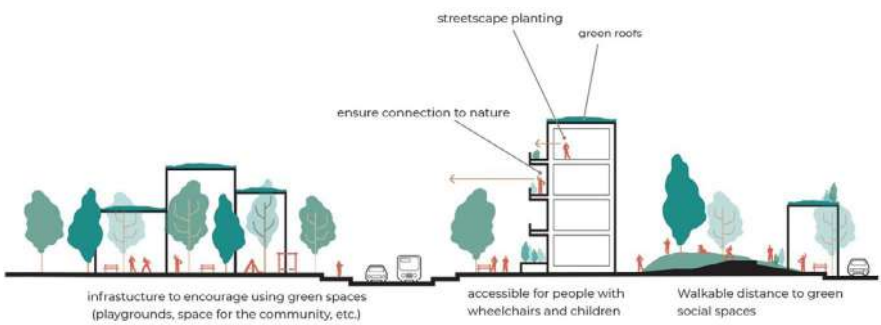

Figure 5.6 Graphical representation of social infrastructure at different levels; adapted from Pelsmakers, Donovan, et al. 2022

Inclusive and Equitable Infrastructure

Inclusive and equitable infrastructure means that residents in the local community are involved in a genuine co-creation process of the building and surroundings. These democratic and participatory processes need to be implemented as part of the three previous key resilience principles (see Figure 5.1). The key aspect of involving inhabitants in the democratic process is to create knowledge exchange between the design experts and the local experts (i.e., the community) in order to provide living spaces that service them and meet their needs fully (Birchall & Bonnett 2021). This creates a feeling of ownership, empowering the community and ensuring that their needs are included in the design and transformation process without putting at risk the wellbeing of individuals or the community. There are different methods for community engagement, depending on community characteristics and purpose. For instance, public meetings create a more formal and official environment, while newsletters, questionnaires, or surveys help to increase the engagement rate as people interaction is much more limited, which is ideal when people have limited time (Pelsmakers, Donovan, et al. 2022). However, deeper and more genuine co-creation processes include informal discussion and interviews that make more personal the interaction between technical experts and the community, helping to promote a feeling of trust (Schiefer & van der Noll 2017). Residents can also be involved in workshops and ideation to truly co-create suitable solutions through consensus. Observations catch those aspects that have not been discussed/addressed through the previous methods due to either lack of confidence during the engagement process or preparation (Pelsmakers, Donovan, et al. 2022). Clearly, buildings, and communities, must be designed and transformed for and with the residents, and to ensure that their needs (and those of future users) are prioritised, reducing inequalities. Embracing people's different backgrounds and social, cultural, ethnic, and financial situations needs to be at the forefront of all decisions (French et al. 2013).

Figure 5.7 highlights the implementation of this inclusive and equitable approach where spaces for social interaction have been provided at all scales; where spaces are flexible and easy to expand and extend in case of demographic changes; construction and maintenance are low cost; there is accessible access with large corridors and staircases to promote social encounters; informal outdoor and indoor meeting places; and DIY and personalisation by residents is possible (Pelsmakers, Donovan, et al. 2022).

It is crucial to note that a solution cannot be resilient by itself. It can only be resilient when it is adopted and taken ownership of by the community, and this is best done through inclusive bottom-up approaches (Castaño-Rosa et al. 2022). For example, a residents' community garden (see green infrastructure principles) cannot be resilient without 1) a good implementation and maintenance of the solutions at the housing and neighbourhood scale; (2) an active community which is willing to use and engage with the solutions, as well as taking care of them to ensure long-term sustainability at the neighbourhood scale; (3) people who have skills and knowledge to know how to use the place and work the land; and (4) good legislation and/or policies that support/allow this to happen in other communities (Castaño-Rosa et al. 2022).

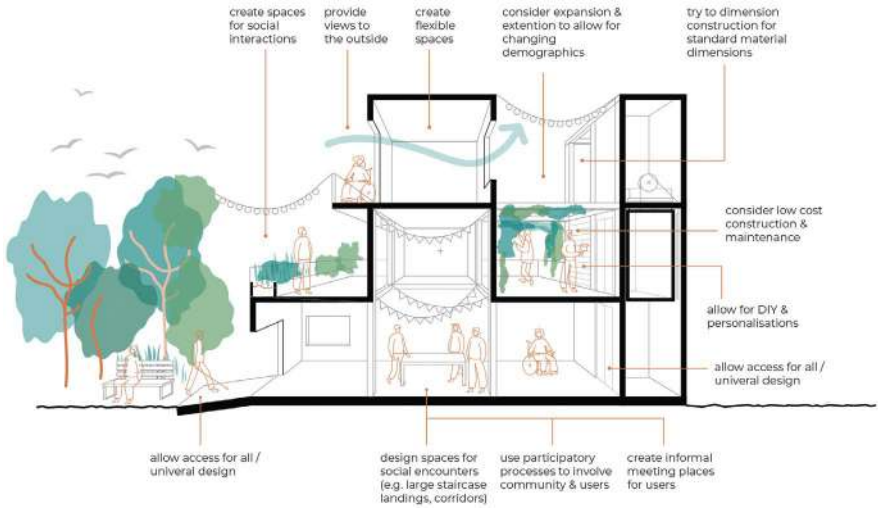

Figure 5.7 Graphical representation of the implementation of inclusive and equitable approach at different levels; adapted from Pelsmakers, Donovan, et al. 2022

Case Studies

In this section, two real case studies are presented to show how different aspects of the four key principles in Figure 5.1 have been implemented together to promote resilience in the living environment and community in general.

Eco-Viikki

Eco-Viiki is considered to be the first ecological housing area in Helsinki, Finland (*Eco-Viikki. Aims, Implementation and Results* n.d.); see location in Figure 5.8. Many aspects of the four resilient principles can be seen in the different housing projects that constitute Eco-Viikki at different levels; see Figure 5.9.

The green infrastructure principle is at the heart of the project through the preservation of the existing natural environment where trees and plants grow in both private and common gardens. This diversity of green spaces supports flora, fauna, and biodiversity, and creates delight through sensory experiences and connecting residents with nature. Inclusive and freely accessible green areas provide space for recreational activities for children and adults, while stabilising the microclimate of the housing area and buffering noise and pollution. Rainwater is also used in the communal yards, and the rest absorbed into the ground. Gardens for planting is one of the main reasons for the 'attractiveness' of Eco-Viikki where residents can farm fruit trees, berries, and other different vegetables for self-consumption; see Figure 5.9.

Passive resilience was considered at the design phase by orienting housing to the south for the best sunlight and energy savings related to solar gains. However, careful consideration was needed to avoid overheating during summer. Thus,

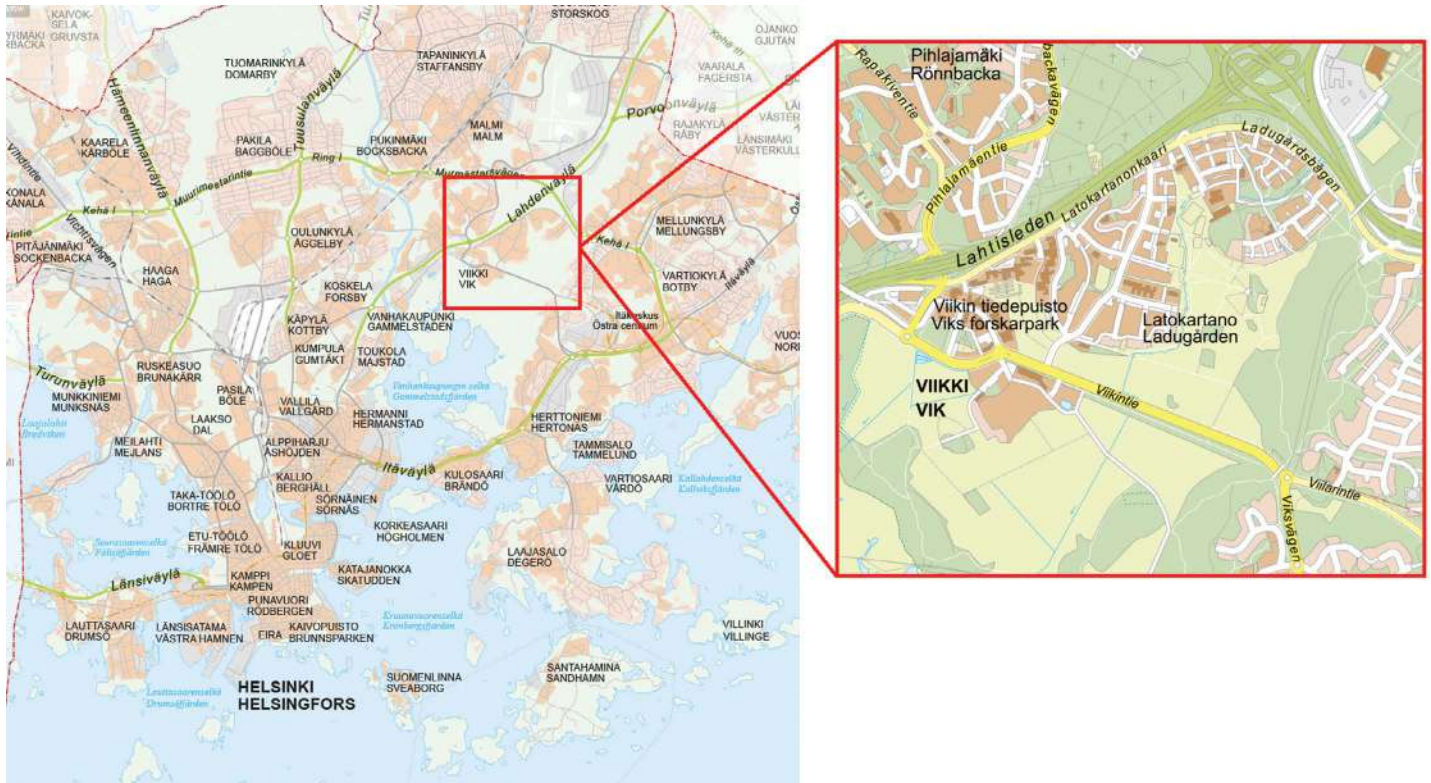

Figure 5.8 Location of Eco-Viiki in Finland, near Helsinki; adapted from https://kartta.hel.fi/

Figure 5.9 Community garden in Eco-Viiki (authors' own)

several passive design strategies for cooling were included, such as awnings, blinds, and external sun blinds blocking solar radiation from entering the dwellings; see Figure 5.10. Furthermore, solar energy is used for domestic hot water and partly heating the bathrooms through a novel district solar heating system, the largest in Finland since 2001.

Residents were involved in the design process since the beginning (inclusive and equitable principle), ensuring that their needs are met as best as possible. Wooden structural frames and facades allow for easier adaptation of spaces to different and changing needs, promoting longevity, stability, and community building; residents do not need to move out of the home if their situation changes.

A strong aspect of this area is that it was a resident-centred design with common spaces for the community, such as club room, wood-heated sauna, community garden, etc., while carefully addressing residents' privacy in the way that common spaces are separated from private spaces through soft boundaries (hedges, vegetation). There are several aspects, however, that could still improve this ecological

Figure 5.10 Example of passive design strategies for cooling (authors' own)

housing area: 1) parking areas could be reduced to create more gardens and common spaces for residents and to reduce local noise and pollution; 2) biodiversity could be enhanced by increasing nature diversity, e.g., a greater variety of trees and bushes; 3) promotion of ecological knowledge amongst residents through community activities could help reduce maintenance costs and promote long-term sustainability of the plots; and 4) some of the existing trees could have been preserved.

Pöllölä

Pöllölä is co-housing built in a renovated old mental health hospital (former Luopioinen mental hospital building) in Pälkäne municipality in Finland; see location in Figure 5.11. This building was promoted by the Pöllökartano co-housing cooperative, a cooperative privately founded in January 2014, that built this new residential community operating according to a new way of living for the people in the village of Luopiois, Pälkäne (Cooperative Pöllökartano n.d.).

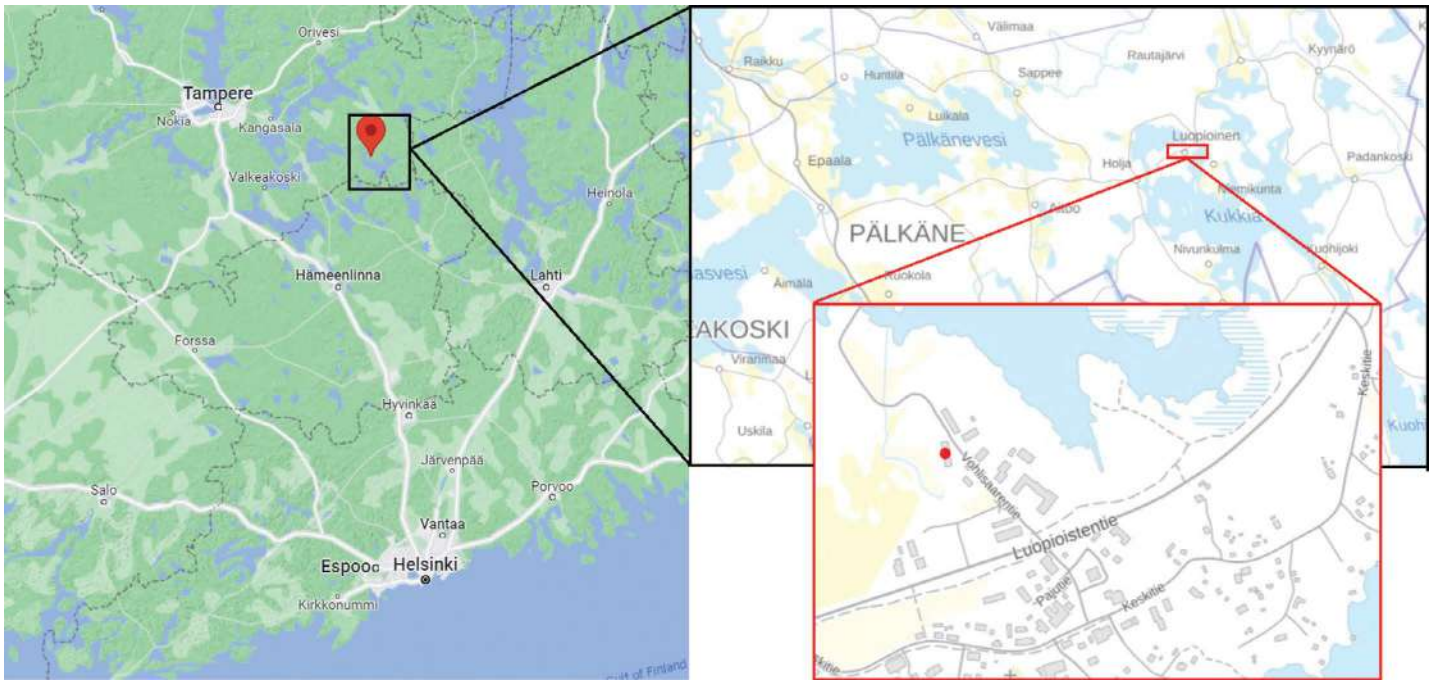

Figure 5.11 Location of Pöllölä in Finland, near Tampere (authors' own)

In the past, Pöllölä experienced many changes in its form, structure, and use to service the community: between 1913 and 1950 it was a mental health hospital for the municipality; in 1951, a thorough repair to give service to more patients from nearby municipalities was undertaken; from 1969, the building changed its use to rental houses for older people; and between 1995 and 2015, the building was empty. It was in 2015 when the cooperative was granted the building permit to start repairing the most relevant building in Luopiois, always respecting its history and traditions. Figure 5.12 shows Pöllölä after renovation works were completed.

An inclusive and equitable approach was used from the beginning of the renovation process. Technical experts and the local community came together to create knowledge exchange, making sure that their needs were included in the renovation process, social and environmental issues related to the historical aspect of the building, and financial limitations of the residents were also considered. This democratic approach started with a discussion about what parts of the existing building could be repurposed, what materials could be harvested and reused, and what other opportunities for sourcing reused material existed. The residential community itself decided what the different common spaces were and how to use them. Windows were renovated by the local community through the organisation of workshops, painting, gardening, and many other tasks were also carried out by its members. They were fully embedded during the whole renovation process, which created a feeling of ownership and empowerment, i.e., a very resident-oriented form of living.

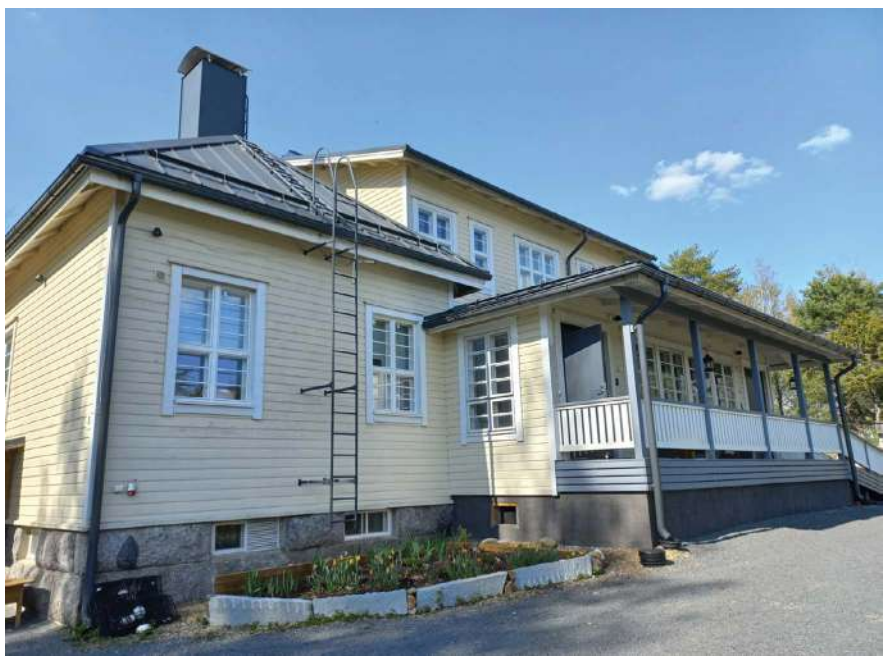

Figure 5.12 Pöllölä building after renovation work completion (authors' own)

Figure 5.13 Common kitchen and living space (authors' own)

The first floor was redesigned to promote social encounters, e.g., access to the kitchen and common living spaces where residents can have dinner together, informal meetings, and simply spend time together – see Figure 5.13. As shown in Figure 5.13, standard materials with low cost and limited maintenance needs were used, allowing residents to use DIY and personalisation depending on their future needs. Spaces are open, with high ceilings, easily accessible, facilitating separation and combination as needed. Window positioning and provision creates access to good natural light, promoting its future adaptability potential. Similarly, there is a good connection to the outdoor environment, views to the sky, and the possibility for natural ventilation.

This configuration promotes social interactions among residents, where problems are discussed, and support and solutions found. This is an invaluable aspect that can also help prevent other indirect problems while creating a good environment and foundation for the smooth running of everyday activities.

In Figure 5.14, we can see a delightful space, with large windows, plants, view to the outside, and different kinds of chairs and benches that encourage getting together and shared experiences and events among the residents, creating joy, contentment, and a healthy atmosphere.

In this co-housing model, residents find good relationships in their everyday life, helping them to meet their needs and reduce feelings of isolation and encourage sharing (e.g., carpooling, joint ordering of groceries, and various kinds of community activities). However, residents can also find privacy in their individual rooms, located on the second floor, which they can adjust according to their needs, e.g., they can install a small kitchen, have a pet, plants, TV, etc. As in the common spaces, furniture, fixtures, and equipment can be reconfigured easily in each room, providing space for different kinds of functions (e.g., rest, eating and work if needed, hygiene care, spend free time, etc.).

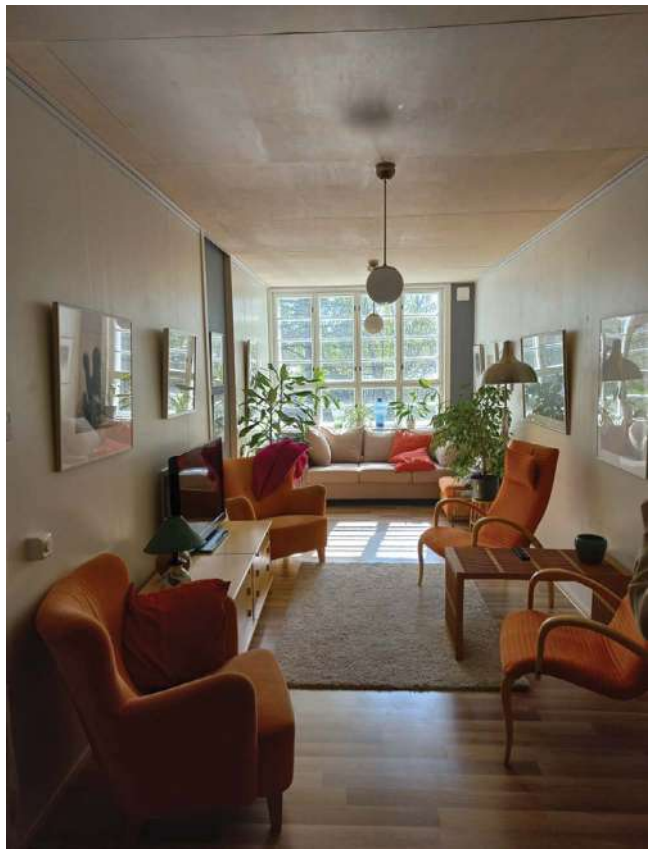

Figure 5.14 Informal common multi-use space (authors' own)

Concluding Remarks

Knowledge on how to promote resilience in the built environment is quite extensive, with a wide variety of frameworks, indexes, principles, and potential solutions available. However, the way this knowledge is presented, e.g., focusing on the technical, legislative, financial, and social barriers, makes it difficult for different stakeholders to understand and implement the main aspects of the key principles to promote resilient housing design and transformation in their day-to-day activities. This chapter synthesised and illustrated existing knowledge about the role housing design and transformation play as part of a resilient society, and how to implement those main aspects of the key resiliency principles: i.e., green, diverse and adaptable, social, and inclusive and equitable infrastructure at different scales of the living environment (i.e., building and neighbourhood level).

In all cases, living environments need to be inclusive, and co-produced with inhabitants, where green, diverse and adaptable and social infrastructure is prioritised

Table 5.1 Practical recommendations on how to build resilience in the built environment based on this chapter's findings

Key Principle	*Practical Recommendation*
Greenery	Plant trees, construct wetlands, recover wastelands, etc. Create edible urban commons and urban lawns (either in the backyard or in front of the house). Collect rainwater for irrigation and flushing toilets, for instance. Consider using green walls and/or roofs. Provide view and physical connection to nature and greenery, e.g., through green courtyard, indoor plants, green balcony, etc.
Diverse & Adaptable	Consider window positioning to promote daylight. Provide view to the outside/sky and natural ventilation. Design and retrofit for disassembly, i.e., it can be dismantled, relocated, and reused.
Social	Create diverse public space and building use. Provide accessible public services, e.g., park, library, public buildings, children's playground, etc. Design and/or transform accessible buildings and community spaces, e.g., to promote interaction. Develop walkable distance to green and community/neighbourhood spaces.
Inclusive & Equitable	Use participatory processes to involve community and users. Allow for DIY and personalisation. Consider expansion and extension to allow for changing demographics.

in order to promote individual and community resilience and wellbeing. Though there is still room for improvement, the two Finnish case studies presented show that it is possible to design resilient living environments, by simply implementing four basic principles as described earlier and as summarised in Figure 5.1. By designing and transforming resilient housing, neighbourhoods, and cities we can support human wellbeing and a healthy planet at the same time. After all, we cannot be healthy and do well on an unhealthy planet, or a planet in crisis. Finally, some practical-oriented recommendations on how to build resilience in the built environment based on this chapter's findings are provided in Table 5.1.

Note

1 Infrastructure refers to essential systems and physical and organisational structures and facilities in rural and urban environments (Feofilovs & Romagnoli 2017).

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6 Responding to Stress and Crisis: The Case of Social Resilience in Comprehensive Planning in Stockholm, Copenhagen and Helsinki

Johanna Lilius

Introduction

> When I try to find a suitable term for the time before the first world war, the time in which I grew up, I hope to be right when I say: it was the golden age of security… Everything had its standard, its definite measure, and its definite weight… No one thought of war, revolution, or upheaval. Everything radical, everything violent seemed to be ruled out in advance in this age of reason.
>
> Stefan Zweig[1]

Stefan Zweig calls the time before the First World War the time of security. In the opening chapter of his book *The World of Yesterday*, published in 1942, he thoroughly explains a time when everyone knows what to expect: "The feeling of security was the most desirable possession for millions of people, the common ideal of life" (Zweig 2011/1942, 18). This state of mind he recalls as something new for the late 19th and early 20th century. Throughout history, people and places have constantly been faced with different kinds of natural catastrophes such as fires, floods, and earthquakes. Today however, we have moved to a new era, where risks, crises, and catastrophes and preparing for them has become all the more important in policymaking, and everyday life. The risks, crises, and catastrophes have also become more complex and now include climate change, terrorism, competition between cities, immigration, and structural changes in work life (see, for example, Vale & Campanella 2005).

Holgersen (2022) goes as far as to say that our current societal form is dependent on recurrent crises. Beck (1992) and Giddens (1990) have argued that we today live in a risk society where there is an increasing emphasis on thinking about the future and risks related to the future. This also poses challenges for the planning profession. Spatial planners and other experts now need to address the future as potentially ungovernable, and thus develop risk management based on prediction, prevention, and protection (Amin 2013). In cities comprehensive planning increasingly is presented as strategic planning, emphasizing that blueprints for today should make many different futures possible. Many cities, including Helsinki and Copenhagen, include visions in the planning process which stretch forward 20–30 years in time.

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Resilience, according to Davoudi (2012), is one remedy for urban planners to deal with the uncertainty and the risk that these new challenges pose. Resilience, according to the United Nations Office for Disaster Risk Reduction (2023), is:

> The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.

This chapter will discuss social resilience and preparedness for resilience within the comprehensive planning context in three Nordic capitals. Resilience in connection to cities can focus on both physical spaces and social communities. Yet, as cities are often organized in ways in which they both produce and reflect underlying socio-economic disparities, some parts of cities remain more resilient than others. To Vale (2014) uneven resilience is a treat to the economic, social, and political functioning of cities. Therefore, he claims that resilience is a useful concept only when it considers the need to improve life prospects of disadvantaged groups. Amin (2013, 140) has argued that "preparedness" and "resilience" are keywords emanating from what he calls a "neoliberal calculus of risk mitigation". To him, welfare democracy can counterposition the need for a culture which is based on providing comprehensive risk avoidance and protection of the neoliberal way of viewing the future as unpredictable and dangerous. Since Stockholm, Copenhagen, and Helsinki are capitals of countries that are part of the Nordic welfare regime (Esping-Andersen 1991), they are particularly interesting to explore in terms of social resilience.

Resilience and Urban Planning

According to Ameel (2016) resilience became part of urban policy in the 2000s, as international finance institutions adopted it as part of their activity. The concept of resilience is today part of almost all strategic planning, from social sciences to economy and urban planning.

Vale (2014, 191) argues that resilience is simultaneously both a concept and a practice. It is both a theory about how "systems can behave across scales, practice or proactive approach to planning systems that applies across social spaces", as well as an "analytical tool that enables researchers to examine how and why some systems are able to respond to disruption". Likewise, to Davoudi (2012), there are multiple meanings of the concept of resilience, which are rooted in different world views and scientific traditions. Resilience has been used in the field of ecology since the 1960s. Within this field, a distinction exists between engineering resilience, the ability of a system to return to an equilibrium or steady state after disturbance, and ecological resilience, which describes the magnitude of a disturbance that a system is able to endure before changing its structure. In engineering resilience is measured by the speed by which the system can return to equilibrium, in ecological resilience

emphasis is put on adaptability, and that several equilibria can exist. According to Davoudi (2012) both views underpin a belief in in the existence of equilibrium in systems, from which the system can "boune back (engineering)" or "bounce forth (ecological)". One of the problems that have been posed related to these understandings is that while the emphasis is on the return to "normal", there is no questioning of what normality entails (Davoudi 2012).

Davoudi offers a third understanding of resilience: evolutionary resilience, or socio-ecological resilience. She notes that socio-ecological resilience systems can change over time with or without external disturbance. Evolutionary resilience considers that social systems and natural systems are mutually dependent and operate on multiple scales and timeframes. The aim to reach equilibrium is rejected, putting the focus instead on the interplay of persistence, adaptability, and transformability. Thus, it also makes it possible to research the interaction between humans and the environment in new ways (Ameel 2016).

Taipale (2016, 230) points out that in urban policies, resilience is often used to support sustainable development. However, the social dimension of sustainability is not part of the scrutiny. To her, understanding resilience, like sustainability, is used due to its supposed objectivity, neutrality, and apoliticalness. Resilience doesn't highlight social-, human-, or societal-related threats, rather they are left in the shadow of economic risks (Taipale 2016, 233). Similar criticism has been posed of the concept of sustainability. It has been considered vague and inapplicable, and often neglecting the social pillar in favour of economic and environmental issues (Dillard et al. 2009). Urban planning not only has an effect on the physical environment, but what is planned and developed also influences our social relations, not least as urban planning also influences for whom the built environment is planned. Like sustainability, resilience could potentially also promote unexpected social consequences in terms of unequal distribution of social, economic, and environmental resources among citizens, such as recognized by Isenhour et al. (2015) for example. In the social world, resilience has as much to do with shaping the challenges we face as responding to them (Davoudi 2012, 306).

Data and Methods

Using the following planning documents as data: a) the *Comprehensive Plan for Stockholm* (2018), b) the *Helsinki Urban Plan* (Yleiskaava selostus 2016), and c) the *Copenhagen Municipal Plan – City with Responsibility* (2019) the paper asks:

1 Which words are in use for resilience, and what do they mean?
2 Why is resilience needed?
3 Are there stated, desirable resilient outcomes, and who benefits and is excluded by them?

Comprehensive planning, in Finland called general planning and in Denmark municipal planning (Table 6.1), usually consists of making a blueprint that guides the planning on a detailed level. The plans are typically drawn for a period of around

Table 6.1 The plans at a glance

Timespan	*Copenhagen*	*Stockholm*	*Helsinki*
	12 years	*Until 2040*	*Until 2050 (vision)*
Legally binding?	Blueprint guides the planning	Guides planning	Binding, but strategic in its character: It strongly shows the priorities of the city's development, but precise areal boundaries are not presented
Participation (residents)	Social media and pop-up events	Internet, hearings	Survey, planning meetings
Overall vision	1 Global city with responsibility 2 A green, healthy, and sustainable city 3 A cultural metropolis with an edge 4 An international urban region	1 A growing city 2 A cohesive city 3 Good public environments 4 Climate smart and resilient city	1 Helsinki is an urban metropolis pulsating with life 2 Helsinki – a city of appealing living options 3 Helsinki – city of economic growth and jobs 4 City of sustainable mobility 5 Recreation, urban nature, and cultural environment 6 Helsinki's seaside areas 7 International Helsinki and 8 Helsinki as part of the region
Risks	At-risk housing areas (socially)	Unpredictable events, environmental risks related to air quality, noise, floods	Floods, risk related to industrial activities
Climate adaption?	Adaption of buildings, public spaces, green spaces, biodiversity to the climate of the future The climate plan KBH 2025: At least 75% of traffic should be by bike, foot or public transport by 2025 Climate-friendly food support The climate adjustment is integrated in the city's development and conversion so that damages are prevented efficiently and derived possibilities for innovation, green growth, recreation, etc., are exploited	Green infrastructure, effective land use, flexibility to enable future technical solutions	More people, better public transportation, less CO2 emission

ten years. Lately, they have become more strategic in their character, visioning futures far beyond this period. The can be but are not always legally binding. The blueprint normally has a narration attached. This chapter analyses those narrations.

The chapter is loosely guided by discourse analysis. Discourse analysis builds on the notion that reality is constantly constructed in discourses. A discourse is a specific way of talking about and understanding the world. Language is thus an act, and a discourse is any meaningful part of, for example, a discussion or a written text (van Dijk 2012). To Plöger (2001, 64), urban planning is a discursive practice that produces a sense of place, place-identity, image, and common cultural schemes.

The Many Meanings of Resilience in the Nordic Context

Resilience as a term may be used in different ways in different languages. In Finnish, for example, terms such as "adaptability" (*sopeutumiskyky*), "elasticity" (*elastisuus*), "adaptability/flexibility" (*muutosjoustavuus*), "*anticipation*" (ennakointi), and "immunity" (*vastustuskyky*) are in use. The four first have a more positive connotation as a starting point for resilience than the last (Taipale 2016, 232). The *Helsinki Urban Plan* does not mention any of these terms. The comprehensive plan for Stockholm (1998) talks about a "resilient" (*resilient*), "resilient/tough" (*motståndskraftig*), and "enduring" (*tålig*) city. In the *Copenhagen Municipal Plan* resilience as such is not mentioned, but climate adaptability is (though not explained).

Although resilience as a term isn't mentioned in the *Copenhagen Municipal Plan*, in Copenhagen, as the chapter will soon show, a more comprehensive approach to resilience seems to be prevalent. The city of Copenhagen, according to a Resilient Cities report[2] (2018), is already resilient. This has been "materialized through a comprehensive urban development strategy", which has aimed to make Copenhagen "liveable". Liveable in this context aligns "with what is generally meant by resilience": Communities have the inner strength to resist future stresses or shock (Resilient Cities 2018, 30). This is considered the core of resilience. In other words, there is more emphasis on the social world than the physical. The *Comprehensive Plan for Stockholm*, on the other hand, is the only plan that mentions the term resilience. However, the plan connects resilient capacities above all to the physical environment. One of the five goals in comprehensive planning in Stockholm is to be a "climate smart and resilient city". Being resilient, according to the plan's glossary, means that a city is resilient and durable "so that it can withstand various types of changes and stresses without buildings, transport systems or other important social functions being knocked out" (Comprehensive Plan for Stockholm 2018, 166). The *Comprehensive Plan for Stockholm* (2018, 6) further emphasizes that "the city structure and the technical systems must be well-functioning and durable so that the city can face climate change and other stresses". In Helsinki resilience is connected to the urban economy and climate change. By developing the city so it can "ensure strong business areas, secure a sufficient supply of housing that keeps housing prices and labour costs reasonable, and ensure good functioning of the labor market through accessibility", and the "urban

productivity" can be kept high. Central to this is "Climate change and the ability of cities to adapt to it, as well as energy issues." The technical infrastructure must secure the supply to communities (Yleiskaava selostus 2016, 7).

As mentioned, in resilience thinking, social-, human-, or societal-related threats are often left in the shadow of economic risks (Taipale 2016, 233). Therefore, it is interesting to see that the need for resilience, according to the comprehensive plans, also stems from social risks and challenges. For example, the *Comprehensive Plan for Stockholm* mentions that changes and stresses occur since our time is "characterized by 'global climate change'", but also by "urbanization, strong population growth, increased social tensions, a changed world situation and economic differences" (Comprehensive Plan for Stockholm 2018, 26). In Copenhagen it is recognized that "the development in at-risk urban areas should be strengthened in order for Copenhagen to remain a diverse city with a high degree of cohesion" (Copenhagen Municipal Plan 2019, 17). There is in other words a social risk (the people in at-risk areas), which needs to be addressed.

Understanding the Challenges to Prepare For

To a great extent, the approach of the city plans is that social issues can be solved with physical solutions. The solutions to increase social cohesion, for example is often done through physical remedies. The *Helsinki Urban Plan* states that densification is important because it has an impact on "how an area is develops and whether its population structure, housing stock or service offering is diversifying". And it further states that "Strengthening the identity of parts of the city and emphasizing their characteristics are also important for preventing segregation" (Yleiskaava selostus 2016, 71). In Stockholm, social issues in the plan are also addressed with physical remedies. It is thought that by improving connections between different neighbourhoods, in other words connecting different neighbourhoods physically, people from different neighbourhoods and with different backgrounds can meet in their everyday life in public spaces. The idea is that these meetings create a sense of community and understanding and counteracts exclusion in society (Comprehensive Plan for Stockholm 2018). In Copenhagen too, "Good infrastructural connections across the city support social cohesion, security and integration between the various neighbourhoods so that one or more neighbourhoods are not isolated" (Copenhagen Municipal Plan 2019, 18). Copenhagen further has a neighbourhood programme for resilience that concentrates more on the physical environment. According to a Resilient Cities report (2018, 32): "Copenhagen has managed to build and maintain a social fabric" that is "so fundamental to resilient societies". That is one that goes beyond "affordable housing, clean air, jobs and transportation infrastructure": namely high-quality public spaces.

Densification is considered important in all three cities. How can densification then serve social cohesion? The densification presented in the general plans aims to prevent the segregation of residential areas and to develop neighbourhoods as independently functioning small towns within the city. This is because "In big cities, there is an atmosphere that emphasizes solidarity and increases innovation"

(Yleiskaava selostus 2016,126). It is considered that a denser and larger city will emphasize an atmosphere of solidarity, which will increase innovation and through that – in line with thoughts from Richard Florida (2006) – also attract the creative classes and fuel the economy. In all three cities an important way to address social issues is having a diversity of tenures, housing types, and different groups of residents. In Copenhagen it is recognized though that not everyone can afford to live in the city. To avoid the city from becoming unaffordable, the city builds at least 25 per cent social or affordable housing in new areas. However, while social housing is being developed in new areas, it is being demolished in the at-risk areas. This has been criticized by UN human rights experts as it puts "residents at a high risk of forced eviction in violation of their right to an adequate housing" (OHCHR 2020). Critical scholars have also emphasized that the inner areas have been gentrified deliberately by the city and the state, and thus it is impossible for low-income and even middle-income people to enter the housing market for example in the inner areas (Gutzon Larsen & Lund Hansen 2012). New social housing, however, is not developed in these areas. In Helsinki out of the new housing 25 per cent is allocated as social housing, or affordable housing. However, this housing is becoming increasingly unaffordable: Some of the new social housing is already rented out almost at market rent, something that the main newspaper in Finland also recently paid attention to (Palkoaho 2023). To provide affordable housing is also an aim in Stockholm in order to "make it easier for various groups to enter the housing market". To provide affordable housing, however, is identified as a difficult task and is addressed, for example, through a special kind of housing type, the Stockholm houses. These buildings are designed with good quality in a uniform and standardized way to reduce construction costs and shorten planning and production times (Comprehensive Plan for Stockholm 2018, 48).

The *Copenhagen Municipal Plan* is a description of the overall vision for the urban development. The plan is called *World City with Responsibility*. Social responsibility in this context means, for example, making room for current residents, new residents, and those visiting the city. One way to realize this is to allow the building of smaller units. "With the new regulations it will in principle be possible to build twice as many smaller homes than before" (Copenhagen Municipal Plan 2019, 16). Whereas less dwelling space is seen as an opportunity in Copenhagen, it is seen as a risk in Helsinki and Stockholm: the approach is in other words very different. In Helsinki not building enough housing is considered to increase housing prices, and consequently, as people cannot afford enough space, also decreasing dwelling space (Yleiskaava selostus 2016, 101). In Stockholm, housing affordability is not mentioned, but cramped living is considered a "serious problem" (Comprehensive Plan for Stockholm 2018, 45). Cramped living is a problem particularly in what in Sweden is called at-risk areas, where many low-income, low-educated residents with immigrant backgrounds live. According to the public health agency of Sweden, residents living in crammed housing were hit worst by the Covid-19 crisis (Folkhälsomyndigheten 2021). Quite contrary to Stockholm, in Copenhagen providing small affordable housing to most at-risk inhabitants is one of the key focuses of the city when developing at-risk areas (Copenhagen Municipal Plan 2019, 18).

Social equality in terms of health is also to some extent addressed. For example, in Copenhagen, it is recognized that health is closely connected to residents' educational background, income, and their place of residence. The remedy is called health-promoting city planning which is directed to areas most in need, and includes interventions such as noise-reducing asphalt, urban spaces with designs that promote increased physical activity, and recreational areas that promote mental health (Copenhagen Municipal Plan 2019, 28).

Conclusions

This chapter set out to understand resilience in comprehensive planning in three Nordic capitals. As a concept, resilience is not particularly actively used in the comprehensive plans, but when used, it focuses on both physical spaces and social communities. Preparedness for different kinds of threats, risks, crises, and catastrophes are part of the plans. They include both physical risks, such as floods, as well as risks related to social resilience, the focus of this chapter. Such recognized risks are, for example, increased social tensions and economic differences. The remedies identified in the plans to increase social cohesion are spatial. They include the aim to densify the cities and to build public spaces where people with different backgrounds can meet.

Taipale (2016, 233) has argued, that resilience often concentrates on the consequences, instead of the reasons. This also seems true for the plans. It is well known that spatial segregation is led by those who can make the choice of where to live (Kovacs 2020, 124), yet in order to create socially resilient cities, the remedies concentrate on those who cannot, often for financial reasons, make that choice. In line with Porter and Davoudi (2012, 331), "Crises are never inevitable: they are produced and could always be otherwise." They argue that, for example, gross wealth disparities and over-inflated housing markets have been normalized, meaning that we accept wealth disparities and over-inflated housing markets as something normal instead of questioning how they happened and if they could have been avoided. As today we have moved from a general feeling of security, described by Zweig (2011, 18) more than one hundred years ago, into a risk society (Beck 1992; Giddens 1990) in which a "neoliberal calculus of risk mitigation" (Amin 2011: 140) has become a norm, more emphasis could be put on how crises are identified, defined, and constituted, also in planning. After all, power lies as much in these as in the responding to it (Heslop & Ormerod 2020). Depoliticization of spatial inequality, for example, can at best result in seeking for spatial solutions instead of questioning the structural problems that cause them. Merely bouncing back is not enough, since it doesn't allow for renewal, and may be prone to further breakdown and inequality.

The structural reasons for inequality (in other words questions related to the knowledge on which crises and threats are built) are particularly important to address, since once inequality, for example, has been inscribed in the built environment, it is difficult to erase, and therefore also has lasting impacts. Vale (2014, 195) argues that for resilient theory to be a viable guide for resilient practice an ethnical

imperative is needed. Urban investments in resilience practice, for example, should be directed at those who have suffered most. In comprehensive planning in the Nordic capitals, resilience seems to be used in ways in which it resembles the concept of sustainability. Vale (2014,195) considers resilience to be a more useful concept than sustainability, as sustainability suggests that it is enough to sustain a system, while resilience challenges the inadequacy of a system. In this respect, there is also much potential in the concept of resilience for urban planning.

Practical Recommendations

- Think more than spatially about social resilience and let the concept of social resilience challenge the inadequacy of a system. In what kind of political economy did the crisis occur? Don't depoliticize crisis, ask for whom resilience needs to be built and why?
- Concentrate on the reasons just as much as on the consequences when building social resilience. Spatial segregation is led by those who can make the choice of where to live, is it enough if the solutions concentrate on those who cannot?

Notes

1 Zweig (2011/1942: 17–18)
2 The report has a chapter "Copenhagen: resilience and liveability" written by the city of Copenhagen and the Veolia Institute.

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7 Responding to Disruption in Built Environments: Lessons from Circular Thinking

Riikka Kyrö and Rebecka Lundgren

Introduction

The societal changes linked to the built environment are multiple and varied. Globalisation, urbanisation, digitalisation, and environmental crises were recently joined by a global pandemic. These changes and their effects, including gentrification, shrinking cities, and workplace transition, to name but a few, cause functional and locational obsolescence of built environments. Simultaneously, construction activities are a major cause of environmental concern, as about one third of global energy use, one third of global greenhouse gas emissions, and a staggering half of all waste globally stems from the construction industry. To minimise the environmental impact, utilising existing buildings effectively through, e.g., adapting buildings to new uses, should always take priority over demolishing and building anew. Besides saving embodied emissions and resources, building adaptation also maintains cultural heritage and entails positive impacts for the local community (Kyrö & Lundgren 2022; Lundgren 2023).

Adaptability, including the flexibility and multifunctionality of the building stock, is typically listed as one of the key attributes for resilience in the built environment (Arup 2014; Castaño-Rosa et al. 2022). Resilience has traditionally been seen as a system's adaptive capacity (Holling 1973). Heinonen et al. (2023) describe resilience as a capacity to overcome, survive, or in some cases even benefit from crises. Another crucial component is the capacity to renew through processes and activities based on emerging circumstances. Resilience is thus both about enduring and adapting. This creates a contradiction which is apparent in the building context. Buildings are known to withstand for centuries through different times, uses, and societal changes. In that sense, a building can be considered very resilient. Yet, despite the building adaptability ideal gaining foothold since at least the 1990s with Stuart Brand (1994), buildings remain rigid structures which are difficult, time-consuming, and expensive to modify. Bluntly put, buildings are poorly equipped to deal with the future, and with emerging phenomena.

To add to the challenge, the building and construction industry may be considered rather conservative and, despite the long lifecycle of buildings, is not known to be future oriented. This could be due to the project-based nature of the industry, traditionally low R&D investments, extensive regulation, or the lack of diversity

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in the field. Nonetheless, Toivonen et al. (2021) study the importance of futures capabilities for built environment practitioners and note that students do have a willingness to improve their futures literacy, first through awareness of potential future phenomena, second through participating in creative processes to imagine different futures, and finally as the ability and willingness to act.

This chapter introduces circular thinking as a source of solutions to crises and the resulting disruption in the built environment. Circular economy research and practice have been focusing on design-for-disassembly, recycling, or even remining materials as circular ways to add value. Abundant research and initiatives focus on the recycling of building material and components for new uses (Pomponi & Moncaster 2017; Malabi Eberhardt et al., 2022). Interestingly, recycling is the least effective of all circular measures (Morseletto 2020; Ranta et al. 2018). Retaining value that has already been created would be a more effective circular strategy (Reike et al. 2018). In the built environment context, retaining value tied to the existing building stock not only conserves cultural heritage, but also significantly reduces the environmental impact (Baker et al. 2021; Huuhka & Vestergaard 2020). In practice, this means finding solutions to functional or locational obsolescence in the face of changing circumstances.

We hope to provide a novel outlook on circularity in the built environment, including different ways to respond to disruption caused by different contemporary crises. To this end, we will employ business model concepts. Business models are typically organised based on different components, including value proposition (the problem, or need), the value creation and delivery (the solution), and the value capture (the gain). Traditionally, the value capture has comprised the cost structure and revenue streams, i.e., traditional economic indicators (Osterwalder et al. 2005). However, sustainable business models should not only deliver economic value, but also value to the environment and society (Boons & Lüdeke-Freund 2013; Bocken et al. 2014). More specifically, circular business models should aim to loop or retain the value that has been already created in the system for as long as possible (Achterberger et al. 2016; Geissdoerfer et al. 2020). This thinking is well aligned with the ideas of planetary boundaries (Steffen at al. 2015), combined with the doughnut economy model (Raworth 2017), detailing how societal needs should be met through, e.g., economic growth and employment, but within planetary boundaries.

We will include four case examples for circular responses to crises in the built environment. The first case is a Swedish space sharing platform, Vakansa, responding to the COVID-19-accelerated workplace transition, which has been a major disruption to the traditional office market sector. The second case is a circular business incubator and testbed, De Ceuvel, in a former shipyard in Amsterdam Noord. The case emerged after the decommissioning of harbour operations, which in turn derives from urbanisation, and the global phenomenon of developing waterfront properties in cities. The third case stems from globalisation and post-industrialism in the Global North, and the major disruption caused to a small town by the decommissioning of factory operations – Ifö Center in Southern Sweden is an arts centre located in a former ceramics factory. Finally, the case of Luossavaara-Kiirunavaara AB from the Swedish Arctic is centred

around the disruption of mining operations causing the old town centre to sink. The response is to relocate some of the existing building stock to a new location. All case descriptions are based on a variety of data sources. The first case is based on secondary sources and an online interview, the two following cases are based on secondary sources, site tours, and in-person interviews, and the final case description is based on secondary sources only.

Through the business model lens, each of our cases is first presented through a value proposition stating the need, in other words, the disruption that is the consequence of a crisis. Next, the value creation and delivery, i.e., the circular solution, is presented through a detailed description of the key characteristics of each circular response. Finally, the value capture, namely the potential or intended environmental, social, and economic gain is discussed for each case. The book chapter concludes with some lessons learned and final remarks.

Case Vakansa

The Disruption: Workplace Transition

The COVID-19 pandemic accelerated the already ongoing green and digital transition, perhaps most notably in the way people work and do business. This has caused a major disruption in the commercial real estate market, as the need for office space has reduced. In the European Union up to 37% of workers started to work remotely during the pandemic (Eurofound 2020), and many have decided to continue post-pandemic. Organisations are re-evaluating their space needs based on employees' preferences, undoubtedly also incentivised by the lower costs of downsizing. As a result, office space is less attractive as an investment, and the percentage of vacant office space is increasing. Meanwhile, the need for workspace outside private homes remains. Based on a Swedish study (Markgren & Åstedt 2022), real estate owners and investors expect there to still be a need for office space in Stockholm CBD, albeit perhaps in a different form (see Figure 7.1). The needs will likely shift towards new types of workspace, such as co-working even for traditional office users (Markgren & Åstedt 2022).

The Circular Response: Shared and Multifunctional Spaces

As a response to the workplace transition, the company Vakansa offers a platform for sharing spaces to redistribute and use space optimally (see Figure 7.2). According to the founder, Vakansa was created with the simple conviction that there are already enough buildings and spaces for all actors in society. The platform enables organisations to list spaces that could be utilised by other organisations. The spaces can be made available to others either simultaneously within the same space, simultaneously side by side, or during different times. The platform will match potential space users with the most suitable available space. The intent is for the sharing not to be a one-off, but instead a longer standing agreement. The company also provides lease agreements, insurance cover, and other services which remove

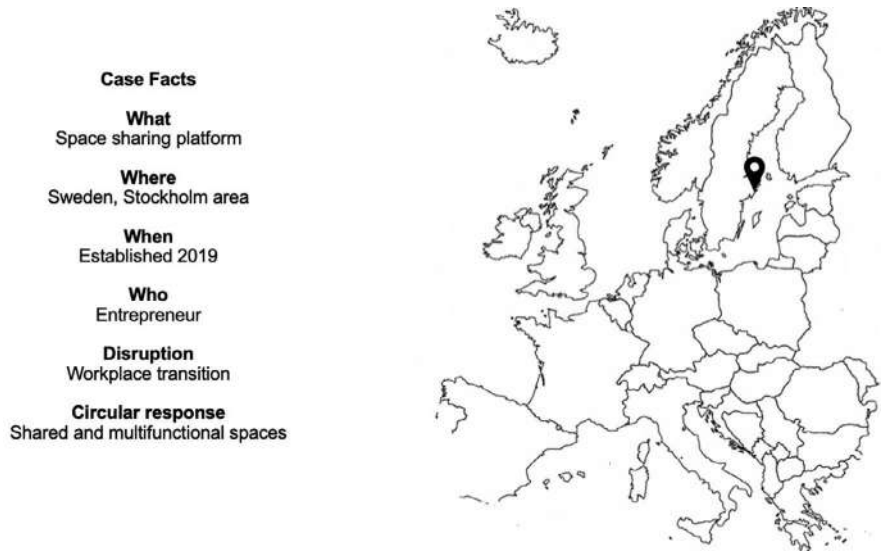

Figure 7.1 Vakansa. Map by unknown author is licensed under CC BY-SA-NC

the barriers for sharing spaces. "We see how many buildings and spaces are empty, or partly empty, in our cities. At the same time many looking for a space cannot access the market due to high costs and complex regulations" (Vakansa founder, interview). The platform makes space sharing easier, both in matching spaces with potential users and throughout the process by removing barriers relating to feelings of space sharing being too difficult, risky, or troublesome (see Figure 7.3).

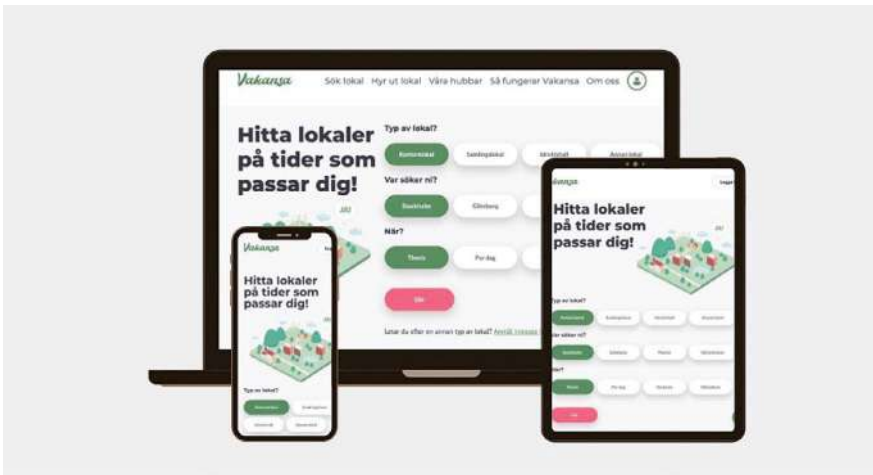

Figure 7.2 The application allows for easy sharing between space providers and end users. (Illustration by Vakansa)

Figure 7.3 Spaces shared through the platform are often co-working spaces. (Photograph by Vakansa)

The Potential Gain: Reduced Space, Collaboration, and Cost Savings

Environmental. Vakansa's vision is to contribute to sustainable development where people's space needs are met, without having to construct new buildings: "Because we know one thing; the most sustainable building is the one never built and that buildings today are wholly or partly empty everywhere!" (Vakansa founder, interview). Considering the large impact of embodied carbon and the emissions from the material and construction of the building, reducing the amount of space will have a significant impact on environmental sustainability. It is worth noting that, at first, the environmental impact per building may even increase due to increased capacity and energy consumption (Lundgren et al. 2023). However, as less space will be needed, the future environmental impact of office spaces overall will be less.

Social. A significant social impact is connected to shared spaces, both for end users and for the local community (Kyrö and Lundgren 2022). When the sharing is simultaneous, en users experience collaboration and community (Brinkø et al 2015; Lundgren et al. 2022). Typically, in access-based consumption, end users experience that they are contributing to environmental sustainability (Bardhi & Eckhardt 2012), which in turn has a positive impact on their sense of pride. Additionally, all forms of sharing contribute to more activities in the local community which may contribute to economic development, a feeling of safety, as well as inclusion and diversity; "All buildings and spaces should be able to be used by a diverse set of activities which invites a diverse set of individuals" (Vakansa founder, interview).

Economic. The platform has two pricing models. The basic model allows listing of space and matching the space with potential users, and the advanced model provides additional assistance with regulations, booking systems, insurance, access, and lease agreements. Non-profit organisations being allowed to use the platform at no or low cost may contribute to the community and have positive social impact. Both for profit and non-profit organisations utilising space will also contribute to more movement and financial activity in the neighbourhood where they use the space. From the end user perspective, considering that space often is a large expense post for an organisation, savings can be significant; "A study found that office spaces are used only 10% of the time. This means that tenants today pay 100% of the rent for space which is empty 90% of the time" (Vakansa founder). Meanwhile, the platform also enables organisations that otherwise would be unable to lease space due to administrative costs, to do so.

Case De Ceuvel

The Disruption: Decommissioning of Harbour Operations

Waterfront locations are extremely attractive for housing and commercial activities. Consequently, urbanisation is putting pressure on decommissioning of harbour activities from waterfront locations in many growing cities (see Figure 7.4). However, the harbour activities have often caused severe soil contamination. Extensive and expensive remediation activities are typically required for the locations to be suitable for non-industrial use. As a result, the decommissioning often leaves these locations vacant in a temporary, in-between stage.

Case Facts

What
Business incubator

Where
Amsterdam Noord, the Netherlands

When
2012-2022

Who
Tenant association

Disruption
Decommissioned harbour

Circular response
Temporary creative reuse

Figure 7.4 De Cauvel. Map by unknown author licensed under CC BY-SA-NC

Figure 7.5 A restaurant in the area is open to the public and is a central meeting place. (Photograph by the authors)

The Circular Response: Temporary Creative Reuse

De Ceuvel is a circular initiative in Amsterdam Noord, a former shipyard at Amsterdam's waterfront. On one hand it is a business incubator for the creative industries. On the other it is a test area for soil remediation through so called phytoremediation, and other sustainaiblity solutions. The area was leased from the City of Amsterdam with the prerequisite that it is used as a circular testbed and business incubator. The lease period was 2012–2022. The site is home to 16 houseboats, where the tenants include different types of creative professionals, with about 60 tenants onsite. Site services comprise a popular restaurant, a hostel, a sauna, spaces which are open for everyone to visit (see Figure 7.5). Although the first lease period ended in 2022, there are plans to maintain the operation in some form.

The Potential Gain: Soil Remediation, Community, and Rental Income

Environmental. Environmental sustainability is at the core of the operations, as the aims are both to promote novel environmental solutions through supporting small businesses engaged in the field of sustainability, as well as test different sustainable solutions and technologies. The main activity, phytoremediation, is mostly maintained by volunteer work, which may be considered a risk. Other sustainable technologies onsite, such as irrigation and fertilisation systems, have been developed and built onsite. The resident businesses all contribute with their own actions, e.g., by using dry toilets, and saving fresh water. Even the site landscaping reflects the environmental ideology with the lush and green aesthetics.

Social. The site tenants have formed a strong community. The community feel is enforced through collective efforts to maintain and develop the site, as well as

Figure 7.6 Circular thinking is present in the area in many ways, including the recycling of grey water for irrigation. (Photograph by the authors)

a common set of values: environmental sustainability, social inclusiveness, and creativity. The tight-knit community may be considered exclusive, as becoming a tenant in practice requires knowing someone who is already a member. However, cultural events open to the public are organised regularly, and the attempt is to involve the nearby residents in the site activities and promote the community values. For the neighbourhood, this type of creative use as an alternative to a vacant former shipyard increases safety and activity in the area (see Figure 7.6).

Economic. The site maintenance and management, including lease agreements, are organised through a board of tenants. Board members are volunteers who are elected for the position. The municipality of Amsterdam is a key stakeholder, both as the owner but also supporting the site with external funding. The board of tenants is responsible for stakeholder management. In addition to the public subsidy, a loan from the local bank was crucial when developing the site and infrastructure. In the operating phase, the rental income from the small businesses occupying the houseboats, and their sub-tenants, is a major income source.

Case Ifö Center

The Disruption: Decommissioning of Factory Operations

For decades, globalisation has meant relocating operations from the Global North to the countries of the Global South. Impacts of the decommissioning to the local community and the built environment are often drastic. Post-industrial cities are typically also shrinking cities, where housing prices plummet. The existing building stock may be left vacant and dilapidated (see Figure 7.7). These cities and small towns have a dire need to reinvent themselves, a process often referred to as regeneration

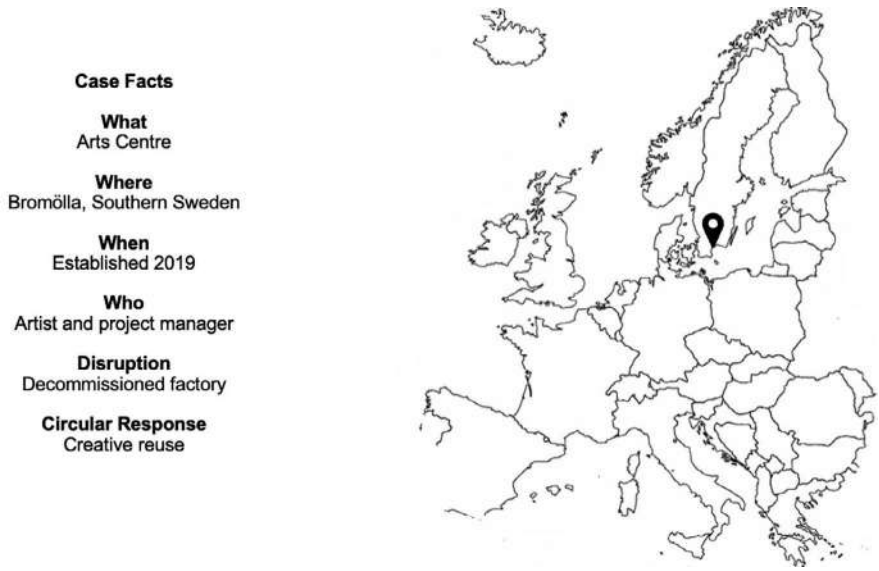

Figure 7.7 Ifö Center. Map by unknown author licensed under CC BY-SA-NC

or revitalisation. Regeneration may occur top-down, led by, e.g., regional or municipal actors, but may also happen through bottom-up grassroot initiatives.

The Circular Response: Creative Reuse

In the small town of Bromölla, southern Sweden, an Arts Centre is operating in a former ceramics factory, which was decommissioned in 2019. Creative reuse of former industrial sites and buildings is a global phenomenon and may contribute to regeneration. In Bromölla, the response was to reclaim the former industrial facility and repurpose it for artistic creative use. The Arts Centre now hosts an exhibition hall, outdoor gallery, workshops, studios for artists, and office space. The spacious surroundings and large windows are well-suited for artistic creation, and even circus artists have made use of the generous floor height. Workshops are held with the local public and schools for example. The site has become a popular tourist attraction, visited both locally, regionally, nationally, and internationally.

The Potential Gain: Saved Embodied Emissions and Resources, Empowerment, and Tourism

Environmental. Making use of the material and embodied energy and carbon in the enormous former factory building creates significant positive environmental impact. Adaptive reuse is an effective way to retain value in the built environment (Foster 2020). Moreover, the less intervention to a building is required, the better

Figure 7.8 Daylight from the old factory windows is well-suited for artistic work. (Photograph by the authors)

(Jerome et al. 2021). In this case, as little as possible has been done to the building. Although mainly for economic reasons, this has positive environmental implications. Additionally, the interior and fittings are mostly reused or recycled.

Social. Key social benefits are the possibilities for job training and volunteering opportunities for migrants, young people, and others with trouble entering the job market. This will hopefully lead to more diversity and social equity in the local community. Maintaining the cultural, or in this case industrial, heritage of the building has enforced the place-based identity of the local people. Naturally, many local residents would have preferred to see the factory operations continue, rather than an Arts Centre. Yet, the new cultural identity has created a sense of pride within the local population, not the least through the very visible street art. Even outside the local population the site offers arts and culture events such as workshops, and exhibitions (see Figure 7.8).

Economic. The facility was acquired with the help of a crowdfunding campaign, which convinced the local bank to give a loan to the arts association. The future of the site is uncertain as the operation relies on private donations and public funding, as well as volunteers and trainees. Some funding is collected through visitors' entrance fees. However, the ownership is organised as a limited liability company with a profit limitation, so economic profit is not even an aim for the operation. While challenging to the operation, the lack of funds contributes to both environmental and social impact, as most everything is reused or recycled, and the renovation requires working collectively with the do-it-yourself attitude. As the site attracts both visitors and artists-in-residence, it should have a positive impact on the local shrinking town in the fields of tourism abd hospitality and even longer-term economic activity (see Figure 7.9).

Figure 7.9 The outdoor gallery exhibits street art which has transformed the townscape and created a sense of pride among residents. (Photograph by the authors)

Case Luossavaara-Kiirunavaara AB

The Disruption: Sinking Caused by Mining Operations

Well above the Arctic circle, in the northern Swedish town of Kiruna, mining operations are causing a need to relocate the existing town centre. The case links to a larger phenomenon where mining and industrial operations in the Arctic are causing local disruption (see Figure 7.10). Although there have been people residing and practicing traditional livelihoods in the area for several hundreds of years, the current town with its Swedish settlers started to develop when the ore mining operations commenced in 1890. The state-owned mining company Luossavaara-Kiirunavaara AB (hereinafter LKAB) is responsible for developing not only the mining operations in the area, but also major parts of the town, including public buildings and housing for the miners. In the early days, the location of the town was carefully considered so that the mining operations would take place far enough away from the town. However, continuously expanding the operations increases the risk of the town centre sinking. As the mining operations continue to expand, the underground activities are affecting the surface. The existing town centre with its buildings will eventually sink. This concerns approximately 6,000 inhabitants, corresponding to ca 3,000 housing units, along with an additional 450,000 square meters of public and commercial facilities.

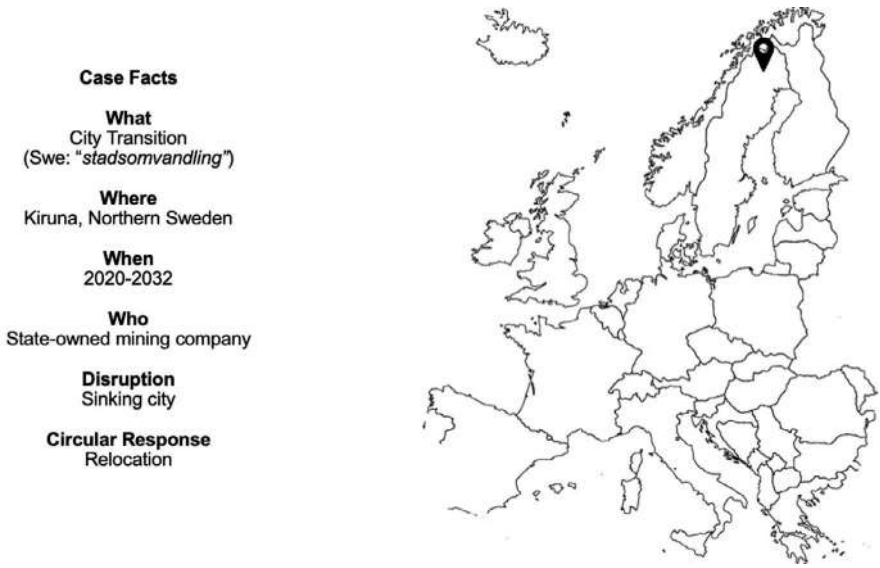

Figure 7.10 Luossavaara-Kiirunavaara AB. Map by unknown author licensed under CC BY-SA-NC

The Circular Response: Relocation of Selected Buildings

Many of the buildings in the old town centre are listed heritage buildings. Due to the cultural heritage values, simply demolishing all of buildings was not seen as a viable option. It was considered that the company should bear responsibility for relocating at least some of the buildings affected by its operations. The regional council, the municipality of Kiruna, and the company LKAB eventually negotiated the relocation of 39 heritage buildings. The relocation is scheduled in four phases, with the buildings closest to the mine already either relocated or demolished between 2020–2022. The ongoing phase, 2022–2025, concerns an area a bit further away from the mine, and the following one, 2026–2028, on the outskirts of the centre. The final section is scheduled for relocation or demolition in 2029–2032. The plan is that in 2035 the existing town centre will be decommissioned and the new one fully developed. The new centre is being developed three kilometres east of the current one.

The Potential Gain: Saved Embodied Emissions and Resources, Cultural Heritage, and Innovation

Environmental. Relocation as an alternative to demolishing and building anew saves significant amounts of building materials and associated embodied energy and carbon emissions. Although not common practice, the relocation of existing buildings as they are, without adaptation or major renovation, may be considered the embodiment of a circular approach in the built environment (Kyrö et al. 2019).

Figure 7.11 A guesthouse from 1901 could not be relocated due to structural concerns. (Photograph by Arild Vågen licensed under CC BY-SA 4.0)

Temporary buildings, designed to be relocated, are already popular in the public sector, as they can be transferred to a new location based on changing demographics, adding to the resilience of municipalities (Edelman et al. 2016). For traditional buildings, reasons for the low scalability so far could be, e.g., technical concerns of structural integrity, as well as uncertainties about liabilities during transportation.

Social. The relocation process enables maintaining the cultural heritage of the buildings, although not the site. Cultural heritage has been one deciding factor when selecting which of the buildings to relocate, and which to demolish. As dominant examples, the city hall from the 1960s was demolished, only the original clock tower was saved and relocated next to a newly built city hall in 2018 (see Figure 7.12). Meanwhile, the town church dating back to 1912 is scheduled to be relocated and a corporate guesthouse, "Bolagshotellet", from 1901 was to be relocated but the process was cancelled due to structural problems (see Figure 7.11). The way in which built heritage is valued, or not valued, today is decisive, even though aesthetic preferences are subject to change over time. On their website, LKAB notes that they are committed to preserving the cultural heritage and have engaged in careful documentation of the heritage value. The documentation is a requirement of the municipal and regional authorities and includes an ethnological study of the lives of people living or working in the respective buildings. It is worth noting that the despite these efforts, the relocation, demolishing, and new development will have negative consequences on both the built heritage and local people, including the Indigenous Samí people. However, a surprisingly positive

Figure 7.12 The old city hall from 1963 was demolished in 2019. (Photograph by Dag Lindgren licensed under CC BY-SA 3.0)

general attitude prevails towards relocation, as well as towards continuing and expanding the mining operations in Kiruna. This is likely due to the local identities and livelihoods being so intertwined with the mining history and operations, and the town built around them. It may also be that the local people consider it better to continue operations in this location, already heavily affected by mining, and by a state-owned company, rather than to give way to international mining companies currently prospecting new sites in the area (Lopez 2021).

Economic. The relocation of buildings as such may not economically justifiable, even though the cost of new construction is also high. However, in this case the economic benefit of continuing the mining operations is significantly more in comparison. Therefore, the company LKAB will be financially responsible for almost all, 37 out of the planned 39, building relocations, while the municipality will cover the relocation of two buildings. One important thing to note is that a massive initiative like this offers the opportunity to innovate, test, and learn, which ideally would reduce the cost of relocation in later endeavours.

Lessons Learned and Concluding Remarks

With this chapter, we set out to provide a novel outlook on circularity as a way to respond to disruption. We did so through a business model lens, where the value proposition, the *need*, arose from disruption caused by different types of crises, and the solution, the *response*, demonstrated circular thinking. Finally, we looked at the value capture, the environmental, social, and economic *gain* from the response.

Several patterns may be detected from the case descriptions, and we consider the key lessons learned to be threefold.

First, while the social and environmental benefits of all cases are evident, the economic gain is not as clear, direct, or in some cases even existent. Significant investments with uncertain return are needed for some of the cases, most notably in the case of LKAB. However, it is worth recalling the definition of a sustainable business model (e.g., Boons & Lüdeke-Freund 2013), the doughnut economic model (Raworth 2017), along with the planetary boundaries' framework (Steffen et al. 2015). We are reminded that the planetary boundaries should always take precedence, and the social foundation should also be met. Only after those two are ensured should we start considering the potential economic gain.

Second, three out of the four cases exhibited shared collaborative use in the built environment. Access-based consumption and the sharing economy have in general been gaining traction over the past decade. Sharing is considered both environmentally and socially sustainable, often even economically viable. Access-over-ownership is one archetype of a sustainable business model (Bocken et al. 2014). Sharing typically involves pro-social motivations, which may be hard to achieve when the item being shared is not shared simultaneously (Bardhi & Eckart 2012). In the built environment context, however, the sharers are often physically adjacent, making the sense of community and collective effort more achievable (Lundgren et al 2022). It is easy to assume that a resilient built environment is a shared built environment.

Finally, an active and determined focal actor seems to be key. All cases have a focal actor without whom the circular response would not have been discovered or realised. For some cases it is a single, passionate person, for others is a collective of like-minded people, and for one case it is a large state-owned company. The three first cases may be considered more grassroots type, bottom-up initiatives, whereas the final one is clearly a top-down initiative.

To conclude, the built environment with its enormous impact on the environment, people, and the economy, is an excellent mirror of our society. Many societal changes call for resilience, and a resilient building stock is a prerequisite for a resilient society. The inherent paradox of resilience is most palpable in the building context, where buildings typically endure, but not necessarily adaptable. Circular business model thinking could offer some solutions, when focused on retaining value in the system.

Practical Recommendations

- Conduct an inventory of vacant spaces to enable sharing and multifunctional use.
- Facilitate creative or temporary uses, e.g., by lower than market rents, or allowing safe deviations from local building codes.
- Engage and empower local residents, note that creative reuse thrives in a collaborative bottom-up mode.
- Share learnings from novel circular approaches, like the relocation of buildings, to enable diffusion of innovation and best practices.

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- *Case De Ceuvel*
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8 The Sustainable Temporary Adaptive Reuse (STAR) Toolkit: A Solution for Underused and Vacant Buildings

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Introduction

The COVID global pandemic necessitated significant changes in people's lifestyles and work habits (Marzban et al. 2023). In response to the pandemic, many governments, including Australia's, implemented lockdowns, allowing people outdoors only for short durations and limited activities to curtail the disease's spread. Given advances and changes in technology many people were able to switch to working and learning from home (Verma et al. 2023), which allowed most economies and businesses globally to keep functioning. By 2022, due to the advancements in vaccination protocols, most of the population was safeguarded against the prevalent variants of COVID. With the cessation of lockdowns, the pertinent question emerged: Was it indeed appropriate to resume office-based work?

Many office workers had gotten used to working from home and enjoyed the flexibility it offered, especially where they had caring responsibilities for older people and/or children. Workers argued that their performance had been maintained, and in many instances increased in quality and quantity, so why did they need to return to the office? Admittedly not all workers felt this way, some younger people, or newly employed staff, preferred to base themselves in the office to learn the organisational culture and to create a network (Nanayakkara et al. 2023).

However, overall, there is considerably less office worker use of workplaces than pre-COVID (Marzban et al. 2023). This has been compounded with the low unemployment rates, which has made employers reluctant to 'force' workers back to the office. In some cities like Melbourne, Australia, there has been more occupancy on Tuesday, Wednesdays, and Thursdays during the week, with Mondays and Fridays being very quiet. The low rates of office occupancy have a ripple effect, as local cafes and retailers have far fewer customers and this has led to increased vacancy in this part of the property market (Armstrong et al. 2023).The result is underuse and vacancy in city centres, Central Business Districts (CBDs), or Downtowns. How long will this last? Is it temporary or permanent? Many have theories (Armstrong et al. 2023) but at this point, nobody knows. Questions arise, such as: What can be done with this vacancy?

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The Sustainable Temporary Adaptive Reuse (STAR) Toolkit project is an attempt to gain a deeper understanding of this post-COVID trend and to develop a series of resources, the toolkit, to facilitate short-term, or temporary reuse of commercial property in Sydney (Armstrong et al. 2023). The STAR Toolkit is a knowledge exchange research project tha takes a qualitative approach to delve deeper into this complex issue that cannot be easily quantified (Creswell 2013).

The project takes a co-design approach to developing the toolkit, by engaging with stakeholders with a keen interest in the concept of STAR from a professional or personal perspective. The stakeholders engaged are from industry (property owners, advisors, and building designers such as architects and engineers), built environment regulation and advocacy (planning approval and construction code compliance, city-shaping or strategic planning), and different communities seeking new space. In addition, the research team consider themselves stakeholders with significant experience as property advisors in financial investment and asset management, surveying, architecture, and planning.

The tools within the STAR Toolkit are under development at the time of writing, and have been identified through a series of knowledge exchange workshops, both in person and online. The selection of the tools has been informed by pragmatic discussions between the researchers and the stakeholders as to what resources are needed to normalise the concept of STAR in practice, and what resources are perceived to be needed to support STAR evaluations and uptake. The ideas proposed for tools include:

- A STAR Toolkit website – an accessible, one-stop-shop for all things STAR.
- A STAR Guide – a description and definition of STAR as an asset management option for a broad layperson audience.
- STAR Ideas – an architectural exhibition documented to visualise examples of what STAR can be to spark the imagination.
- STAR Case Studies – real examples of STAR in Australia and beyond.
- Regulatory checklist – guidance on where to start when considering compliance with the National Code of Construction for building owners and end users of STAR space.
- Planning pathway – a clear map of the planning conversations needed to guide a successful temporary change-of-use planning application.
- STAR Contexts – a series of videos that capture the conversations from multiple expert perspectives about the challenges facing cities that STAR can help resolve.
- STAR Space - a place where building owners and space seekers can connect.
- ESG Scorecard – a ratings tool of ESG values or metrics that can be used to guide STAR evaluations and decisions.
- Research articles – publications leading from the STAR project journey for others to discuss, share, and build on to grow the concept of STAR as a sustainable asset management option to increase the usefulness of existing buildings so that they are fully utilised for as long as possible.

Whilst our focus for the first STAR Toolkit is Sydney, Australia, the issues detailed in this chapter affect many cities globally and some findings and outputs could be transferable.

This chapter sets out a detailed analysis of the Sydney commercial property market, the shocks and stresses it experiences, occupancy vacancy, and the concept of the STAR Toolkit and how this might address short-term vacancy in the CBD. The issue of Environmental, Social, and Governance (ESG) and its growing importance in commercial property is then discussed along with STAR potential. The chapter concludes with a review of some of the legal and regulatory compliance issues that might impact STAR's potential.

Shocks and Stresses in the Built Environment

Just as the online shopping boom reduced the demand for commercial brick-and-mortar stores, the recent global pandemic has shaken the property market with many employees demanding flexible work arrangements. The rebound from the post-lockdown workscape has left global cities at varying levels of activation, with some cities left underoccupied, and others having reimagined their use cases (Glaeser 2022; Fiorentino et al. 2022). A reduction in the face-to-face workforce has led to significant vacancy in commercial spaces and large and medium-sized businesses re-evaluating their needs for large commercial leases. With a reduction in the onsite workforce, and downsizing of many major organisations, prime real estate needs to ease the conditions for leases, or at least incentivise occupancy (Fiorentino et al. 2023). As such, leases that would previously be reserved for significant businesses are now available to lower tier companies, which facilitates a shift up the commercial leasing ladder. This has ultimately created an issue with vacancy and underutilisation of D-grade real estate, which is starting to have flow-on affects to the ground level market. In the Australian commercial office market, top-quality stock is graded Premium, followed by A, B, C and D. The top-quality stock is owned and managed by commercial entities, whereas the lowest grade stock is more likely to be long-term owned by 'mum and dad' investors.

The increased vacancy of D- and C-grade real estate has resulted in a lower demand for retail services and cafes on the ground level in Australian major cities and globally (Greenhalgh 2022; Florida et al. 2021). The primary issue with ground-level vacancy is that regions appear to be dead or dying to the public, which creates a stigma about certain areas in urban centres, and further serves to devalue the potential commercial opportunities (Greenhalgh 2022). A loss of ground-level retail and cafe services and the appearance of a dead or dying area contributes to the overall feeling of a city that is losing or has lost its vibrancy, which would have significant economic impacts for both the domestic and international tourism markets. The responsibility of revitalising these areas that have succumbed to vacancies and underutilisation ultimately falls to the local government and councils, typically through the implementation of social and economic activities and initiatives. One example is the City of Sydney, Australia, which eased outdoor dining requirements, and converted several thousand street parking spaces to outdoor

seating for restaurants and cafes to reshape the social and dining culture in those areas (City of Sydney 2021). Similarly, the City of Singapore has begun establishing 'Parklets' by converting on-street parking into temporary green spaces for residents and tourists to relax and linger in spaces for longer periods. Another more forward-looking example is the City of Barcelona, Spain, that has begun implementing a programme called 'Superblocks' where the streetscapes in certain neighbourhoods are redesigned to create larger, pedestrian-friendly blocks to reduce traffic-related congestion and pollution and to free up space for community and social projects (Love & Stevenson 2019).

While some communities and councils are looking towards a more inclusive, socially sustainable urban environment, there are still many regions of the world that are suffering from a lack of use due to changes in the commercial property market (Armstrong et al. 2021; Armstrong et al. 2023). Historically, traumatic events such as economic recessions have led to increased vacancy rates as businesses fail, resulting in underuse and vacancy. Typically, a recovering market or technological innovation will often alter building uses, resulting in the redesign and adaptation of commercial markets. The pandemic is the latest global event to trigger changes in building uses, albeit slowly and with a disproportionate effect on lower-grade commercial markets. Besides the previously mentioned public perception associated with a dying ground-level market, empty and underused buildings physically deteriorate at a faster rate than occupied ones (Sayce et al. 2022). With an ever-increasing need for urban sustainability, allowing for large commercial spaces to fall into disrepair through neglect and underuse should attract significant attention. The economic and environmental cost associated with destroying and rebuilding derelict properties is enormous and, with forethinking, could be avoided.

While the return-to-work movement is slowly increasing, the pandemic has forever changed the workplace. To achieve urban sustainability, commercial properties that are affected by vacancy and underuse should look to redesign their spaces to revitalise the local community and attract new commercial leases. One idea that is gaining traction is the conversion of commercial spaces to social spaces that provide benefits to the local community or building tenants that have remained in the spaces. To address this, we have developed the Sustainable Temporary Adaptive Reuse (STAR) Toolkit concept.

Occupying Vacancy; Understanding the Voids to Evaluate STAR Options

Vacancy in commercial buildings has become a global concern since the COVID pandemic due to a myriad of societal and technological changes. Before this, vacancy was connected to economic downturns, localised issues connected to supply and demand imbalances, or issues such as land banking and managed decline of existing buildings (Abramson 2015).

For commercial buildings, adaptive reuse is believed to be a solution to both resolving vacancy and addressing shortages in other types of buildings such as

affordable housing. Certainly, there has been significant uptake in office-to-residential conversions in cities such as London, when residential is seen as the 'highest and best' use (Clifford et al. 2019). Tools are in development for rapid evaluations of the suitability of buildings for office-to-residential conversion, when office buildings have become stranded assets (Beaney et al., 2023).

Since the pandemic, the focus on adaptive reuse as a solution to the vacancy is suggested by research and in practice (Armstrong et al. 2023; Hassell 2023; Roberts & Carter 2023; Lynch 2022). In real estate, calls for policy action to address vacant space have increased sharply, particularly for commercial buildings (Poleg 2023; Capps 2023; Hassell 2023). In research, however, adaptive reuse literature is limited in its discussion of vacancy. A review of the literature found vacancy is often used to describe a building's end state, with little critical discussion of what vacancy looks like before a building is wholly vacant (Armstrong et al. 2023).

Vacancy understanding and metrics are useful for policymaking and strategic planning (Burkholder 2012). Further questions can be asked which highlight the need to develop our understanding of vacancy so that appropriate solutions can be effectively supported by policy action. These questions are:

1 Are whole office buildings close to standing empty, or are buildings suffering underoccupancy? If the latter is the case, whole building adaptive reuse may not be a viable option for buildings which have tenants on long leases.
2 Which buildings have 'problematic' vacancy? Where is the vacancy located? And what is 'problematic vacancy'? For older office towers, building owners may have little or no outstanding debts and therefore may not be financially problematic. For newer buildings, there is an unwillingness to consider adaptive reuse as these buildings may be premium-grade office buildings, yet they may have high vacancy levels. In these cases, adaptive reuse policy may be ineffective at increasing uptake of adaptive reuse.
3 How long do we expect to see the drivers of vacancy remaining? In times of unprecedented and unforeseen societal change and flux, longer-term vacancy rates can be hard to predict.

These questions highlight the need for a more nuanced understanding of vacancy. Currently, the evidence presented to understand vacancy is typically simplistic average vacancy rates, aggregated across the whole city. There is a lack of nuanced debate which includes different types of vacancy, and the distribution of vacancy types in different buildings to inform effective policymaking (Armstrong et al. 2020).

In research, scholars are unpacking vacancy and provide a taxonomy for existing buildings including residential (Caramaschi & Coppola 2023) and commercial buildings (Muldoon-Smith & Greenhalgh 2017). These taxonomies highlight vacancy types such as:

- Structural, meaning the vacancy will not be resolved if the building's use or condition is not adapted (Muldoon-Smith & Greenhalgh 2017).

- Dysfunctional vacancy occurs when governance is restricting changes in the building which would increase demand (Caramaschi & Coppola 2023). A driver of dysfunctional vacancy could be when a local government is not wishing to permit adaptive reuse to residential in a commercial zone.
- Churn, meaning vacancy that is the result of tenants moving to buildings of better grades in the same city (Muldoon-Smith & Greenhalgh 2017).
- Greyspace is understood as underoccupation, for example, a space which is currently leased but not needed by the current tenants (Muldoon-Smith & Greenhalgh 2017).
- Strategic vacancy occurs when buildings are purposefully left empty awaiting site redevelopment and approvals for demolition (Muldoon-Smith & Greenhalgh 2017).
- Inefficient vacancy occurs when a building is functional but does not perform well (Muldoon-Smith & Greenhalgh 2017).
- Inertial vacancy is when building owners are not taking steps to resolve the unleased space, following a 'wait and see' approach (Muldoon-Smith & Greenhalgh 2017).
- Unhabitable vacancy, meaning a building is not fit for use (Caramaschi & Coppola 2023). An example of this is where contamination has occurred, although the building itself is structurally sound.

Vacancy is believed to change according to the building grade it sits within, with 'healthy' vacancy sitting in higher-grade buildings and 'unhealthy' or stagnating vacancy existing in lower-grade buildings. However, a recent study challenges this, suggesting vacancy can be caused by the building design failing to meet the needs of businesses seeking office space (Armstrong 2020). For example, if a city's businesses are small to medium enterprises, the demand for very large floor plates will be low and structural vacancy can occur even in new, high-performing buildings considered to be premium buildings.

Not all vacancy is seen as negative: for instance, too little vacancy can create other problems such as undersupply and high rents stifling diversity in the types of businesses and tenants that can afford to use the buildings in any given location. Initial, frictional, and cyclical are types of natural vacancy, and resolve themselves easily. These vacancy types are a sign of a healthy, balanced market and economy, depending on the time it takes for their resolution (Muldoon-Smith & Greenhalgh 2017).

These emerging taxonomies of vacancy are useful as they offer opportunities for developing and evaluating solutions for sustainable asset management to fit localised market conditions. However, the taxonomies must be coupled with access to transparent unaggregated vacancy data to enable greater understanding (Armstrong et al. 2021).

Sustainable asset management options include refurbishment and retrofitting to upgrade the building's amenities for its current use and/or upgrade its aesthetics to reposition buildings in the market. Aside from retrofitting and refurbishment, there are several options available for adaptive reuse, which is where the building is adapted for a new use that is different from its current use. These different types of adaptive reuse are discussed in what follows next.

Proposed Applications of STAR

Sustainable Temporary Adaptive Reuse (STAR) is a type of adaptation also known as 'meanwhile use'. STAR is the process during which a part or whole of an existing building undergoes a change-of-use classification on a temporary basis. At the end of the time period, the spaces revert back to their former use. STAR can bring benefits to aid the longevity of the lifecycle of the building through active use whilst limiting the environmental impact of real estate practices and construction works, enabling temporary new use(s).

Buildings are classified according to their main use and can contain different uses. In Australia, uses are defined by the Australian Building Codes Board's (ABCB) list (www.abcb.gov.au/sites/default/files/resources/2022/UTNCC-Building-classifications.PDF). There are ten different classes that define building use and a further two classes for mixed-use and multiple-use buildings. Office buildings are Class 5, and retail uses are Class 6 buildings. Mixed-use is for buildings that may have a basement car park (Class 7a) with ground-floor retail space (Class 6) and residential apartments on levels one to eight (Class 2) and offices above level eight (Class 5). Buildings that have multiple classifications are designed for speculative development and can be designed to comply with regulations of multiple classes, for example, Classes 5, 6, and 7. For a STAR development, the 'new' use in part of the building differs from the existing use.

As mentioned previously, most adaptive reuse case studies and discussion focus on whole-building reuse. However, this is a limited view of reuse that can be developed to form new types of adaptive reuse. The partial building basis speaks to mixed-use building typologies or can transition buildings to multiple classifications, depending on the scale of the building and its proposed new uses.

STAR's additional value, on a partial building basis, can increase demand for a building's space and prolong a building's usefulness. For buildings that are reasonably well-performing, partial adaptive reuse can add new temporary or trial uses to add additional value to buildings, making them attractive to both retain existing tenants and attract new tenants looking to upgrade their accommodation from low-grade buildings at the end of their lives. It can be a solution to resolving pockets of underuse, long before vacancy reaches terminal levels, and the assets are at increased risk of becoming stranded, or prematurely obsolete. For premium buildings, the additional value creation via STAR can offer premium tenants looking to encourage knowledge workers back from working from home. This is particularly likely if the social value of the new use is considered. STAR can offer increased opportunities for knowledge workers to connect, or it can deliver new uses which provide greater convenience or essential services to those who find working from home offers other advantages. New uses can also increase diversity and factor in workers' life balance and wider needs. For example, services to help workers meet their caring responsibilities for children, aged parents, or even beloved pets.

The temporary nature of STAR provides an alternative to any inertial vacancy by which owners and managers 'wait and see' before investing in more radical or costly actions, particularly in markets with sudden or uncertain demand changes.

STAR can also be useful for 'trial' uses, where the idea is novel or market demand for other uses is uncertain. The key to viable temporary uses is a compatibility between the new use and the existing physical attributes of the space, the new users' needs, and the needs of the existing users of the adjacent spaces or buildings.

The question to be asked is: What does 'temporary' mean? Over time, all buildings are temporary as they are demolished at the end of their structural life. Older heritage buildings have often undergone multiple changes of use. For example, the Pantheon in Rome (circa 126 AD) has been a temple, a marketplace, a legal centre, and currently a tourist attraction. However, for STAR the key to defining what is 'temporary' is the length of the leases typically offered for the building's existing uses. Since the pandemic, the average lease length for office and retail space have fallen and can be as short as 1–2 years. What is temporary is a dynamic length of time that can be lengthened or shortened depending on the market. At the time of writing, temporary in office buildings can be as short as 1 day to 1–2 years and we are defining STAR are a time period shorter than the typical lease for a building.

A key aspect to STAR in office buildings is factoring in the social value of the new use so that spaces attract flows of people and the new use is regenerative. Flows of people can create vibrancy and can also generate flow-on associated economic activities, such as workers buying lunches and other goods and services. This social value can be quantified and measured through increased visitation and revenue in nearby spaces and businesses. The vibrancy or connections that STAR can offer can also create a sense of belonging for existing tenants. The social value of STAR can also be applied to the wider community. If spaces are converted for use by social enterprises, the social value can be calculated in terms of social impact. For example, offering space to a social enterprise can align with the sustainability (environmental or social) values of the owners of a building, or their tenants.

Increasing Importance of 'Social' in ESG

The Environmental, Social, and Governance (ESG) framework has placed a lot of emphasis on the 'social' aspect in recent years. This is due to its significant impact on the sustainability of businesses, stakeholder relationships, and overall corporate responsibility. As companies face mounting scrutiny from investors, regulators, and the public, the social dimension of ESG has become a critical factor in evaluating a company's long-term viability and ethical standing (Mah 2021). ESG is a comprehensive framework that assesses the sustainability and ethical practices of companies and organisations. It has become increasingly popular among investors, stakeholders, and consumers who prioritise responsible and ethical business practices (Cloutier 2020; Robinson & McIntosh 2022). ESG criteria provide a structured way to evaluate a company's impact and performance beyond traditional financial metrics, aiming to capture a holistic view of their contributions to society, the environment, and corporate governance. As a result, ESG criteria have gained significant traction as a framework for evaluating the sustainability and ethical practices of companies and investment portfolios (Cloutier 2020).

The corporate responsibility landscape has undergone a paradigm shift with the emergence of the social dimension (Mah 2021). This encompasses a variety of issues such as labour practices, human rights, diversity and inclusion, community engagement, and supply chain ethics, among other social value elements. Companies are no longer solely accountable for their financial performance, but also for their societal impact. This has prompted a reassessment of business strategies and practices through an ethical lens. While all three components – environmental, social, and governance – are important, the Social aspect has taken centre stage in discussions and assessments (Wilkinson 2022; Mah 2021). It reflects a company's impact on society, its treatment of employees, customers, and communities, and its commitment to ethical and equitable practices. The emphasis on social within ESG has grown as stakeholders and investors recognise the significant influence companies have over society. This highlights its importance in shaping sustainable business practices and promoting positive societal outcomes.

When evaluating a company's performance, the ESG framework looks at three main areas: environmental, social, and governance. The environmental aspect focuses on how the company impacts the environment through carbon emissions, energy efficiency, waste management, water conservation, and sustainable sourcing. The goal is to reduce risk and promote sustainability. The social component examines how the company interacts with stakeholders such as employees, communities, customers, and suppliers. It considers factors such as labour practices, human rights, employee wellbeing, diversity, and community engagement. Finally, the governance aspect assesses the quality and transparency of the company's corporate governance practices, including board composition, executive compensation, shareholder rights, risk management, and ethical decision-making. Effective governance promotes accountability, prevents conflicts of interest, and ensures fair and responsible management practices. Companies are increasingly evaluated not just on financial performance but on their commitment to fostering positive social impacts and addressing social challenges (Mah 2021).

Many stakeholders are taking note of the ethical implications of their actions and demand greater accountability from companies (Cloutier 2021; Wilkinson, 2022). Consumers, investors, and jobseekers are all increasingly influenced by a company's social track record, which is causing businesses to prioritise socially responsible practices. Organisations are realising that ignoring social issues can lead to reputational damage, legal trouble, and operational disruptions down the line. The social dimension provides a framework for identifying and mitigating these risks by fostering a culture of ethical behaviour and responsible business practices. Governments and regulatory bodies may start paying more attention to social issues and enforcing laws and regulations related to things such as labour standards, human rights, and community engagement (Cloutier 2021). Complying with these regulations will be vital to maintaining a company's social responsibilities. Institutional investors and asset managers are also considering ESG factors when making investment decisions. The social dimension, particularly in terms of employee wellbeing, fair labour practices, and diversity, has been linked to improved financial performance and long-term sustainability, which is attracting investor interest.

Organisations that prioritise social sustainability tend to create stronger connections with their employees, customers, and communities (Cloutier 2021). These positive relationships can lead to a better reputation, customer loyalty, and long-term value. Environmental, social, and governance criteria are now used as a framework to evaluate the sustainability and ethical performance of businesses and investment opportunities. While the 'E' and 'G' components of ESG have been the focus of corporate responsibility discussions for a while, the importance of the 'S' – the social dimension – is gaining prominence. The increasing significance of the social aspect in ESG reflects the acknowledgment that the way organisations treat their employees, customers, communities, and other stakeholders has a substantial impact on value creation, reputation, and overall sustainability (Mah 2021; Wilkinson 2022).

The importance of the social aspect in ESG is increasing due to changing expectations from stakeholders, especially investors and consumers. Investors now seek companies with strong ethical values, transparency, and a commitment to addressing social issues, instead of just financial returns. This shift in investor behaviour has led to a surge in sustainable investment products, and companies are improving their social performance to attract investment. Consumers are also becoming more conscious of the social impacts of their purchasing decisions and demand products and services from companies that align with their values (Mah 2021; Wilkinson 2022). This demand for ethical products and responsible business practices has pushed companies to prioritise social considerations and adopt sustainable and inclusive practices. Additionally, employee engagement and talent retention contribute to the social aspect in ESG. Companies that prioritise employee wellbeing, diversity, and a safe working environment enhance their reputation and foster a motivated and loyal workforce (Mah 2021). Potential employees are now drawn to companies that prioritise social responsibility, creating a positive feedback loop that attracts and retains top talent in today's competitive job market.

In addition, recent regulatory and legal changes have emphasised the significance of the social component in ESG. Governments worldwide are implementing more stringent regulations to tackle issues like workplace safety, modern slavery, and human rights violations. Companies that fail to comply with these regulations face not only financial penalties but also damage to their reputation. Thus, it's essential for businesses to abide by social norms and legal requirements. It's worth noting that the social element of ESG isn't just about mitigating risks; it also offers significant potential for innovation and value creation. Companies that welcome diversity and inclusion, for instance, can benefit from a wider range of perspectives that can lead to better decision-making and product development (Mah 2021). By engaging with local communities, businesses can form strong partnerships that enhance their brand reputation and customer loyalty. The significance of the social dimension in ESG has been growing due to the evolving environment of business and society. Stakeholders now expect companies to be more accountable, transparent, and responsible. Hence, organisations are realising that their social performance directly affects their long-term success and are integrating social aspects into their strategic plans and operations. The changing role of the social component in ESG

highlights the interconnectedness of social, environmental, and governance factors, thereby creating a more sustainable and morally grounded business landscape.

The Compliance and Certification Conundrum

Another important aspect to consider in STAR is the legal requirements in respect of building regulations and fire regulations. Buildings, when submitted for assessment, are allocated a code within the regulations, for example, office buildings are Class 5 buildings, whereas retail buildings are Class 6. This classification is important as it establishes the criteria under which the building will be assessed for code compliance.

Australian buildings, when designed and completed, are checked for compliance with the Building Code of Australia (BCA). The BCA is a set of technical provisions contained within the first two chapters of the National Construction Code (NCC). They dictate the minimum mandatory requirements for the health, safety, amenity, and sustainability in the design, development, and construction of new buildings within Australia (Australian Building Codes Board 2017). Building certifiers/surveyors and fire engineers acting for building owners are required to propose designs and make recommendations for compliance. The proposed drawings are submitted for approval. Once construction is completed, the building is checked for compliance with the design and NCC and, if correct, will be certified as compliant and a certificate of occupation is granted.

Any subsequent alterations to the building, may or may not trigger different parts of the NCC. Some uses have higher levels of fire risk than others (Carroll 2009). For example, building uses involving people sleeping, such as hotels or housing, have higher levels of fire protection as a fire may occur at a time when people are sleeping. The occupants would need longer to wake up and then evacuate the building. Likewise, some building uses have different requirements in respect of the distance to a fire escape staircase. Some building uses may have higher requirements in respect of toilet facilities than others. Other uses may pose higher risks in respect of fire and so on (Carroll 2009). The STAR Toolkit needs to identify and then assess the different options available for short-term uses for a Class 5 office building and the degree to which the proposed temporary use might trigger fire and NCC requirements. The rationale is that some new temporary uses would require minimal or no changes, whereas other uses would trigger extensive alterations to the building to meet compliance with fire and NCC standards. Extensive alterations are cost prohibitive and would not fit the STAR timeframe.

The issue of temporary use is somewhat of a challenge because the NCC does permit temporary uses, for example, with sporting or arts events, temporary structures such as tents accommodate catering outlets (Carroll 2009). The structures are erected for the event and then dismantled upon completion of the event. The standards in respect of fire differ to permanent structures with the same uses. With increasing vacancy within buildings, the question arises: *Can we apply the same approaches towards temporary uses within buildings?* Given the precedents of temporary structures for arts and sports events it appears possible (Armstrong

2020). The next question is then: *How long is a temporary period?* Our STAR workshop in 2022 concluded that in the Sydney market, the temporary use period would be 1 year or 12 months. The typical lease term in Sydney at the time was 2 to 3 years, and therefore a period of 1 year would be seen as temporary or short term.

The best way forward is to develop an NCC Checklist of critical issues to consider when proposing a STAR. This would ensure any critical fire or compliance issues are raised early in the evaluation of suitability. The stakeholders can then determine whether the proposal is legally, as well as technically, socially, and economically, viable or not. Note that this work is in progress.

Conclusions

This chapter has set out a detailed analysis of the Sydney commercial property market, the shocks and stresses it has experienced since COVID, and how this has impacted occupancy and vacancy. Whilst the commercial market has recovered to some degree since mandatory lockdowns, it would appear that the experience from mid-2020 to mid-2022 has caused many of the CBD workforce to seek a more flexible work-life balance. Sydney is not alone as cities globally adjust to post-COVID social and economic patterns.

These changes have led to the concept of the STAR Toolkit and how this set of resources might address short-term vacancy and a lack of occupancy in the CBD. Headline vacancy in Sydney CBD is between 10% and 11% but occupancy rates are far lower than before COVID (anecdotally between 60% and 70%) meaning there is a lot of commercial space unoccupied on any given day. Further, current work patterns seem to indicate a preference for working from home on Mondays and Fridays which provides for greater levels of unoccupied space during these times. Given the changes to work patterns and practices and subsequent uses of buildings, which are new to many owners, regulators, occupiers, there is much uncertainty about where things are trending.

The market needs to better understand which buildings, market sectors, or time periods are experiencing 'problematic' vacancy, where is the vacancy located, and what is 'problematic vacancy'? The STAR toolkit will assist owners, occupiers, and the wider market in understanding these issues. It may be the case that issues relating to vacancy and underoccupancy are different between differing building grades and sub-precincts. STAR aims to explore these issues and open the conversation on using existing building stock more intensively.

The issue of Environmental, Social, and Governance (ESG) and its growing importance in commercial property was discussed along with the potential to incorporate and measure this in STAR. The chapter concluded with a review of some of the legal and regulatory compliance issues which might impact on STAR potential. As a result of these issues and STAR workshops, we established the need for stakeholder guidance and the STAR Toolkit. It is envisaged that this toolkit will be beneficial to building owners in a market where owners are trying to differentiate themselves from the competition and where occupiers are looking to ESG-related ratings and gradings in their decision-making to occupy space.

Not only is there an environmental benefit from utilising existing structures rather than building new ones, a well occupied and vibrant building will likely be more attractive to existing tenants, particularly ground-level retail and cafe tenants who rely on footfall. This is amplified if temporary uses are complimentary to existing tenants' uses elsewhere in the building.

STAR will bridge a gap between landlords and tenants, introducing shorter-term occupiers to owners in uncertain market conditions where owners may be unable or unwilling to commit to longer-term more traditional lease structures. This chapter has also discussed the ability of shorter-term occupiers to extend the useful life span of a building that might be approaching obsolescence.

Practical Implications

The following practical considerations have been established in this research to date:

- Provision of resources for stakeholders will facilitate the use of underused and vacant city centre buildings.
- The STAR Toolkit will assist owners, occupiers, and the wider market in understanding issues surrounding vacancy and underuse.
- The social aspect of Environmental, Social, and Governance (ESG) and its growing importance in commercial property is impacting the market and may enable new users to occupy spaces previously unavailable to them.
- STAR is one solution as the market transitions from a traditional 5-day working week in office buildings to a new mode.

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9 Australian Case: Black Summer Bushfires

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Introduction

Anthropogenically induced climate change, associated with increased atmospheric CO2 concentrations and the greenhouse effect, has led to a hotter, drier climate worldwide. With increasing temperatures, the intensity and severity of global wildfires are increasing (see Figure 9.1 below). Wildfires are labelled bushfires in Australia. In the last few years, however, a sharp increase in global megafires has been observed, with over 75 million hectares of combined land being burned since 2020 (Australia ~36.5m (2019–22) (Li et al. 2023); Brazil ~5.5m (2020) (Pivello et al. 2021) Russia ~21.5m (2021) (Bondur et al. 2023); USA ~3.2m (2022) (National Interagency Coordination Center 2022); Canada ~8.8m (2023) (WSWS 2023)).

Wildfires are an important environmental process in Australia, with several flora dependent on wildfires to stimulate fresh plant growth. However, the recent megafires experienced worldwide and on the Australian continent were more significant and hotter than previously experienced. Due to the high fuel loading associated with the endemic eucalypt forests, extended and frequent periods of drought, low relative humidity, and high solar radiation, Australia has a reputation for being extremely fire-prone (Nolan et al. 2016). The recent Black Summer Bushfires (2019–2020) were particularly severe, with over 30 million hectares of burned land, leading to the destruction of over 3000 homes, the loss of 33 human lives (Cowled et al. 2022), and the death of over three billion native animals (Dickman 2021). In response to the loss of property and human life, there is a need to design and distribute fire-ready retrofit guides for properties to reduce the risks associated with both stay-and-defend and evacuation practices.

The prevalence of formal bushfire home retrofit toolkits in Australia has evolved over the past few years, primarily because of the Black Summer Bushfires, at a community level and through the economic backing of government, private funding, and the Insurance Council of Australia. Various programmes or toolkit methodologies have come into existence for assessing personal and building vulnerability and retrofit options – including social and environmental profiling (Auld et al. 2020), assessment of bushfire vulnerabilities of regions and communities (Cramp & Scott 2019; Parsons et al. 2021), audience segmentation guides (Villeneuve et al. 2018), and building sustainability guides (Green Building Council 2020). Bushfire

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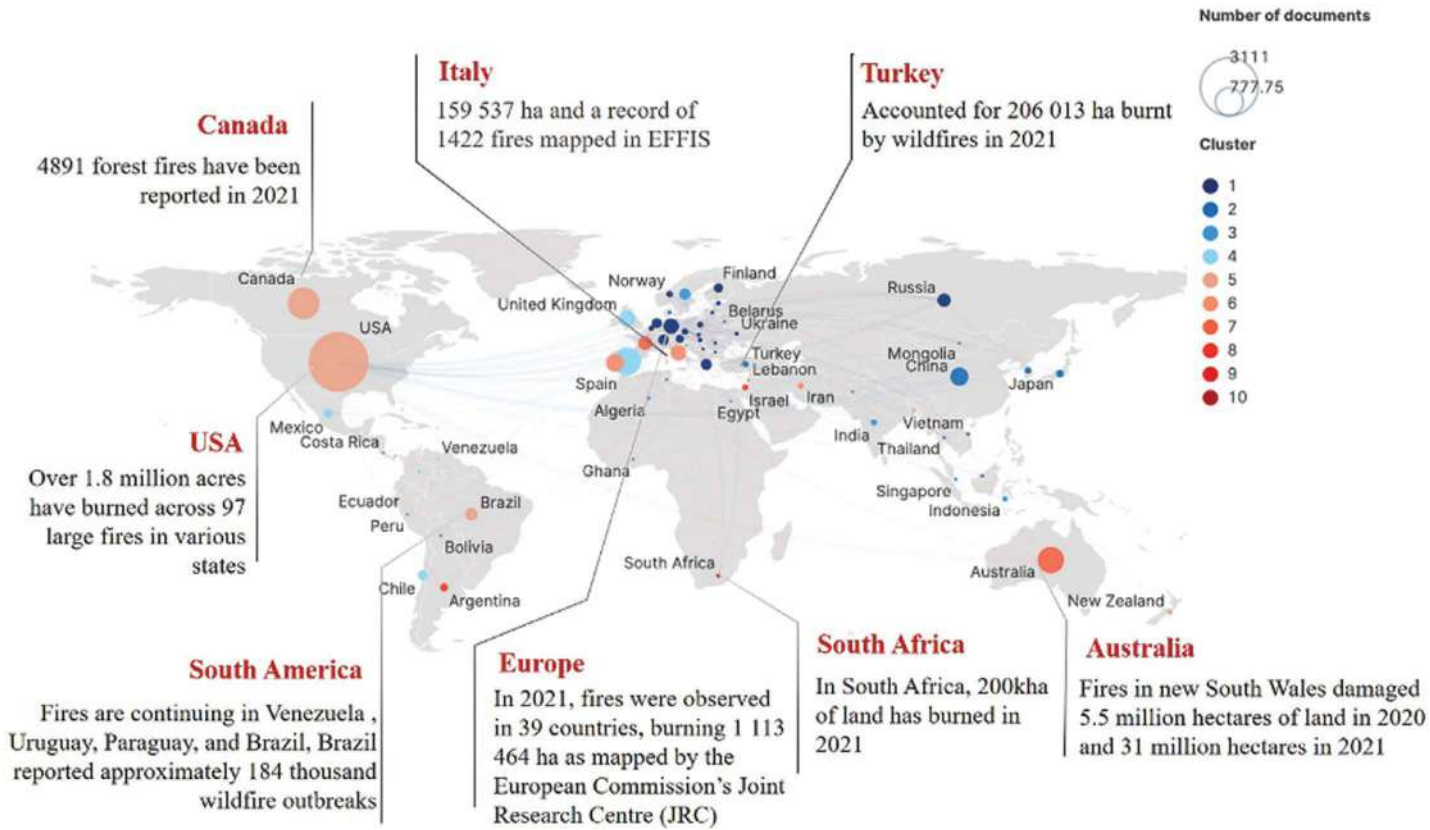

Figure 9.1 Global distribution of wildfire studies and the extent of burned land and destruction in major countries. Image source Li et al. 2023

resilience home rating tools are now coming into existence (initially developed by the Bushfire Building Council Australia and newly rebranded as the Resilient Building Council of Australia in 2023[1]). They aim to inform residents of their homes' potential bushfire resilience issues. This is the first step towards making changes. However, there is still limited centralised information on what homeowners can do to improve the bushfire resilience of their homes.

This research was funded in 2022 under the Black Summer Bushfire Recovery Grants Program. The research reviewed the current glo, national, state, local, and independent guidance on building for bushfire resilience. The broader research uses two case study regions, Bega Valley Shire in New South Wales and Noosa Shire in Queensland, to assess the suitability of available bushfire retrofit guidance to be adapted and implemented by vulnerable people in fire-prone areas.

Megafires: Effects on the Australian Landscape and Built Environment

Megafires cause devastation beyond the norm and cause long-lasting effects on people and the built environment, as well as on biodiversity and the broader landscape and ecological function of entire regions. The effects have been linked to higher rates of landscape-scale decline and environmental regeneration failure (Godfree et al. 2021). Their effects extend beyond single fire events and have ecological impacts beyond individual species (Keith et al. 2022), extending to significant chemical and physical changes to soil, water, and air (Akdemir et al. 2022; Legge et al. 2022). For example, fine particulate matter in the air caused by large fires has been linked to environmental "ammonification, eutrophication, loss of biodiversity and a decreased resistance to drought and frost damage" (Akdemir et al. 2022). Megafires have caused catastrophic damage to human settlements and infrastructure within flammable vegetation zones, reflected in subsequent economic disasters and environmental loss (He et al. 2022; Ullah et al. 2021). The period between October 2019 and February 2020 witnessed extensive bushfires in the south-eastern part of the country, peaking in size during December and January (Attiya & Jones 2022). These were the most significant bushfires in the south-east as the burnt area exceeded that of the Ash Wednesday fires in 1983 and the Black Saturday fires in 2009 combined, destroying nearly 6000 buildings, causing the loss of 34 human lives, and the death of over 3 billion terrestrial vertebrates (Sharples et al. 2016). In terms of directly burnt landscape-level losses, the 2019–2020 Black Summer Bushfires on the east coast of Australia devastated 21% of the Australian temperate forest biome, possibly moving many ecosystems toward classification as "threatened" under the International Union for Conservation of Nature (IUCN) Red List of Ecosystems (Bland et al. 2017, in Le Breton et al. 2022).

Commencing in November 2019 within the Blue Mountains vicinity west of Sydney, these bushfires extended across multiple New South Wales (NSW) sectors, encompassing the northern, central, and southern coastal regions, affecting bushlands, state forests, and national parks. Earmarked as the most severe fire incidents documented in NSW's history, over 140 fires covered an area of approximately 70,000 square kilometres, destroying 2176 homes (Ullah et al. 2021). The fires

generated an orange-red haze enveloping NSW. They escalated pollution levels in numerous zones, including Sydney's metropolitan area, influencing air quality levels in urban zones such as Sydney, Lower Hunter, Central Coast, and Illawarra (Attiya & Jones 2022).

Australia's Housing and Vulnerability to Bushfire Damage

The trend for urban planning has meant that the divide between urban and rural has become more blurred, and peri-urban areas now account for around 15% of Australia's housing stock (Sutton et al. 2009, in Norman et al. 2021). In Australia, bushfire resilient homes are an architectural issue faced in rural and peri-urban areas and tree-change and sea-change settlements, the latter of which has been increasing in trend for the past 50 years (Obaldiston 2012, in Norman et al., 2021). This has taken previously urban dwellers into more bushfire-prone areas to live. Whilst some of these homes may have been recently built, much of Australia's housing stock already existed before significant improvements were made to building codes for better bushfire climate resilience. Many people in Australia live in housing built before the advent of the bushfire building standards in the Australian building practice.

The impact of bushfires on this housing trend is primarily centred on the locational choices made by people with personal aspirations connected to living close to nature, living in less dense or developed settlements, and/or close to the land. However, it would not matter how well the design of building is to withstand bushfire; no house is entirely fireproof, and there is little chance of survival if caught in the path of a megafire. These personal aspirational values are mostly forgotten in urban sustainability retrofit frameworks, many of which purport the need for medium-density housing urban morphologies and home energy retrofits rather than direct climate-resilient retrofits that reduce bushfire attacks (Saffari & Beagon 2022; Simpson et al. 2020). Internationally and within Australia, there is increasing pressure to move towards planning and building more climate-resilient housing, reflected in the development of bushfire, flood, and cyclone planning policies and guidelines within the different state jurisdictions. However, a disconnect remains between planning policy and building regulations and standards. The standard regulating bushfire-resilient housing in Australia is the Australian Standard for Building in Bushfire Prone Areas (Standards Australia 2018), initially instigated in 1991 through the development of *Planning Conditions and Guidelines for Subdivisions* by the Victorian Country Fire Authority.

The general timeline of pivotal events leading to improved standards in bushfire building methods is shown in Figure 9.2.

The development of the Australian Standard has led to bushfire building standards formally adopted by the National Construction Code (NCC 2022) and the Building Code of Australia (BCA 2023). The NCC provides the core regulatory framework for all building construction in Australia. Even though AS3959 (Standards Australia 2018) was first developed in 1999, it was not entirely written into the National Construction Code until after its second edition in 2009. It was

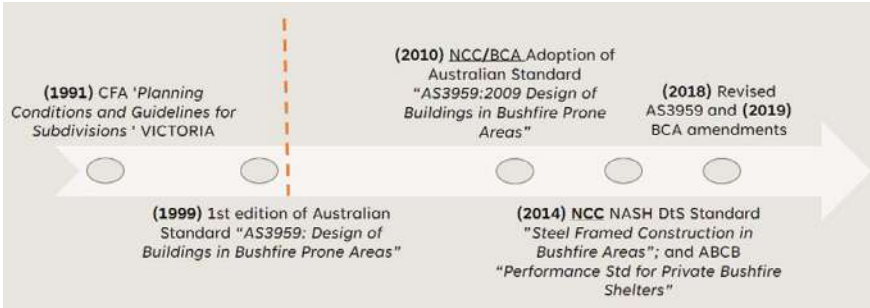

Figure 9.2 Timeline of the formal development of bushfire building standards in Australia (the dashed orange line indicates Year 2000)

written into the 2010 Building Code of Australia after the tragic Black Saturday Bushfires in Victoria.

Results of a research study published in 2022 found that most of the damage to homes in a significant bushfire in the Blue Mountains NSW in 2013 occurred for those built pre-1990s. These homes suffered "more than twice the level of impact" as houses built post-2000 (Price & Roberts 2022). This study concluded that "Houses built to standards imposed from 2000 onwards fared better than previous standards", indicating a line in the sand about when bushfire building performance was significantly improved in Australia; it seems to sit somewhere around the turn of the millennium. The Price and Roberts study found that "post-2000 houses assessed at Flame Zone level were vulnerable", inferring that building practices can be improved to deal more effectively with "flame zone contact" from bushfires. This same study also found that most residences in bushfire-prone areas in the Blue Mountains were built to predate the AS3959 (Standards Australia 2018) regulations, meaning existing houses are unlikely to achieve the required bushfire protection levels. Whilst there is significant research into controlling the number of bushfires and their severity and reducing the impact on structures through fuel-free zones around buildings, there has been less investment in research and development into bushfire-resilient building materials and systems (Hendawitharana et al. 2023).

Bottom-Up vs. Top-Down Bushfire Resilience Programmes

In Australia, top-down bushfire resilience programmes are primarily divided into those overseen by fire service agencies and disaster management authorities at all levels of government jurisdiction. The way that funding is allocated is based on regional statistics viewed through disaster resilience ratings such as the Australian Disaster Resilience Index (ADRI) (Parsons et al. 2016), as well as through direct need through government agencies such as the National Emergency Management Authority and the Australian Federal Government. Education-based programmes are invariably based on the notion of disaster management as being a "shared responsibility", a concept that is an essential pillar of the international Sendai Framework for disaster risk reduction.

A key local government programme adopted by local governments across various parts of Australia, "Climate Wise Communities" (Cramp & Scott 2019), aims to educate and inform residents about local community and personal risks and offers incentives to improve the resilience of homes. It has become more common for local councils to help facilitate bottom-up resilience programmes amongst community members by promoting the formation of local area disaster management committees. However, since the Black Summer Bushfires, in some areas, such as Cobargo in Bega and Mallacoota in the Gippsland region,[2] local community members have begun their own bushfire resilience response (Lloyd & Hopkins 2022; McDonough 2022).

The validity of the growing interest in Indigenous-led cultural burning to reduce wildfire risk has been noted by various scholars both in Australia and in Europe (Atkinson & Montiel-Molina 2023; Berkes et al. 2000; Folke 2004; Tedim et al. 2016), and although not yet embraced by a top-down approach in government, it has already found many advocates and community activists who have ensured its practical uptake in various parts of Australia (Atkinson & Montiel-Molina 2023; Freeman et al. 2021; Williamson 2020).

Bushfire Risk Assessment Tools in Australia

The Australian Standard AS3959:2018 (Standards Australia 2018), *Construction of Buildings in Bushfire Prone Areas*, provides the national metric for assessing the severity of bushfire risk – the BAL (bushfire attack level) rating. Calculating a building's BAL requires the following information for a property:

1 The Fire Danger Index (FDI) of the state/region.
2 Classified Vegetation Type(s).
3 Distance of site from Classified Vegetation Type(s).
4 Effective slope under Vegetation Type(s) calculated in degree, ratio, and percentage.

Slopes are further categorised as upslope, downslope, or a combination of upslope and downslope.

The assigned ratings are BAL-LOW, 12.5, 19, 29, 40, or FZ (Flame Zone), with increased BAL indicating a higher level of structural vulnerability. Once the BAL of a property has been measured, suitable construction regulations are applied to minimise the risks of ember attack and radiant heat exposure to the building. Figure 9.3 illustrates the level of construction required for the BAL zones.

In addition to the BAL rating, more consumer-facing bushfire risk assessment tools have been developed to extend beyond identifying surrounding hazardous vegetation to encompass property maintenance, building construction, and disaster management risks. These tools are developed and continue to be updated by state fire service and government agencies, CSIRO (Commonwealth Scientific and Industrial Research Organisation),[3] local council initiatives such as Climate Wise

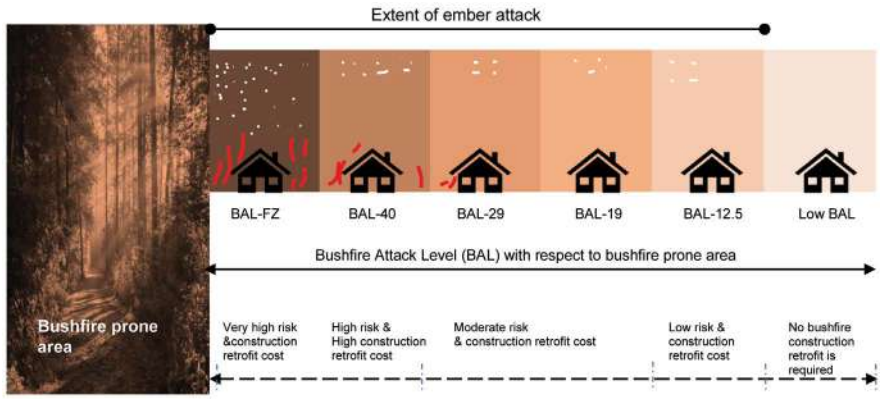

Figure 9.3 Visual representation of Bushfire Attack Level (BAL) assessments to frame the AS3959:2018 (Standards Australia 2018)

Communities,[4] and independent organisations such as the Resilient Building Council[5] (formerly Bushfire Building Council Australia). Using these tools to identify and eliminate multifactor risks can reduce or mitigate the impact of bushfire damage to bushfire-prone properties.

Identifying Hazardous Vegetation

Hazard reduction burns are common practice and managed by state fire services. However, it is still important for people in bushfire-prone areas to identify the proximity of their property to what has been classified as hazardous vegetation. The CSIRO BAL Calculator uses the AS 3959-2018 to generate a high-level assessment and visualisation of the risk of hazardous vegetation in relation to topography around a property (Figures 9.4 and 9.5). The NSW Rural Fire Service also published a Vegetation Classification Chart with photographic examples of the hazardous vegetation classified by AS 3959 (Standards Australia 2018). These tools are a starting point for individuals to self-assess before a fire consultant is engaged to make a certifiable BAL assessment.[6]

The FDI for NSW Local Government Areas is published by the NSW Rural Fire Services[7] and available to the public. For example, the FDI for Bega Valley NSW is 100, and by being away from the vegetation, the BAL level is 12.5, as shown in Figure 9.4, requiring lower retrofitting adjustments (see *lower construction requirements and costs* in Figure 9.3). On the other hand, the FDI for Queensland is 40, as noted in the AS3959 (Standards Australia 2018) (represented in Table 9.1) and also available to the public through road signs in the summer season and can be accessed online.[8] This low value of FDI equates to a lower BAL of 12.5. However, the proximity of vegetation to residential properties could raise the BAL to its highest levels, as shown in Figure 9.5, requiring costly retrofitting measures.

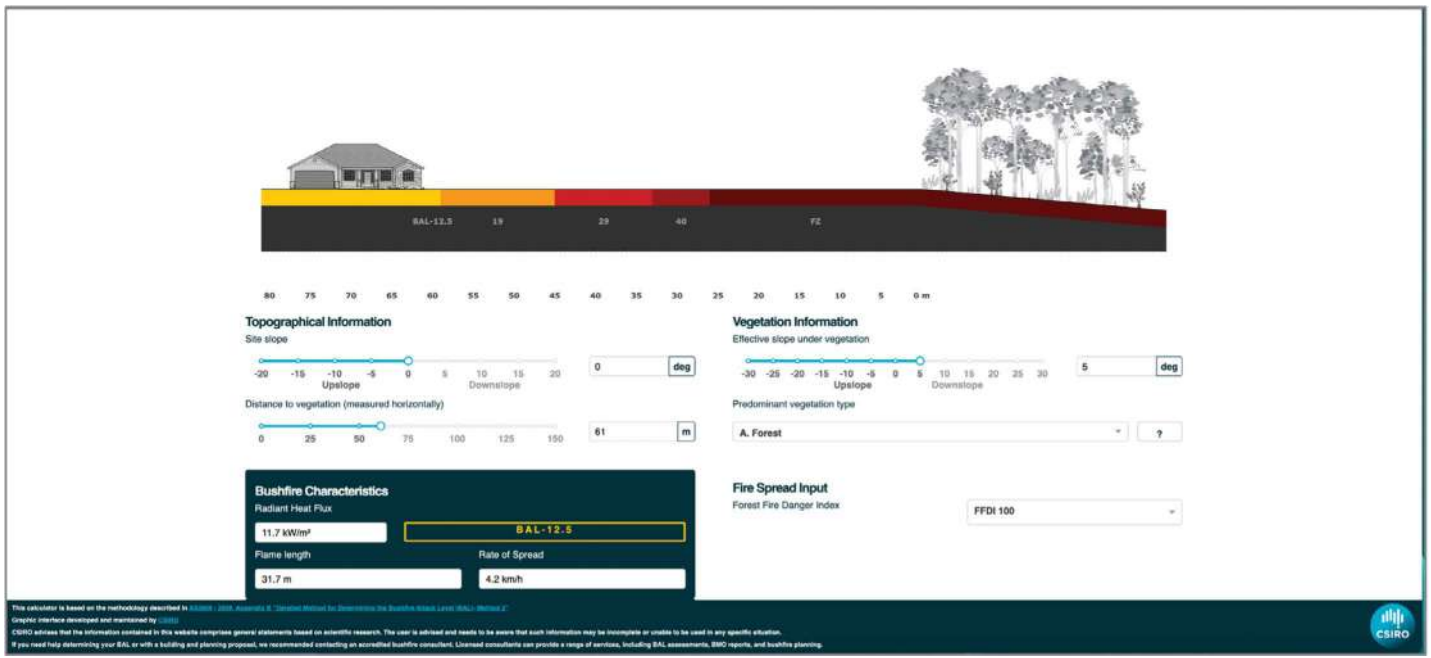

Figure 9.4 CSIRO Bushfire Attack Level Assessment Tool © Copyright CSIRO Australia, accessed 2023 to demonstrate BAL-12.5

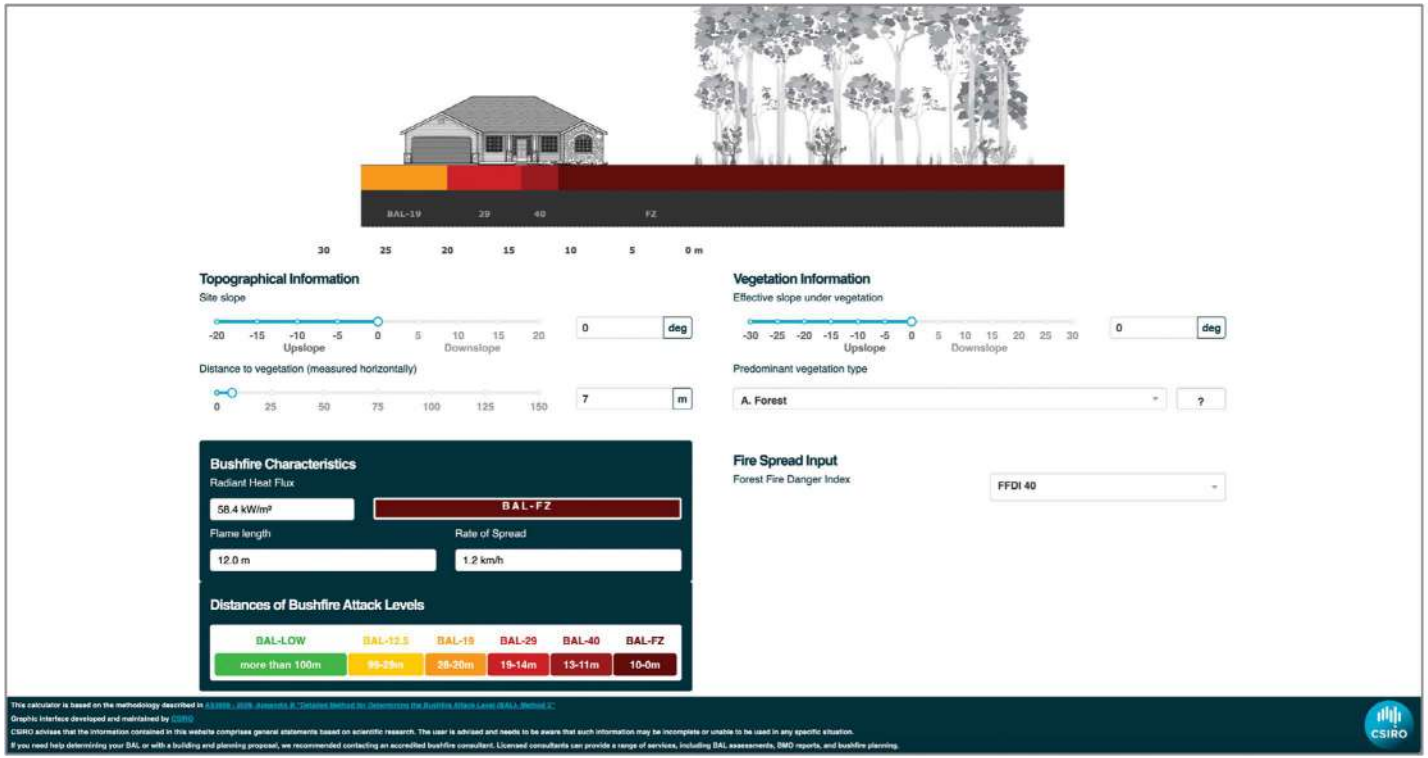

Figure 9.5 CSIRO Bushfire Attack Level Assessment Tool © Copyright CSIRO Australia, accessed 2023 to demonstrate BAL-FZ

Table 9.1 Representation of jurisdictional and regional values for FDI in AS3959 (Standards Australia 2018)

State/Region	*FDI*
Australian Capital Territory	100
New South Wales	
a Greater Hunter, Greater Sydney, Illawarra/Shoalhaven, Far South Coast, and Southern Ranges fire weather districts	100
b NSW alpine areas	50
c NSW general (excluding Greater Hunter, Greater Sydney, Illawarra/ Shoalhaven, Far South Coast, and Southern Ranges fire weather districts)	80
Northern Territory	40
Queensland	40
South Australia	80
Tasmania	50
Victoria	
a Victoria alpine areas	50
b Victoria general (excluding alpine areas)	100
Western Australia	80

Property Maintenance

Property maintenance plays a significant role in hazard reduction for people residing in bushfire-prone areas. In rural and remote areas of Australia where bushfires are prevalent, the dominant housing type is the single detached dwelling, which comes with land to manage in addition to the dwelling. The AS3959 (Standards Australia 2018) does not address risks and compliance at the property scale. Therefore, the supplementary guidance can be accessed from state fire services. Table 9.2 summarises the guidance reviewed to highlight the different house types addressed.

Table 9.2 Summary of the hazards and recommendations for property maintenance in bushfire-prone areas

Hazards	Flammable vegetation in and around the property
	Flammable vegetation debris
	Outdoor furniture
	Gas cylinders and valves
Recommendations	Maintain landscaping around the dwelling
	Unobstructed property access for firefighters
	Adequate water supply for firefighters, i.e., rainwater tanks, pool water, and hose reels
References	*Planning For Bush Fire Protection*, NSW Rural Fire Service, 2019
	Queensland Fire and Emergency Service
	Guide for applying the Bush Fire Risk Treatment Standards, Department of Fire and Emergency Services (Western Australia), 2020
	Fire Ready Kit, Country Victoria Authority, 2022

The NSW Rural Fire Service also identifies the need for an Asset Protection Zone (APZ), defined as "a buffer zone between a bushfire hazard and buildings", which would need to be maintained to reduce and manage potential fuel loads during a bushfire. This approach is consistent with the majority of recommendations from state fire services to clear all possible fire loads and hazards around the dwelling of a property. Queensland Fire and Emergency Services (QFES) (2021), Tasmania Fire Service (TFS) (2023), and the Climate Wise Communities (Cramp & Scott, 2019) online assessment tools ask the question of "leave or defend" to scale the level of preparedness required during a bushfire. For people who elect to leave, having an evacuation plan, notifying emergency contacts, and preparing a survival kit are essential in reducing risk. To defend, property owners will need to have adequate firefighting equipment as well as remove all possible fuel loads in and around the house as per the property maintenance guidelines identified.

A range of consumer-facing resources continue to be published to improve the resilience of both new and old housing stock in Australia against bushfire disasters. These resources adapt the AS3959 (Standards Australia 2018) building codes to provide more tailored information, visual diagrams and implementable actions for new housing stock and retrofitting older housing stock. The guidance for retrofitting varies from state to state as the dominant housing types vary. Table 9.3 summarises the guidance reviewed to highlight the different house types addressed.

The construction guidance for newly built housing, such as the *Fortis House model* (RBC 2020), includes construction details and material specifications in more depth than the retrofitting guidance, which is more generic to adapt to multiple housing types. People living in bushfire-prone areas can utilise these tools to self-assess and determine their level of risk, which will determine the level of retrofitting or protection required from bushfires. Although these tools are publicly available online, how they are promoted or distributed to at-risk communities needs to be further considered in evaluating the accessibility of the information they provide.

Usability of Assessment Tools

The Council of Australian Governments has identified the following key outcomes for community education around bushfire risks (Adapted from the National Strategy for Disaster Resilience (NEMC 2011)):

- Current information about disaster risk and mitigation, including relevant local knowledge tailored to different target audiences, is available on websites and in other forms.
- Strong networks across sectors and regions share information and build skills and understanding at all levels.
- Communities are supported through appropriately targeted training and awareness activities, including those that highlight volunteers' role in enhancing local capacity to mitigate and cope with disasters.
- Vulnerable individuals have equitable access to appropriate information, training, and opportunities.
- Compatibility of information-sharing technologies is promoted.

Table 9.3 Summary of retrofit toolkits and bushfire building guidance reviewed

Retrofit Toolkit	*Author/s, Year Published*	*Distribution Method*	*Intended Users*	*Disaster Types*	*House Types*	*State Of Origin*
Minderoo Climate-resilient Housing Toolkit	(CRJO 2020)	Online, hardcopy, and community outreach	Local government regions and consumers	Bushfire	weatherboard, old brick veneer, metal clad, newer brick veneer, and timber clad	NSW/ACT NATIONAL
Green Rebuilt Bushfire Retrofit toolkit	(Renew 2020)	Online and community outreach	Consumers	Bushfire	New build fire-resilient house	NATIONAL
Fortis House model	(RBC 2020)	Online and hardcopy	Consumers needing to rebuild because of bushfire property loss	Bushfire	New build fire-resilient house	NSW
One House model	(CRJO 2020)	Unpublished	Consumers and insurers wishing to reduce multi-hazard risks	Multi-hazard	New build fire-resilient house	QLD
Bushfire Best Practice Guide	(CSIRO 2020)	Online only	Consumers, building industry	Bushfire	Nonspecific	VIC, NATIONAL
Bushfire Resilient Building Guidance for Queensland Homes	(Queensland Reconstruction Authority 2020; CSIRO 2020; Leonard et al. 2020)	Online and hardcopy	Consumers, building industry	Bushfire	Two-storey slab on ground house, raised house on a sloped site, Queenslander house, partly raised timber and slab-on-ground brick veneer house	QLD, NATIONAL
A guide to retrofit your home for better protection from a bushfire	(Victorian Building Authority 2014)	Online and hardcopy	Consumers, building industry	Bushfire	Nonspecific	VIC, NATIONAL

It is essential to consider how vulnerable groups access information about bushfire risks and prevention guidance. The majority of bushfire guidance is available online, with further links to printable documents. However, there is also the need for adequate community outreach and engagement to distribute and promote this information.

Vulnerable Groups Affected by Bushfire Damage

During major bushfire events, certain groups of people are considered more vulnerable due to age, health status, socioeconomic conditions, mobility limitations, communication barriers, and access to resources (Australia Government 2018). These vulnerabilities can impact the ability of vulnerable people to respond to and recover from bushfire events.

It is important to identify the risks and limitations of vulnerable groups to provide inclusive and targeted disaster-resilient strategies. The United Nations Office for Disaster Risk Reduction's (UNDRR) *Sendai Framework for Disaster Risk Reduction 2015–2030* (UNDRR 2015) has identified culturally diverse, non-English-speaking communities, and isolated rural communities as being disproportionately affected during natural disasters. As such, engaging these vulnerable groups with disaster reduction planning efforts and access to educational resources is critical in building community resilience. Table 9.4 summarises the key risk factors of vulnerable groups.

In Australia, one in six people are over 65 (Australian Bureau of Statistics 2020), which aligns with the average global trend of an ageing population. Further, 34% of Australians over 65 live in rural and remote areas, defined as all areas outside of major cities (Australian Bureau of Statistics 2012), with a higher risk of bushfire exposure. Older Australians also have more compounding risks that may impact their ability to retrofit their homes and maintain their properties for disaster resilience.

Research Methodology

The above section discussed the challenges vulnerable homeowners face regarding retrofitting decisions in fire-prone areas. This research proposes a tailored bushfire retrofit assessment methodology addressing the multifaceted concerns encompassing the personal heritage, accessible design, building, construction, and landscape aspects. The research design adopted the embedded multiple case study design following replication logic (Yin 2017). This research design approach allows the use of multiple data sources to enable the researchers to cross-reference multiple interpretations and produce a reliable understanding of the phenomenon under investigation (Creswell & Poth 2018). The data collection methods included: 1) insightful focus group interactions with homeowners within New South Wales (NSW) and Queensland (QLD) local government areas (LGAs), 2) site visits to homeowners who are seeking to enhance the bushfire resilience of their homes, 3) conducting

Table 9.4 Summary of the key risk factors for vulnerable groups through a literature review of key disaster emergency policies

Vulnerable Groups	*Risk Factors*	*References*
Older People over 65	Chronic illnesses Cognitive illnesses Physical disabilities Limited access to resources Technological barriers Access to care and support	*Older people in emergencies: Considerations for action and policy development* (World Health Organization 2011)
People with Disabilities	Mobility limitations Cognitive limitations Limited access to care and support Lack of emergency plan	*Vulnerable People in Emergencies Policy* (Victoria State Government 2018)
Isolated Rural Communities	Access to resources Limited evacuation routes	*UN 2013 Global Survey Explains Why So Many People Living with Disabilities Die in Disasters* (UNDRR 2013)
Women	Gender bias Domestic violence Social inequity Financial disadvantages	"Understanding the experiences of women in disasters: Lessons for emergency management planning" (Chowdhury et al. 2022)
Culturally Diverse, Non-English-Speaking Communities	Language barriers Lack of familiarity with the local environment Access to resources	*Sendai Framework for Disaster Risk Reduction* (UNDRR 2015)

interviews with homeowners to gather their insights about retrofitting options, and 4) follow-up site visits and interviews with homeowners to discuss tailored bushfire assessment and retrofitting measures. These site visits aim to obtain a holistic comprehension of the prevailing conditions of the visited properties to propose a prioritised list of retrofit measures against bushfire hazards, establishing a foundation for informed decision-making and proactive protection. Figure 9.6 illustrates the data collection process.

Focus groups are commonly used to achieve predefined goals, such as evaluating community needs, devising policy strategies, or assessing consumer reactions to products (Stewart & Shamdasani 2015). Focus groups investigate group dynamics influencing individual perceptions and decisions while postulating that group interactions generate richer information than individual interviews (Kamberelis & Dimitriadis 2013). The research utilised two focus group workshops with residents over 55 in Bega and Noosa LGAs to understand local perspectives on climate resilience retrofitting, educate on available bushfire risk assessment resources, and build community relationships. These workshops also enabled ongoing engagement with participants as case studies for implementing the field study to develop the tailored bushfire retrofit assessment toolkit. Three

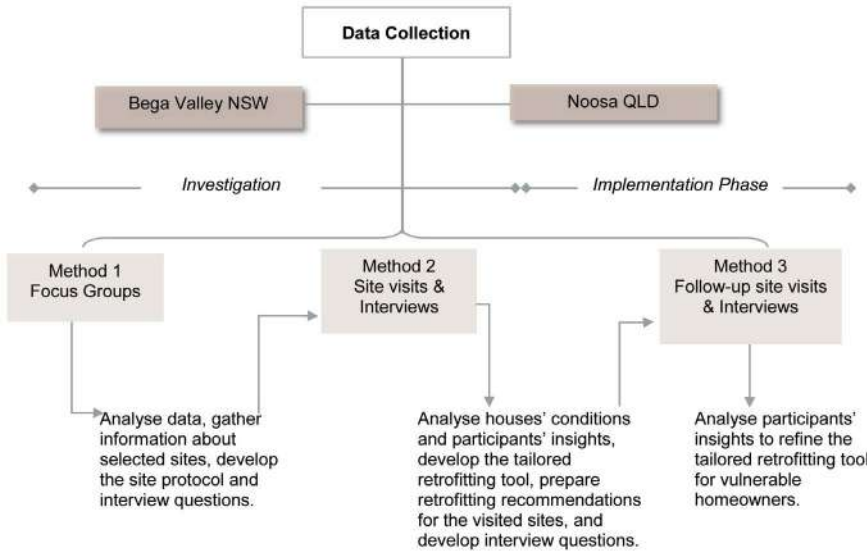

Figure 9.6 Data collection methods and process

homeowners from each focus group agreed to have their property assessed by the researchers.

Site visits adopted the structured observation approach that uses operational quantifiable dimensions to gather information about the unit of study (Mack 2005). After reviewing the toolkit shown in Table 9.3, a site data collection protocol was developed, including nine sections covering property details, roof and walls, windows and doors, subfloor, external features, outdoor area, garage, storage, and garden. Each section had a table listing the features, types, house condition, and existing gaps, and a page of reference photos to facilitate documentation. For example, pictures of the roof types commonly used in Australia are attached to the roof section. The protocol aims to help researchers capture the house condition, construction materials, and any hazardous vegetation around the property during the site visits. Interviews with the case study participants included four semi-structured open-ended questions to get insights about retrofitting, personal heritage, and disaster management. The interviews were conducted using a standard procedure (Patton 2002) to facilitate interviewing different participants more systematically. The focus groups, site visits, and interviews represent the research investigation phase. The next phase is the implementation phase, which will be conducted after the data analysis. The aim of the implementation phase is to 1) discuss with participants the retrofitting recommendations, 2) gather their insights on the usefulness of our tailored retrofitting guides, and 3) discuss future retrofitting plans. A more detailed discussion about the components of the tailored bushfire retrofit assessment toolkit is provided in the subsequent sections.

Personal Heritage Considerations

The fabric of people's homes and possessions embodies their personal heritage and identity, as well as that of their families. Fire can massively damage this heritage, either directly through burning or indirectly by depositing layers of soot that carry visual and olfactory reminders of the trauma of fire, which can trigger both physical illness and psychological trauma (Harms et al. 2021). Material possessions and environments trigger and support the recall of stories and memories and underpin the sharing of family and cultural practices such as cooking, faith-based practices, and celebrations. They facilitate the creation of links between generations through the use of handed-down family implements and the identification of intergenerational traits and talents (Woodham et al. 2017). This means that tangible, material heritage, as well as being significant for individuals and families, is also crucial to retrieving and perpetuating intangible heritage. This means that when tangible material heritage is affected by fire, the intangible aspects of personal and family heritage also suffer damage and loss.

Older people, particularly women, tend to fill the role of guardians of the past, often not just for themselves but for their extended families. Therefore, one home in a bushfire-prone area can be the storehouse for the personal heritage of a much wider group living in distributed localities. While some older people recognise this keeping role, others have not clearly articulated the importance of personal heritage to themselves and their families or thought through the range of items that constitute their personal "archives" (Woodham et al. 2017). Personal heritage items that are not used regularly can also be stored in "out of the way" places that are not well protected from fire and smoke.

Research compiled by Edge consultants during the development of the first iteration of the CRJO toolkit suggested that older Australians can be reluctant to invest in retrofitting their homes for bushfire resilience. Attitudes observed in the research included people assuming that their property is already sufficiently protected from fire, that the government will protect them, and that if anything should happen, they will be protected by their insurance (CRJO 2020). Recent events, however, have shown that most properties in fire-prone areas were not adequately protected and that the government of the day was ill-prepared to protect citizens in fire-prone areas. Insurance, for those who had it, did provide money to clean and rebuild homes, but in the aftermath of the 2019 fires, insurance has become vastly more costly and in some fire-prone locations unobtainable. Current insurance and building practices are also founded on the assumption that the material environment can be relatively easily replaced, if not by exact replicas of the past at least by analogues that are functionally as good, if not better. However, this ignores the importance of the past to wellbeing and the sense of alienation and defeat that can be caused by the loss of both significant individual items and the overall ambience of an environment that has been built, grown, and curated, often over decades, to express in tangible form the preferences, needs, and beliefs of the occupants of that environment (Miller et al. 1998). Merely replacing affected material with new fabric does not erase the impact of loss. In fact, it may erase the things that can

help people come to terms with their loss (Kousa & Pottgiesser 2020). This means that preventing damage to personal heritage is a vital part of maintaining personal and family resilience and through that, maintaining the capacity for people to be part of wider community resilience activities and processes. This research is therefore exploring the potential of personal heritage to provide older Australians with stronger motivation to undertake retrofitting on their homes, as it is a component of their lives that has a profound impact on the wellbeing of themselves and their families, and the impersonal structures of insurance-based repair and replacement cannot readily replace it.

Accessible Design Home Modifications

The majority of older housing stock in Australia has not been designed with any consideration to measures of accessibility and universal design principles (Carnemolla 2012). Although bushfires disproportionately impact older people and people with disabilities, current guidance on bushfire-resilient retrofitting is not tailored to the liveability considerations and capabilities of older people and people with physical disabilities.

In Australia, new principles for universal housing design are being introduced by the National Construction Code in the Liveable Housing Design Standard (LHDS). These design standards state that a universally designed house should "be easy to enter, be easy to move in and around, be capable of easy and cost-effective adaptation; and be designed to anticipate and respond to the changing needs of home occupants" (Ward, 2015). Although these standards only apply to new housing and have not been adopted by all states, they provide a clear framework for inclusive housing design and retrofitting.

Key standards in the LHDS include step-free entry access, corridor clearances of 820 mm, and modifications for accessible bathrooms. These standards ensure the ease of mobility around the house for older people, which can impact their movements during evacuation from emergencies. Home modifications that prolong the time older people can live in their homes and age in place can increase their sense of wellbeing and improve their health-related quality of life (Carnemolla & Bridge 2016). Being able to maintain a sense of independence as well as remain in their communities to access local support will likely contribute to the resilience of older people in bushfire-prone areas, though more evidential research is needed on this. There is potential to integrate home modifications for accessibility with retrofit recommendations for bushfire resilience for a more tailored approach for older people and people with physical disabilities.

Building, Construction, and Landscape

Single dwelling Australian homes are generally one- or two-storey timber or steel frame houses with typical external wall cladding of brick veneer, timber weatherboard, or fibre cement cladding, and roof cladding is either concrete or terracotta tiles or corrugated metal roof sheets (NCC 2022). Window frames are timber or

light aluminium, often accommodating single glass panes as thin as 3 mm, upgraded recently to a thicker glass pane of 5 mm, and double-glazed configurations to provide better protection against sunlight and heat (Bowditch et al. 2006). Costin (2021) mapped other common features of Australian homes, such as the raised floor structures enclosing the subfloor area with a vented short brick wall to allow for ventilation, either partially screened with timber battens or left entirely open. The veranda is often a timber or steel-framed deck with timber or polymer flooring. Other features related to the external cladding are the 450–600 mm wide eaves and more recent "eave-less" designs, timber or light steel fascia, eave soffits that are usually cement-sheet lined or timber-ventilated, and galvanised or prepainted steel gutters leading to above- or below-ground water tanks.

The building envelope type plays an important role in preventing ember and smoke incursion in fire-prone areas. Several studies highlighted that the ember attack significantly impacted homes lost in bushfires and sadly led to the loss of lives (Costin 2021; Shahparvari et al. 2019; Ullah et al. 2021; Whittaker et al. 2020). In high winds, ember penetration can affect houses even before fire flames arrive (Honey & Rollo 2011). While research mentioned that ember penetration into urban areas is harmful at a distance of 700 m from the fire flames, the 2003 Canberra fire records show that houses located 2 km away were severely affected by fire-generated wind even before the flame arrived (Ghaderi et al. 2020). Other studies argue that the ember attack alone cannot be held accountable for the damaged houses based on observations of undamaged houses adjacent to those secured from the attack (Honey & Rollo 2011). Ghaderi et al.'s (2020) and Honey and Rollo's (2011) research shows bushfires create weather phenomena, like fire tornadoes, and the presence of structures influences fire intensity and dynamics, which reshapes fire behaviour from steady heat to dynamic pulsations, uplifting vortices, and extreme airflows. As such, Costin (2021) and Roberts et al. (2017) argue that AS3959 (Standards Australia 2018) lacks comprehensive provisions for safeguarding houses against ember ingress during wind-driven fire events. For instance, the metal sheet roof cladding in older homes is frequently nailed rather than screwed, and newer homes often use pop rivets for capping and flashings instead of screws (Costin 2021). Even if sheeting or capping remains intact, gaps might form at sheet ends and overlap, allowing embers to enter (Costin 2021; Honey & Rollo 2011). These authors recommend 1) filling gaps between flashings and corrugating with non-combustible materials like rock wool and 2) fastening tile roofs mechanically, as they are commonly minimally secured or not tied down in areas with low wind.

Similarly, the external wall cladding in older homes with no sarking might have gaps in weatherboard overlaps, eave-to-wall junctions, and wall corners. These areas can be vulnerable to ember ingress due to upward ember movement (Honey & Rollo 2011). The AS3959 (Standards Australia 2018) requires the subfloor areas to be shielded by steel mesh and close-fitting battens, gaps or cracks in brick walls should be filled, and the junction between walls and main wall cladding should be inspected. Fascia, eave, and guttering areas are vulnerable to ember attack due to wind angles of 45–60 degrees from horizontal (Honey & Rollo 2011). Typically, soffits are non-combustible cement sheets, and gutters are galvanised or painted

steel. In high heat, steel might bend, leading soffit sheets to detach from the roof, creating gaps for embers ingress (Honey & Rollo 2011). The AS3959:201 (Standards Australia 2018) advocates using shutters or screens for windows and doors, however, the small gaps allowed in door frames for movement should be sealed with high-temperature-resistant seals as the standard rubber seals are insufficient (Costin 2021). Although the above discussed retrofit recommendations are considered extra measures based on studies conducted after the Black Summer Bushfires, applying these retrofitting options remains challenging due to homeowners' willingness and financial capabilities.

Utilising the multiple case study approach (Yin 2017), this research has the potential to explore the current conditions of specific types of houses and properties of older people living in bushfire-prone areas in Bega and Noosa, aiming to investigate the external cladding conditions and landscape surrounding the properties. As explained in the above sections, the type and proximity of the vegetation around houses are key factors in identifying the BAL and the required retrofitting measures. Therefore, building construction and landscape are assessed under the provision of the BAL assessment guidelines in AS3959:2018, *Construction of Buildings in Bushfire-prone Areas* (Standards Australia 2018). That is, each site will be assessed in terms of the surrounding effective slope, native vegetation, building materials, and construction features using multiple types of data, including 1) a property assessment protocol capturing the house design, building materials, and surrounding landscape, 2) collecting photos of the property to capture the condition and access route in and out of the property, and 3) conducting a 30-minute semi-structured interview with homeowners to further elaborate on perceptions towards retrofitting plans, personal heritage, and engagement with their local community.

Key Findings

To reduce the impact of ember attacks and enhance the fire resilience of residential structures, the following general and specific retrofitting practices are derived from the existing retrofit toolkits and bushfire building guidance mentioned in Table 9.3. These recommendations are classified below from minor to major in terms of effort and cost.

- Clearing vegetation near the house is essential. Large trees and eucalypts should be spaced apart to minimise the risk of fire spread.
- Clear gutters to prevent the accumulation of flammable debris.
- Relocate flammable items away from the home to reduce fire risk.
- Install sprinklers around the house to provide additional protection.
- Seal gaps in the roof and external cladding with steel wire mesh.
- Exposed plastic water storage tanks should be shielded with a barrier of corrugated iron.
- Close overlapping areas of different roof materials (e.g., concrete and terracotta tiles, metal roof sheets) in wall and roof cladding.

- Seal ventilation gaps with metal flyscreen and employ rockwool insulation for other gaps.
- Enclose the ground floor structure using steel cladding, fine steel mesh, or masonry materials (brick, stone, concrete blocks), with Zinc aluminium-coated steel for metal cladding.
- Use non-combustible eaves fascia and lining.
- Consider upgrading to aluminium frames for windows and doors to improve resilience to bushfires.
- Consider upgrading to 6 mm toughened glass as standard glazing for windows and doors.
- Use shutters to achieve a BAL-40 rating or install external steel wire mesh screens on all windows and doors if shutters are not used to prevent ember ingress to comply with BAL-40 standards,
- Consider upgrading verandas, patios, and decks to non-combustible materials like concrete or steel if they are connected to the house or situated within 10 metres of the house.
- Enclose open areas under decks using non-combustible materials such as masonry or steel mesh.

Conclusions

The frequency and intensity of megafires and bushfires are increasing globally. Australia is very vulnerable to bushfires. Various changes have been instigated to increase resilience to bushfire, from management of bushfire responses at state and local levels to the development of bushfire toolkits for homeowners to improve the resilience of their property. This chapter has explored and proposed the development of a retrofit toolkit to increase bushfire resilience and proposed a bushfire retrofit assessment toolkit tailored for older Australians as they represent 16.6% of the population, a percentage which is increasing. Older Australians have a higher vulnerability compared to younger people. Their physical and mental health may differ, their economic circumstances may be fixed, and their access to technology may be lower than others. Two case study regions, Bega Valley Shire in New South Wales and Noosa Shire in Queensland, were used to assess the suitability of available bushfire retrofit guidance to be adapted and implemented by vulnerable people in bushfire-prone areas.

Existing toolkits offer a set of resources to improve and inform decision-making. Residents need to consider what to protect and how to protect it. For example, the cost and protection of personal heritage within homes is important. Personal heritage has high personal value and can be hard to put an economic value on. The form of personal heritage is very variable in terms of size and scale, flammability, and so on. Different housing typologies, for example, brick construction compared to timber construction, have different responses to heat and fire. Furthermore, the age of the construction of the buildings reflects different standards in fire protection, which are increasing over time.

The top-down and bottom-up approaches in the management of bushfire resilience programmes highlights the different approaches and their respective strengths and weaknesses. The main strength of national programmes is the level of support provided and adherence to national standards, whereas the local programmes tend to be more personalised to that community and location and have higher community engagement. Significantly, Indigenous-led cultural burning is gaining traction in the bottom-up scale of management. Existing bushfire risk assessment tools are described and the ways they increase protection and reduce risk. Existing state-level property maintenance recommendations take into account local housing typologies and highlight the target audience, different disaster types, and different formats for distribution.

A weakness for some people is that most materials are distributed online which may not be easily accessible to older people or those who have English as a second or third language. Furthermore, many toolkits are not targeted at minority groups. Accessibility is more important for older people and bushfire impacts mobility impaired people more than others. New housing adopts the latest standards; however, many existing houses are less suited for access and retrofit is desirable.

The chapter concluded with a critical review of the typical specifications for housing in Australia and the standards, materials, and construction methods adopted. Importantly, in bushfire evaluation the surrounding landscape needs to be considered, as presence of flammable materials in external areas will increase fire danger. The variety of materials and methods that are used over time, plus the adaptations and alterations undertaken by owners, make bushfire retrofit a challenging and multifaceted decision. Rarely are two houses the same in respect of fire protection and vulnerability, in addition the physical and mental health of the occupants impacts their safety. Whilst current standards reflect best practice constant re-evaluation is needed as the climate changes.

The methodology adopted for the development of the toolkit for older Australians focusses on a minority group who are vulnerable. The research design involves focus group workshops and site visits and interviews to gain a deep understanding of their situations and the form a toolkit would need to take to meet their specific needs. Existing toolkits are designed for the general public not a minority group.

The political and practical implications are that, at state and federal level, elections occur every few years and groups with different political views may come to power. Consequently, the amount of funds attached to programmes and the support for them can vary. The quality and impact of the toolkits will improve over time as practical guidance becomes more available for more targeted and informed decision-making. The increasing incidence of these destructive climate-induced fire events makes this work essential.

Notes

1 https://rbcouncil.org/resilience-ratings/
2 https://madrecovery.com/
3 https://www.csiro.au/en/research/disasters/bushfires
4 https://climatewisecommunities.com.au/

5 https://rbcouncil.org/resilience-ratings/
6 https://best-practices-assessment-tool.herokuapp.com/
7 www.rfs.nsw.gov.au/site-search?query=FDI&collection=nsw-rfs
8 https://research.csiro.au/bushfire/assessing-bushfire-hazards/hazard-identification/fire-danger-index/

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10 Building Urban Resilience for Coastal Urban Communities: The Surprise of Tsunamis with Consideration of Human Factors

Azin Fathianpour, Mostafa Babaeian Jelodar, Barry Evans, and Suzanne Wilkinson

Tsunamis: Unpredictable and Devastating Forces of Nature

Tsunamis are wild cards, often referred to as "tidal waves," are natural disasters of unparalleled destructive power (Fathianpour, Evans et al. 2023b). These massive waves have the potential to cause significant destruction along coastal areas, leaving behind a trail of devastation, injuries, and fatalities. Understanding the dynamics and impact of tsunamis is crucial for disaster preparedness and response. In this section, we delve into the destructive effects of tsunamis on human life and property, drawing from historical data to underscore the severity of these events (Couling 2014).

Tsunamis come in two primary forms: distant and local. Distant tsunamis are typically triggered by earthquakes occurring thousands of kilometres away from the coastline. These waves traverse vast ocean expanses, taking several hours to reach coastal areas (IBAWORLDTOUR 2023). For instance, as shown in Figure 10.1, the tsunami triggered by the 1960 Chilean earthquake took approximately 12 hours to reach New Zealand's east coast, 14 hours to reach Hawaii, 15 hours to reach Australia's south-east coast, and over 20 hours to reach Japan and Asia. While they may lose some energy during their journey, distant tsunamis are still formidable in scale. When they finally make landfall, they can inflict substantial damage and casualties, though to a lesser extent compared to their initial force (Chacon-Barrantes & Arozarena-Llopis 2021, Fathianpour, Wilkinson et al. 2023b).

Conversely, local tsunamis are born from events much closer to the coast, within a few hundred kilometres (Fraser et al. 2014). These tsunamis can strike with little warning, arriving at the shore within minutes of their inception (Zaki 2017). For instance, a tsunami generated by an earthquake from the Hikurangi subduction zone can reach the coast in just 7 minutes (Figure 10.2). The proximity of their source magnifies their destructive potential, resulting in significant harm and damage to immediate coastal areas (Chacon-Barrantes & Arozarena-Llopis 2021; Fathianpour, Wilkinson et al. 2023b).

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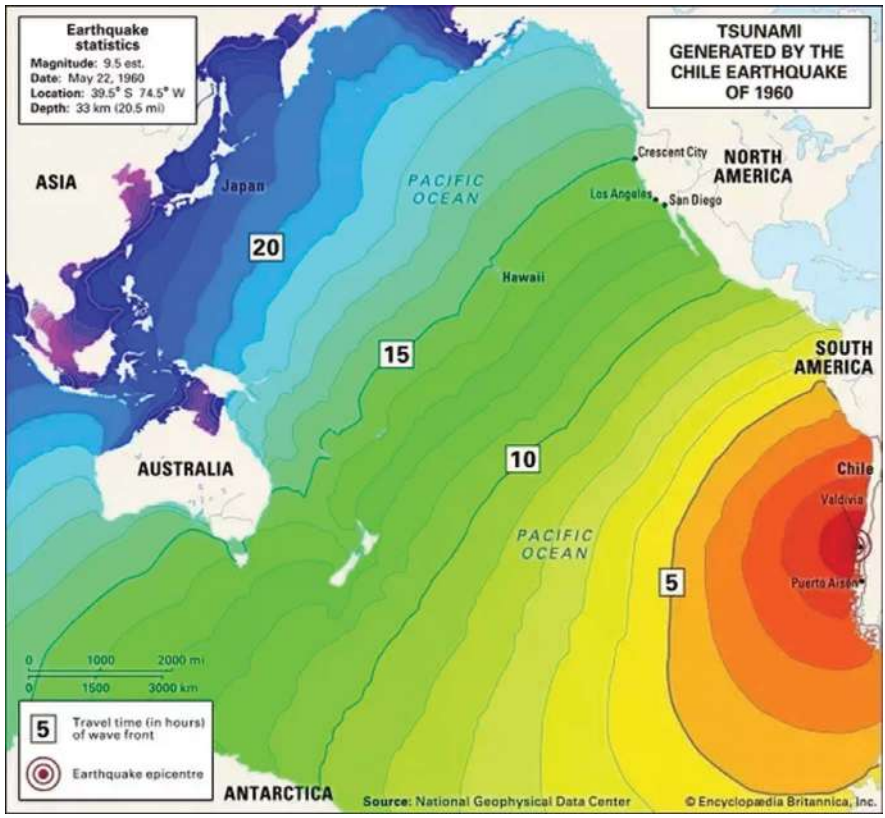

Figure 10.1 Distant tsunami arrival time, adapted from News5 2021.

Impact of Tsunamis on Human and Built Environment

Assessing the impact of local tsunamis can be particularly challenging. Unlike distant tsunamis, where damage and casualties are often distributed across vast areas, local tsunamis often strike with a devastating blow in a concentrated region (Darienzo et al. 2005). This concentration of destruction can make it challenging to separate casualties and damages based on the events that caused them, especially when the earthquake's epicentre is near the coast. In such cases, the immediate casualties associated with the earthquake and the subsequent tsunami may be reported as a single figure (Fathianpour, Wilkinson et al. 2023b).

Tsunamis are characterised by their low probability but high impact. These unpredictable giants of the sea can obliterate entire coastal communities, resulting in widespread injuries and fatalities (Takabatake et al. 2018). The energy carried by a tsunami wave is so immense that it can destabilise individuals, causing them to fall and hindering their escape to safety (Imamura et al. 2012). The consequences can be dire, with injuries and death being potential outcomes. Historically, there have been numerous tsunami events associated with severe casualties.

Figure 10.2 Local tsunami travel time, generated by the author

Figure 10.3 shows the tsunami distribution across the globe. The data represents the tsunami source, severity, and death toll (NCEI n.d; Gusiakov 2020).

One of the most devastating tsunamis in recent history occurred in December 2004 when the Sumatra–Andaman earthquake triggered a massive tsunami in the Indian Ocean. This catastrophic event resulted in a staggering 227,899 reported deaths or missing individuals (Gusiakov et al. 2019). Similarly, the Tohoku earthquake and tsunami that struck Japan in 2011 left a grim legacy, with 18,487 recorded deaths, 6,157 injured, and 2,594 people reported as missing (Murata et al. 2018). These tragic statistics serve as stark reminders of the destructive power of tsunamis (Fathianpour, Wilkinson et al. 2023b).

In light of the historical data and the profound impact of tsunamis on human life and the built environment, it is evident that proactive measures are essential to mitigate the devastating consequences of these natural disasters (Suppasri et al. 2013; Reid & Mooney 2023). In the following section, we will explore strategies and methodologies for reducing the risk posed by tsunamis and enhancing urban resilience.

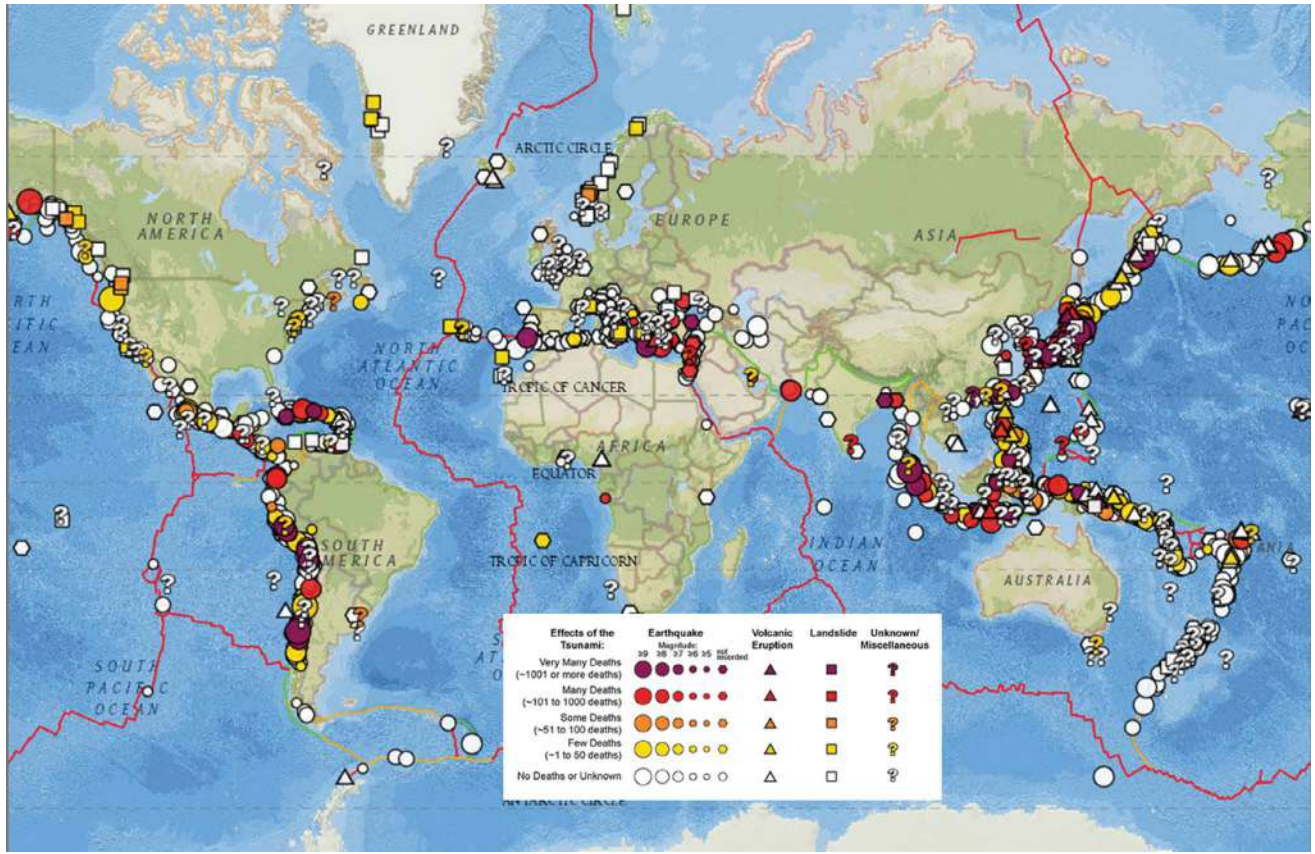

Figure 10.3 Historic tsunami, data adapted from NCEI n.d.

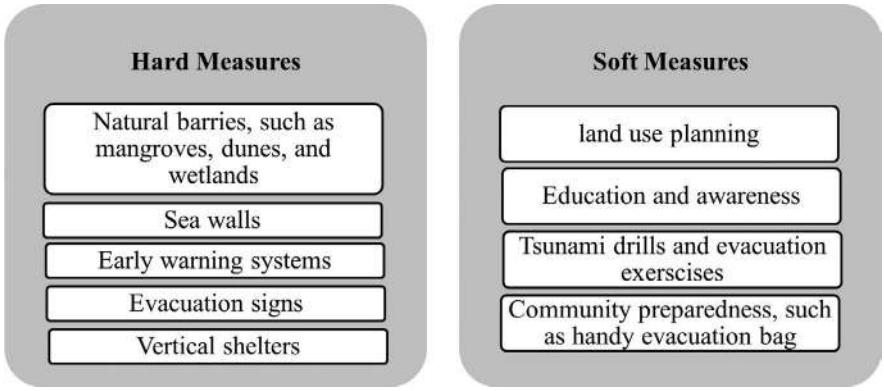

Figure 10.4 Tsunami risk reduction measures

Tsunami Risk Reduction Approaches

The heightened risk of tsunamis to both human lives and the built environment is compounded by the short notice time associated with local tsunamis. Nevertheless, a well-crafted risk reduction and preparedness strategy has the potential to significantly mitigate the threat to people and the built environment. In recent decades, practitioners and stakeholders have shown more interest in collaborating and enhancing their urban resiliency toward tsunamis (Fathianpour & Wilkinson 2023).

Diverse risk mitigation measures have been identified worldwide. As shown in Figure 10.4, two categories of risk reduction approaches have emerged to mitigate the impact of tsunamis: hard measures and soft measures (Takabatake et al. 2020). The former involves physical infrastructure and technology, such as natural barriers, sea walls (Nateghi et al. 2016), early warning systems (Teshirogi et al. 2009), evacuation signs (Lonergan et al. 2015), and vertical shelters (Mayasari et al. 2021). In contrast, the latter encompasses strategies that focus on education (Dengler 2005), awareness and community preparedness, including land use planning and tsunami drills (Dhellemmes et al. 2016).

Challenges in Tsunami Emergency Planning

Planning for tsunamis has always been a formidable task for decision-makers, particularly regarding local tsunamis with their short notice times (Fathianpour & Wilkinson 2023a). The challenge in tsunami risk reduction lies in assessing the effectiveness of each measure and determining the most optimal solution (Anggraini & Koestoer 2023).

However, it's important to note that no single measure can be considered a silver bullet solution. Tsunamis, renowned for their devastating force and sudden onset, necessitate a comprehensive and balanced approach that leverages both hard and soft measures to mitigate their impact effectively.

The risk reduction methods are discussed in this section and a summary is provided in Table 10.1. These measures are classified as hard and soft measures and cover a range from creating natural barriers to safety drills; in addition, the strength and limitations of each measure is included. In coastal risk reduction, natural barriers like mangroves and wetlands provide sustainable protection by absorbing wave energy and ecological benefits like habitat preservation and carbon sequestration

Table 10.1 Strengths and limitations of risk reduction measures

Measure	*Strengths*	*Limitations*
Hard Measures		
Natural Barriers	Sustainable and self-maintaining	Not present or effective in all coastal areas
	Offers ecological benefits	Takes time to establish and mature
		Requires protection and preservation efforts
Sea Walls	Provides immediate protection	Expensive to build and maintain
	Can prevent inundation and erosion	May disrupt natural coastal processes
	Relatively low-maintenance	Attracts more people to live on coast, subsequently increasing the number of people exposed to a higher tsunami wave height
Early Warning Systems	Provides advance notice for evacuation	Relies on efficient communication and response
	Utilises advanced technology	False alarms or system failures can erode trust
Evacuation Signs	Cost-effective and easy to implement	Alone, insufficient without education efforts
	Provides visual guidance	
Vertical Shelters	Can be located in dense populations and low access to natural safe zones	High cost to build or even certify
		Poses reliability for emergency management teams
Soft Measures		
Land Use Planning	Reduces exposure to tsunamis	Implementation and enforcement challenges
	Minimises construction in high-risk zones	Balancing development needs with risk reduction
	Saves lives and reduces property damage	Potential conflicts with stakeholders
Public Education & Awareness	Fosters a culture of preparedness	Maintaining interest and engagement can be hard
	Educates communities on tsunami risks	Overcoming language and cultural barriers
	Increases public awareness	
Tsunami Drills & Exercises	Familiarises communities with evacuation routes	Requires resources and coordination
	Identifies and addresses weaknesses in plans	May not involve all community members

(Osti et al. 2009). However, their effectiveness depends on their presence and maturity, limiting their applicability (Tanaka et al. 2011). Engineered sea walls offer immediate defence against tsunamis but come with substantial construction and maintenance costs and potential disruptions to natural coastal processes. Also, *sea walls* can inadvertently foster overconfidence and encourage more people to settle along the coast, which, in turn, amplifies the risk when faced with a tsunami of greater magnitude (Parady et al. 2019).

Early warning systems are crucial for timely evacuation, yet their success requires efficient communication and maintenance to avoid eroding public trust due to false alarms. Evacuation signs, while cost-effective, depend on integrated education efforts to convey their significance effectively to all individuals. Vertical shelters are strongly advisable for vulnerable populations, such as the elderly and children, who may have difficulty evacuating to natural safe zones or for cities which do not have easy access to natural high ground (Wood et al. 2014). They also offer a cost-effective solution when strategically placed in densely populated areas. Nevertheless, although they have been embraced by residents and implemented in various cities as their preferred choice (McCaughey et al. 2017), a noteworthy drawback arises from the reluctance of local officials to formally designate specific structures as safe zones, frequently citing concerns regarding their dependability (Fathianpour, Wilkinson et al. 2023a).

On the other hand, *land use planning* is a critical soft measure that effectively reduces community exposure to tsunami risks by limiting development in high-risk coastal areas, thereby saving lives and reducing property damage. Nevertheless, its implementation and enforcement can be challenging due to political, economic, and social factors, highlighting the need to balance development needs and risk reduction goals (Puppim de Oliveira & Fra.Paleo 2016). Public education and awareness campaigns play a pivotal role in fostering a culture of preparedness, educating communities about tsunami risks, and increasing awareness, empowering individuals to make informed decisions during a tsunami event (Bandecchi et al. 2019). Also, tsunami risk awareness practice needs to be carried out by emergency management practitioners. Wehrle et al. (2022) introduced a tool called "serious games" designed to create a controlled and structured platform for meaningful discussions among decision-makers. Serious gaming is recognised as a valuable research instrument that enhances stakeholders' *situational awareness*, thereby contributing to enhancing infrastructure resilience and its evaluation (Table 10.1).

However, maintaining public interest and engagement can be challenging, particularly among tourists from regions with rare tsunami occurrences and those from foreign-language-speaking countries. This underscores the need for concerted endeavours to surmount language and cultural barriers to achieve effective outreach (Nguyen et al. 2018). *Tsunami drills and evacuation exercises* offer practical training, familiarising communities with evacuation routes and procedures, ultimately reducing panic and confusion during actual events while enabling the identification and rectification of response plan weaknesses (Chen et al. 2022) (Table 10.1).

It is clear that each of these tsunami risk reduction measures has its own merits and limitations, emphasising the importance of a multifaceted approach (Takabatake et al. 2020). Natural barriers, sea walls, early warning systems, and evacuation

signs all offer valuable contributions to mitigating tsunami risks, but none can single-handedly provide comprehensive protection. With their destructive power and unpredictable nature, tsunamis necessitate a strategic amalgamation of hard and soft measures to minimise their impact effectively. Only a well-managed, integrated plan can harness the strengths of these measures while mitigating their respective limitations (Alexander 2002). Furthermore, a resilient city necessitates a risk reduction strategy and demands a pragmatic response plan (Table 10.1).

The response plans for tsunamis vary depending on the distance between the earthquake's epicentre and the coastline. In cases of local tsunami risk, immediate evacuation is typically recommended as the primary response. New Zealand recommends local tsunamis as soon as you feel a long and strong earthquake, wait for the shake to be over, and then evacuate to the high ground or far inland (HBEM 2021).

The evacuation plan should be evaluated to assess its practicality and identify potential risks. A valuable approach for evaluating evacuation plans, including identifying potential enhancements and making optimal recommendations, is through the use of simulations (Takabatake et al. 2020; Fathianpour, Babaeian Jelodar et al. 2023). The simulation of the evacuation process depends on various factors (Aguilar et al. 2019). To ensure evidence-based results, it is essential to quantify and prepare the relevant factors as input data (Fathianpour & Wilkinson 2023).

Effective Factors in Evacuation Processes

Various factors, such as individual reactions, risk perception, and response stages, significantly influence how people respond when faced with the threat of a disaster like a tsunami. The success of evacuation plans hinges on accurately representing these behavioural attributes in simulation models. Data on how people recognise risks, their actions, and their movement patterns during evacuations is essential for developing effective emergency response strategies (Arce et al. 2017).

Numerous studies have explored the multifaceted nature of human reactions during the onset of an impending tsunami. When people face a disaster like a tsunami, their reactions can vary significantly. How each person typically behaves and responds in such situations influences these variations. People do not all react the same way when confronted with a disaster; their responses can differ. Their characteristics and behaviours influence these responses and the specific circumstances at the time disaster strikes (Yasufuku et al. 2017; Yamato et al. 2019).

Makinoshima et al. (2020) have systematically categorised these behaviours into four stages: risk recognition, response activity, evacuation movement, and additional activity and evacuation stages. An essential element in understanding these responses is how individuals process information during the early notification stages of evacuation. Diverse backgrounds and psychological predispositions contribute to different perceptions of tsunami risk. Even when residents share a similar level of awareness, they make distinct choices concerning evacuation. The level of risk awareness, often shaped by the reception of risk education and information, significantly impacts individuals' evacuation behaviour. Recent tsunami evacuation management practice emphasises the crucial role of community leadership in assisting residents during evacuations (Payne et al. 2020). Unfortunately,

tourists, who may lack local knowledge and understanding of warning signs, are often overlooked in evacuation planning. Tourists can be more vulnerable to disaster events than permanent residents due to their unfamiliarity with the area and limited access to information (Fathianpour, Wilkinson et al. 2023b).

Additionally, the influence of group behaviour, as noted by Harnantyari et al. (2020), is substantial; high awareness among residents, coupled with witnessing others evacuate, has proven instrumental in saving lives during past tsunami events. Overall, Fathianpour and Wilkinson (2023) state that the behavioural factors in the evacuation process can be summarised as:

> (1) resident reaction time, (2) resident moving time, (3) tsunami awareness, (4) provided evacuation training, (5) time of day the tsunami occurs, (6) the preferred mode of evacuation, (7) the possibility of rerouting to pick up children or elderly relatives, (8) motivation to evacuate, (9) seek help from their family and friends, (10) confusion in choices, (11) risk of disorientation.

Their research can be used to categorise the behavioural attributes in tsunami evacuation (Figure 10.5).

The time it takes to react and move swiftly becomes crucial in local tsunami evacuations due to the short notice provided before the tsunami wave arrives. Individuals must recognise that a delay in taking action may result in an inability to reach safety on time. Therefore, the ability to recognise the signs indicating the necessity for evacuation becomes important (Fathianpour & Wilkinson 2023), with witnessing others evacuate being a highly effective trigger that reduces disorientation and enhances overall survival rates (Payne et al. 2020), corroborated by Harnantyari et al. 2020.

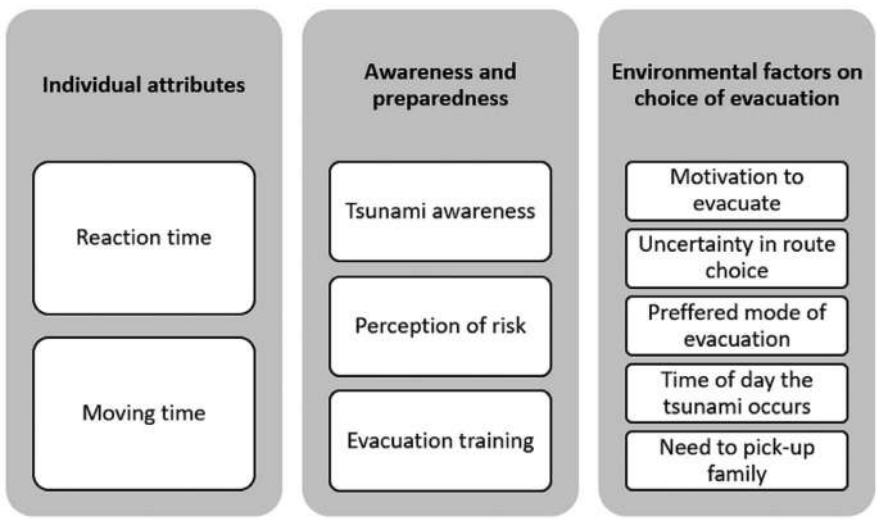

Figure 10.5 Effective factors in evacuation processes

Although tsunami awareness and evacuation training are known to reduce the risk of disorientation (Wachtel et al. 2021), real-life situations following an earthquake often lead to less predictable responses due to overwhelming emotions, consistent with findings by Wei et al. (2017). Nevertheless, it is essential to maintain and sustain training and awareness programmes, as they serve as vital instruments in consistently fostering a heightened perception of tsunami risk and encouraging individuals to evacuate. Additionally, these training programmes can catalyse individuals to select the most appropriate evacuation mode (Fathianpour & Wilkinson 2023).

The timing of a tsunami event is another significant factor, as it varies based on individuals' locations, affecting their decision-making and the visibility of evacuation route signs. Ensuring the visibility and comprehensibility of route signs is crucial. Evacuation route signage should utilise non-linguistic symbols and graphics, considering that tourists and foreigners may not be fluent in the country's native language. During daytime, when people are at work or school, there may be a tendency to detour to pick up family members, potentially delaying evacuation. Conversely, at nighttime, when people are sleeping, the level of consciousness to make an evacuation choice diminishes, further compounded by reduced visibility of evacuation route signs, potentially leading to individuals getting lost even if they attempt to evacuate (Lonergan et al. 2015).

Evacuation Simulation: A Decision-Making Tool

In recent years, there has been notable progress in developing various evacuation models designed to simulate evacuation processes during emergencies. *Evacuation simulation models* are primarily categorised into three main types: microscopic, mesoscopic, and macroscopic. Microscopic models excel in simulating individual interactions among agents, making them suitable for capturing detailed behaviours, such as pedestrians' route choices and varying walking speeds. Mesoscopic models, which yield simulation results based on gridded areas, are less frequently used for large-scale evacuations due to diminished accuracy as the size and density increase. In these models, areas are divided into cubic sections connected by nodes. These models primarily focus on tracking changes within the grid cells rather than the movement of individual agents. The accuracy of the model decreases depending on the grid size and scale. Macroscopic models, on the other hand, focus on crowd movement density but lack the granularity of microscopic models.

Hybrid models, like Pathfinder and Exodus, do not neatly fit into these categories; they combine elements of both microscopic and macroscopic approaches, offering a broader perspective. In urban-scale evacuation simulations, diverse models are available, each with unique assumptions and methodologies. These models necessitate geospatial network data, routing information, and behavioural conditions to simulate evacuation scenarios effectively. Moreover, the evacuation models need to be specialised for tsunamis, as most existing models are geared toward fire evacuation, with tsunamis requiring different considerations, such as reaching high ground. Table 10.2 summarises the reviewed evacuation simulation models used in tsunami evacuation planning.

Table 10.2 Reviewed evacuation simulation models used for tsunami evacuation planning

Evacuation Simulation Model	*Characteristics*	*Modelled Entities*	*Reference*
Cellular automaton	Microscopic model with discrete elements.	Pedestrian	(Kirchner & Schadschneider 2002; Vranken et al. 2021)
Agent-based	Microscopic model simulating individual agents with various characteristics	Pedestrian, Vehicles	(Chen & Zhan 2008; Lumbroso & Tagg 2011; Nakanishi et al. 2020)
Social force	Microscopic model considering social forces and interactions	Pedestrian, vehicles	(Makinoshima et al. 2018; Zhang & Fu 2022)
MSEM	Micro-simulation, continuous in time and space	Pedestrian and cars simultaneously	(Fathianpour, Evans et al. 2023b)
Pathfinder	Hybrid model combining microscopic and macroscopic elements – not on urban-scale	Pedestrian, vehicles	(Guo et al. 2022)
Exodus	Hybrid model incorporating rule-velocity- and acceleration-based approaches	Pedestrian, vehicles	(Filippidis et al. 2020)
SUMO	Microscale simulation of evacuation processes considering pedestrians and cars	Pedestrian, vehicles	(Lopez et al. 2018)
Particle swarm optimisation	Microscopic model, focuses on pedestrian movement	Pedestrian	(Izquierdo et al. 2009)
Fluid dynamic	Macroscopic models, where large-crowd group movements are modelled with non-linear partial differential equations – no interactions between agents considered	Any type of agent	(Hughes 2003)
Queuing models	Macroscopic model, based on representing the movement of pedestrians as a flow on a geometry graph	Pedestrian	(MacGregor Smith 1991)

These evacuation models can function as an evacuation time predictor, providing information on the time it takes for individuals to reach safety, the path they would take, and their ultimate destination. However, few models are designed to provide input on multiple purposes, such as evaluating the effectiveness of existing transportation networks, informing strategic resource allocation for long-term infrastructure upgrades to bolster a city's resilience against tsunamis, and preparing for catastrophic scenarios. Furthermore, these models prove invaluable in assisting decision-makers by providing insights into formulating more efficient evacuation plans drafted for emergencies. Therefore, the next step is to translate the simulation data into evidence-driven recommendations.

MSEM: A Simulation Platform for Mass Evacuation

Among all evacuation models mentioned above, the Micro-Simulation Evacuation Model (MSEM) is a sophisticated tool designed to simulate and analyse the evacuation process during emergencies, with a particular focus on tsunamis where immediate mass evacuation is required. Developed using Python and integrated into the SUMO platform, MSEM operates on an agent-based model, treating individuals as autonomous agents with distinct characteristics and behaviours. This unique approach provides a comprehensive understanding of how people react and make decisions during evacuations, making MSEM an invaluable asset in disaster preparedness and response efforts.

MSEM utilises various input data to initiate simulations and make informed assessments. The primary input data include geospatial information, encompassing details of the physical environment, such as road networks, buildings, hazard zones, and safe zone locations. This spatial data is fundamental for creating a realistic simulation environment. Additionally, MSEM incorporates individual attributes of evacuees, including mobility, familiarity with the environment, and specific behavioural parameters. This data enables MSEM to simulate how different individuals respond to evacuation scenarios. This event-specific data, such as the time the evacuation triggering event (e.g., an earthquake) occurs, serves as the basis for initiating the simulation and assessing the time-sensitive nature of the evacuation. Another specific aspect of MSEM is that it simultaneously considers pedestrian and vehicular evacuation by considering the interactions between pedestrians and cars.

Therefore, the normal traffic on the road at the time of the evacuation is critical input data into the model. Furthermore, MSEM acknowledges the influence of the topography. This is particularly relevant because safe zones are predominantly situated in elevated areas, and the varying road slopes can impact the speed at which individuals move during evacuations. MSEM can also incorporate behavioural aspects of individuals, including group evacuations, passenger load per vehicle, and rerouting options during high traffic congestion. Figure 10.6 is an example of required input data used to assess the resiliency of the Napier City evacuation plan using MSEM (Fathianpour, Evans et al. 2023a; 2023b; 2023c).

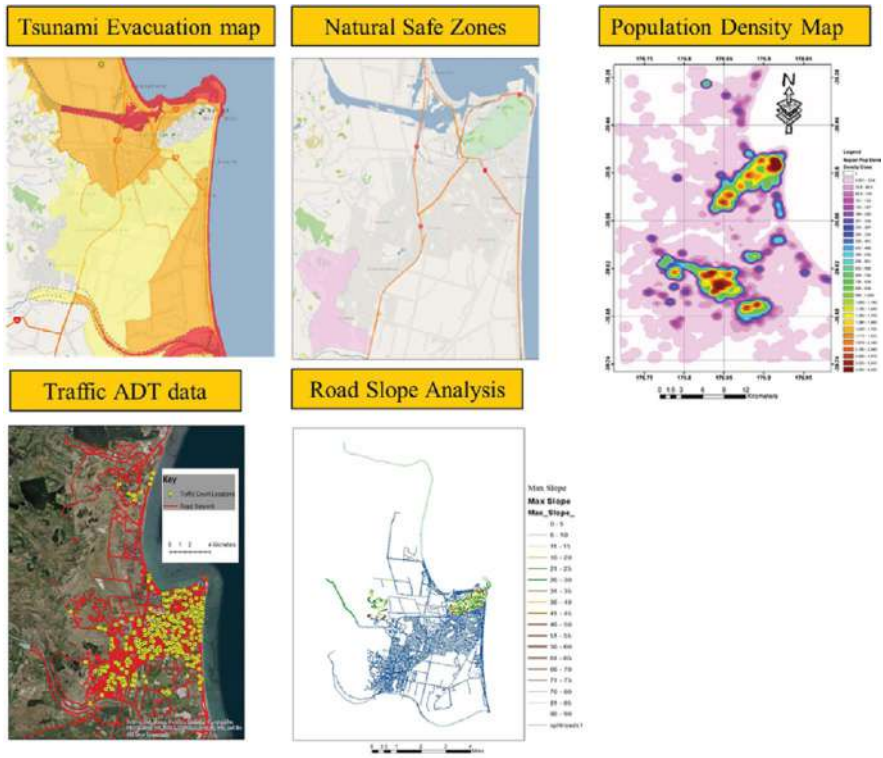

Figure 10.6 Example of required input date for MSEM: case study of Napier City, New Zealand, adapted from Fathianpour, Evans et al. 2023b

MSEM's simulation process involves several key components and calculations. It simulates the behaviour of individual agents (evacuees) based on their attributes and the evolving situation. Each agent autonomously decides on actions such as selecting evacuation routes and reacting to changing conditions. The model also considers predefined safe zone locations where evacuees should reach during an evacuation. It calculates the time required for each individual to reach the nearest safe zone, utilising shortest-distance algorithms. There are a few algorithms developed in this area, such as Dijkstra and A-star. The A-star algorithm is famous for its fast simulation process (Krajzewicz et al. 2012). This algorithm considers various factors, including the time it takes to reach a specific node from the starting point (denoted as g(n)) and a heuristic function (h(n)), estimating the cheapest path from that node to the destination. It operates on weighted graphs and starts from a specific node, searching for the path with the lowest cost (f(n)). The analysis iteratively examines all possible shortest paths from a starting location to safe zone boundaries, ultimately selecting the shortest route that adheres to permitted road and vehicle travel directions (Fathianpour, Evans et al. 2023a; 2023c). This calculation provides insights into evacuation timeframes and potential bottlenecks. Additionally, MSEM accounts for people following others as a trigger of evacuation.

The utilisation of MSEM generates valuable outcomes and insights. It offers a detailed perspective on individual behaviour during evacuations, facilitating a deeper comprehension of various agents' responses to disaster scenarios. While the evacuation simulation model outputs data on individuals' paths, including the edges travelled, start times, and arrival times, this information alone does not provide practical input for emergency management strategies. Therefore, these findings must be translated into actionable policies.

Translating Simulation Output to Decision-Making Factors

This section intends to bridge the gap between simulation data and practical policy recommendations for enhancing tsunami evacuation processes. Therefore, a structured framework is employed to evaluate the effectiveness of these evacuation processes (Figure 10.7) (Fathianpour, Evans 2023).

Survival Rate

At the heart of this evaluation lies the crucial survival rate metric, which serves as a barometer of a successful evacuation. Factors influencing survival rates include the safety of evacuation locations, pre-disaster preparedness, and the time it takes for individuals to initiate and complete evacuation.

A survivor is defined as an individual who successfully reaches a safe zone ahead of the approaching tsunami wave. To determine survival, the time it takes for individuals to reach safety is compared to the expected arrival time of the tsunami wave. The individual is considered a survivor if the travel time is shorter than the anticipated wave arrival. The survival rate is then calculated as the percentage of people who successfully evacuate and reach safety out of the total population at risk (Fathianpour, Evans et al. 2023c).

Transportation Network Capacity

The capacity of the transportation network emerges as a pivotal determinant of the success of an evacuation plan. It dictates the maximum number of individuals

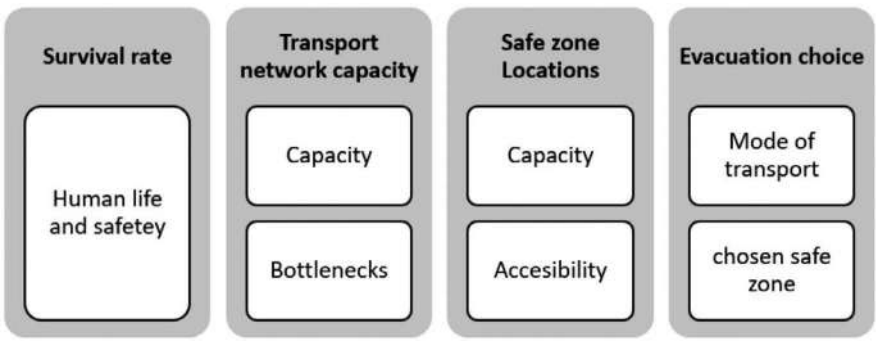

Figure 10.7 Evacuation simulation translation framework

or vehicles that can be accommodated within a specific timeframe. Notably, the capacity of individual lanes within the transportation network significantly impacts movement speed, which, in turn, affects the overall outcome of the evacuation. Finding an equilibrium between an effective transportation system and cost-efficiency is of utmost importance. Identifying road capacities and potential bottlenecks helps guide informed decision-making regarding transportation network investments, ensuring optimal allocation of resources (Liu et al. 2021).

A usage-based scoring model calculates the capacity of the transportation network. This method ranks the roads based on how often they are used. In this system, the most-used road receives a score of 1. Subsequent items are then assigned higher scores in ascending order of usage frequency (Fathianpour, Evans 2023c).

Safe Zone Capacity

Safe zone locations within urban areas constitute another critical aspect of evacuation. These safe zones can be shelters, elevated terrain, or far inland areas. The availability of multiple safe locations with increased capacities plays a pivotal role in reducing the average evacuation time (Birkland et al. 2006, Sun & Sun 2019). Historical data underscores the importance of offering diverse evacuation options, such as vertical evacuation centres in low-lying areas, as this correlates with higher survival rates (Suppasri et al. 2013). However, the design and evaluation of shelters must consider their locations and anticipated demand to prevent overcrowding, which can potentially create secondary disasters during evacuation (Muhammad et al. 2017).

The safe zone's accessibility and location are investigated based on the percentage of individuals who reach each safe zone. A balanced distribution indicates a sustainable and well-placed safe zone arrangement where a similar percentage of individuals reach each safe zone. Conversely, if one safe zone consistently has a low percentage of arrivals, it may signal inaccessibility due to traffic congestion. In such cases, establishing a vertical evacuation centre at a midway point to ensure timely access is recommended (Fathianpour, Evans 2023a).

For instance, in the safe zone capacity in vertical evacuation, the number of evacuees reaching the zone is the main driver to identify if the safe zone is out of capacity. If the number of people reaching each safe zone is more than the identified capacity of the building, the safe zone would be known to be out of capacity.

Individual choices made during the evacuation process also considerably affect its effectiveness. Decisions regarding actions to take, destinations to reach (Wang et al. 2016), and the mode of transportation to employ (Wood & Schmidtlein 2012) all influence the overall evacuation strategy.

Precise simulation models are invaluable tools for decision-makers and emergency management officials, offering insights into network upgrades and shelter locations that can minimise delays and improve survival rates. While various simulation projects have been undertaken to capture survival rates in evacuation scenarios, the challenge lies in translating these findings into practical policies and procedures. MSEM tends to overcome that challenge by leveraging simulation results to evaluate the efficiency of current evacuation processes and

infrastructure and propose improvements based on the evacuation simulation results. The goal is to identify potential weaknesses in the existing infrastructure and highlight areas where improvements can be made. This research seeks to continually empower policymakers, emergency planners, and communities to enhance their tsunami evacuation plans by translating simulation outputs into actionable decision-making factors.

Conclusion

In summary, despite the various risk reduction approaches available for tsunamis, it is essential to scrutinise the suitability of each and formulate a comprehensive risk reduction strategy. Simulation emerges as one of the most effective means to assess the emergency management plan. As evacuation is an inevitable response to local tsunamis, evacuation simulation is the preferred method to evaluate what is needed to enhance the resiliency of a tsunami-prone community.

The Micro-Simulation Evacuation Model (MSEM) is a powerful tool that employs agent-based modelling to simulate and assess evacuation processes during emergencies, particularly in tsunami scenarios. It utilises input data encompassing geospatial information, individual attributes, and event-specific data to provide insights into behaviour, safe zone allocation, and communication dynamics. The outcomes include the time and path each individual would take to reach safety. This model comes with additional features to enhance the translation of the simulation output to policy and strategies.

Translating simulation outputs into decision-making factors is instrumental in strengthening tsunami evacuation processes. Survivability rates, transport network capacities, safe zone locations, and individual evacuation choices are criteria for assessing evacuation processes. By integrating simulation data into policy recommendations and infrastructure improvements, communities can better prepare themselves to mitigate the devastating impacts of tsunamis and safeguard the lives of their residents.

This insight aids in crafting more effective evacuation plans and response strategies. By simulating different scenarios, MSEM helps decision-makers allocate resources strategically. It also offers insights into the most efficient evacuation routes and timing, allowing decision-makers to optimise evacuation plans, reduce congestion, and improve overall safety. Lastly, MSEM can be utilised for realistic training and drills for emergency responders and the public, helping participants become familiar with evacuation procedures, communication protocols, and resource utilisation.

Practical Orientations

Overall, the findings of this study have emphasised that to build resilience for human and built environment, it is important to consider the following practical considerations:

- Language barrier – tsunami evacuation signs must be nonlinguistic
- Tsunami awareness and evacuation training are top priorities in any tsunami-prone city, and simulation models are a great tool for evacuation training

- Evacuation management is a subjective matter to the area; different strategies for different suburbs
- The choice of evacuation mode significantly impacts the resiliency of the evacuation plan
- Vertical evacuation is recommended for highly dense areas located far from natural, safe zones

Overall this study has proposed a valuable tool (MSEM) to assist emergency management officials to draft an evidence-based plan for the reduction and readiness' phase of the 4 Rs of resilience (Reduction, Reediness, Response and Recovery).

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11 The Resilient Urban Environment at All Levels and with All Its Actors

Saija Toivonen

Introduction

We live in a VUCA world, where a variety of crises can emerge and take place as evidenced throughout this book. The typical characteristics of a VUCA world include volatile changes, lack of predictability, the complexity and interconnectedness of impacting forces and an ambiguity that thwarts us from developing a holistic understanding of prevailing and forthcoming situations (Bennett & Lemoine 2014; Heinonen et al. 2017; Karjalainen et al. 2022). This book demonstrates that crises are often caused by, experienced in and potentially coped with by the built environment. In countless ways, space and land play an important role in establishing the basis of our self-resilience, complemented by the surrounding neighbourhoods and communities and by the interplay between public and private places and actors. Therefore, the built environment should be seen not merely as a physical means to build resilience but also as a toolbox with a variety of possibilities – private and public, micro and macro, quick and slow, easy and demanding, cheap and expensive, immediate and long term – that contribute to the promotion of holistic resilience. This chapter ties together the various parts of this book and reinforces its main message: imagine possible futures and be prepared!

After the introductory part of this chapter, Covid-19 is cited as a case example of the central role of the built environment in a crisis situation. Next, the nature of future crisis impacts on real estate, space and land use are analysed and their further implications discussed in relation to their subjectivity, determining compensation and their connection to real estate market dynamics. The basis on which we can build resilience to future threats is then described, and a summary is provided of practically oriented solutions and action plans that aim to develop the holistic resilience of the built environment. This chapter refers to other chapters of the book but also introduces aspects that have not been previously covered.

The Built Environment in the Era of Constant Crises and Uncertainty

At the end of 2019, the Covid-19 virus commenced its fatal spread and continued until it had grown into a pandemic that disrupted the daily lives of people around the world. In many ways, the situation seemed beyond control, but diverse means

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of managing and surviving were nonetheless proposed and urgently implemented. Suggestions were given and regulations established by public authorities, but, ultimately, significant responsibility was placed on individuals who implemented the given instructions according to their own capacities, aspirations and premises.

One of the main countermeasures adopted during the Covid-19 crisis was restrictions on physical interactions between people, as it was hoped that the recommended physical distancing would restrain the virus. In addition to their direct impacts on the spread of the virus, these restrictions had dramatic consequences on the built environment when space-use patterns changed quickly and dramatically. In response to the recommendation to work from home, a massive number of companies and their employees changed their working habits almost overnight. Previously, only 15% of employees in the EU had experienced remote working, a number that leapt to 40% of the workforce because of Covid-19 (Eurofound 2020). This also meant that workers who were not keen on working remotely had no choice, and work tasks that were not typically deemed suitable for working from home were relocated to private home environments (Toivonen et al. 2022).

This unprecedented, crisis-driven transformation in space use not only placed great pressure on the performance of workers and their families but also challenged physical settings and spaces alike. The multifaceted results were also witnessed in the real estate market environment (Toivonen et al. 2023). The entertainment and hospitality sectors faced challenges. The restrictions related to leisure activities, global travel and new working habits influenced not only the service sector and office use but also transportation, travel and people's overall physical activity patterns, leading to secondary impacts that were also experienced in the built environment. Many previously lively spaces were muted. At the same time, while some spaces were abandoned, others in the built environment become even more crucial than before the pandemic. First, more capacity was needed to support pandemic management, and spaces were converted into, for example, testing centres or temporary hospitals when space demand for these activities increased sharply. Also, public green spaces and multilocal living arrangements grew in popularity as people escaped crowded homes that lacked flexibility and did not necessarily offer possibilities of spending time outdoors (Pelsmakers et al. 2021). The digitalisation of everyday activities well demonstrated the importance of communication technology and virtuality as effective crisis solutions but, interestingly, also underlined the importance of physical location and the quantity and quality of physical spaces.

During the pandemic, many private homes turned into fortresses for coping with the crisis situation. This meant that homes became the central place for all everyday activities, including study, leisure and paid and unpaid work. As more time was spent at home, a greater variety of activities were conducted in the home environment, and spaces were simultaneously shared among several family members or with no one. As a result, the impacts were dichotomous: some spaces became overcrowded, whereas other people dealt with a heightened feeling of loneliness. This unique "human experiment" enabled the population to personally and concretely experience the limitations and pitfalls of existing space and land use as people were required to adapt to and cope with the circumstances that the built environment

provided them in a crisis situation. This book demonstrates that many possible crises are actually experienced at home or influence home environments. In our observation, crisis impacts that involve negative effects on home environments are perceived especially strongly (also see Hasu 2017; Tervo 2021). We argue in this book that issues related to social sustainability should be highlighted when planning urban resilience against future crises.

While the fight against the Covid-19 pandemic was still ongoing, two more crises – the war in Ukraine and the electricity crisis – crashed onto the scene, creating a polycrisis situation that further challenged societies. The built environment also played a significant role in both these new crises. In Ukraine, the war's massive destruction of the built environment was experienced as exceptional economic, emotional and cultural losses when the national wealth that was bound to the real estate stock vanished and people lost their homes and had to flee from their neighbourhoods. Also, the electricity crisis caused vulnerabilities because it challenged the ability of low-income households to sufficiently heat and use other energy services at an affordable cost.

These latter crises concretised once again, from the crisis management point of view, the ultimate vulnerability of the built environment, as real estate is immovable. The current building stock is locked to its location, meaning it must meet the conditions and consequences of crises, whatever they might be, and it is expected that future crises will challenge the resilience of the real estate stock even more. Many of this book's chapters underline flexibility as an important feature of resilience. Flexibility can relate to the amount or quality of space, to the capacity of space to be converted to different purposes and to its ability to simultaneously host several distinct space users. Flexibility can also be connected to the flexibility of real estate-related laws, market procedures and agreements as well as flexible crisis management plans. One of the more extreme suggested remedies is portable buildings (Toivonen 2011; also see Chapter 4).

Crisis Impacts on Real Estate, Space and Land Use and Their Further Implications

In addition to being the culprit in the creation of several crises, the built environment is often heavily impacted by the crises that take place in society and the market environment. Space and land users are further impacted via the consequences experienced in the built environment as demonstrated throughout this book. In other words, there is a lot at stake.

The real estate business is typically considered a high-risk field. Risk is usually seen as the potential for economic loss due to, for example, factors related to business, finance, liquidity, inflation, tenants, management, interest rates, legislation and the environment (Brueggeman & Fisher 2011; Kaleva et al. 2017). Risks in the real estate field are often considered by dividing them into property-specific risks and market-specific risks (Wilkinson & Reed 2008). The risk associated with achieving the intended economic performance is managed in various ways, for example, by testing the sensitivity of the multiple components influencing

the future cash flows produced by the real estate in question. Thus, uncertainty regarding future developments and their impacts is a central and inherent element in real estate economics and when, for example, determining the value of real estate. However, the actual forces behind the possible negative outcomes of the components impacting future cash flows are not fully acknowledged or analysed (Toivonen & Viitanen 2015).

During the RESCUE project, it was shown that a great variety of crises can indeed have an impact on the built environment and the real estate market environment (Tähtinen et al. 2023). As the relevant crises are diverse, their possible impacts also vary. They may have material or immaterial consequences, and their appearance, duration, magnitude and scope can vary. The impacts on real estate may be experienced as the first-, second- or third-level impacts (etc.) of a crisis. In one study, Tähtinen et al. (2023) analysed 128 possible future crises and their possible impacts. According to the findings, crises' possible impacts on real estate can be divided into soft and hard impacts based on the nature of the experienced influence. Hard impacts include instant or gradual physical damage to building materials and structures and the unavailability of real estate-related systems, such as water, sewage, energy and transport infrastructure. The consequences affecting the quantity and quality of supply and demand are also included among the hard impacts. In addition, hard impacts have consequences on particular built environment elements that are related to, for example, food systems, manufacturing, healthcare, recreation, defence, education and green infrastructure. These elements have wider societal roles, so impacts on them are especially pertinent.

Soft impacts include impacts on the formal and informal institutional framework related to the built environment. They may, for example, relate to property rights or responsibilities. Soft impacts also include perceptions regarding safety, real estate value and the availability of tangible and intangible resources and services (e.g. know-how and maintenance). Clearly, many of the soft and hard impacts are connected to one another. What is most surprising is that, despite the great number of crises and their varying characteristics and origins, it has been possible to identify joint themes for potential crisis impacts. Consequently, rather than following the outdated tradition of focusing on a limited number of crises and building probabilistic, crisis-specific preparedness, we can and should promote "overarching" resilience to combat future crises regardless of their nature. In other words, by implementing crisis solutions that respond to the joint themes of the identified crisis impacts, the built environment could assist in fighting against several distinct crises, even simultaneously.

Subjectivity and Locality of Crisis Impacts

Some future crises are local, and their impacts are relevant only for a limited geographical area, whereas many crises have the potential to generate global consequences. At the same time, many of the crisis impacts are globally comparable, with physical destruction of the built environment and a high level of vacancy as examples. This book presents case studies and examples of resilience building

from many parts of the world, including Australia, Canada, Denmark, France, Finland, Japan, Sweden, Nepal, the Netherlands, New Zealand and Nigeria.

Crisis impacts depend on the observers, their agendas and the observers' existing circumstances and are consequently subjective and local (see Chapters 3, 4 and 5). The real estate market environment embraces a variety of actors, including ordinary households, office workers, real estate owners, firms occupying spaces and public sector representatives. They all have their own aims and aspirations concerning space and land. For example, a participant in one of the RESCUE project workshops argued that the "surveillance society" and its impacts should not be considered as negative developments, even though the RESCUE researchers had earlier identified them as a future crisis based on the conducted literature review. This participant pointed out that surveillance can, for example, increase safety and the feeling of safety. Thus, the same impact can be experienced very differently depending on the physical and mental capacities and standpoint of the observer as well as on the built environment and the overall society in which the crisis is experienced as discussed earlier.

This is in line with the view of Pursiainen (2018), who considers both exposure and vulnerability when defining and estimating risks. In other words, a given crisis impact can be addressed easily in one place, whereas identical crisis impacts may be devastating in another. As discussed above, a variety of vulnerabilities have been identified in the built environment context during recent crises, when an identical crisis was found to have different primary and secondary impacts depending on the physical setting where it was faced. This can be very concretely experienced with, for example, natural disasters. Typically, people who are already in a vulnerable situation before the disaster are hit hardest by a crisis, and the built environment is not able to protect them as it should. Furthermore, those who have fewer resources may lack opportunities to relocate as pointed out by Ira Verma in Chapter 2. This has an impact on their futures resilience.

Crises Impacts on Real Estate Market Dynamics

This book makes clear that many crises impact both the supply and demand of real estate. For example, pandemic countermeasures or the shrinkage of cities can change space demand patterns (Chapters 7 and 8). The supply of space can also decline instantly due the destruction wrought by natural disasters, such as earthquakes, wildfires and tsunamis (Chapter 9 and 10). The primary impacts of destruction may remain local, yet the changes in market dynamics caused by the crisis may be experienced both in the crisis area and in neighbouring areas and even other countries. For instance, the war in Ukraine caused massive destruction of buildings in certain parts of the country but also had far-reaching spatial impacts related to, for example, the demand for both emergency and long-term accommodation.

In addition to affecting the quantitative supply and demand of real estate, crises can change the qualitative preferences of real estate market actors (Toivonen et al 2023) as happened when, due to Covid-19, high-density areas lost their

popularity as people sought safety in less crowded places to avoid exposure to the virus (Liu & Su 2021; Rosenthal et al. 2022). Similarly, waterfront areas may be deemed unfavourable places to locate if the risk of future floods is expected to increase, and apartments with south-facing balconies may be avoided in preparation for a warming climate. This means that crises and even the fear of a possible crisis have the power to change even deeply rooted preferences related to the built environment and real estate.

The crisis impacts influencing real estate market dynamics that are described in this chapter make evident another vulnerability related to the real estate market environment: its inflexibility. Rapid changes and responses are often required in crisis situations, causing pressure and challenging the fundamental characteristics of the built environment. Because construction takes time, creating new space is inherently slow, making it difficult for the real estate stock to respond to rapid increases in space demand. Similarly, getting rid of vacant space is no simple matter for reasons such as complicated environmental, legal, social, cultural and economic considerations. In addition, it has been shown that even slowly developing phenomena, such as the shrinkage of cities, complicate the capability of building stock to respond to the changing demand for space and land (Kiviaho & Toivonen 2022; 2023). Thus, the current built environment cannot easily respond to either quickly emerging crises or the challenges of slowly developing ones. A typical result is increased levels of vacancy, the deterioration of building stock and a downturn in real estate value, which further weakens the private and public economic base and results in inefficient space use with several severe consequences (see more in Chapters 7 and 8, which propose possible solutions to crisis-induced vacancy and provide tools and global examples).

Compensating Crisis Impacts

One option for coping with crises is to transfer the risk of negative impacts to be borne by someone else (Berg 2010). For example, the 9/11 attack increased the popularity of terrorism insurance among real estate owners, but it did not seem to have long-term impacts on real estate preferences per se, such as a tendency to avoid skyscrapers or other monumental buildings (Toivonen et al. 2023). In the future, when the number and complexity of crises is expected to increase, the need for built environment-related insurance will also grow. One of the more pressing challenges is represented by areas that have already experienced a crisis and are therefore deemed to be at greater risk of another, which is especially the case in areas prone to natural hazards, such as floods and wildfires. These areas may be avoided by both space users and investors, making it difficult to sell or lease real estate in these areas. The perception of the potential risk may also prevent real estate owners from obtaining insurance or loans when insurance companies and financiers are unwilling to deal with real estate located in an area with a crisis history. This naturally negatively impacts the value of the real estate in question. As the number of such areas and such real estate increase in the future, the urgent question will be how and by whom these risks will be borne. Furthermore, how will

we compensate real estate losses that are experienced not only due to a crisis that has occurred but also due to the fear of a crisis yet to take place?

In recent years, natural hazards have caused a massive destruction in the built environment. Covid-19 did not result in an instantaneous physical destruction of space, but it may have initiated slow deterioration due to growing vacancy and falling real estate value. After the Ukraine war, there will be a tremendous need to reconstruct the destroyed built environment. This will also underscore very challenging questions regarding the assessment of crisis impacts, in this case, the war losses related to the built environment. It must be determined who will be compensated and how the value of compensation will be defined. In addition to the primary impacts (e.g. physical destruction of buildings and infrastructure), will the secondary and tertiary impacts be covered, including, for example, business losses related to the built environment? Because the built environment constitutes a significant amount of both private and public capital and greatly affects the surrounding society, these questions will be pivotal.

Building Resilience to Future Threats

The first step in crisis management is to identify possible threats and build preparedness for them (Pursiainen 2018). As recent years have demonstrated, crises come in many forms and sizes. Chapter 1 discussed at depth the definitions, categorisations and characteristics of crises. There is no lack of definitions of crisis but rather an absence of holistic understanding in viewing the landscape of possible futures threats. Historically crisis management has concentrated on a limited number of crises that have been identified as significant regarding the magnitude of their potential impacts (Tähtinen et al. n.d.). Crisis management has also traditionally focused on crises that are deemed probable in the prevailing situation and based on historical development. Examples of crises typically considered probable can include periodic crises, such as floods. By contrast, the impacts of slowly developing, creeping crises may be more difficult to detect and therefore attract less attention and not necessarily be included in crisis management actions.

It also seems that previously experienced crises are more often deemed risks meriting preparation for the future than crises that have not been previously experienced (e.g. a zombie apocalypse). Our past crisis experiences and local knowledge impact our views of possible future crises, our futures crisis consciousness and, therefore, our futures resilience (see more in Chapters 2–4). In the past, for example, building fires were common and often related to the daily and domestic use of fire. Now, building-based fires occur less often than in the past, but we still typically prepare for them in many ways, such as ensuring the safer use of fire, choosing fire-safe building materials and structures, developing appropriate micro and macro layouts, ensuring the availability of fire emergency equipment and training space users in proper evacuation skills. Another example of history-inspired preparedness comes from Finland, which, due to its geographical location and past experiences of armed conflict, has long prepared for war by including civil defence shelters in the built environment (see more in Chapter 2). Such preparations have

taken place even though, at least before the Ukraine war, the likelihood of foreign invasion had been considered rather small. According to Ira Verma (see Chapter 2), this is explained by local memory, indicating that personal experiences of crises affect perceptions of the probability of crises recurring in the future. In connection with this, Anahita Rashidfarokhi promotes benefitting from the past experiences of local people and Indigenous knowledge when preparing for crises (Chapter 3).

Assuredly, evaluating and learning from past events is a crucial part of crisis management and resilience building as pointed out by several authors of this book. However, existing crisis management draws criticism for being too narrow-minded and backward-looking and consequently lacking a far-reaching perspective that would enable better preparedness for possible future threats – including novel and unprecedented crises – and promote the consideration of prolonged and indirect impacts. In the future, possible crises are expected to grow in number, in their interrelations and in their complexity (Castaño-Rosa et al. 2022; Iloniemi & Limnéll 2018; PwC 2021). This will make future crises even more challenging to assess and contain. As demonstrated in the chapters of this book, several future crises are connected to today's megatrends, such as climate change, urbanisation, ageing, digitalisation and segregation. Because the real estate market environment is tightly connected to society and its diverse forces of change (Toivonen & Viitanen 2015; 2016), future crises will also be relevant in this context, and the built environment will be exposed to new types of risks. An important notion is that the crises for which we should be prepared originate, emerge and exist in a variety of domains of society (Tähtinen et al. n.d.). This challenges all actors in the built environment to broaden their scope of understanding of possible future threats and encourages us to abandon the siloed, short-sighted and narrow-minded approaches favoured in the past.

Crisis management and the identification of possible future threats in particular are challenged by the great diversity of possible crises (see more in Chapter 1). Some are connected to the forces of well-known megatrends, which typically have broad, significant impacts, whereas others are born from less acknowledged forces, such as wild cards and black swans (Heinonen 2013; Hiltunen 2010; Petersen 1999; Taleb 2007). Despite their differences, both megatrends and wild cards can potentially bring radical future impacts (Kuusi & Kamppinen 2002; Hiltunen 2010), so both are important to consider when aiming to add resilience to the built environment. As pointed out before, increasing complexity will challenge probability-based resilience building. In addition to their probability and significance, the pace of development differs between crises. Some future crises may appear suddenly, whereas others have a longer development path. Creeping crises challenge our ability to detect underlying events and driving forces that slowly create societal pressure before reaching a breaking point. As discussed above, the built environment has already faced difficulties in responding to both slowly developing and instantaneous crises.

In addition to natural disasters, such as earthquakes and floods, it seems that in the future we will increasingly face slowly developing, creeping crises that challenge the capacity of actors in the built environment. We must also recognise that

such forces are relevant from the built environment point of view. For example, the significant increase in mental health problems has been identified as one of the more pressing challenges endangering our society (see Chapter 4, thesis 10). Another phenomenon, which is termed a new "pandemic", is obesity. At first glance, both these crises may seem irrelevant in the built environment context, but this is not the case; in the future, the central role of space and land needs to be recognised and harnessed to promote building holistic resilience against a variety of crisis born in diverse domains of society. The built environment can, for example, bring people together, create interaction and fight against marginalisation and alienation. It can also encourage physical movement and activity instead of a sedentary lifestyle. The built environment should be more often recognised as a proactive tool. When a crisis has already taken place, even more input may be needed to cope with its impacts. After a crisis, there may be an increasing need for modifications that require more resources and cause environmental impacts.

Even though future crises differ by such factors as their nature, origin, duration and scope, many are still interlinked. This means that the direct impacts can easily and rapidly lead to secondary and tertiary consequences, even without, for example, geographical or administrative boundaries or other restricting elements. As a result, a crisis can be universally relevant despite its originally limited geographical or field-specific place of origin. This requires futures orientation and a capacity for wide- and long-range monitoring and planning (see Toivonen 2021; Heinonen et al. 2023). Above all, we will need the skill to imagine alternative and possible futures, a skill that can be taught and learned (Toivonen 2021; Toivonen et al. 2021) and that must be taught and learned if we aim to achieve a greater level of resilience.

Solutions for Real Estate Market Actors for a More Resilient Built Environment and Happier Societies

As demonstrated in multiple ways throughout this book, space and land play an important role in creating the basis of our self-resilience. When building resilience, however, the focus should not be limited to individual, separate properties but should acknowledge the surrounding neighbourhoods and communities and the interplay between public and private places and actors. As described in Chapter 1, public organisations have the power and responsibility to lay the foundation for creating a resilient built environment, and they play a key role before, during and after crisis activities. Their contribution is related to all the various levels of the built environment, including national and cross-national emergency planning, as well as to ensuring the safety of individual buildings, spaces and their occupants.

The public sector possesses multiple tools and resources to assist in this task. For example, it can use its power in the form of land use policies to steer and monitor the quantity and quality of urban development. It can establish building codes and permit systems that promote durability and the safety of materials, structures and layouts (see Chapter 9 on the development of building codes related to wildfire safety). The public sector can also steer the development of the urban structure and

prevent negative crisis impacts by, for instance, not allowing development on areas that are considered unsafe (e.g. areas prone to natural disasters) or that are believed to lead to negative development paths (e.g. segregation or increasing vacancy). In addition to the pivotal role of the public sector in strategic crisis management, real estate developers and architects are responsible for the creation of the spaces in which future crises will be experienced. Therefore, they are responsible for seeking the best, most holistic practices and implementing them in their creations. At a minimum, this requires resources to look for novel solutions as well as communication with other built environment actors.

While the aforementioned real estate market actors create the frames in which resilience can be nurtured, much responsibility still rests on the shoulders of individuals, the actual people occupying or managing the space. Space users need to know how to use the spaces before, during and after a crisis to promote their resilience. This is not necessarily easy, as only some of the activities are assisted or monitored by the public sector, and it may be difficult even to know what to do and when. Therefore, building resilience demands an active attitude to achieve up-to-date skills and diverse know-how. For example, a space user should not neglect maintenance procedures that safeguard the durability of building materials and during a chemical accident, the space occupant should know how to shut down the ventilation system. As buildings become more technical, the ability of occupants to react is also challenged. The same applies to contracts and other real estate-related rights, responsibilities and procedures that may require specialised know-how related to legal issues. For example, the European Green Deal and the development of the EU taxonomy increase the need to identify, monitor, evaluate and report sustainability impacts related to real estate. Many actors will need assistance in these tasks to reach the intended outcome and avoid negative impacts. In addition, when spaces are increasingly shared between diverse occupants and managers and used for a variety of purposes and when space users themselves occupy multiple spaces, it is increasingly necessary to monitor and to ensure that the right actions are taken when they should be taken. In other words, behaviour is as important as physical spaces.

To respond to this need, all space users could be provided with a "resilience manual" that compiles the key features and actions that space users can take to add resilience to the space they occupy. During a building fire, most of us are aware of the emergency guidelines stating that we should evacuate the building by following evacuation signs and by not using an elevator. During the Covid-19 lockdown, many of us had to figure out by ourselves, without outside assistance, how the built environment could foster our resilience and how our private spaces should be organised to minimise the negative impacts of the crisis. Events with a high risk of immediate casualties should still be underlined when planning for crisis management, but it is also important that, in the future, space users be supported against creeping crises and possess the know-how to enhance their resilience with the help of the built environment around them.

Because the aims, time perspectives and possible crisis impacts experienced or feared vary between the diverse actors in the built environment, resilience building

must seek to include them all. Multilevel, far-reaching and cross-cutting resilience planning should be employed and a silo mentality and hierarchal approaches eschewed (see more in Chapter 4). As stated at the beginning of this chapter, the built environment can be seen as a toolbox with a variety of possibilities – private and public, micro and macro, quick and slow, easy and demanding, cheap and expensive, instant and long term – that can all contribute to holistic resilience. Some actions are bigger and some smaller, but they are all important. Concrete, practically oriented suggestions and action plans are provided in each chapter of this book. To conclude, they are reprised below with complementary features as final suggestions to demonstrate that everyone in the built environment can start building resilient cities today.

Identifying Possible Future Threats

- Lengthen and widen the horizon to scan for a variety of possible (and surprising) futures
- Apply a multilevel, cross-cutting approach in all crisis management activities
- Map crisis impacts and vulnerabilities to them (at micro, meso and macro levels) and plan responses considering the local context
- Favour proactive crisis management methods, and do not be blind to slowly developing, gradual changes
- Provide fair systems for assessing impacts and compensation
- Simulate crisis situations and test and award pilot solutions on a regular basis

Guiding Principles

- Secure emergency response capability, critical infrastructure and other key functions and activities of the society
- Use existing spaces (e.g. public spaces, vacant stock)
- Foster flexibility (e.g. hybridisation, multilocation, portability, agile behaviour)
- Guarantee self-sufficiency, safety zones, alternative access and routes and civil defence shelters
- Ensure the constant development of building codes and other steering methods
- Also provide solutions for the existing building stock
- Favour nature-based and low-tech solutions
- Establish plan B options
- Promote greenery as a multipurpose tool to add resilience
- Acknowledge and train both physical and mental capacities to prevent, respond to and recover from crises

Communication and Participation

- Identify key personnel and their responsibilities (public and private as well as voluntary and temporary work). Ensure backup personnel
- Collect and compare scientific, local and Indigenous knowledge and shared futures visions in crisis management

- Ensure up-to-date, transparent communication before, during and after a crisis
- Encourage creative, multichannel and accessible communication and information platforms
- Enhance existing social networks and create new ones to assist in local crisis response
- Foster community spirit and empower locals to take ownership of their own resilience strategies and implementations
- Share and pool resources and expertise
- Support transnational collaboration and share lessons learned

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