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Resilience in Postdisaster Reconstruction of Human Settlement

An Architectural Perspective

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Introduction

Diverse extreme events, varying from earthquakes to traffic accidents and mass shootings, have been taking place in every corner of society, causing catastrophic effects on human settlement and its inhabitants' overall well-being. Generally, there are three types of hazards: natural hazard, technical hazard, and terrorist attacks or other acts of intentional violence (Centre for Research on the Epidemiology of Disasters, 2009). Natural hazards are "natural processes or phenomena 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," including massive forced displacement of people, extreme temperatures, drought, and epidemics (United Nations, 2019, para. 9). The United Nations International Strategy for Disaster Reduction defines technological hazards are "originating from technological or industrial conditions" that "may cause health impacts, property damage, loss of livelihoods," including chemical spills, transportation accidents, and industrial pollution (United Nations, 2009, p. 29).

Despite these definitions, some social science scholars suggest that "there is no such thing as a natural disaster" (Smith, 2006, para. 1). When a hazard devastates a human community, the societal characteristics, such as vulnerability, social status, and economic development, collectively contribute to the catastrophic impact of the adverse event, dramatically increasing casualties, increasing economic loss, and damaging structure and infrastructure.

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These outcomes turn a hazard into a disaster. Hazards are, therefore, primary triggers of disasters. Social and humanitarian factors, however, are the fundamental generators of disasters (McFarlane & Norris, 2006). Thus, all disasters are not natural processes but, rather, human-made outcomes. Disasters affect the natural, built, and social and humanitarian dimensions of human community.

Accordingly, disaster risk reduction has become an international strategy, aiming to build capacity by successfully dealing with extreme events at individual, family, community, and societal levels (United Nations International Strategy for Disaster Reduction, 2019). This capacity to anticipate, adapt, and recover from a hazard has been interpreted as resilience. Resilience has recurrently become the core structure of a series of international policies and agreements for disaster risk reduction, such as the Hyogo Framework for Action 2005–2015 (United Nations, 2005), the Sendai Framework for Disaster Risk Reduction 2015–2030 (United Nations, 2015a), and the 2030 Agenda for Sustainable Development (United Nations, 2015b). Correspondingly, almost all nations have adopted their own resilience strategies for climate change, disaster, and other world crises, aiming to achieve sustainable development goals (Partnership for Resilience and Preparedness, n.d.).

Principles of Disaster Resilience

According to Ungar (2018), resilience is a system's capacity "to anticipate, adapt, and reorganize itself under conditions of adversity in ways that promote and sustain its successful functioning" (p. 34). When this concept is applied to hazards and disaster research, resilience enables a system to prepare for, respond to, adapt, and recover from extreme events (Berke & Campanella, 2006; Cutter et al., 2008). The following two definitions are among the most commonly cited regarding disaster resilience at international and national levels:

> 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 (United Nations, 2016, p. 24).
>
> Disaster Resilience is the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses—such as earthquakes, drought or violent conflict—without compromising their long-term prospects. (Department for International Development, 2011, p. 6)

Based on these two definitions and other related concepts and/or contributions to disaster resilience, the following five principles are clearly observed in the writings of disaster resilience experts.

- *Principle 1*: The core competence of resilience is "to absorb disturbance" and "re-organize into a fully functioning system" (Cutter et al., 2008, p. 599). The United Nations uses the phrase "build back better" to illustrate the ideal outcomes of a resilient community's postdisaster recovery, rehabilitation, and reconstruction (United Nations International Strategy for Disaster Reduction, 2017). The key issue is "build better" rather than "build back."

- *Principle 2*: Resilience should be interpreted as a process rather than an outcome (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). Resilience is adaptive rather than stable (Norris et al., 2008). The ongoing process consists of: sensing, anticipating, learning, and adapting (Park, Seager, Rao, Convertino, & Linkov, 2013).
- *Principle 3*: Disaster affects almost all socioecological environments, including the economic, built, cultural, and political aspects of society. All these dimensions are closely connected to and strongly influence one another.
- *Principle 4*: Since disaster encompasses a cycle, the postdisaster response, reconstruction, and recovery from a particular disaster is the predisaster preparedness for the next one, which is essential for communities that are geographically located in hazard-prone zones (Wu & Hou, 2019). Building resilience is an ongoing process, involving long-term engagement between the local residents and their communities.
- *Principle 5*: The process of building resilience necessitates "the principles of equity, fairness, and access to resources" (Cutter, 2016a, p. 112). Since resilience is a shared capacity within a system, building resilience does not privilege one element over another. The process of building resilience reflects and supports social equality (Tierney, 2006).

Building Disaster Resilience Requires a Collaborative Approach

Currently, resilience research in the hazards and disaster field mainly concentrates on two phases of the disaster cycle: (a) predisaster preparedness, including preventing potential risks and hazards and (b) postdisaster initiatives to reduce damages and losses (Tierney & Bruneau, 2007). These two streams strengthen two aspects of resilience: inherent capacity (during the noncrisis periods as the predisaster stage) and adaptive capacity (during the postdisaster stage; Cutter et al., 2008). As previously mentioned in Principle 4, there are rarely clear boundaries between different stages within one disaster cycle and among multidisaster events. The adaptive resilience capacity developed as a consequence of previous disaster events will be converted into the inherent capacity of systems to cope with future disasters. This ongoing dynamic process is aligned with the unique characteristics of resilience.

To achieve this pattern of early preparedness and learning from past efforts to adapt, multidisciplinary engagement has become a mainstream innovative approach in hazards and disaster research to examine, measure, and evaluate community resilience (Ellingwood et al., 2016). Although academic researchers tend to stay in their own disciplinary domains, the complexity of hazards and disasters propels them to collaborate to more deeply understand resilience. Hence, resilience becomes a boundary word to connect various disciplines. For example, the civil engineering perspective of resilience focuses on the postdisaster reconstruction of the built environment, especially physical infrastructure (e.g., buildings, transportation, power, and telecommunication), which contribute to the goal of "bouncing back" to the predisaster condition (Bruneau et al., 2003). The complexity of societal issues necessitates viewing these engineering solutions within broader social and economic processes (Peek et al., 2020). To do this, cross-disciplinary cooperation must be pursued, especially between engineers and social scientists, to comprehensively evaluate contributions of the physical environment and move toward community resilience (Hassan & Mahmoud, 2019). Fiksel (2003) argues that cross-system design that builds resilience needs to "take advantage of fundamental properties such as diversity, efficiency, adaptability, and cohesion" (p. 5330), all of which are properties of both engineered and social systems (see other chapters in this volume).

Academic researchers have been qualitatively and quantitively measuring and evaluating resilience from different disciplinary perspectives (Chang & Shinozuka, 2004; Cimellaro, Reinhorn, & Bruneau, 2010; Choi, Deshmukh, & Hastak, 2019; Linkov et al., 2013; Sina, Chang-Richards, Wilkinson, & Potangaroa, 2019). Indeed, the "systems-theoretical accident model and process" was developed to analyze system accidents to advance the resilience of engineered systems (Leveson, 2004). In the field of risk management, for example, "qualitative uncertainty assessment" and "scenario building instruments" have been applied to address uncertainty and severity of terrorism risk (Aven & Renn, 2009, p. 587). From the perspective of geography, disaster resilience is measured by "the spatial, temporal scale of resilience, and attributes of hazard-affected bodies" (Zhou et al., 2010, p. 21). To date, there is no standard monodisciplinary measurement protocol for evaluating resilience of engineered and social systems, let alone pluridisciplinary approaches that are standardized.

Research aims to guide practice as well as inform policy development and the decision-making process, especially in the hazards and disaster field (Wu & Hou, 2019). Implementing the field trip, which is a widely employed research approach in hazards and disaster research, can bring many benefits but largely depends on community-based support from local residents, agencies, and different levels of government (Tierney, 2007). In turn, community-based stakeholders, such as agencies, organizations, and institutions, may request of academic researchers to provide their community-based solutions regarding disaster and emergency management. However, political and practical guarantees need to be developed to safeguard disaster risk reduction. Simultaneously, a collaborative approach, connecting "individuals, families, communities, the private sector, faith-based organizations, nongovernment organizations, academe, and all levels of government" must be established to increase resilience at individual, family, and community levels (National Research Council, 2012, p. 28). The collaborative approach was one of the main themes in the 2019 Global Platform for Disaster Risk Reduction (GP2019, Geneva, Switzerland): *Resilience Dividend: Towards Sustainable and Inclusive Societies* (United Nations Disaster Risk Reduction, 2019). In addition to the UN's global horizontal cooperation platform, the UN encourages nations worldwide to develop a vertical collaborative approach within their countries by engaging different stakeholders to sculpt a resilient community for future generations.

Indeed, immediately after the 2015 Nepal Earthquake, the National Human Rights Commission of India (NHRC; an ethical review board) was not approving international research applications that included human subjects due to concern about the potentially coercive nature of research that might burden disaster survivors. Those research projects, which were proven to be in cooperation with National Human Rights Commission of India, co-led by Nepali organizations (including local government officials and local community leaders, especially those that came from ethnic minority groups), hired local professionals from affected communities, and developed intervention-based strategies with local community-based service agencies were, however, swiftly approved. Welton-Mitchell and James (2018), two American researchers who conducted research of mental health integrated disaster preparedness (MHIDP) during that period, highly recommended the collaborative approach:

> [T]his process of co-creation, adaptation and facilitation by local staff helps to ensure that the MHIDP intervention does not challenge or undermine existing belief systems or practices—a key consideration, not only in terms of ethical practice, but also to increase the likelihood of community acceptance. (para. 7)

Resilience in Postdisaster Human Settlement Reconstruction

Postdisaster reconstruction of the built environment is the basis for other disaster initiatives, such as the social, economic, cultural, and ecological efforts to restore a community (Wu, 2014). Architects are frequently on the front lines of these initiatives, taking leadership of the built environment reconstruction, as well as coordinating with other professionals such as urban designers, planners, landscape architects, and civil engineers (Wu & Hou, 2016).

Human Settlement

Generally, extreme events have catastrophic influence on natural and built, as well as social and human, environments (National Research Council, 1999; see Figure 33.1). The natural environment, also known as the ecological environment, comprises all living and nonliving things, in contrast to synthetic things (Johnson et al., 1997). An ecological system has its own inherent resilience capacity to cope with hazards (Holling, 1973). Environment-friendly human interventions have demonstrated positive outcomes of mediating human with ecological systems, and the potential for accelerating ecological renewal (Gunderson, 2000). For instance, cities, built on the natural environment, play an essential role in tackling climate change and disaster. Increasingly, city governments worldwide have been upgrading their spatial policies in their urban regeneration plans to increase the areas of urban ecological systems (such as green spaces, water bodies, and urban farms) within their urban land use planning (Puppim de Oliveira & Balahan, 2013). These urban ecological systems not only provide recreational space, contributing to urban residents' wellness, but also reduce air pollution and flooding risks, as well as protect biodiversity. In a very specific case that took place in the Cowanus Channel, New York City, Kate Orff, a landscape architect, bundled oysters into the river bank to clean dirty water (Orff, 2010). Her urban greenspace-based intervention aimed to "links nature and humanity for mutual benefit" (Orff, 2010, para. 1). Although

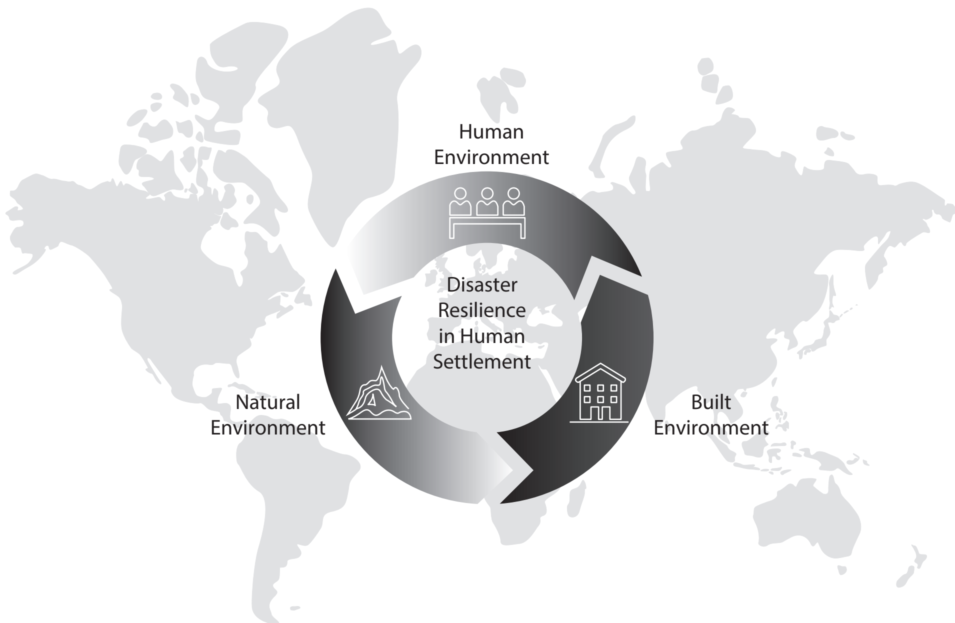

FIGURE 33.1 Disaster's influence on human settlement.

the ecological system offers a foundation for the recovery of built as well as social and human environments, none of these systems should be examined in isolation.

In the social sciences, the built environment refers to human-made physical surroundings, which create the physical foundation for human activities (Roof & Oleru, 2008). This definition is aligned with the civil engineering language of built environment, which includes structural systems (e.g., school, hospital, and recreation center) and infrastructure (e.g., water supply and drainage system, power, telecom, and road). The human–environment interplay that takes place in the built environment, such as day-to-day routines, cultural and social events, along with political and economic development, forms the social and humanitarian environment (Knight, 2015). For instance, one of public health's focuses is on health impact assessment of the built environment, especially how the built environment supports and influences inhabitants' activities as in physically active communities (The Community Guide, n.d.) to build a healthy and livable social and humanitarian environment (Centers for Disaster Control and Prevention, 2011).

Architectural intervention is one type of human–environment interplay. Hence, architects examine the living planet through two types of systems: the nonartificial one (the natural environment) and the artificial one (the built environment). Architectural approaches convert natural environment into built environments by imbedding human activities into the ecological system (Tuan, 2001). This transformational process requires balance in the design of both structures and infrastructure as well as the utilization of these structures to maintain and stimulate human activities. In other words, the architectural perception of the built environment includes dimensions from both the physical environment as well as social and human activities. This type of built environment is frequently understood as human settlement or community and includes all the varied societal characteristics, such as social, economic, health, and political systems. The architect serves a leadership role, improving the overall quality of human settlement so that the inhabitants are better served (Crawford & Rahman, 2018). Thus, the architectural perspective of disaster resilience involves increasing the capacity of human settlement, assisting all dwellers to plan for, respond to, adapt to, and recover from a disaster (Wu, 2020).

Architectural Interventions for Building Resilience

The multidisciplinary nature of architecture emphasizes science, technology, engineering, and mathematics (the STEM subjects), as well as the social sciences and humanities (Dunleavy, Bastow, & Tinkler, 2014). Architectural interventions aimed at building resilience in human settlement reconstruction postdisaster mainly focuses on two aspects: the physical and the social/humanitarian.

Physical aspect of human settlement. Since postdisaster reconstruction research is dominated by STEM (National Research Council, 2006), it also principally orients the architectural motivation toward the physical aspect of human settlement. In fact, collaborating with STEM professionals, architectural approaches are primarily committed to the advancement of the structural safety, such as improving building codes (Behnam & Ronagh, 2016), designing new structural systems and materials (Kwon & Elnashai, 2006), and protecting critical infrastructures, such as roads, power, water, and telecom systems (Ouyang, 2014). These strategies guarantee that when a disaster hits, disaster survivors' basic living requirements, such as access to water, food, and power are secured. In other words, these interventions build resilience capacity by securing disaster survivors' fundamentally physical needs.

Social and humanitarian aspects of human settlement. The social and humanitarian pillars are two critical mainstays of human settlement (UN Educational, Scientific, and Cultural Organization, 2017). During the postdisaster process, the social and humanitarian dimensions of disaster recovery must be given equal attention as the physical dimensions, which is commonly understood as social recovery (Wu, 2014). Parallel to physical reconstruction, social recovery aims to maintain and stimulate human activities in the rehabilitation of disaster survivors' social life and livelihood, so that their social wellness and overall well-being is improved by their new surroundings. Social recovery, which essentially promotes disaster survivors' resilience capacity, prepares people to respond better to the next disaster. Although STEM researchers, especially in the engineering and technology fields, have already grasped the significant lag of the postdisaster social process and have attempted to narrow the gap between physical reconstruction and social recovery by increasing cooperation among social scientists and scholars working in the natural sciences. Current political and economic forces have not given as much attention to social recovery as they have given to the rebuilding of physical structures and infrastructure (Wu, 2014).

With the onset of the 2016 European refugee crisis, Greece, especially the Greek Islands in the Aegean Sea, became the first place where the majority of refugees arrived by sea. Due to the increasingly restricted immigration policies of European Union members, the legal immigration process was dramatically delayed and the majority of these refugees had to stay on these islands for months, and even years (Vigliar, 2016). Dealing with the refugee crisis, the UNHCR (the UN Refugee Agency) cooperated with the local island governments and international organizations, such as the European Union Humanitarian Aid and Civil Protection, the Norwegian Refugee Council, and the International Organization for Migration, to provide daily meals and then engaged engineers and construction crews to build refugee camps. As time passed, the increasing violence refugees experienced pre- and postmigration propelled those sponsoring organizations to also focus on the refugees' social wellness by providing psychological support and counseling service, hiring refugees to support sponsoring organizations' daily work, operating schools, and conducting other training programs. These sponsoring organizations also coordinated volunteers with backgrounds in architecture and urban planning to collaborate with refugees to improve the refugee camps and surroundings, as not just a place to stay, but a place to live. For example, in some refugee camps on Chios Island, Greece, humanitarian workers initiated efforts to change wastelands into playgrounds, built small grocery stores and shuttlebus stations, and created gardens and farmlands. In some schools, the refuges children were invited to draw on the walls to decorate their schools.

Architectural Practice and Community Engagement

Disasters motivate disaster survivors to improve their surroundings (Cutter, 2014). Consequently, disaster survivors should participate in the design process or even the decision-making procedures related to reconstruction (Wu, 2019a). Most existing postdisaster projects are decided by politicians, governmental offices, real estate developers, and other policy and decision makers, who might not, themselves, be residents of the affected communities (Wachtendorf, Kendra, & DeYoung, 2018). Political and economic influences essentially impact and guide reconstruction. This factor, in itself, largely limits the direct input from disaster survivors (Wu, 2014).

Resilience, which is a dynamic social learning process that develops after an extreme event, is facilitated by ongoing long-term human–place interplay (Cutter, 2016b). Local residents and communities directly benefit from this learning process by profoundly understanding their surroundings, for instance, knowing what and where potential risks are and how to adapt their daily activities to avoid these risks. When a disaster happens, these place-based experiences enable the residents to take advantage of their surroundings to reach a new balance, not only of physical safety, but also social, cultural, and economic stability (Wu, 2019a).

Public interest design, a very popular current architectural approach, provides a bottom–up method that increases local residents' involvement in the design process of their own community (Abendroth & Bell, 2015). The Butaro Hospital in Rwanda is an example that reflects this human-centered and participatory approach. During the design process, the architect, Michael Murphy, lived in Butaro for over a year to understand local residents' requirements and decipher the best way to take advantage of the local ecological environment. During the construction stage, local skilled workers were hired. The whole hospital was built with local materials, and the outstanding local construction skills were also utilized (Cary

& Martin, 2012). Furthermore, during the operation of the hospital, most of the employees have come from local communities with chronic unemployment (Cary & Martin, 2012).

The architectural design not only fulfilled the building's original function by utilizing local materials and skills to harmonize with the local environment, but also provided some solutions for other societal issues, such as proving job opportunities to decrease the unemployment rate. In the postdisaster reconstruction of human settlement, architects are hopeful in the utilization of similar processes to involve local residents to cooperate with professionals to empower them with potentially vital decision-making input (Wu, 2018). This process not only achieves the goal of community empowerment by stimulating local residents' leadership (Lee, 2013), but also, more important, provides a community-driven approach when building resilience at individual, family, and community levels.

Case Studies of the Wenchuan Earthquake

Measuring 7.9 on the Richter scale, the Wenchuan earthquake occurred on May 12, 2008. It was the seventh deadliest earthquake of the 20th century worldwide (Tovrov, 2011). This earthquake devastated the rural areas of Sichuan Province in China and caused approximately 11 million people to become homeless (Hooker, 2008). As part of the Chinese Economic Stimulus Program, the Chinese central government invested US$586 billion, taking three years to rebuild the earthquake-ravaged areas (Barboza, 2008). The reconstruction was facilitated through a Counterpart Support Plan. This plan arranged for 19 provinces and municipalities located throughout the eastern and central regions of China to help with 18 counties' reconstruction in Sichuan Province (Xu & Lu, 2013). Most sponsoring provinces and/or municipalities imported their own designers, construction crews, machinery, and construction materials from their own provinces and/or municipalities to Sichuan to swiftly reconstruct villages, towns, and cities (Ge, Gu, & Deng, 2010). The speed with which the physical reconstruction was carried out did benefit disaster survivors in some ways, although the long-term impacts have been less universally positive. The enormous number of people made homeless by the earthquake were able to access housing and other resources to meet their basic living requirements within the new surroundings. China was the first country, and still is among only a few in the world, to achieve such a quick response in such a short period to a disaster of this magnitude.

The urban-style residential communities, comprised of several condominium buildings, were the commonly accepted reconstruction style by sponsoring provinces and/or municipalities to house relocated disaster survivors. However, most disaster survivors were farmers who came from villages. These disaster survivors formerly lived in hand-built houses surrounded by gardens and orchards, in close proximity to their farmlands. In the new residential communities, each family was given one apartment in a condominium, no doubt much smaller than their original home. Furthermore, any open spaces, such as plaza, family gardens, and other spaces for creative activity, were extremely limited in the new communities. As the example illustrates, top–down government-led reconstruction projects predominantly concentrated on the reconstruction of structural systems and infrastructure, largely ignoring the social dimensions and limiting the bottom–up input directly from local residents (Wu, 2019b). The side effects of this situation have continued to reveal themselves during the long-term recovery stage as the disaster survivors have continued to live in and have remained deeply engaged within their new the urban-style communities. The limitations of the new environmental structures, such as no public space afforded for socialization with their neighbors, along with the survivors being unable to keep doing their original farming activities, have proven that this urban-styled community to not be effective in supporting survivors' recovery in social, economic, and other related areas. These structures even significantly interrupted residents' recovery.

Physically, the urban-style residential communities fit urban land use situations and their inhabitants' lifestyle. The planners of the expedited reconstruction after the Sichuan earthquake did not sufficiently consider the difference between urban and rural people and did not effectively collect data about local rural dwellers' requirements. Relocation provided the dwellers with physical shelters, rather than having considered their social needs. Furthermore, the condominium-style buildings did not encourage the farmers who relocated there from adjacent villages to meet each other, to repair their social connections and social networks. This directly resulted in people expressing a desire to move back to their villages immediately, even if it meant giving up their new condominiums. As the example illustrates, limited consideration of social factors postdisaster can result in little support for the re-establishment of people's social networks or the resumption of their social lives.

Furthermore, without thorough consideration of disaster survivors' livelihoods, builders of new built environment may inadvertently cause the survivors to not be able to support their long-term economic recovery, which directly influences their basic living requirements. Survivors described themselves as "farmers without farmland."

There were other significant social and economic losses for the population as well. The traditional architectural style in the earthquake-hit rural areas of Sichuan is mud-stone foundation with a wooden structure on top. The sponsors built modern-style concrete buildings only. The traditional architecture had become a famous local cultural heritage, attracting multitudes of tourists annually who enjoyed exposure to the rural lifestyle, including fresh local produce and the leisurely rural life. This type of tourism could no longer be supported by the new communities. The economic loss had the same negative affect on the local residents livelihood as did the end of farming practices.

Conclusion

Architecture is unavoidably social (Wood, 2015). When basic living requirements are no longer unachievable, the architectural approach must also contribute to other dimensions of recovery and rehabilitation, such as social, economic, and cultural. The multidisciplinary nature of disaster recovery and reconstruction determines the systemic nature of disaster resilience. The example of post-earthquake Sichuan province clearly indicates the interplay between the physical quality and social, economic, and cultural qualities of resilience. Obviously, there are other aspects as well that are strongly associated with the built environment of most concern to architects, such as political and ecological factors. According to the barrel principle, the shortest bar determines the capacity of a barrel (Frank, 2010). Different dimensions of disaster resilience could be designated as different bars. No matter how strong the physical bar is, the capacity of resilience is ultimately measured by the shortest one, which is typically the social dimensions of those who are forcibly displaced. Building disaster resilience requires the raising of the capacity of all the various dimensions of people's lives.

It is understood that multidisciplinary and multi-stakeholder engagement has already become a trend in the field of hazards and disaster research and practice and has begun to augment a better understanding of building resilience at individual, family, community, and societal levels. Within hazards and disaster practice, multi-stakeholder engagement and collaboration aims to build resilience by minimizing disaster's impact on human settlement. The collaborative approach, especially in building cross-organizational partnerships, is an appropriate strategy for disaster practitioners to more effectively address the complexity of human settlement reconstruction. It also generates the question: Who can best facilitate various stakeholders becoming engaged in the reconstruction process? Such a question, in both research and practice, orients the prospective of disaster resilience initiatives.

Disaster resilience, as a whole, illustrates the systemic connections among various factors across multiple scales which influence resilience. The reconstruction, recovery, and rehabilitation of human settlement creates the foundation so that other social and engineering processes can unfold smoothly, all heading toward the refinement of a population's capacity for resilience the next time they experience a disaster.

Key Messages

1. The interdisciplinary academic nature of architectural research and education, as well as the collaborative nature of architectural practice, position architects as leaders of multidisciplinary and multi-stakeholder engagement processes for building postdisaster resilience.
2. The multidisciplinary nature of disaster research and practice necessities that, in the course of building disaster resilience, all societal factors need to be simultaneously and comprehensively balanced.
3. Disaster resilience in human settlement reconstruction requires a seamless synthesis of short-term physical reconstruction with long-term social and humanitarian recovery.
4. Building disaster resilience is an ongoing learning process. Community engagement is one of the most effective strategies to strengthen resilience at individual, family, and community levels.
5. Hazards and disaster research and practice inescapably involve multidisciplinary and multi-stakeholder engagement. Leadership needs to be established for harmonious facilitation of engagement of professionals' and other stakeholders' engagement, to build affected communities' resilience.

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