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PAPER**

**Grassroots adaptive social protection:
Diverse benefits of survivors'
self-reconstruction efforts after
Wenchuan earthquake**



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Grassroots adaptive social protection: Diverse benefits of survivors' self-reconstruction efforts after Wenchuan earthquake

Keywords: grassroots adaptive social protection, vulnerability reduction, self-reconstruction, benefits, Wenchuan earthquake

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Introduction

In the global priority effort of climate change adaptation and disaster risk reduction, adaptive social protection (ASP) aims to reduce affected communities' various vulnerabilities (e.g., geographical, social, and economic) and build residents' and communities' resilience capacities (Davies et al., 2013; The World Bank, 2021). Current ASP initiatives, primarily related to the post-disaster reconstruction and recovery initiatives associated with the redevelopment of built environment (e.g., housing and infrastructural systems), have been historically predominantly designed via a top-down trajectory, that is, starting from the governmental (organizational) level (Bowen et al., 2020). ASP initiatives associated with this top-down approach usually require the affected communities to passively accepted the government- or institution-designated plans, while largely limiting these communities' active participation in the post-disaster efforts serving them. Although these designated ASP programs (henceforward, "official ASP") have been successful in addressing the general reconstruction and recovery needs of the survivors, such as providing safe housing and infrastructure, as well as supporting basic living and social services (e.g., access to food, water, medical care, and educational services), the neglect of utilizing grassroots input has maintained systemic risks and societal inequalities, thus jeopardizing long-term sustainable development (Wu & Drolet, 2016).

Generally, reconstruction of housing and community has always been the first and foremost step in most post-disaster initiatives (Jha et al., 2010). The outcome, a sound physical platform, plays the fundamental role of upholding other aspects of reconstruction and recovery (e.g., social, cultural, economic, and political). Since disaster survivors are the final beneficiaries of the disaster efforts, grassroots participation (e.g., survivors' self-rebuilding activities of repairing their houses and other structures in their communities) should be included in the reconstruction process. Disaster survivors' long-term engagement with their natural and social environments is usually what stimulates these self-reconstruction efforts. Previous research has broadly demonstrated that these grassroots efforts have, to a certain extent, reduced disaster survivors' vulnerabilities by fulfilling their unique needs (Cretney, 2016; Pelling & Smith, 2008). What remains under-researched is the systematic examination of the various benefits of the multiple self-reconstruction endeavours and how these self-efforts contribute to building resilience at individual, family, and community levels, achieving the same and even more as the official ASP. Based on a case study of the post-earthquake rural reconstruction and recovery that took place after the Wenchuan earthquake (2008), Sichuan, China, this study qualitatively identifies the evidence-based benefits of the self-reconstruction of housing and community from an ASP perspective. By examining the interplay between official ASP and grassroots efforts, this research contributes to a nuanced understanding of the importance of grassroots efforts in rebuilding the lives and livelihoods of disaster survivors. These grassroots efforts ultimately assisted in promoting the disaster survivors' resilience capacity. This Chinese case may provide a valuable reference to inform the disaster risk reduction policy in China and beyond, by empowering disaster survivors' post-disaster engagement.

A Conceptual framework: ASP and grassroots efforts in built environment reconstruction

Disasters have catastrophic influences on almost all dimensions of human settlement, including physical, social, cultural, economic, and health (Gillespie & Danso, 2010). The reconstruction and recovery of built environment (e.g., housing and infrastructure systems), usually known as the core of human settlement, is always understood as the primary step in the post-disaster agenda (Pesaro, 2007). Due to the scope and complexity of this task, built environment reconstruction and redevelopment usually depend mainly on governmental and non-governmental organizations' leadership in the coordination of different resources at local, national, and even international levels (Anand, 2009). Notably, the ASP programs associated with built environment reconstruction also engage grassroots participation in their government-/organization-led reconstruction of communities (Sorace, 2014). Aiming to minimize the various negative impacts of extreme events on human settlement, these ASP efforts are designed to enhance the coping capacity at individual, family, and community levels, to better prepare for, respond to, adapt to, and recover from extreme events (United Nations, 2016). This coping capacity is commonly spoken of as resilience in the field of hazards and disaster research. Hence, this section forms a conceptual framework by portraying interconnections among ASP, grassroots efforts, vulnerability reduction, and the building of resilience in built environment reconstruction and recovery (see Figure 1 below).

Limited grassroots participation in the official ASP

Vulnerable and marginalized groups are always severely hit by extreme events; Simultaneously, their various vulnerabilities weaken their coping capacities, causing them to be incapable of facilitating the same level of recovery processes as their peers (Wu & Karabanow, 2021). Hence, the existing leading disaster risk reduction policies and plans, at both national and international levels, such as the U.S. Federal Emergency Management Agency (FEMA) and the United Nations Office for Disaster Risk Reduction (UNDRR), consistently target vulnerability reduction (FEMA, 2021; UNDRR, 2015). Accordingly, official ASP practice was developed at the top organizational level by centering on the core missions of vulnerability reduction, especially addressing the vulnerable and marginalized groups, through the following three types of approaches, social assistance (humanitarian cash and/or in-kind transfer), labour market interventions, and social insurance (White, 2016; Devereux & Sabates-Wheeler, 2004). The promising practices worldwide have demonstrated that these ASP strategies have contributed to the goal of disaster risk reduction in the following principal threefold manners: (1) diminishing the disaster survivors' exposure to potential risks (Davies et al., 2008), (2) building the survivors' coping capacity in economic, social, and other risk areas (The World Bank, 2001); and (3) reducing the unfavourable impact of disasters, especially on disaster survivors' health and well-being (UNRISD, 2010),

Remarkably, although the three ASP approaches have been collaboratively applied into built environment reconstruction and recovery, humanitarian cash and/or in-kind transfer and labour market interventions are the two most widely used methods. An example of cash and/or in-kind transfer was conducted after Typhoon Haiyan (2013), when the governmental authorities in the Philippines provided cash to support the disaster survivors' repair of their damaged houses (International Federation of Red Cross and Red Crescent Societies, 2014). The approach of labour market interventions provides paid employment opportunities by engaging disaster survivors in organization-led reconstruction projects to rebuild housing and

infrastructure systems (Bergner & Vasconez, 2012). Notably, the Social Safety net Project in Cameroon (2013-2019), operated by the World Bank (2018), engaged local low-income households in rural regions to participate in infrastructure maintenance and reforestation. The largest labour market scheme in the world, India's Mahatma Gandhi National Rural Employment Guarantee Act (2005) guaranteed 100 days of paid employment to every rural household so that they could contribute to their communities' infrastructural redevelopment (Godfrey-Wood & Flower, 2018). Briefly, these governmentally designated projects primarily improved the natural environment-related vulnerabilities and advanced the quality of the local infrastructure, to better prepare their residents for potential extreme events (Srivastava & Mishra, 2020).

The merits of the above-mentioned official ASP strategies are that they (1) guarantee the disaster survivors income, so that their basic living and social requirements could be fulfilled, (2) reduce the physical environment related vulnerabilities and thus lessen the local inhabitants' exposure to potential hazards, and (3) equip these employees with experience, skills, and knowledge through their participation, which supports them to develop new income venues and livelihoods. These benefits and other indirect influences synthesize to contribute to vulnerability reduction and building the residents' and their communities' resilience capacity. On the other hand, the weakness is also apparent, wherein local residents may only passively participate in these pre-developed projects, which are based on the designated understanding of the communities' short-term and long-term needs. The lack of disaster survivors' input in the decision-making stage of these pre-developed external interventions might cause the endeavour to not accurately address the short-term, unique needs of the local communities and the individual dwellers. They also may not appropriately support these communities' long-term development. Bringing the final beneficiaries of official ASP efforts (the local communities and their inhabitants) to the forefront, the official ASP should promote active grassroots participation and empower their leadership in the reconstruction of their own houses and communities.

Grassroots efforts and official ASP

The disaster management cycle indicates four stages, namely preparedness, response, recovery, and mitigation (Wisner & Adams, 2012). Disaster survivors' grassroots efforts have been widely reported in all of these stages, including the development and operation of community-based early warning systems (Basher, 2006), urgent self-rescue and rescue of other residents (Vedantam, 2011), protection of community-based heritage (Wu & Hou, 2019), and community consultation for developing resilient housing (Anh et al., 2014). These efforts have bespoken effective evidence directly serving any particular community's unique backgrounds and characteristics to accelerate community-based response, reconstruction, and recovery processes. As an illustration, the "Neighbours Helping Neighbours" program has been advocated in North America for pre-disaster preparedness and immediate response when a disaster does hit (Lampman, 1999). Since a disaster may isolate a community by destroying connections with other communities, swift action on the part of local disaster survivors' rescuing themselves and their neighbours would save many lives before the official rescue teams' arrival (Bunin, 2017). Moreover, through the examination of three government-led ASP programs of building early warning systems in Kenya, Hawaii, and Sri Lanka, Baudoin et al. (2016) argue that grassroots participation shifted the traditional expert-driven approach to a community-centric practice that better fulfilled the local vulnerable communities' needs and improved the official endeavours for disaster risk reduction.

Residents in an area are equipped with a certain level of place-making knowledge and skills through their long-term engagement with their surroundings. These community-based knowledge and skills that enable them to be actively involved in and contribute to their communities' reconstruction and recovery. For instance, after the 2015 Kathmandu earthquake, many international non-governmental organizations flooded Nepal to help the local reconstruction and recovery through the official ASP scheme (Holmes et al., 2019; Rayamajhee et al., 2020). According to Knowles (2018), the cities and infrastructure research project funded by British Academy discovered that the cooperation between the local residents and the external helpers enabled a swift identification of the local community's reconstruction and recovery priorities. This cooperation also encouraged the local residents to share their traditional construction techniques with the external sponsors.

In short, the examples of grassroots efforts presented above have demonstrated that grassroots efforts have become complementary to the official ASP efforts and are capable of generating the same and even more positive outcomes within the disaster cycle, as compared to the official ASP outcomes. However, these self-endeavours have not been sufficiently encouraged in official ASP agendas. Put differently, can grassroots efforts formulate a new stream of ASP, namely grassroots ASP?

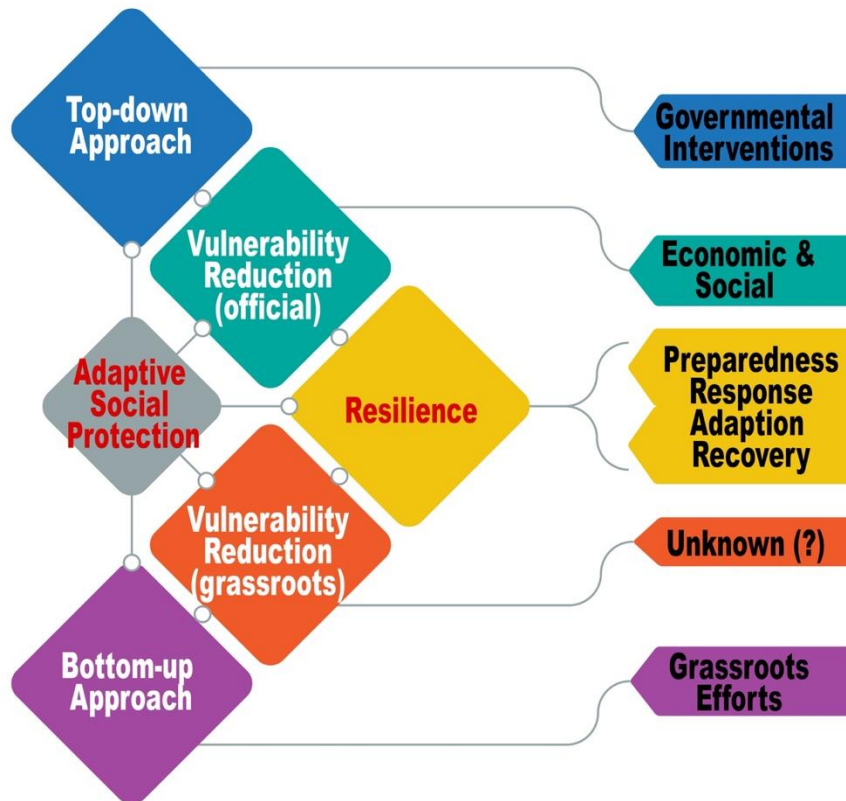
Feasibility: Initiating grassroots ASP

Local dwellers have a certain level of capacity in utilizing their place-making knowledge and skills to improve the outcomes of official ASP. As a case in point, after the devastation of the 2010 Chilean earthquake and tsunami, in several of the worst-hit communities in Constitución, Chile, the government provided the disaster survivors "half a good house" living units (Moore, 2016). The unfinished half allowed these dwellers freedom to expand according to their own needs (Zilliacus, 2016). This type of housing structure was highly appreciated by the local residents, especially low-income families, who could arrange their limited resources to meet their urgent priorities (Franco, 2016). The long-term benefits strongly illustrated that these residents continually improved their housing, to support their ongoing recovery and prepare for prospective extreme events (Moore, 2016). This example powerfully portrays the grassroots' capacity to successfully facilitate their post-disaster housing reconstruction and carry out their own recovery agenda.

Similar to the Chilean case, current research has generally disclosed the benefits of grassroots self-efforts in housing and community reconstruction associated with the outcomes of official ASP initiatives (Tenzing, 2020). However, stratified analysis of contributions of self-reconstruction, inextricably linked with the diverse dimensions of human settlement (including physical, health and well-being, cultural, social, and economic), have not been comprehensively examined. Since all of these dimensions of human settlements are intricately interconnected, a systematic examination of the various advantages of self-reconstruction efforts within one disaster event, in both the short-term and long-term post-disaster processes, would provide evidence-based strategies, informing the policy decision-makers to use survivors' traditional reconstruction knowledge and skills to improve the existing official ASP initiatives, in particular (Vincent & Cull, 2012), and to promote disaster risk reduction policy, in general. Empowering the grassroots leadership through the entire process of the reconstruction of their homes and communities and the recovery of their lives and livelihoods will further advance their resilience capacity.

Based on ASP, this section portrays a conceptual framework, linking ASP with vulnerability reduction and building resilience from governmental interventions and grassroots efforts (see Figure 1). This qualitative case study of the post-Wenchuan earthquake rural reconstruction and recovery aims to explore various merits of grassroots efforts, especially their efforts of rebuilding their housing and communities and how these merits contribute to vulnerability reduction at the grassroots level. Founded on the Wenchuan case, the goal of this case study is to identify evidence-based grassroots strategies that improve the official ASP plans and strengthen the resilience capacity at individual, family, and community levels in China and beyond.

Figure 1. A Conceptual Framework.



Case study: Post-Wenchuan earthquake reconstruction and recovery

Built environment-oriented reconstruction and recovery

The 7.9 magnitude Wenchuan earthquake that took place on May 12, 2008, was the second deadliest earthquake to occur in China after the proclamation of the People's Republic of China (Rafferty, 2020). This earthquake devastated the rural areas of Sichuan Province, causing over 5 million people to become homeless (French, 2008). The demands for accommodation for this enormous amount of homeless earthquake survivors enforced by the nation's infrastructure-centric economic development pattern propelled a built-environment oriented reconstruction and recovery plan (State Council of the PRC, 2012). Accordingly, the official reconstruction model of "concentrated rural settlements" was established in the rural areas in order to collectively accommodate these disaster survivors (most of whom were farmers) (Peng, 2018).

Since historically, rural areas' development has always been comparatively slower than in their urban counterparts, the official reconstruction and recovery plan aimed to fully leverage the redevelopment opportunities triggered by the earthquake, to enhance the quality of rural residents' life to the same level as their urban peers (Central People's Government of the People's Republic of China, 2008). Hence, the urban-styled residential condominium communities were introduced to reshape the rural settlement landscape. The delivery of condominiums to disaster survivors served as an ASP instrument of in-kind transfer because the residents were charged close to nothing. Although self-reconstruction was made an available option in the official reconstruction and recovery plan, considering various limitations, such as time-critical issues and labour and material costs, most disaster survivors chose to relocate into these urban-style residential communities. Self-reconstruction, which was not the popular choice, was still conducted by some survivors in some rural communities. This mixed reconstruction condition grounded a comparison approach to examine the benefits of disaster survivors' self-reconstruction behaviours.

Data collection

Focusing on housing and community reconstruction, this study utilizes a qualitative approach to examine the disaster survivors' self-reconstruction activities that took place after the Wenchuan earthquake (from 2008 to 2018). The data collection was completed during two stages of field trips, administered in the worst-hit and second worst-hit rural communities. Stage one included intensive six-month fieldwork conducted from August 2012 to January 2013, one year after the official announcement of the completion of the official reconstruction (Xiao et al., 2020). Stage two consisted of four continuous summer field trips (four weeks per trip) on an annual basis from 2014 through 2017.

The qualitative data collection instrument of in-depth interview facilitated data collection by utilizing a community-based snowball approach to recruit the disaster survivors being interviewed from the rural communities. During Stage One, through community-based participant recruitment (e.g., announcements in community meetings and participant reference), 19 people from 11 self-reconstruction families participated in 11 family-based interviews (the length of each being approximately 1.5 hours). For the sake of comparison, 11 participants, who were relocated into condominiums in the urban-style residential communities,

who came from these 11 families' villages or communities, engaged in individual interviews (the length of each being approximately one hour). All of these interviews were audio-recorded and facilitated with open-ended questions, examples being: "What has been your feeling since you have lived in the new place?" "What do you miss about your old house or community?" During Stage Two, the researcher revisited these 11 families' villages or communities. Although not all of these 11 families were available for a revisit during each field trip, the researcher still had the opportunity to continually trace five of these 11 families' long-term recovery processes. The data collected during this stage was mainly supported by the researcher's observation and informal communications with local residents.

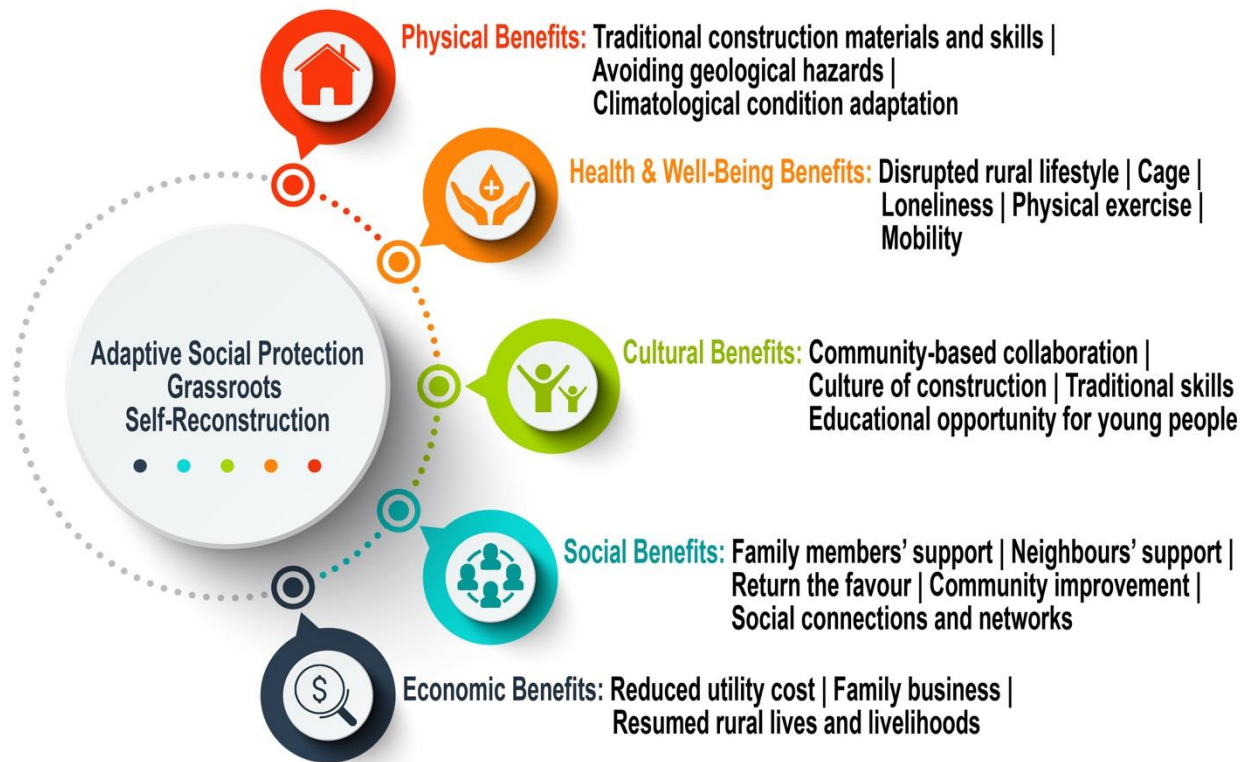
Data analysis

The thematic analysis of interview transcripts was supported by the qualitative data analysis software of NVivo 10. The researcher's observation notes during the field trips provide extra background and relevant information to assist the data analysis. Deductive and inductive coding and theming strategies that are well-known for phenomenology studies were utilized to address the impacts of self-reconstruction through two rounds of data analysis. Utilizing the inductive analysis approach, the first round of coding and theming focused on the stratified contributions of these self-efforts. This round of deductive analysis focused on the merits of self-efforts and catalogued these merits within five types of community-specific emerging themes, namely, physical, health and well-being, cultural, social, and economic benefits (see Figure 1). These five themes are exactly aligned with the major societal vulnerabilities that the official ASP plans aim to reduce. This alignment indicates the possibility of developing grassroots efforts as a parallel ASP approach, along with the official one.

The second round of analysis concentrated on the inductive explanation of the grassroots efforts' short-term and long-term influences. This process aimed to identify the potential contributions of grassroots efforts that helped build resilience capacity at individual and community levels. The inductive analysis enables the researcher to thoroughly evaluate the strengths and limitations of the grassroots efforts, especially generating knowledge mobilization from the Wenchuan case to communities worldwide, who will confront similar reconstruction and recovery relevant tasks. This round of analysis encourages the researcher to elaborate the practice value of the grassroots ASP efforts, potentially informing policies of disaster risk reduction locally and internationally. The synthesis of the two rounds of data analysis is reported in the next section. The themes and codes used in developing this article are shown in Figure 2.

The five coloured circles demonstrate the five themes that emerged in the data analysis regarding the various benefits of grassroots efforts. Each subtheme was followed by different codes, which were used to identify related information from interview transcripts.

Figure 2. Themes and codes.



Benefits of grassroots efforts

Drawing a comparison between the governmental interventions and grassroots efforts, this section presents various benefits of grassroots efforts from five aspects: physical, health and well-being, cultural, social, and economical. These grassroots efforts not only improve the safety, health, and well-being features of the built environment, but also protect local residents' traditional place-making knowledge and skills, as well as their traditions and culture. Furthermore, these efforts improve residents' social connections and promote community cohesion, thus fundamentally supporting disaster survivors' efforts to rebuild their lives and livelihoods and strengthen their resilience capacity.

Avoiding physical environment's vulnerabilities

Generally, the government-led reconstruction aimed to collectively and quickly move as many disaster survivors into the urban-style residential communities as possible, in order to swiftly fulfil the basic living requirements for a considerable amount of disaster- impacted homeless persons (Wu, 2020). This type of swift reconstruction might not thoroughly consider different local geographic, climatologic, and other relevant natural environmental dimensions, resulting in the new buildings or residential communities ending up being unsuitable for the local climate and not accommodating these disaster survivors' unique requirements. Rushing the reconstruction period might also further expose the disaster survivors to other potential hazards.

In the yard of his repaired house, an older man, approximately 60 years old, stood articulating his concerns regarding a particular new urban-style residential community that had been hit

by floods only one year after completion. He further elaborated on his decision, after the earthquake, to repair and move back into his slightly damaged house.

We all know that area [where the new community was standing] was flooded several times before. [But] they [construction teams] just wanted to swiftly build... My family has lived here for several generations. Of course, a lot of people here knew where the best place was [to build]. No one [construction teams] listened to us, and they all believe that we are just farmers. The earthquake only slightly destroyed my house. The repair work was not costly or time-consuming. I know the condo looks more luxurious than my old house, but I feel comfortable here; at least I do not have to worry about floods.

A middle-aged couple chose to build a traditional wooden house with a stone foundation. They were very proud about having built their new home themselves and were deeply engaged in the local climatological factors.

We have hot summers. The natural wind is the best air conditioner and at no cost at all. All the windows in my house can open. I thought I should use some modern materials. The windows and doors made of aluminium alloy look nice but cannot keep warm very well. They are not suitable for winter. I am considering changing them back to wooden ones [when we do the next renovation]. I know the new communities used a lot of aluminium alloy and every family has an air-conditioner. But why shouldn't we use natural wind rather than pay for electricity? It is not necessary at all.

During the rapid planning and reconstruction process, the governmental efforts might not have comprehensively considered community-based geological risks. The residents' community-based, place-making knowledge and skills guided their self-reconstruction activities to successfully avoid physical environmentally related weaknesses. The grassroots endeavours created a solid foundation of safe places to stay, which upheld other dimensions, as well, such as health and well-being, and cultural, social, and economic recovery.

Health and well-being benefits

The built environment directly contributes to the dwellers' physical health, mental wellness, and overall well-being. The governmental reconstruction plan of moving the majority of rural residents (earthquake survivors) into urban-style residential communities, to some extent, disrupted these farmers' traditional rural way of life. The changes of lifestyle had an unfavourable influence on these dwellers' health and well-being, especially among the elderly and others who found it difficult to swiftly commit to a new lifestyle (Ians, 2016).

A young father with two children settled in the City of Chengdu after completing college. His parents lived in their original rural community, which was devastated by the earthquake. He addressed how he collaborated with his older sister, who also moved out of the rural community after marriage, to persuade their parents to self-rebuild their original house.

When my parents saw that most of their neighbours decided to move into the condos, they had very mixed feelings. My sister and I understood their ambivalence. Self-reconstruction involved a lot of work. My parents had never lived in a condominium, and they thought they might want to try, but actually, they would regret that decision very soon because they would never get used to the "cage" [condo]... After moving into their new house [rebuilt by

themselves], they heard many of their neighbours complaining, how inconvenient and lonely they were, living in a “cage”. So, my parents became really happy about our decision. They can plant vegetables and flowers in the yard, do some exercise, and breathe fresh air every day...

As many others who moved to the urban-style residential communities, this older woman was missing her rural life in her original rural village. Similar to other older dwellers, she worried whether or not the self-construction could maintain their original rural-style life and support her and other older adults' health and well-being.

I so regret [having moved into the condo], and I should have chosen self-reconstruction. Now, any place I go, I have to climb stairs. My legs hurt a lot. In my old village, muddy paths connected all the families. I visited my neighbours almost every day. We talked and kept an eye out for one another. Now everyone just stays in their condo, rarely speaking to one another.

Comparing the different living experiences, the health and well-being benefits of self-reconstruction are outstanding. In this scenario, the grassroots efforts perpetuate the residents' original lifestyles, supporting their daily activities and special requirements and contributing to their health and well-being.

Maintaining traditional culture and skills

In the rural areas of Sichuan, housing construction is a community-based group activity, which plays an essential role in the formation of rural culture (Dong & Fu, 2008). This group activity usually stimulates community-wide collaboration in the construction of each family's housing. Its far-reaching effects exceed the primary purpose of providing safe physical shelters to residents. This communal activity creates an educational opportunity enabling the younger generations to understand and promote their traditional culture.

A young mother with a toddler recalled her memories regarding building houses in her village when she was young. The community-based self-efforts have always been a critical part of the rural tradition, supporting local culture. The decline of this type of self-effort after the Wenchuan earthquake has threatened rural communities' local tradition and culture.

[When any family was planning to build a house], all the children [in my village] were very happy and looked forward to that. It felt the same as when we were waiting for [Chinese Lunar] New Year... People in my village and nearby villages would come to help. When the central beam of the house was set up, it was the most important day. Fireworks went off to drive away bad luck... [After the earthquake], most of my neighbours either moved into the residential communities or purchased condos in the cities. They all left. Gradually no one will remember this tradition. My son will never know the same experience as I had.

A carpenter was very proud of his new house and explained that his self-reconstruction decision had the effect of “killing two birds in one stone”, not only rebuilding a new house, but it also stimulated the young people's (his son) interest in learning traditional skills.

[Carpentering] is my family skill and my livelihood. My son only knew I was a carpenter [before the earthquake]. [Taking part in] rebuilding our own house was the first time he worked with others [to use the traditional skills]. Then he told me that he would like to learn my skills. You can imagine how happy I was.

I also shared this great news with my neighbour, a mason who had come to help build my house. [As I had been] he was so worried that his family skills would not have an heir. Young people in our rural areas always stay in the cities after their college. Only a few want to come back and learn [the traditional skills] because they believed our traditional skills were backward and just labour work. There must be someone who would like to learn, so that [these skills] would not be lost.

Rural communities' traditions and their residents' traditional skills are associated with residents' place-making activities, insomuch as the housing construction activity becomes a conventional "festival". Encouraging these self-efforts also educates the next generation to learn how to protect their cultural traditions and traditional skills.

Strengthening social connections and social networks

As mentioned above, regarding self-reconstruction's cultural influence, this group activity unites community members, reinforces the residents' connections, and strengthens their social networks, contributing to community cohesion. The following two examples indicate how the self-efforts' social benefits connect the community.

A university student's description of the reconstruction process of her house (that firmly upholds the rural community's collaborative spirit) follows.

When my parents decided to rebuild our house, it was just the peak time of reconstruction. It was not easy to find a construction crew and get construction materials. All my family members came back, and almost all our neighbours came to help. They brought lumber, cement, and sand. The mason and carpenter from my village also asked their co-workers to help to complete the house before winter. My parents asked my brother and me to remember everyone's contributions. When they needed help, of course, we would return the favour.

A middle-aged man explained how the grassroots activities connected him with new neighbours and worked together to improve the physical environment to better serve the community residents.

There was no place for older people and children to gather [in the new community]. I talked with my old neighbours [who lived nearby in the new place], and we decided to change an empty lot into a small plaza. Then this news was widely spread. [On the construction day], lots of people came to help. Some of them had just moved here, and we did not know they had great construction skills... It only took us about one week to finish the work. After that, we also talked about other things [improvements], like adding some fitness equipment to the plaza and building a parking lot.

Grassroots activities serve as a social instrument to repair disaster survivors' social connections and rebuild their social network. These grassroots activities also further stimulated the disaster survivors' endeavours to improve the physical environment and accelerate their recovery process.

Rebuilding livelihood

Rebuilding livelihoods ensures that disaster survivors can resume their regular life and move forward, especially after the external assistance is finished and/or no longer continues (Sugarman, 2006). Self-reconstruction and other grassroots efforts enable the disaster survivors' economic self-recovery, supporting them to resume their new lives and re-establish their livelihoods. In the following two cases, the two families chose to self-rebuild in their original locations, applying the economic merit of grassroots efforts toward rebuilding their livelihoods.

An older woman in her 70s returned to her old house. Her children helped her repair the house, and she resumed her life, as she had before the earthquake.

My grandson's family lives in the condo. They have to pay for everything, [such as] electricity, water, gas, and property fee. [Adding them together], it's a lot of money. [Living in my old house], I plant grains and greens. I have chickens, pigs and goats. These are enough for me. Water is free, and I burn straw to cook. My children get some daily necessities [for me] once in a while. I give them grains and greens I cannot eat; this saves some money for them. I do not have to depend on them.

A middle-aged couple shared about how their self-reconstructed house supports their livelihood. Their success also attracted their neighbours to return to the rural communities.

I rebuilt my house as a family hotel. Our climate is perfect for this business, neither too hot in summer nor too cold in winter so that we could see green all year round. Every weekend, I host visitors from Chengdu. They stay here one day or two and enjoy the relaxed rural life. Visitors have been increasing every year. My neighbours, who moved to the residential communities, told us that they just stay in their condos and use up their savings [because they lost their farmland and do not have other skills]. Some of them would also like to move back, operating a family hotel or some other small business.

These short-term, government-led interventions were created to assist disaster survivors in recommencing their new lives and livelihoods. However, these interventions may not have always attained the ideal results (Hagen-Zanker et al., 2016). Grassroots efforts have the ability, at best, to accurately address disaster survivors' unique needs and enable them to resume their original lives as farmers or establish their new livelihoods.

Discussion: Grassroots ASP strategy

Improving official ASP initiatives

Taking a look at the official ASP programs as compared to the grassroots self-rebuilt attempts that took place in the Wenchuan case, it is clear that the grassroots efforts targeted the most easily ignored aspects of the official initiatives. Definitely, the official ASP programs of in-kind transfer of the free condominiums swiftly accommodated a considerable amount of homeless disaster survivors. The basic living requirement of a safe place to stay was fulfilled. Since the unique community-based characteristics were, for the most part, not wholly considered in the official ASP programs, these programs' final outcomes present some weaknesses that local residents do not appreciate. The vulnerabilities identified by the local disaster survivors, such as geographical, climatological conditions, health and wellness, cultural, and economic have a collective, continual influence upon the community's overall quality, jeopardizing residents' resilience capacity. The grassroots endeavours successfully developed effective solutions to remedy these disadvantages by reducing these identified vulnerabilities.

The scope and complexity of built environment reconstruction make it evident that grassroots efforts are not able to completely replace official ASP programs. That said, the question remains: how could the soundness and strengths of the self-reconstruction attempts improve the existing official ASP plans? As explained above in the Chilean case (Franco, 2016), after the earthquake and tsunami, the government laid the foundation and major structures of the houses, leaving the rest to the residents to complete according to their individual needs. A similar approach could have been applied to the Wenchuan case by offering a certain amount of freedom to improve the urban-style residential communities. As some participants clarified during their self-reconstruction processes, their traditional knowledge and skills would have improved the government-led planning (e.g., deciding the sites of housing and communities), design (e.g., choosing local architectural style), and construction (e.g., utilizing the local construction materials). Furthermore, the governmental and other organizations' coordination capacity at local, national, and international levels could secure the construction materials and labours, which would fundamentally support the grassroots efforts. All these things could have stimulated beneficial cooperation between the official and grassroots efforts.

The value of grassroots self-reconstruction in the Wenchuan case, which accomplished much more than the official ASP initiatives could have alone achieved, is strongly associated with the local rural backgrounds, such as geographic, cultural, and social. Hence, the community-based nature of grassroots ASP initiatives also reflects their limitations. Specifically, when these self-efforts are applied in other communities' disaster-specific agendas, the potential benefits would not be the same or may even be completely different. Although community-based backgrounds and characteristics limit any particular community-driven self-reconstruction effort, the self-reconstruction enables an innovative bottom-up ASP strategy, encouraging communities to develop their instruments to address their inequalities and deprivations. Consequently, the collaboration of official ASP and grassroots innovations elucidates that the community-driven course of action is vital in serving disaster survivors' adaptation and recovery from extreme events and preparing for the next one.

Self-reconstruction initiatives to build resilience capacity

Within the four stages of the disaster management cycle (Wisner & Adams, 2012), the current post-disaster disaster reconstruction and recovery will become the pre-disaster preparedness for the following extreme event, especially for communities located in disaster-prone zones (Wu, 2021). The increase in global extreme events call for that these built environment structures would protect and serve their inhabitants for several subsequent extreme events. The grassroots self-reconstruction activities that took place after the Wenchuan earthquake accelerated these residents' multi-faceted recovery. The advantages identified in this article would definitely equip these residents with a certain level of capacity regarding pre-disaster preparedness and mitigation for potential extreme events. In other words, self-reconstruction endeavours contribute to the strengthening of their resilience capacity, as has been advocated by the official ASP.

Specifically, avoiding the geographical hazard zones and being deeply engaged in the local climatological condition formed the physical foundation for the residents to commence other aspects of reconstruction and recovery. Living in their self-rebuilt homes improved their physical health, mental wellness, and overall well-being. Strengthened health and wellness gains prepared the local residents for future disasters. Furthermore, the social, cultural, and economic benefits not only enhance these earthquake survivors' individual capacities but also contribute to the collective capacity, at family and community levels, by extending the residents' social networks and establishing uninterrupted, ongoing community-wide social connections. Although the individual and collective benefits of these self-reconstructions were mainly generated during the reconstruction and recovery stages following the Wenchuan earthquake, their long-term, positive influences have definitely moved beyond those stages, assisting the residents and their communities' disaster mitigation, as well as provided preparation for and ability to respond to disasters in the future.

Vulnerability reduction, as addressed by grassroots efforts in the Wenchuan case, directly decreased the residents' exposure to potential risks and hazards by qualitatively proving that the grassroots crusades strengthened these residents and their communities' resilience capacity. The mechanism linking vulnerability reduction and building resilience is still unclear, namely, whether or not vulnerability reduction is an indicator for building resilience capacity (Baggio et al., 2015). The short- and long-term contributions of grassroots efforts towards vulnerability reduction have been generally examined during the reconstruction and recovery stages. However, the exact mechanism for enhancement of resilience during the other stages (pre-disaster preparedness, emergency response, and mitigation) within the disaster management cycle still requires further exploration.

Conclusion

The various benefits of official ASP in the global context of climate change and disaster have been attracting the policy decision-makers' attention. Currently, ASP initiatives have been administered through a top-down trajectory, for the most part neglecting the grassroots know-how and effort. Based on the post-Wenchuan earthquake's built environment-oriented reconstruction and recovery, this case study qualitatively examines the diverse benefits of the self-reconstruction of housing and community. The grassroots self-built efforts successfully tended to the disaster survivors and their communities' geographical, climatological, health and wellness, social, cultural and economic vulnerabilities. This accelerated the post-Wenchuan earthquake reconstruction and recovery, and further strengthened their coping capacity for potential extreme events. These grassroots accomplishments' far-reaching effects complimented the official ASP program with far exceeded benefits. This case study contributes to the existing ASP literature regarding the development of community-driven programs that integrate the bonded strength of official ASP initiatives and grassroots self-endeavours.

In the realm of human settlement reconstruction and recovery, although there are always some disaster survivors who have the capacity to rebuild their original houses or construct new ones, the accommodation for tremendous numbers of disaster survivors and rapid restoration of infrastructural systems requires the official ASP programs. Hence, providing certain levels of freedom for disaster survivors to improve their housing and communities that are built through the official ASP initiatives is vital and should be embedded within the official ASP plans. This would allow the bottom-up self-efforts to improve outcomes and address the considerations that the official ASP programs have not addressed. In the Wenchuan case, the grassroots ASP endeavours presented reduced built environment-related vulnerabilities, accelerated the disaster survivors and their communities' post-disaster reconstruction and recovery processes, and strengthened local residents' and communities' resilience capacity. The evaluation of the grassroots efforts from the Wenchuan case provides a valuable reference for other communities and nations to encourage the placement of self-efforts into their official ASP initiatives. Although the community-based nature of grassroots ASP reflects its limitations in transferring identical strategies to other communities, each community should develop community-driven grassroots efforts to address their own disaster-specific vulnerabilities. Future research could further explore the mechanism between the vulnerability reduction generated by the grassroots efforts and the building of resilience across different stages of the disaster management cycle.

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