

Temporary Housing: an Obstacle or an Opportunity for Enhancing Community Resilience in Bam, Iran?

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Abstract

The 2003 earthquake in Bam, Iran, killed 25,514 people. Building temporary houses became a key component of the recovery phase; yet, it also led to several drawbacks in the development of disaster resilience. This study examines the impact of four types of strategies of housing provision that were used in this process. They include: (a) temporary camps developed by the national government, (b) temporary camps built by international donors and agencies, (c) prefabricated units built in dispersed areas, and (d) units made of masonry and permanent materials. This detailed case study is analysed through the lens of a resilience framework, in order to identify the impacts of the different strategies and their outcomes for the adaptive recovery of the affected community. The results show that certain strategies had negative consequences in the just distribution of resources and in the development of social capital. As a consequence, it is estimated that nearly 3,100 shelters were never occupied. The delivery of temporary shelters raised the survivors' expectations about the permanent units that they were supposed to receive, postponed the construction of permanent houses, and reduced their participation in the permanent reconstruction phase. The conclusions suggest that temporary housing programs have a crucial effect in building long-term community resilience. They provide insightful information that can help decision-makers identify the appropriate strategy of temporary housing to be implemented.

Keywords: Iran, Temporary Housing, Permanent Housing, Post-disaster Reconstruction, Recovery Phases, Resilience.

Introduction

The phase of post-disaster temporary housing brings an important opportunity for enhancing community resilience against future threats and can play a critical role in the recovery of affected families, particularly by increasing their adaptive capacities. Literature in the field of community resilience is still recent and it can be considered a work-in-progress. However, several recent studies have already identified the constitutive components of community resilience in order to create operative measures for assessing it (Cutter et al., 2008). One of the most comprehensive frameworks is proposed by Norris et al. (2008), who state that community resilience emerges from four primary sets of adaptive capacities: Economic Development, Social Capital, Information and Communication and Community Competence. We adopt this framework in order to examine the role of temporary housing in enhancing community resilience.

On December 26th 2003, a 6.7 magnitude earthquake severely damaged the city of Bam, Iran (Ghafory-Ashtiany et al., 2008). The majority of houses were destroyed, and more than 75,000 residents were left homeless (Gharaati, 2006). Around 37,900 temporary housing

units were built by adopting four distinctive methods to settle affected families (Fallahi, 2005). This study examines the role of these temporary-housing methods in enhancing community resilience using a framework presented in the first section of this paper. The second section presents the qualitative research methods used for the empirical work. We then present the results in the form of assessment tables of community resilience. Finally, we discuss the practical and theoretical implications of this study, and conclude with a review of the main findings.

Resilience

The concept of resilience was first introduced in disaster-related research by Holling (1973). By now, multiple definitions of resilience exist in the literature (see Table 1), and it has become difficult to identify a universally-accepted definition of it (Klein et al., 2003). For many, resilience is a “measure of the persistence of systems and their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables” (Cutter et al., 2008). Within the field of global environmental change, resilience is defined as the ability of a social system to respond and recover from disasters; it includes inherent conditions that allow the system to absorb impacts and to cope with an event. It also includes adaptive processes that facilitate the ability of the social system to reorganise, change, and learn in response to a threat (Adger et al., 2005; Klein et al., 2003).

It is accepted in the literature that resilience implies pre- and post-event measures in order to prevent hazard-related damage and losses and to cope with and minimise disaster impacts (Bruneau et al., 2003; Tierney et al., 2007). Moreover, Cutter et al. (2008) state that resilience has two qualities: inherent qualities that function well during non-crisis periods, and adaptive capacities, notably flexibility, in response to disasters (Cutter et al., 2008). In fact, several authors now accept that community resilience emerges from adaptive capacities and that these constitute the key components of a strategy for disaster readiness (Norris et al., 2008).

Table 1: Representative Definitions of Resilience. Source: authors.

Authors	Definitions	Key elements of resilience			
		Ability to withstand against hazard	Ability to mitigate impacts of hazard	Ability to recover after hazards	Ability to adapt the community's capacities
Brown et al. (1992)	The ability to recover from or adjust easily to misfortune or sustained life stress.	X			
Sonn et al. (1998)	The process through which mediating structures (schools, peer groups, family) and activity settings moderate the impact of oppressive systems.		X		
Adger (2000)	The ability of communities to withstand external shocks to their social infrastructure.	X			
Paton et al. (2001)	The capability to bounce back and to use physical and economic resources effectively to aid recovery following exposure to hazards.			X	
Bruneau et al. (2003)	The ability of social units to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimise social		X	X	

	disruption and mitigate the effects of future earthquakes.				
Ganor et al. (2003)	The ability of individuals and communities to deal with a state of continuous, long term stress; the ability to find unknown inner strengths and resources in order to cope effectively; the measure of adaptation and flexibility.			X	X
Ahmed et al. (2004)	The development of material, physical, socio-political, socio-cultural, and psychological resources that promote safety of residents and buffer adversity.	X	X		
Kimhi et al. (2004)	Individuals' sense of the ability of their own community to deal successfully with the ongoing political violence.	X	X		
Coles et al. (2004)	A community's capacities, skills, and knowledge that allow it to participate fully in recovery from disasters.			X	
Pfefferbaum et al. (2007)	The ability of community members to take meaningful, deliberate, collective action to remedy the impact of a problem.		X	X	
Tierney et al. (2007)	Pre-event measures to prevent hazard-related damage and losses (preparedness) and post-event strategies to help cope with and minimise disaster impacts.		X	X	
Norris et al. (2008)	A process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance.				X
Martin-Breen et al. (2011)	For an object: Bouncing back faster after stress, enduring greater stresses, and being disturbed less by a given amount of stress. For a system: Maintaining system function in the event of a disturbance... For an adaptive system: The ability to withstand, recover from, and reorganise in response to crises.	X	X	X	X
(Howell, 2012)	A national system of resilience has three attributes: Robustness, redundancy and resourcefulness. Its performance can be measured according to response and recovery.			X	

Adaptive Capacities

The concept of adaptive capacity refers to the dynamic attributes of resources that are robust, redundant or rapidly accessible. In the case of hazards, adaptive capacity is defined as the ability of a system to adjust to change, moderate the effects, and cope with a disturbance (Brooks et al., 2005; Burton et al., 2002). Considering the concept of adaptive capacity, Norris et al. (2008) argue that resilience is “a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance” (Norris et al., 2008). The authors propose a network of four primary sets of adaptive capacities – along with their subsets - required for achieving resilience: Economic Development, Social Capital, Information and Communication, and Community Competence. Having recognised these

primary sets of adaptive capacities, this study aims at analysing the specific impact of temporary housing in long-term resilience.

Research Methods

The case study method, addressed through both qualitative and quantitative analysis, is the most suitable for this study because it allows for developing an empirical approach to complex social and human phenomena within their own context (Yin, 2008). Information about the case study of the temporary housing projects conducted after the Bam earthquake in 2003 was obtained mostly from the Bam Reconstruction Documentation Project (BRDP)¹ conducted by the Iranian Housing Foundation Organisation (HFO)². The BRDP work was published in 11 thematic reports³ and additional appendices. The first author of this article was involved in the BRDP and supervised the sub-project “Temporary Housing projects after the Bam earthquake in 2003” between 2008 and 2012. Printed information used by the first author, in order to conduct the case study, includes reports prepared by the directions of the ministries involved in the project, minutes of project meetings, contractual documents and agreements, press releases and construction documents. Moreover, narrative reports, which explain the phases of reconstruction chronologically, were examined. Information also includes 85 questionnaires conducted by the BRDP and filled out by temporary housing residents. The questionnaires consisted of three sections: demographic information, questions related to the temporary housing process, and open-ended questions concerning residents’ opinions about their shelter solutions and the reconstruction process. Additionally, 70 interviews were conducted in order to understand the planning, decision-making and implementation process. They include: 12 interviews with members of the Steering Committee for Reconstruction of Bam (SCRB)⁴, 3 interviews with HFO’s managers, 3 interviews with officers of the local government, 4 interviews with presidents of private companies, 3 interviews with members of the city council and 45 interviews with members of affected families.

Research Results

The city of Bam was severely shocked by the earthquake in the early morning of December 26th 2003, when most of people were still sleeping (Statistic Center of Iran, 2003). Because of the earthquake intensity, the time of occurrence and the instability of traditional mud-straw houses, the event led to a high rate of casualties and damages: approximately 25,500 people were killed, more than 75,000 residents were left homeless, and nearly 93 percent of urban buildings were destroyed. The disaster forced national and local authorities to temporarily settle the affected families until permanent houses were provided. However, the

¹ The BRDP aims at categorising, summarising, archiving and analysing data and information of the reconstruction experience. Data collection was conducted between 2008 and 2012.

² The Iranian Housing Foundation Organisation (HFO) is a para-public organisation responsible for providing affordable houses to low income families and for post-disaster reconstruction.

³ The publications by the BRDP project include the following themes: 1- Relief and rescue process, 2- Debris removal process, 3- Temporary housing process, 4- Participatory approach in Bam reconstruction, 5- Project management in Bam reconstruction, 6- Resource management in Bam reconstruction, 7- Permanent housing process (planning and designing), 8- Involved Non-Government Organisations (NGOs) in Bam reconstruction, 9- Needs and damages assessment, 10- Control and monitoring techniques, and 11- Indexing resources.

⁴ The SCRB consisted of the Iranian vice president, the ministers of the interior, housing and urban development, transition, information technology and communication, health, agriculture, power and suppliers, economy and finance, the governor-general of the Kerman province, parliamentary representatives of Bam, the president of the Housing Foundation Organisation, and additional experts.

social, political and geographical characteristics of Bam complicated the process of temporary housing provision. One of these difficulties was to distinguish between real affected families and post-disaster immigrants. In fact, a large number of low-income families arrived in Bam from other settlements and villages with the hope of obtaining financial aid. This made the assessment of needs difficult and, consequently, led to poor management of the limited resources available.

Initially, the national authorities opted for the construction of temporary shelter camps. Several vast land areas in the outskirts of the city were selected for this, aimed at keeping the survivors away from the city and facilitating debris removal. However, the majority of affected families refused to move to the camps and preferred to live near their remaining assets and destroyed houses. In response, authorities proposed dispersed temporary shelters built in the yards of destroyed houses. Some of these units were made of masonry, like permanent houses. Others were pre-fabricated temporary houses transferred from the camps into the yards of affected houses. Finally, several high-quality pre-fabricated temporary units were imported by two industrialised donor countries more than one year after the earthquake. Those units were arranged in camps located in the outskirts the city and eventually became permanent houses. In sum, four strategies were used: case A: Camps of 9050 prefabricated units assembled in situ (within or outside of city); Case B: 5800 temporary units made of masonry materials in the yards of destroyed houses; Case C: 21655 prefabricated units assembled in the yards of destroyed houses; and Case D: 1400 completed high quality units installed in camps (see fig. 1).

In the following sections, the four methods of temporary housing are compared through the variables of adaptive capacities (see Table 2).

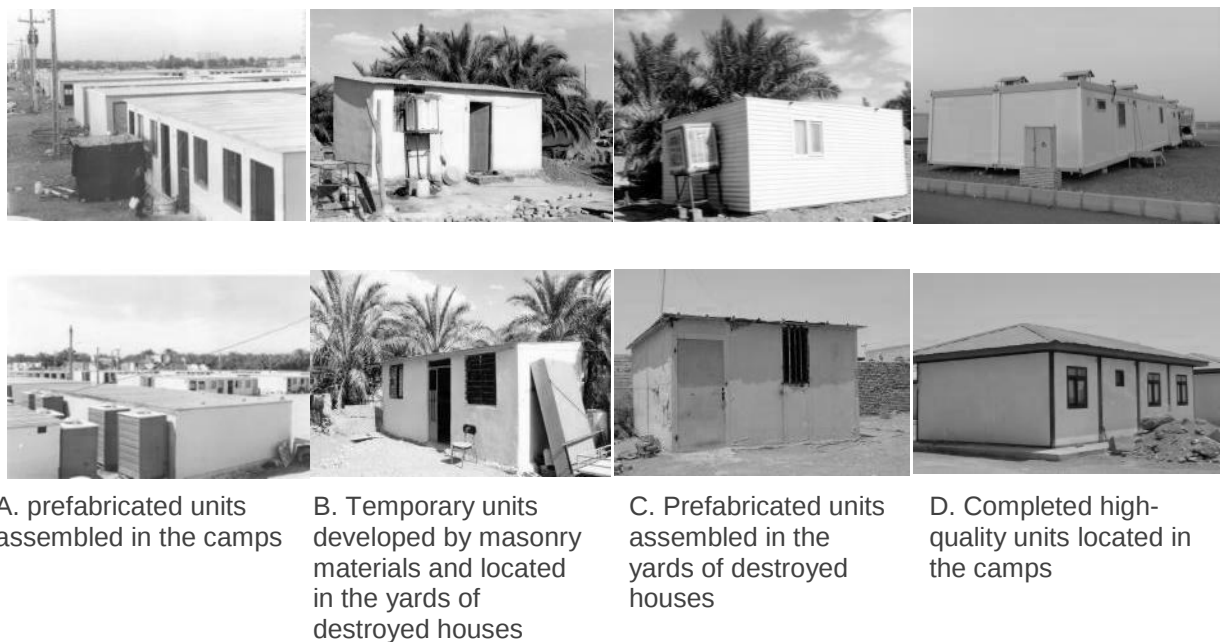


Figure 1: Different solutions of temporary houses in Bam. Source: first author.

Table 2: Categories of analysis of temporary housing adapted from Norris et al. (2008) frameworks of adaptive capacities network⁵.

Resources	Adaptive capacities	Variables of temporary housing
Economic development	Equity in the distribution of resources	Duration of the benefits
		Waiting time for receiving temporary houses
	Level and diversity of resources	Level and diversity of temporary houses
Social capital	Fairness of risk and vulnerability to hazard	Risk and vulnerability of affected communities
	Sense of community	Sense of similarity and interdependence
	Place attachment	Emotional, physical and financial connection to place
Information & communication	Citizen participation	Formal decision making
	Reliable information sources	Announcement
		Communication with responsible organisations
Community competence	Narrative	Training information and activities
		Communication among affected families
	Community action	Refusal to occupy the units
		Acceptance and occupation of the units
	Critical reflection and problem solving skills	Expressing preferences
	Flexibility and creativity	Creative local solutions
		Re-use of temporary houses
	Collective efficacy + empowerment	Involvement in reconstruction of permanent houses
		Collective sharing of knowledge and information

Temporary Housing and Economic Development

“The capacity to distribute post-disaster resources to those who most need them seems vitally important for community resilience” (Norris et al., 2008, p. 137) . Arguably, temporary housing units, as a primary physical and financial aid distributed to affected families, have economic impacts on adaptive capacities. Three capacities (equity of resource distribution, level and diversity of resources, and fairness of risk and vulnerability to hazard) are here examined by using four distinctive variables: benefit duration, waiting time for temporary houses, level and diversity of temporary houses and vulnerable affected community.

The pre-existing diversity of vulnerabilities in Bam was exacerbated after the earthquake by the arrival of post-disaster immigrants into the city. In fact the target groups became two: the real native affected families (landowners and tenants), and the temporary low-income immigrants, which include three distinctive groups: low-income families that immigrated just after the earthquake, immigrant workers and immigrant students (Farhoudian et al., 2006). This demographic distortion led to fictitious assessments of needs based on an increased demand and a competitive atmosphere. It eventually kept hundreds of affected families out of the program, many of whom lost their head of the family and faced psychological problems (mostly in case D). This diversity of beneficiaries also reflected different attitudes towards the various types of temporary houses. Table 3 shows that, while native landowner families (mostly in cases B and C) preferred to settle near their destroyed houses, the native tenants and low-income immigrants (mostly in cases A and D) did not have any choice but to

⁵ - The two columns on the left (resources and adaptive capacities) come from Norris et al. (2008)’s adaptive capacities network while the third column (variables of temporary housing) is proposed by the authors of this article.

accept the temporary units in the camps located in the outskirts of the city. Hundreds of temporary immigrants (administrative staff, employees and students) and highly affected families – mostly settled in case D - who did not have access to any sort of temporary houses were settled permanently in the high-tech units provided by donor countries (Japan, Turkey and North Korea) (Fayazi, 2012). The problem was that allocating different types of temporary houses to distinctive groups of vulnerable communities, reinforced differences between social groups (see Table 3).

The affected families did not all have the same opportunities to receive temporary units at the same time. Although a large number of units were quickly provided in the camps after the disaster, native landowners – who were involved in cases B and C (table 3) refused to occupy these units and lived for a long time in their emergency shelters. Eventually, several affected families did not receive temporary units at all because of the competition with immigrant families. Although all the temporary units built in the yards of destroyed houses became permanent, only those built with masonry (case B in table 3) were used as living spaces. Similarly, native landowners and immigrant families who received high-tech units as permanent houses kept their temporary houses permanently. In contrast, 1570 affected families, who were settled in the camps and involved in case A (Table 3), were forced to return to their units when they received the permanent houses (Fayazi, 2012). It can be argued that this led to a pronounced inequity of resources distribution.

Table 3: Comparison of economic development capacities enhanced by temporary housing strategies.

Adaptive capacity	Variables of temporary houses	Criteria of analysis of the variables	Cases				Comments
			A	B	C	D	
Equity in the distribution of the resources	Duration of the benefits	Only during temporary housing phase	X		X		The program led to inequity of resource distribution.
		Use as secondary space		X	X		
		Remained after temporary housing phase			X		
		Use as secondary living space			X		
		Use as permanent houses				X	
	Waiting time for receiving temporary houses	Less than 2 months		X			The affected families did not have the same opportunity to receive temporary housing units at the same time. Affected families and native landowners received temporary units after passing several months in emergency shelters.
		Between 2 and 6 months	X	X	X		
		Between 6 months and one year			X		
		More than one year				X	
Level and diversity of resources	Location	Camps outside of city		X		X	Allocating different types of temporary houses to distinctive groups of vulnerable communities reinforced differences between social groups and exacerbated vulnerabilities.
		Camps within the city		X			
		In yards of destroyed houses			X	X	
	Level & diversity of temporary houses	Complete units installed in situ				X	
		Prefabricated units assembled in situ	X		X		
		Masonry materials		X			

Fairness of risk and vulnerability to hazard	Risk and vulnerability of affected communities	Natives	Landowner native residents	X	X
			Native tenants	X	
			Vulnerable affected families	X	X
		Non-natives	Temporary non-native residents	X	X
			Low-income non-native immigrants	X	X

Temporary Housing and Social Capital

Environmental threats can enhance survivors' sense of similarity and interdependence, increasing their sense of community (Edelstein, 1988). This can be mobilised during the early recovery phases to accelerate the rehabilitation process. Social capital capacity, according to Norris et al. (2008), is developed through community bonds and commitments (which create a sense of community), emotional connections to one's neighborhood (which enhances place attachment), and the engagement of community members in formal organisations (through citizen participation). The failure of recovery programs to respect these variables of social capital eventually results in the failure of the objective of achieving community resilience. Conversely, we argue that temporary housing programs can influence social capital by facilitating or reducing sense of community, place attachment, and citizen participation.

The pre-existing sense of community led the native affected families to expose their concerns about the temporary units provided in the camps. In fact, table 4 shows that native families, mostly settled in cases B and C, allied to challenge the authorities, rejected unsuitable units and presented their own solutions to live temporarily in proximity to their destroyed houses. Temporary houses built beside the destroyed houses eventually met and strengthened the native inhabitants' emotional, physical, and socio-economic connection to their place. In contrast, the lack of sense of community among immigrant families led them to inevitably accept occupying the camps (mostly in cases A and D). They were less prepared to challenge the authorities, expose their needs and propose alternative solutions.

Table 4 explains that place attachment also helped the affected native families (mostly in cases B and C) to keep their connection with their previous social organisations and to continue their livelihood activities⁶. While the native families who settled beside their destroyed houses had a quick adaptive recovery process, the other groups of families (immigrant families, temporary residents and other affected families) struggled painfully with security problems, public health issues and social troubles in the camps. These challenges included lack of security for themselves and their assets, a cholera epidemic and major barriers to finding jobs.

Not surprisingly, native landowners, due to their involvement in formal organisations, increased their participation in formal decision-making and eventually accelerated the recovery process. This study shows that temporary houses built beside the destroyed houses were the most successful in enhancing social capital capacities (see Table 4). As such, location (proximity) played an important role in creating emotional, physical and financial connection to place.

⁶ Most traditional houses in Bam include a "date garden" which is critical in terms of livelihoods.

Table 4: Comparison of social capital capacities enhanced through the four temporary housing methods adopted in Bam.

Adaptive capacity	Variables of temporary houses	Criteria of analysis of the variables	Cases				Comments
			A	B	C	D	
Sense of community	Sense of similarity and interdependence	Capacity to find common problems	X	X			In Cases B and C the high concern of affected community for decision-making led to enhanced social capital and fast recovery.
		Capacity to challenge authorities	X	X			
		Rejection of unsuitable units	X				
		Presentation of alternative solutions	X				
Place attachment	Emotional, physical and financial connection to place	Emotional connection		X	X		The pre-existing sense of community enabled the native affected families (in the cases B and C) to expose their concerns about temporary camps, whereas immigrant families (mostly in cases A and D) accepted inevitably to live in the camps. Native families allied together to challenge to authorities, reject unsuitable units and present their creative solution to live temporarily besides their destroyed houses.
				X	X		
				X	X		
		Physical connection		X	X		
		Physical connection		X	X		Place attachment or a strong connection to place helped the native affected families (in cases B and C) to continue being involved with existing social organisations, benefit from existing livelihoods and remaining assets.
				X			
		Financial connection		X	X		
				X	X		
	Citizen participation	Formal decision making	Representative	X	X		

Temporary Housing and Information and Communication

Information is also considered by Norris as an important adaptive resource that can enable community members to recover from disasters. By means of communication (where there is opportunity for members to articulate needs, views and attitudes), the community is also able to create common meanings and understandings (Norris et al., 2008). Arguably, the different strategies of temporary housing used in Bam promoted different levels of access to information and communication.

The communities who had access to formal information resources, such as national or local media, were able to receive timely important announcements from the authorities. Access to reliable information helped the affected families to be aware of the new challenges and opportunities. In fact, the families who had access to reliable information were more able to adapt to the post-disaster challenges than the families who only had access to uncompleted and unreliable information. Access to reliable information published by responsible

organisations played a critical role in reducing the uncertainties of residents involved in the construction process. Table 5 shows that the native landowner families, mostly settled in case B, were constantly informed about the reconstruction plans, amount of financial aid available (including loans), time frames, involved companies and contractors, and about the design and construction process of permanent houses.

The process was also clear for the native landowners who built their temporary houses by using masonry and had access to HFO's⁷ technical support. In fact, communication among the community of native land-owners was an important asset. It is important to underscore the general agreement amongst social scientists, who argue that community recovery depends partly on collectively telling the story of the community's experience and response (Landua et al., 2004). Table 5 illustrates that native landowners in case B adapted quickly to post-disaster challenges by sharing their understandings of realities and experiences with their neighbours. In contrast, families living in camps had limited chances to make narrative communication with their unfamiliar neighbours, and thus to adapt to the new challenges (see Table 5). The tenants who lived among the immigrant families in camps thus had limited opportunities for reducing their post-traumatic stress disorder (isolated tenants and immigrant families strongly suffer from post-traumatic stress disorder and its symptoms) (Farhoudian et al., 2006).

Table 5: Comparing information and communication resources through the four temporary housing methods adopted in Bam.

Adaptive capacity	Variables of temporary houses	Criteria of analysis of the variables	Cases				Comments
			A	B	C	D	
Reliable information sources	Access to responsible media	Formal	X	X	X		The reconstruction process was clear for the native landowners in case B, because they built their temporary houses by using masonry materials and had access to the HFO's technical support.
		Informal	X	X	X	X	
		National government		X	X		
	Communication with responsible organisations	Local government		X	X		Native landowners in cases B and C had access to reliable information and were more able to adapt to post-disaster challenges than the immigrant and low-income families in cases A and D who only had access to fictitious and incomplete information.
		Administrative organisation	X	X	X	X	
		Housing Foundation Organisation		X			
		Implementation companies		X	X		
	Access to training information	Technical		X			Native landowners adapted quickly to post-disaster challenges by sharing their understanding of realities and experiences with their neighbours.
		Financial		X			
		Planning and managing		X			
Narrative	Communication among affected families	Experience sharing		X			Affected families who lived in camps (case A) had limited chances to build narrative communication with their unfamiliar neighbours, and adapt to challenges.
		Resources sharing		X	X		
		Information sharing	X	X	X		

⁷ The Housing Foundation Organisation of Iran (HFOI) was responsible for permanent housing reconstruction and for building 5600 temporary houses next to destroyed houses using masonry materials.

Temporary Housing and Community Competence

Community competence is a critical resource that enables the community to learn about their risks and options, and work together flexibly and creatively to solve problems (Norris et al., 2008). Community competence enables communities to collaborate effectively in identifying problems and needs, achieve a consensus on goals and priorities, agree on ways and means to implement the goals, and collaborate effectively in the required actions (Cottrell, 1976). In fact, community competence has to do with collective action and decision-making, capacities that may stem from collective efficacy and empowerment (Norris et al., 2008). Sampson et al. (1997) define collective efficacy as a composite of mutual trust and shared willingness to work for the common good of a neighbourhood (Sampson et al., 1997). Community competence also enables individuals to overcome their life challenges by developing a close-knit social network. Community competence is achievable by enhancing the community's adaptive capacities including: community action, critical reflection and problem solving skill, flexibility and creativity, collective efficacy empowerment (Norris et al., 2008).

The differences in community responses (refusal, acceptance and modification) to temporary units provided by different organisations were linked to different levels of community competence. For instance, the community action against the inconvenient camps reflected the collective effort in identifying common problems and needs and reacting to them. The 3,100 units in the camps that were not occupied and ultimately abandoned were the most significant indicator of community action and peoples' decision-making abilities (See Table 6, case A). Furthermore, Table 6 shows that in the case of units built in the yards of destroyed houses (case B), the residents modified their units according to their needs, expanding or arranging the units in small groups of families or neighborhoods (see fig. 2).



Figure 2: Left: arrangement of temporary units according to the inhabitants' values and use of space. Right: expansion of temporary units using local materials. Source: first author.

Settling beside destroyed houses enabled the landowner residents to modify their units and benefit from them during and after the temporary housing phase (See Table 6, cases B and C). Some residents expanded their units by using local materials and techniques (see Fig. 2). Settling beside the destroyed houses, the native residents were more easily involved in the reconstruction process. They played critical roles in planning, designing, managing, controlling and building their permanent houses. They were responsible for choosing the plan and structure among solutions provided by private companies, managing the allocated financial aid and loans, buying the materials, contracting companies and controlling the construction process. This involvement allowed them to learn about construction and disaster mitigation and thus to promote their capacities (see Table 6). Table 6 shows that the flexibility and creativity demonstrated by native residents contrasted with the immigrants' lack of choices to make decisions about their temporary units (see Table 6).

Table 6: Comparing community competence capacities of temporary housing methods.

Adaptive capacity	Variables of temporary houses	Criteria of analysis of the variables	Cases				Comment
			A	B	C	D	
Community action	Refusal to occupy the units Acceptance and occupation of the units	Refusal to occupy the units		X			The differences of community action (refusal, acceptance and modification) towards the provided temporary units were linked to pre-existing amounts of community competence.
		Acceptance	X			X	
		Acceptance and modification of units			X		
Critical reflection & problem solving skill	Expressing preferences	Administrative correspondence		X	X		In the case of units built in yards of destroyed houses (cases B and C), the residents modified their units according to their needs and preferences.
		Formal By their parliamentary representative		X	X		
		Informal (Strike)		X	X		
Flexibility & creativity	Creative local solution	Local sheltering skills			X	X	The amount of flexibility and creativity in decision making, promoted community competence among the native residents, whereas the immigrants did not have sufficient opportunity to make decisions about their temporary units. Settling beside destroyed houses helped the residents to be involved in planning, designing, managing, controlling and building their permanent houses. This involvement in the reconstruction process allowed them to learn about disaster mitigation and construction.
		Modifying provided units		X	X		
		Changing the temporary housing strategy		X	X		
	Re-using of temporary houses	As permanent house				X	
		Main life space		X		X	
		Secondary life space		X	X		
		Demolishing and recycling			X		
		Demolishing and wasting materials	X				
Collective efficacy empowerment	Involvement In reconstruction of permanent houses	Planning		X	X		
		Managing		X	X		
		Designing		X			
		Implementing activities		X	X		
		Financial planning		X			
	Collective knowledge and information	Mitigation knowledge		X	X		
		Disaster management knowledge		X	X		

Discussion

Community resilience has been defined in different manners in the literature, with varied emphasis on immediate recovery, redundancy of systems and long-term adaptation to the environment. Norris et al. (2008) assume an adaptive-systems approach and underscore the importance of adaptive capacities (Economic Development, Social Capital, Information and Communication, and Community Competence) in the development of community resilience. Despite these important contributions, knowledge about how the recovery process, and particularly the temporary housing process, can enhance community resilience is still poor. In fact, recent studies demonstrate that the assessment of community resilience and the identification of units of measure is still one of the main gaps in the field.

The variables of adaptive capacities presented in this study (table 1) attempt to assess the role of temporary housing in the construction of community resilience. Results show that temporary units made of masonry materials and built in the yard of destroyed houses (case B) represented the highest level of potential for enhancing community resilience in the case of Bam. The prefabricated units assembled in the yard of destroyed houses represent the second highest level of capacity to enhance resilience (case C). In contrast, the prefabricated units built in camps (assembled units and high-tech units) represented the lowest level of capacity to enhance community resilience (cases A and D).

These results demonstrate that not all temporary housing strategies influence short-term recovery and long term development in the same manner. In fact, proximity to the destroyed units plays a fundamental role in the development of social capital and community competence. Information and communication also influence the capacity of the temporary housing program to achieve community resilience. Finally, an unequal distribution of resources with unequal advantages for different groups of beneficiaries can exacerbate social differences and thus lead to greater social and economic gaps. The cause-effect relationships between the characteristics of temporary housing strategies and the development of adaptive capacities cannot be demonstrated by this study. In other words, it is difficult to distinguish the direction of causality between these variables. However, the study identifies relevant relationships between these variables, which have both practical and theoretical implications. From a practical point of view, the study sheds light on the advantages and disadvantages of different temporary housing strategies. From a theoretical point of view, the results not only illustrate the importance of the theoretical framework for the analysis of temporary housing strategies, but they also open the door to additional studies that can explore the cause-effect relationships between the different variables.

One of the most important limits of this study is that it is based on data developed only by the BRDP project. However, we are confident that the primary – and neutral - role played by the first author in the collection of data guarantees the scientific rigor that validates the results. Most of the data and information was gathered five years after the earthquake (between 2008 and 2012). Hence, equal access to different types of inhabitants was difficult. This limitation was partially reduced by the use of data provided by 85 questionnaires that were completed by inhabitants grouped in four different categories of temporary units.

Conclusions

This study presents a theoretical framework to assess the effects of temporary housing programs on community resilience. Referring to an adaptive systems approach, it examines the four dimensions of adaptive capacities identified by Norris et al. (2008): Economic Development, Social Capital, Information and Communication, and Community Competence. The temporary housing program conducted after the Bam earthquake clarifies how different physical and social aspects impact community adaptive capacities and resiliency. The study finds that the temporary housing process and its final outcomes have important effects on resilience by affecting the primary resources of the affected community.

Four types of temporary housing methods were adopted in Bam, each with different benefit duration and unequal distribution of resources. Such inequity and the diversity of temporary houses led to increased social and economic differences among beneficiaries and generally decreased the capacities of economic development in the city.

However, the strategy that opted for constructing temporary units in the yards of destroyed houses, particularly units made of masonry, had a positive impact on community resilience. This strategy in fact eventually provided opportunities for landowners to increase their social capital. This was partly due to the possibility of settling within their own land and community. This proximity to their community helped them to adapt quickly, sharing their realities and experiences. Furthermore, access to reliable information, through closed relationship with responsible local organisations that were encouraged by this strategy facilitated the recovery process. The same strategy also helped in involving the affected families in collective and flexible decision-making, subsequently enhancing community competence.

On the contrary, the strategies that relied on the construction of camps in the outskirts of the city did not encourage the development of social capacities (notably the development of collective narratives and meanings and thus psychological recovery).

Important lessons can also be learnt for decision-makers. Generally, these strategies were all affected by a demographic change that eventually distorted the assessment of the needs of native affected families and thus the scope of the temporary housing program itself. In addition, decision-makers are responsible for examining the long-term consequences of temporary housing strategies. As such, they must consider if and how a certain strategy enhances adaptive capacities and long-term resilience. If resilience is to be achieved in post-disaster action, scholars and advocates still need to refine frameworks and community resilience indicators and to adapt them to the particular context of temporary housing.

References

Adger, W.N. 2000. Social and ecological resilience: Are they related? *Progress in Human Geography* 24(3), 347-364.

Adger, W.N., Hughes, T.P., Folke, C., Carpenter, S.R., and Rockström, J. 2005. Social-ecological resilience to coastal disasters. *Science* 309(5737), 1036-1039.

Ahmed, R., Seedat, M., Van Niekerk, A., and Bulbulia, S. 2004. Discerning community resilience in disadvantaged communities in the context of violence and injury prevention. *South African Journal of Psychology* 34(3), 386

Brooks, N., Adger, W.N., and Kelly, M.P. 2005. The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global Environmental Change* 15(2), 151-163.

Brown, B.B., and Perkins, D.D. 1992. Disruptions in place attachment. In: I. Altman and M.L. Seta (eds): *Place attachment. Human behaviour and environment* 12. (pp. 279-304). Springer US.

Bruneau, M., Chang, S.E., Eguchi, R.T., Lee, G.C., O'Rourke, T.D., Reinhorn, A.M., and Shinozuka, M., Tierney, K., Wallace, W.A. and von Winterfeldt, D. 2003. A framework to quantitatively assess and enhance the seismic resilience of communities. *Earthquake Spectra* 19, 733.

Burton, I., Huq, S., Lim, B., Pilifosova, O., and Schipper, E. L. 2002. From impacts assessment to adaptation priorities: The shaping of adaptation policy. *Climate Policy* 2(2), 145-159.

Coles, E., and Buckle, P. 2004. Developing community resilience as a foundation for effective disaster recovery. *Australian Journal of Emergency Management* 19(4), 6-15.

Cottrell, L. S. 1976. The Competent Community. In: B. H. Kaplan, R.N. Wilson and A.H. Leighton (eds.): *Further explorations in social psychiatry*. (pp. 195-209) New York: Basic Books.

Cutter, S.L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., and Webb, J. 2008. A place-based model for understanding community resilience to natural disasters. *Global Environmental Change* 18(4), 598-606.

Edelstein, M. R. 1988. *Contaminated communities: The social and psychological impacts of residential toxic exposure*. Westview Press.

- Fallahi, A. 2005. *Architecture for temporary housing after disaster*. Tehran: Shahid-Beheshti University.
- Farhoudian, A., Sharifi, V., Rahimi Movaghar, A., Mohammadi, M.R., Radgoudarzi, R., Younesian, M., and Yasami, M.T. 2006. The Prevalence of post-traumatic stress disorder and its symptoms among Bam earthquake survivors. *Advances in Cognitive Science* 8(3), 58-70.
- Fayazi, M. 2012. *Temporary housing experience after bam earthquake 2003*. Tehran: Housing Foundation Organization.
- Ganor, M., and Ben-Lavy, Y. 2003. Community resilience: Lessons derived from Gilo under fire. *Journal of Jewish Communal Service* 79(2/3), 105-108.
- Ghafory-Ashtiany, M., and Hosseini, M. 2008. Post-Bam earthquake: Recovery and reconstruction. *Natural Hazards* 44(2), 229-241.
- Gharaati, M. 2006. An overview of the reconstruction program after the earthquake of Bam, Iran. Conference Proceedings of the 3rd i-Rec International Conference on post-disaster Reconstruction "Meeting Stakeholder Interests". May 17-19, 2006, Florence, Italy.
- Holling, C.S. 1973. Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics* 4, 1-23.
- Howell, L. 2012. *Global risks 2013* (8th edn). Geneva, Switzerland: World Economic Forum.
- Kimhi, S., and Shamai, M. 2004. Community resilience and the impact of stress: Adult response to Israel's withdrawal from Lebanon. *Journal of Community Psychology* 32(4), 439-451.
- Klein, R.J.T., Nicholls, R.J., and Thomalla, F. 2003. Resilience to natural hazards: How useful is this concept? *Global Environmental Change Part B: Environmental Hazards* 5(1), 35-45.
- Landua, J., and Saul, J. 2004. Facilitating family and community resilience in response to major disaster. In: F. Walsh and M. McGoldrick (eds.): *Living beyond loss: Death in the family*. (pp. 285) New York: Norton.
- Martin-Breen, P., and Anderies, J. M. 2011. *Resilience: A literature review*. Bellagio Initiative Background Paper. www.bellagioinitiative.org/wp-content/uploads/2011/11/Bellagio-Rockefellerbp.pdf (Accessed 15 June 2012).
- Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., and Pfefferbaum, R.L. 2008. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology* 41(1-2), 127-150.
- Paton, D., Millar, M., and Johnston, D. 2001. Community resilience to volcanic hazard consequences. *Natural Hazards* 24(2), 157-169.
- Pfefferbaum, B.J., Reissman, D.B., Pfefferbaum, R.L., Klomp, R.W., & Gurwitch, R.H. 2007. Building resilience to mass trauma events. In: *Handbook of injury and violence prevention*. (pp. 347-358). Springer US.

Sampson, R.J, Raudenbush, S.W, and Earls, F. 1997. Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science* 277(5328), 918-924.

Statistic Center of Iran - SCI. 2003. *Summary of Bam Statistic*. Tehran: Statistic Center of Iran.

Tierney, K., and Bruneau, M. 2007. Conceptualizing and measuring resilience: a Key to disaster loss reduction. *TR news*.

Yin, R. K. 2008. *Case study research: Design and methods* (Vol. 5). London: Sage Publications.

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