Université de Montréal

HOUSEHOLD RECOVERY AND HOUSING RECONSTRUCTION AFTER THE 2003 BAM EARTHQUAKE IN IRAN

by

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A thesis presented to the Université de Montréal
in fulfillment of the thesis requirement for the degree of
Doctor of Philosophy in Built Environment Planning

Montréal, Québec, Canada, 2017

Université de Montréal

Université de Montréal
Faculté des études supérieures

Cette thèse intitulée :

HOUSEHOLD RECOVERY AND HOUSING RECONSTRUCTION AFTER THE 2003 BAM EARTHQUAKE IN IRAN

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Dedicated to my wife;
for all her patience and unwavering love

RÉSUMÉ

La reconstruction de logements après désastre est un processus complexe qui joue un rôle crucial dans le rétablissement des ménages affectés. Dans les dernières décennies, les chercheurs ont examiné les programmes de rétablissement des ménages (à travers les concepts de la résilience, de la vulnérabilité, et du développement durable), et ils ont essayé de déterminer les variables à l'origine de leur succès et ou de leur échec. Cependant, plusieurs lacunes subsistent, notamment à propos du degré inégal de rétablissement parmi les différentes catégories de ménages, des compromis sur les objectifs du rétablissement, et de la collaboration insuffisante parmi les différentes parties prenantes. Cette étude vise à expliquer pourquoi et comment les projets de reconstruction ne réussissent pas à atteindre les objectifs de rétablissement. Elle cherche à révéler les principaux défis dans les initiatives visant à permettre aux ménages d'avoir un rétablissement équivalent et effectif durant les programmes de reconstruction.

Cette recherche se base sur une étude de cas détaillée, longitudinale et qualitative, portant sur le programme de reconstruction après désastre conduit après le tremblement de terre qui a frappé la ville de Bam en Iran en 2003. Elle examine l'expérience de reconstruction à Bam à partir de quatre angles : les objectifs de rétablissement, la politique, la stratégie et l'implémentation. L'étude adopte une stratégie de résonnement déductif, à travers lequel une revue détaillée de la littérature a mené à la formulation de propositions théoriques basées sur les théories de la résilience et de la vulnérabilité et d'autres concepts additionnels en lien avec le logement, la planification urbaine et l'aménagement de projets. Ces propositions théoriques ont par la suite été empiriquement testées pour vérifier si les modèles prévus se produisent réellement. Les résultats de Bam ont ainsi été comparés aux modèles prévus, nous permettant de valider (mais aussi de nuancer) les propositions théoriques déduites.

Les résultats mettent en évidence quatre défis usuellement rencontrés dans les programmes de reconstruction après désastres. Premièrement, les politiques de reconstruction omettent souvent de prendre en considération la diversité des ménages affectés, notamment par rapport à leur statut pré et post désastre. La conséquence de la « même politique pour tous » est que cette approche ne peut pas mener au rétablissement des familles affectées. Le rétablissement de plusieurs types de ménages exige la coexistence d'une multiplicité de mesures et de

programmes leur permettant de choisir la solution qui correspond à leurs besoins, leurs conditions de vie et leurs attentes. Deuxièmement, l'intégration d'une politique générale du logement et de politiques spécifiques de reconstruction est nécessaire pour faire face aux vulnérabilités et assurer un rétablissement à long terme. Troisièmement, le défi d'inclure et d'impliquer toutes les parties prenantes dans une approche participative de prise de décision menace souvent la réalisation des objectifs de rétablissement. Finalement (et conséquemment du dernier point abordé), les programmes de reconstruction doivent prendre en considération les conflits entre les parties prenantes et la fragmentation institutionnelle, à partir des structures et des mécanismes d'une gouvernance appropriée. En définitive, ces résultats nous rappellent que les programmes de reconstruction sont des processus dynamiques et complexes selon lesquels le rétablissement des ménages affectés dépend de plusieurs variables telles que la condition pré et post désastre, la sensibilité des politiques par rapport aux besoins et aux désirs variés des familles, la participation active des ménages dans la prise de décisions, et la collaboration réussie entre toutes les parties prenantes. Décidément, une recherche plus approfondie est nécessaire pour explorer la relation de cause à effet entre les variables et ce processus complexe.

Mots clés : Désastres, Reconstruction de logements, Politiques de reconstruction de logements, Objectifs de rétablissement, Vulnérabilité, Résilience, Participation publiques, Fragmentation institutionnelle, Bam, Iran.

ABSTRACT

Post-disaster housing reconstruction is a complex process that plays a crucial role in promoting affected households' recovery. In the last few decades, researchers have examined housing recovery programs (through resilience, vulnerability, and sustainable development lenses), and made considerable endeavours to determine the variables behind their success or failure. However, several knowledge gaps about, for instance, unequal level of recovery among differently affected household categories, compromises on recovery objectives, and insufficient collaboration between stakeholders in housing reconstruction programs, still exist. This dissertation aims at explaining *why* and *how* housing reconstruction projects typically fail to fulfill recovery objectives. It seeks to reveal the main challenges in initiatives aimed at helping affected households to recover sustainably.

This study is based on a detailed, longitudinal, qualitative case study of the housing reconstruction program conducted after the earthquake that struck the city of Bam, Iran, in 2003. It specifically examines Bam's experience from four perspectives: recovery objectives, policy, strategy, and implementation. The study adopts a deductive reasoning strategy, in which detailed literature reviews led to the formulation of theoretical propositions based on the resilience and the vulnerability theories and additional concepts borrowed from the housing, urban planning, and project management fields. These theoretical propositions were later empirically tested to explore whether the expected patterns actually occurred. Findings from the case of Bam were thus matched with predicted patterns, allowing us to validate (but also to nuance) the theoretical propositions.

Results highlight four main challenges typically faced in housing reconstruction programs. First, housing reconstruction policies often overlook the diversity of affected households, notably with regard to their pre-disaster status and post-disaster situation. As a consequence, the common one-policy-for-all approach cannot adequately lead to the recovery of affected families. The recovery of different household types requires the coexistence of a multiplicity of measures and programs to allow them to choose the solution that best fits their needs, conditions, and expectations. Second, the integration of general housing policy and specific reconstruction policies is necessary to both address vulnerabilities and ensure long-term recovery. Third, challenges in involving the diversity of stakeholders in participatory decision-

making often threaten the fulfillment of recovery objectives. Finally (and as a consequence of the latter), housing reconstruction programs need to address stakeholder conflicts and institutional fragmentation through appropriate governance structures and mechanisms. These results remind us that housing reconstruction programs are complex, dynamic processes where affected households' recovery depends on several variables such as their pre- and post-disaster conditions, recovery policy's sensitivity to families' varied needs and desires, households' active participation in decision-making, and successful collaboration between stakeholders. Indeed, further research is still required to explore the cause and effect relationships between variables in this complex process.

Keywords: Disasters, housing reconstruction, housing reconstruction policies, recovery objectives, vulnerability, resilience, public participation, institutional fragmentation, Bam, Iran

ACKNOWLEDGEMENTS

First, I would like to thank my advisor, Dr. Gonzalo Lizarralde, for being an endless source of moral and academic support. He offered me many opportunities to learn more about disaster research and participate in various enriching academic activities. His constant encouragement, unrelenting focus on equality and justice, and of course, his patience for editing my long sentences are blessings not many graduate students get to have. Without him, I would lack the confidence and writing skills I have now. Gonzalo, you are an inspiring researcher, teacher and mentor.

I would also like to thank my committee members, Dr. Lisa Bornstein and Prof. Colin Davidson, for all the valuable support and help they provided throughout my research. I would also like to acknowledge and express my gratitude for the financial support provided by the disaster resilience and sustainable reconstruction research alliance (Œuvre durable for its acronym in French) and Université de Montréal.

Words beyond simple thank-yous are reserved for my wife, Golsa, who has been incredibly supportive during this whole process and has made big sacrifices to help me get to this point. Thank you for your encouragement, quiet patience, and unrelenting love during the past ten years of my life.

My Dad, Mom, brother and sister (Ali and Mahsa), have provided love and encouragement throughout my schooling. In my family, I was the first Ph.D. student, and from their perspective, my life seemed dull and unusual for being a "student" for decades. But they are proud and have celebrated every one of my accomplishments along the way. Thank you for all your support and for reminding me of the importance of what I am doing.

Particular thanks go to Amy Oliver for her help and support whenever I needed it, especially for editing my manuscript with thoughtful suggestions. I am also very grateful for the help and support from my friends, especially Benjamin Herazo, Faten Kikano, Ricardo Leoto, Georgia Cardosi, Manel Djemel, Michelle Ye, and Anne-Marie Peter. Finally, I would like to sincerely acknowledge all the individuals who participated and assisted in my research. This would have been impossible without you!

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LIST OF ACRONYMS

BAUC	Bam Architecture and Urbanism Council
BBB	Building Back Better
BRDP	The Bam Reconstruction Documentation Project
CCQ	Commission de la Construction du Québec
CDR	Community-Driven Reconstruction
CRED	Center for Research on the Epidemiology of Disasters
DIO	Defense Industrial Organization
DROP	Disaster Resilience of Place
DRR	Disaster Risk Reduction
HFIR	The Housing Foundation of the Islamic Republic
ICOMOS	International Council on Monuments and Sites
IF	Institutional Fragmentation
KCEO	Kerman Construction Engineering Organization
KDTF	The Kerman Disaster Task Force
MC	Mother Consultancy
MHUD	Ministry of Housing and Urban Development
NDTF	The National Disaster Task Force
NGO	Non-Governmental Organization
ODR	Owner-Driven Reconstruction
PER	The Process of Enhancing Resilience Model
RIBA	Royal Institute of British Architects
PMI	Project Management Institute
RSPA	The Reconstruction Supervision and Policymaking Association
SETADS	Provincial branches of the Housing Foundation of the Islamic Republic
UNDHA	United Nations Department of Humanitarian Affairs
UNDRO	United Nations Disaster Relief Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISDR	United Nations International Strategy for Disaster Reduction

PREFACE

This dissertation is based on a longitudinal research project that began seven months after the 2003 Bam earthquake in Iran. The disaster destroyed a historical city in the south-east side of the country, claimed 22,400 lives, destroyed 93% of buildings, and made more than 75,000 residents homeless. From July to August 2004, I had the chance to visit the destroyed city of Bam for a two-month internship program and to participate in the transitional sheltering projects. After one year, the complexity, challenges and multidisciplinary nature of the recovery program in Bam kindled my interest and inspired me to continue my Master's study in post-disaster reconstruction management at Shahid-Beheshti University in Tehran. At the same time, I started working with the Housing Foundation of the Islamic Republic (HFIR) and participated in housing reconstruction projects in Bam. Between 2005 and 2008, I subsequently worked with contractors and housing beneficiaries and provided construction consultations to 20 contractors and 500 households that were reconstructing their destroyed homes. While I was busy with an ongoing reconstruction program in Bam, my Master's thesis let me investigate the reconstruction experience after the 1999 earthquake in the Northern side of Iran. In Autumn 2008, I joined the HFIR's research department and was engaged in the Bam Reconstruction Documentation Project (BRDP). For four years, I supervised one of the BRDP's eleven thematic reports, entitled "Temporary Housing Project after Bam Earthquake 2003," published by HFIR in 2012. In total, I visited Bam four times and lived in the city for 145 days between 2004 and 2012. Several field trips and interviews which were conducted with affected households and authorities built the foundation of my PhD research. In 2014, during my PhD, I re-visited Bam and collected complementary data for answering the research questions of this study. The ethics certificate that was obtained from Université de Montreal in 2014 covers all the data collection process. (Please see more in page 16 and Annex IV.)

This study examines Bam's experience to explain why and how housing reconstruction projects typically fail to fulfill recovery objectives. Findings reveal four main challenges. First, housing reconstruction policies often overlook the diversity of affected households. Second, the separation between general housing policy and specific reconstruction policies hinders long-term recovery efforts. Third, challenges in involving the variety of stakeholders in participatory decision-making often threaten the fulfillment of recovery objectives. Finally,

inappropriate governance structures and mechanisms often cause institutional fragmentation and fuels conflicts among stakeholders. The research findings are reported in four articles, published or submitted to academic journals, containing four chapters of this thesis.

This dissertation includes six chapters, containing four articles. Figure I illustrates how four articles articulate a coherent thesis and compares the order of chapters with a traditional thesis. For establishing the links between the articles and the essential components of a traditional thesis, two more chapters are included. One major difference between a traditional thesis and thesis by articles, that the readers will notice in the following chapters, is the inevitable repetition of information such as theoretical discussions, methodology, and case study identification that need to be explained in every article.

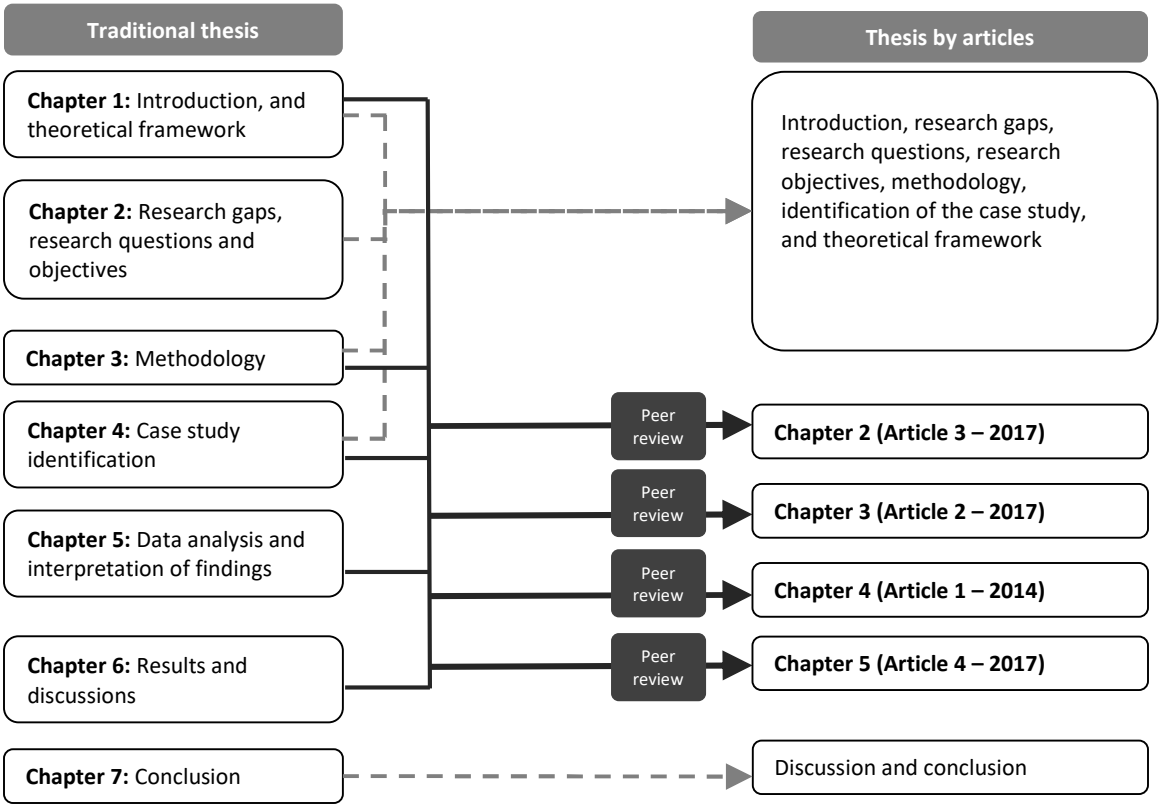


Figure I: Comparison between the order of chapters in a traditional thesis and a thesis by articles – Source: author.

The introductory chapter outlines an overview of the context of disaster research as well as a sketch of typical problems in recovery programs. Furthermore, it points to the importance of empirical research in the context of escalating costs and deaths due to, and expected frequency

of, disaster events. It also describes the key research objectives and questions and provides a brief justification of the research. Moreover, the first chapter presents the overall research design and a description of the case study method. The first chapter describes the various data collection methods, including an overview of why qualitative research methods were selected, and how data was collected. It also includes a discussion of analysis methods, followed by a comprehensive review of life before the disaster. The introductory chapter in the thesis by articles replace the chapters in a traditional thesis describing the problems, theories, hypothesis, objectives, methods, and case study identification.

Chapters 2, 3, 4 and 5 are four different articles. It should be mentioned that the arrangement of articles in the following chapters does not represent a chronological order. Articles are merely organized in this dissertation according to the Project Planning and Implementation model proposed by Davis and Alexander (2015) and Jha's (2010) four steps of housing reconstruction processes (See more in the introduction chapter – sections 1.2 and 1.3.2).

Chapter two:
Fayazi, M., & Lizarralde, G. (2017). Conflicts Between Recovery Objectives: The Case of housing reconstruction after the 2003 earthquake in Bam, Iran. *International Journal of Disaster Risk Reduction (In Press)*.

Chapter three:
Fayazi, M., & lizarralde, G. (2017). The Impact of Post-Disaster Reconstruction Policies on Different Beneficiary Groups: The Case of Bam, Iran. (This chapter has not been submitted to a journal yet).

Chapter four:
Fayazi, M., & Lizarralde, G. (2014). The Role of Low-Cost Housing in the Path from Vulnerability to Resilience. *International Journal of Architectural Research, 7*(3), 146-167.

Chapter five:
Fayazi, M., Arefian, F. F., Gharaati, M., Johnson, C., Lizarralde, G., & Davidson, C. (2017). Managing institutional fragmentation and time compression in post-disaster reconstruction–the case of Bam. *International Journal of Disaster Risk Reduction, 21*, 340-349.

The conclusion chapter explains how the study answered the objectives and research questions outlined in the introduction. It also summarizes how research findings contribute to theory, practice, and policy, and describes the challenges and limitations of conducting this research, highlighting avenues for further research, and indicating areas where there is a need for additional knowledge to improve the post-disaster recovery and reconstruction programs.

CHAPTER ONE

INTRODUCTION

The purpose of this study is to explain challenges in fulfilling housing reconstruction and recovery objectives and – by doing so – to bridge gaps in the literature, in practice, and in policy. The introductory chapter begins with an overview of key concepts in the post-disaster reconstruction field, followed by a deep analysis of challenges in housing reconstruction programs. Subsequently, the research objectives and questions are outlined. To conclude, an overview of the dissertation structure is provided, summarizing the key components of each chapter.

1.1. Background and research justification

Disasters can be described as a "serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (UNISDR, 2009). Since the emergence of hazards and disaster management studies in the 1940s, scholars from architecture, urban planning, sociology, civil engineering, and other disciplines have tried to explain the "vulnerability" of human settlements to damaging events, extract solutions for disaster risk reduction (DRR), and explore ways for achieving the effective recovery of affected communities and settlements.

As early contributors to this field, Burton and colleagues (1978), recognized natural hazards as "any natural process that threatens human life or property" and considered the *exposure to*, the *probability of,* and the *intensity of* damaging events as attributes that turn hazards intro disasters. Later contributions in the field of human ecology, however, criticized this approach to natural disasters. Scholars argued that the political, cultural, and structural conditions of a society also play critical roles in generating a disaster (O'Keefe et al., 1976). Defenders of this approach find the real causes of a community's vulnerability to natural events in these social attributes (Hewitt, 1997; Watts, 1983). By integrating the concept of vulnerability into disaster studies, they argued, for instance, that families and individuals are not vulnerable because they live in hazardous areas, but because social, economic and political pressures push them to occupy unsafe locations and that expose them to natural events (Hewitt, 1994, 1997). Blaikie et al. (1994) explain that root causes such as historic, economic, political, and social conditions often lead to dynamic pressures, such as rapid rural migration or lack of infrastructure and poverty, for instance, that eventually materialize in unsafe conditions that put people and assets at risk. This understanding suggests therefore that disasters are not "natural," but caused by human actions.

Relying on the concept of vulnerability, disaster scholars have explained the increasing frequency of disasters in recent decades. Although natural hazards have been a risk for human communities for centuries, the number of disaster events and their associated impacts have increased, particularly since the 1960s (Abramovitz, 2001; Coppola, 2006; Pelling et al., 2004). Between 1992 and 2001, for instance, the losses associated with natural disasters averaged US$65 billion per year, a seven-fold increase since the 1960's (Freeman et al., 2003). The United

Nations and World Bank recently predicted that the number of people worldwide at risk of catastrophic events will double by 2050, and global economic losses to disasters will triple by 2100 (CRED, 2015; Guerrero, 2013; Jones, 2016). Hazard scholars recognize several factors associated with the rising number and costs of disasters, including precarious development practices, lack of infrastructure to handle hazardous events, urban development in high-risk sites, increased (and rapid) urbanization, and high levels of poverty and economic inequalities (Smith, 2013). Also, within the context of climate change and increased pressure on natural resources, the number of hazards is expected to continue to increase (Abramovitz, 2001; Bogardi & Birkmann, 2004).

In response to the increasing frequency and intensity of disasters, and in order to analyze and reduce the causal factors related to disasters, scholars established the concept of Disaster Risk Reduction, or DRR. The concept seeks the "reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events" (UNISDR, 2013). According to Cuny (1983), disaster risk can be controlled and decreased through reducing three types of vulnerabilities: physical, economic, and social.

On the other hand, some scholars – such as Longstaff (2005) and Norris et al. (2008) – have heavily emphasized the unpredictability and complexity of our world and believe that absolute DRR is an ambitious goal that is nearly impossible to attain. Norris and his colleagues state that some dangers are familiar but unpredictable as to where or when a "known unknown" will happen, but some dangers are new, and "we don't know about and won't know about these until they happen." These are therefore called "unknown unknowns" (p. 132). In response, they broadly call for the use of the concept "resilience" (Allenby & Fink, 2005), emphasizing the need to enhance capacities by which a system can withstand external shocks and recover.

In fact, early understandings of this concept pointed to disaster resilience as a speedy return to a pre-event situation – called a "pre-event equilibrium". In this approach, resilience is the ability of affected communities to bounce back from external shocks, and there is an emphasis on physical stability for determining a community's resilience. Consequently, two main definitions of resilience could be identified in the 1980s. One in which resilience is defined as "the ability of communities to withstand external shocks to their social infrastructure," (Adger, 2000, p. 361)

and, one in which it corresponds to "the capability to bounce back and to use physical and economic resources effectively to aid recovery following exposure to hazards" (Paton et al., 2001, p. 158).

In practice, however, the emphasis on resilience enhancement often led to a short-term focus on recovery at the expense of long-term development (Davoudi et al., 2012; White & O'Hare, 2014). This pervasive interpretation of resilience emphasizing a return to 'normality' frequently guided policies and strategies to recover destroyed physical assets in a short-term process without respecting long-term social development. White and O'Hare (2014) state that what is often accepted in the hazard management field, is an understanding of resilience that primarily refers to preserving what exists and recovering things that have been destroyed. This is for them an inappropriate focus on returning to normality "without questioning what normality entails" (Davoudi et al., 2012, p. 302). Pendall et al. (2010) point to the 2005 Hurricane Katrina disaster as an example in which the affected communities did not find the pre-event situation as the acceptable and desirable normality to which they wanted to return. This first understanding of resilience underlined the assumption that more resilient people can "return" better and faster (Toueir, 2016). Recent studies demonstrate, however, how often this assumption is false (Pendall et al., 2010; Schuller & Morales, 2012). They raise the question of why resilient people should want to bounce back to their pre-event situation, a situation that in fact may be associated with poverty, vulnerability, and lack of sustainability.

Later, the concept of resilience expanded and encompassed what has been called "adaptive capacities." The expansion of the concept, in fact, is a move towards recognizing and respecting the social *capabilities* of an individual, household or community. This conception of resilience highlights people's social capacities and abilities to respond and recover from disasters, including inherent conditions that allow them to reorganize, change, and learn (Adger et al., 2005; Klein et al., 2003). This new approach broadens the notion of resilience "beyond its meaning as a buffer for conserving what you have and recovering to what you were" (Folke et al., 2010, p. 25).

The advancement of the concept of resilience coincided with a recently popularized approach to recovery called "Building Back Better" – or BBB. After the 2004 Indian Ocean tsunami that devastated many communities in Southeast Asia, the overwhelming international response and

academic studies resulted in the emergence of the BBB approach (Kennedy et al., 2008; Lloyd-Jones, 2007), which relies on the idea that post-disaster reconstruction offers a window of opportunity for disaster risk reduction and, more importantly, for improved development (Burby et al., 2000; Kennedy et al., 2008; Lloyd-Jones, 2007). In this sense, the recovery period is seen as an opportunity for much more than a simple return to pre-disaster conditions – and thus the reproduction of pre-disaster vulnerabilities (Alexander, 2006). According to Joakim (2011), the recovery period is an opportunity to remedy common weaknesses in developmental policies, infrastructure, and institutional organizations. Different authors outline key propositions for building back better, which include increasing institutional capacities (Bosher, 2009; Garschagen, 2013), addressing inequalities, and linking recovery efforts to longer-term resilience and sustainable initiatives (Bryant et al., 2016; Davis & Alexander, 2015; Lamond et al., 2013).

By recognizing resilience indicators and means for building back better, several authors specify the required objectives and strategies for successful post-disaster interventions, (Cutter et al., 2008; Norris et al., 2008; Tierney & Bruneau, 2007). Davis and Alexander (2015, pp. 308-313) for instance, propose a set of principles that relate closely to the prevailing culture and system of governance, namely core ethical principles, strategies, tactics, implementation, and monitoring and evaluation. More specifically, their principles include:

Core ethical principles:

- Distribute recovery resources based on the needs of beneficiaries rather than their status.
- Devise and apply anti-corruption measures to ensure that resources flow to meet vital needs and do not corrupt those who handle them.
- Reactivate communities and empower people to contribute to rebuilding their homes, lives, livelihoods, and environments.

Strategic principles:

- Ensure rapid recovery by generating and maintaining a political consensus and by dedicating funds to the process.
- Use existing ministries and institutions to facilitate and manage recovery, except where specialized coordination of complex, cross-disciplinary matters is needed.
- Prevent relocation, as research findings confirm its disruptive impacts on survivors' lives.

- Contribute to long-term development by strengthening governments and governances and by reducing future disaster risks.
- Plan before disasters to prepare for disaster events and their subsequent recovery.

Tactical principles:

- Empower local people to participate in a reconstruction program, but ensure integrate with higher levels of government.
- Provide central control of resource flows and international liaison in major disasters, but give also sufficient autonomy to municipal governments to manage the recovery at the local level.

Implementation principles:

- Augment, complement, and reinforce local initiatives, but do not supplant or duplicate them.
- Supply accurate information (qualitative and quantitative data) at the right time.

and

Monitoring and evaluation principles:

- Monitor and evaluate recovery programs no less frequently than every six months.
- Devise ways to ensure that lessons about how to promote resilience in recovery operations have been learnt, documented, stored, disseminated and acted upon.

Similarly, Jha et al. (2010) provide a list of guiding principles for appropriate post-disaster reconstruction programs and state that after devastating events, stakeholders should apply the following principles:

- Communities and households must have a strong voice in determining post-disaster reconstruction approaches and play a central role in the process.
- The reconstruction policy must address the needs of households in all categories of tenancy: owners, tenants, and those without legal tenancy status.
- The building approaches adopted after a disaster should be as similar as possible to those used in regular times for similar households and should be based on their capacities and aspirations.
- Building codes and standards for reconstruction should reflect local housing culture, climate conditions, affordability, and building and maintenance capacities, and improve housing safety.

- Reconstruction should contribute to economic recovery and the restoration of local livelihoods.

  and

- Good planning principles and environmental practices should be incorporated, whatever the reconstruction approaches.

Reconstruction experiences, however, still show a variety of failures in addressing recovery objectives. Quzai (2010), for instance, explores how the reconstruction of urban and rural areas after the 2005 flood in Pakistan paid inadequate attention to the social-cultural and environmental conditions of the local population, thereby affecting peoples' cultural identity and livelihood resources. Other authors have found that reconstruction policies adopted after disasters often neglect the variety of beneficiaries and the diversity of their needs and desires (Aysan & Oliver, 1987), and fail to consider how they affect communities differently (Aldrich, 2012; Davidson et al., 2007). Besides, reconstruction programs often exacerbate social problems – such as inequality, injustice, and disentitlement – through the exclusionary distribution of resources in recovery and reconstruction (Blaikie et al., 1994; Oliver Smith, 2007). In other cases, resources are not enough for rebuilding what is lost and thus, the reconstructed houses are smaller or have lower standards than pre-disaster ones. There is also a frequent lack of rental housing, which increases rent prices (Comerio, 1998; Quarantelli, 1995). Low-income families and tenants often decide to leave the new settlements or housing projects, which leads to losing jobs, community ties, and social structures and identities (Barenstein, 2010; Comerio, 1998).

In some cases, governments, international organizations, and NGOs provide permanent houses for low-income families and tenants in the outskirts of cities, where land is cheaper. Moving families to remotely located units imposes extra transportation costs and limits access to previous services, economic businesses and networks (Duyne, 2010; Oliver Smith, 1991). Unsurprisingly, the provision of housing in the city outskirts (or in segregated neighborhoods in the city) exacerbates social gaps and exclusion.

Based on evaluation studies, several recent post-disaster housing programs have been almost insensitive to inhabitants' lifestyle and culture (Davis & Alexander, 2015; Fallahi, 2005). Permanent units are often designed as a rubber-stamped repetition of a primary module that often ignores different family sizes, incomes, priorities and expectations (Aysan & Oliver, 1987;

Quarantelli, 1999). Temporal or permanent relocation to a new safe area typically leads to the disruption of community ties, and identities (Davis, 1978). These projects have been often conducted with weak participation of affected communities in decision-making processes, largely ignoring their priorities and needs (Duyne, 2010; Oliver Smith, 1991). Furthermore, the insensitive design of low-income houses to lifestyle, culture, personal needs and local climate conditions forces inhabitants to leave their units or adjust space in ways that reproduce structural failures and weaknesses (Duyne, 2010; Lizarralde et al., 2010).

It is within this context that the relevance of this research is situated. Although disaster recovery has been explicitly defined in the literature, several knowledge gaps still threaten the effectiveness of reconstruction programs. The following theoretical limits and practical problems underlie the relevance of this research. First, the rivalry between recovery objectives often makes the management of reconstruction programs difficult and creates problematic situations that require compromises and trade-offs. Second, reconstruction programs – policies and strategies – often fail to promote the equal level of recovery among differently affected categories of families. Finally, insufficient collaboration and knowledge and information sharing between stakeholders cause serious challenges in reconstruction projects, such as the discontinuity of activities, fragmentation in resource delivery, and overlapping roles and responsibilities. This research, thus, aims at bridging these knowledge gaps and contributes to theory, practice, and policy in order to improve recovery programs.

1.2. Research objective

In the last few decades, disaster and reconstruction-related studies have made considerable endeavors to determine the variables behind the failure and success of housing reconstruction programs. However, insufficient knowledge, as mentioned above, still exists. This dissertation examines the housing reconstruction program conducted after the 2003 earthquake in Bam, Iran to reveal challenges for helping affected households recover effectively. For this purpose, the research project examines the housing reconstruction program from different perspectives related to reconstruction phases.

According to Davis and Alexander (2015), planning and implementation of post-disaster reconstruction programs include five separate steps – core ethical values, strategy, tactics, implementation, and monitoring and evaluation (see Figure 1.1). Typically, reconstruction

programs begin from principles, values or fundamental assumptions that define how recovery can proceed in an acceptable manner. The first level, ethical values, underlies the entire process of recovery by establishing objectives such as "the maintenance of equity and fairness and the exercise of power for the good of powerless" (p.102). Strategic planning, the second level, concerns the direction of tasks that will be informed by the ethical principles and establishes policies and priorities for recovery. The next level, tactical planning, involves the practical application of strategies regarding local and contextual conditions. The fourth level, implementation, is guided by all preceding steps and determines how to move from plans to actions. On this level, project managers typically define applications, stakeholders' roles, and their collaboration according to the prevailing local conditions. The final stage, monitoring and evaluation, occurs at any time to review the process and provide opportunities for changing the courses of action. In the model, the monitoring and evaluation stage is shown apart and interacts with each of the stages to indicate a two-way process of information and learning.

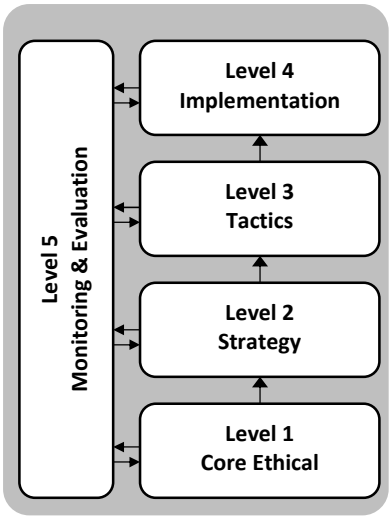


Figure 1.1: The planning and implementation model – Source: Davis and Alexander (2015)

Similarly, Jha et al. (2010) conceive housing reconstruction as a process that begins immediately after a disaster, and consists of four critical steps: objective identification, policy establishment, strategy development, and implementation. Typically, governments, along with humanitarian organizations, first identify recovery objectives, which become guiding principles that often reflect key concepts – such as sustainable development, disaster risk reduction, resilience enhancement, and vulnerability reduction. Policy-making, the second step, is frequently a conceptual framework to improve both the efficiency and the effectiveness of programs. It

concerns "action-oriented" principles to direct decisions. Jha et al. (2010) recognize five principal areas of reconstruction policy: institutional strategy, financial strategy, a community participation approach, a reconstruction approach, and risk management. The next step, strategy development, determines how initiatives will meet the main objectives in terms of, for instance, transitional sheltering, resource distribution, and public participation. Then, the implementation step is about putting strategies into action to accomplish the objectives identified earlier. Finally, monitoring and control happens all the time to evaluate, improve and modify objectives, policies, strategies, and actions.

By borrowing the Project Planning and Implementation model proposed by Davis and Alexander (2015) and after converging the model with Jha's (2010) four steps of housing reconstruction processes, this research breaks Bam's housing reconstruction program into four separate levels – objective, policy, strategy, and implementation – and investigates them distinctly. Figure 1.3 and 1.4 show how different steps in a reconstruction program are being investigated using borrowed concepts and theories from different disciplines.

Research objectives

- To clarify how post-disaster housing reconstruction programs can potentially move communities from a state of vulnerability to resilience, thereby increasing their capacities to withstand shocks and recover after disaster rapidly.
- To bridge gaps in theory and practice about how and why policies often fail to promote equal level of recovery among differently affected categories of families.
- To explain causal and intensifying factors related to conflicts between recovery objectives, and to reveal how to prevent conflicts in disaster management programs, and
- To examine significant obstacles to collaboration and sharing of both knowledge and experience between stakeholders in post-disaster reconstruction projects, and to reveal the leading causes and potential outcomes of insufficient collaboration and knowledge- and information-sharing in reconstruction projects.

1.3. Research method

This section provides a brief overview of the research process and highlights the research design and rationale behind the case selection, data collection methods, and approaches to data analysis.

Every article in the following chapters contains information about the research methods; this section merely gives readers an overview of the research project.

1.3.1. The case study method

The methodological approach adopted for this research is the case study method. According to Creswell (2013), case study research explores a program, event, activity, or individual as a "system," which is bounded by place and time. The case study method is useful when the researcher seeks to understand complex social phenomena or a set of events over which the investigator has little or no control (Babbie, 2012). In socio-political studies, the case study method is employed to understand a decision or a set of decisions that were taken, how they were implemented and with what result (Yin, 2008). In *Case Study Method: Design and Research,* Yin (2008) offers a technical definition of a case study:

> *"A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomena and the context are not clearly evident. The case study inquiry copes with the technically distinctive situations in which there will be many more variables of interest than data point, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion. The case study inquiry benefits from the prior development of theoretical propositions to guide data collection and analysis"* (p.13).

The case study method, therefore, is a comprehensive research strategy that includes research design, data collection methods, approaches to data analysis and generalization of findings. According to Yin (2008), the case study is a research "blueprint" that defines: 1) what data are relevant, 2) what data to collect, and 3) how to analyze data.

1.3.2. Research design

The research design in this study allows for answering the research questions with the right evidence that in turn allows the researcher to draw analytical generalizations, which according to Creswell (2013), are generalizations to the *theoretical propositions* rather than to populations or universes. Stake (2006) recognizes two different case study types: intrinsic and instrumental. He states that an "intrinsic" case study focuses on a unique case and tries to reach a better understanding of that particular case; however, an "instrumental" case study aims at providing insight into and generalizations about an issue rather than a case. This research uses an

instrumental case study to advance knowledge about challenges in post-disaster housing reconstruction programs.

Based on the research questions (see below), some theoretical propositions are established to guide the research design. The theoretical propositions – or theory developments – are informed by the literature review and form the basis of the research, defining specific research subjects, data collection methods and approaches to data analysis. As shown in Figure 1.2, theoretical propositions define criteria for selecting cases, and then, cross-case conclusions from individual cases lead to analytical generalizations.

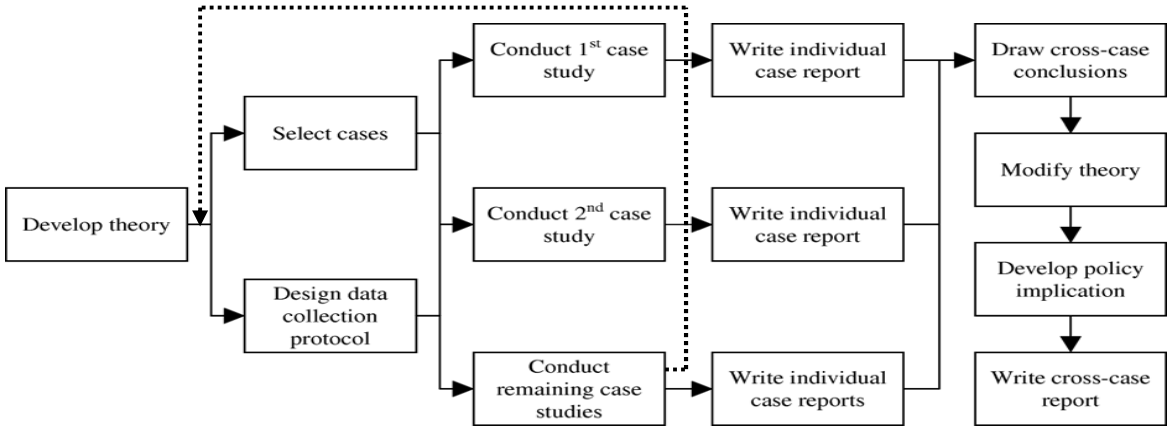


Figure 1.2: The case study method – Source: Yin (2003, p. 50).

The research questions posed in this research are:

1. How and why do conflicts between reconstruction objectives appear and intensify in reconstruction programs?
2. How and why do housing policies produce diverse impacts among different groups of affected households?
3. How did different post-disaster housing strategies applied after the 2003 earthquake in Bam, Iran improve the living conditions of affected families and help them to recover?

   and
4. What are the leading causes and potential outcomes of insufficient collaboration and knowledge- and information-sharing in reconstruction projects?

To answer the questions, an extensive study is conducted and findings are reported in four articles, which are in the four following chapters. The arrangement of articles in the following

chapters is not chronological; however, they are organized according to the Project Planning and Implementation model proposed by Davis and Alexander (2015) and Jha's (2010) four steps of housing reconstruction processes (Figure 1.3). See more about the order of articles in Preface.

The extensive literature review on disaster risk reduction, housing, public participation, project management, resilience and vulnerability led to formulating theoretical propositions (analytical frameworks and hypotheses) in different articles. The Article 1 relies on the use of three main scopes of the literatures: resilience, vulnerability, and DRR. The research was merely focused on housing and DRR in Article 2 to investigate the impact of reconstruction policies on different beneficiary groups. In Article 3, the literature on public participation, stakeholder management, and DRR are reviewed to develop a theoretical framework and to explain conflicts between recovery objectives. Finally, the Article 4 is located in the overlap of the DRR and stakeholder management literature and describes institutional fragmentation in post-disaster reconstruction projects. Please see the overlaps of literature in Figure 1.4.

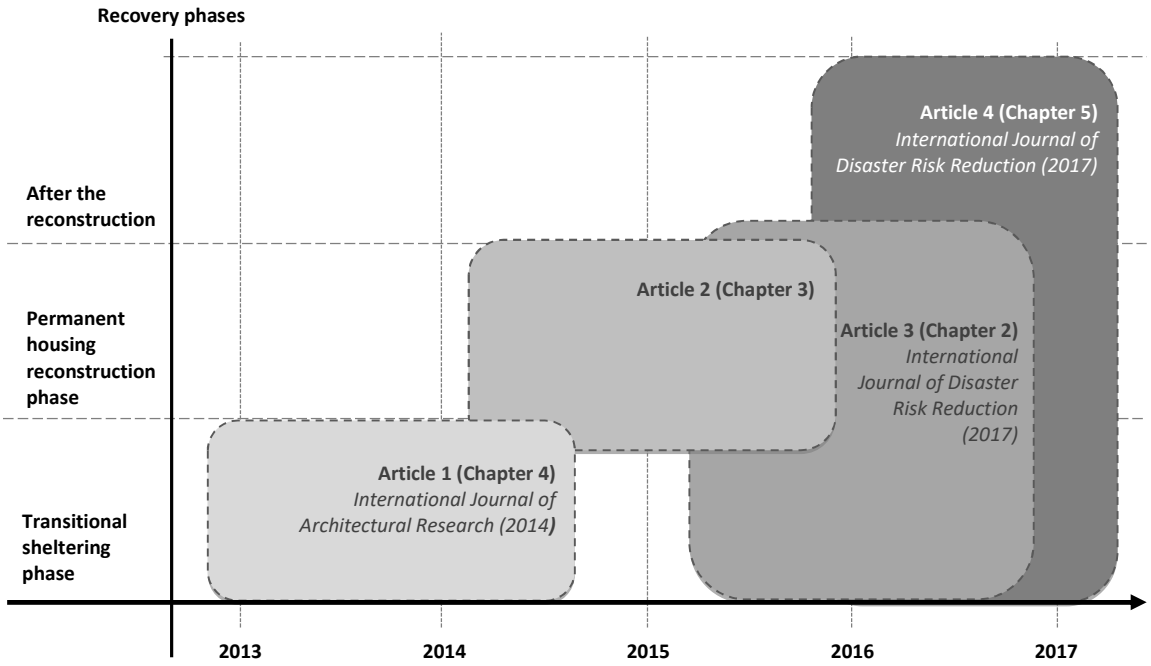


Figure 1.3: Diagram of the chronological order of articles and their coverage. Source: author.

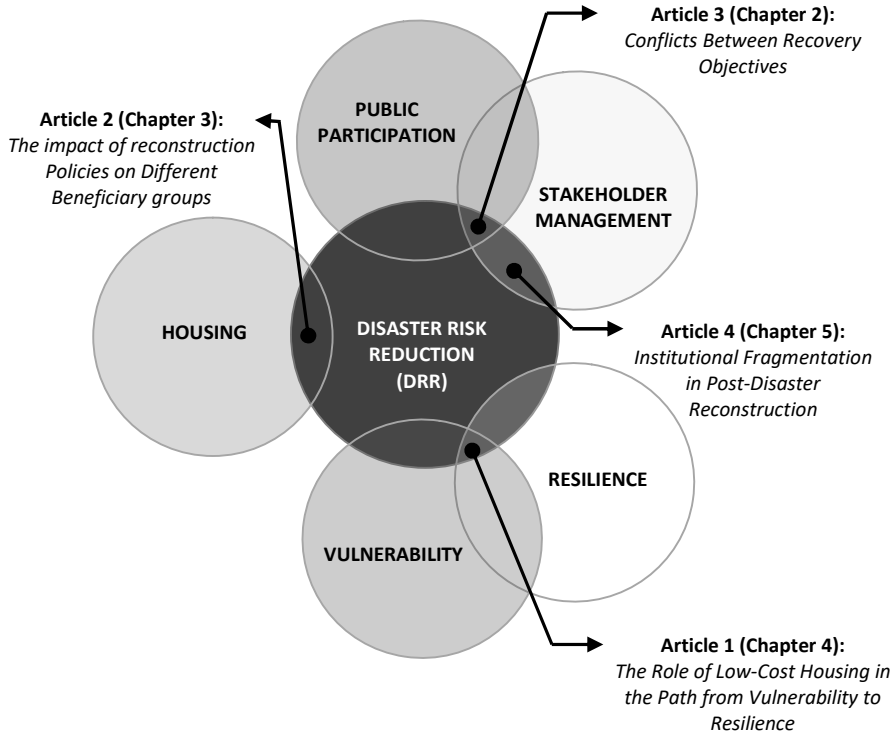


Figure 1.4: The diversity of literature contributions and their overlaps. Source: author.

1.3.3. Case selection

This research selects the housing reconstruction program after the 2003 earthquake in Bam, Iran as a critical case because of its uniqueness and significance. Maxwell (2006) makes distinctions between single- and multiple-case studies. He states that if a single case (*critical case*) meets all the conditions and propositions for testing a theoretical model this then can confirm, challenge, or extend the proposed theory. The single case can be used to determine whether a theory's propositions are correct or whether some alternative explanation(s) might be more relevant.

In this study, the city of Bam in Iran is a unique case in which:

- About 90% of the city was destroyed by a devastating earthquake, and over 30,000 temporary shelters and 35,000 permanent houses were provided by the national and local governments. Therefore, the phenomenon occurred on a significant scale, offering considerable research possibilities.
- The earthquake affected the city' historical heritage and threatened its cultural landscape.
- About 25,000 households collaborated closely with experts from 28 architectural firms located in Bam and participated directly in the architectural and structural designs of their houses.
- There was a significant presence of stakeholders, having varied interests, experience levels, and capabilities in the recovery and reconstruction processes. This allowed for learning about the obstacles against collaboration-, knowledge- and experience-sharing amongst stakeholders.
- The housing reconstruction program had different impacts on varied groups of households. While the housing reconstruction program helped some groups of households rebuild their houses, hundreds of families were still in transitional sheltering camps.
- Different methods, strategies, and policies were applied in Bam. The housing reconstruction experience in Bam is rich enough and lets the researcher examine various impacts of interventions on different groups of households' recoveries.

Moreover, for the researcher, Bam is a critical case because;

- He is familiar with the culture, the local language (Farsi), and the lifestyle of the affected communities;
- He was involved in the post-disaster housing reconstruction project in Bam from 2004 to 2008. Moreover, the researcher participated in the Bam Reconstruction Documentation Project (BRDP), conducted by the Housing Foundation of the Islamic Republic (HFIR) and, between 2008 and 2012, he supervised the sub-project "Temporary Housing Project after the Bam Earthquake 2003;"
- He had access to reports and policy documents, including project meeting minutes, press releases and construction documents, and the BRDP's eleven thematic reports.

1.3.4. Case study design

This dissertation employs a single-embedded case study (see Figure 1.5). The scope of the overall research described in this thesis is focused on the single-case design with embedded units of analysis of housing reconstruction programs in Bam, Iran. It looks at the entire program, and each article is a single/holistic case study that investigates the program through specific lenses.

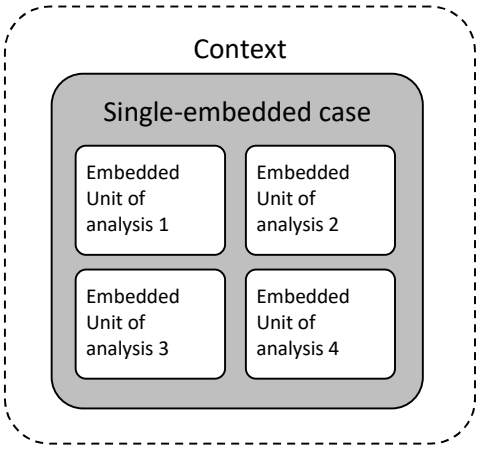


Figure 1.5: Single-embedded case study with multiple units of analysis –Source: Yin (2003)

1.3.5. Data collection

A variety of data collection methods including direct observations, interviews, and secondary data collection was applied to fulfill the research objectives. Data collection methods are explained in every article; however, this section provides an overview of these methods.

It should be emphasized that this is a longitudinal research project and the data collection process began a few months after the disaster - nine years before the researcher enrolled in the Ph.D. program. This is expressed in the ethics certificate obtained from Université de Montreal in 2014. Please see more in Annex IV.

> "*The required data and information for conducting this study were previously collected from three main sources of evidences in Iran, including: direct observations, interviews, and documents. For collecting more information, the researcher will visit Bam in Iran in summer 2014 to meet some authorities and affected families. He will also search for more relevant documents*." (Ethic Certificate CPER-14-082-P-1)

Direct observations

Data collection occurred over five separate field visits to Bam: 1) July – August 2004, 2) November 2008, 3) January 2011, 4) March 2012, and 5) June – July 2014. The first visit was for six weeks in July-August 2004, when the researcher was an undergraduate student in urban planning, in order to help understand families' expectations of the reconstruction of their houses. At that time, the researcher was also responsible for helping beneficiaries to understand the process of housing reconstruction and encouraging them to participate in the architectural design of their houses. During the first visit, valuable information was collected, such as information on families' demographic conditions, pre-disaster quality of houses, families' lifestyle and social connections before the disaster, and the quality of temporary housing camps and temporary housing units in households' properties.

The second visit was for three weeks in November 2008, approximately five years after the disaster, when the researcher was a Master's student and a researcher working for the Housing Foundation of Islamic Republic (HFIR) at the same time. The purpose of that trip was to evaluate families' participation in the architectural, structural, mechanical, and electrical design of their houses. The researcher was seeking information on the quality of the temporary shelters that were provided and on housing reconstruction processes (more specifically about policies, decisions, limitations, and outcomes). During that trip, the researcher interviewed households, HFIR's key managers in Bam, and the head of involved NGOs in the housing reconstruction program.

Between 2008 and 2012, the researcher was involved in the Bam Reconstruction Documentation Project (BRDP), which was conducted by the HFIR's research department. In the context of this project, the researcher was responsible for documenting and evaluating the temporary housing program in Bam. He visited Bam and conducted more interviewees with households and authorities in 2011 and 2012.

The last trip was for four weeks, between June and July 2014, during which time more interviews with different household groups in Bam and HFIR's key managers in Bam and Tehran were conducted. Again, the researcher collected much information regarding households' participation in housing reconstruction processes, the impact of housing reconstruction programs

on their lifestyle and social connections, their access to information during the reconstruction process, and their knowledge about disaster risk reduction requirements.

Interviews

About 70 interviews with households in Bam and 12 interviews with officers and authorities were conducted in Bam and Tehran during four field trips between 2008 and 2014. Every interview with households was nearly one hour and a half in length, although this ranged from 45 minutes to more than two hours, depending on interviewees' responses. These semi-structured interviews followed a standard questionnaire format focusing on households' recovery and housing reconstruction experience. The purpose of these interviews was to provide information on demographic characteristics, number of losses, pre- and post-disaster sources of livelihood, temporary housing locations and quality; location and quality of houses before and after the disaster; participation in housing reconstruction processes; lifestyles and social connections before and after the disaster; land tenure and ownership rights; access to information during the reconstruction process; and later, knowledge on disaster risk reduction requirements. These semi-structured interviews followed a standard question format focusing on recovery and housing reconstruction issues. Follow-up questions were provided to allow the researcher to examine further details and enter into further discussion on relevant topics (Dunn & Hay, 2005). Annex I presents an overview of the interview guide used for the household interviews.

In-depth semi-structured interviews were also conducted with officers and authorities. Representatives from the local and national governments and humanitarian organizations provide information on decision-making processes, recovery and reconstruction objectives and strategies; various stakeholders' roles; housing reconstruction policies; and impediments to the attainment of objectives. Interviews with authorities targeted government officials at multiple levels within Bam, Kerman province, and the national government, as well as NGOs and humanitarian practitioners. Interviews with officers and authorities, regarding their responsibilities in the reconstruction program, varied from 30 minutes to two hours (Table 1.1).

Table 1.1: Interviews conducted for this study. Source: author.

Interviewees		Number of interviews per fieldwork			
		November 2008	January 2011	March 2012	June and July 2014
Different household groups	Pre-disaster house-owners	10	5	1	17
	Members of extended families	4	4	-	4
	Young couples who married after the disaster	-	-	1	1
	Apartment-owners	2	1	-	4
	Pre-disaster tenants	1	3	-	10
	Informal settlers	-	-	1	1
Total		**70 interviews**			
Officers and authorities	HFIR's key managers	1	-	2	3
	Bam's representative in the Islamic Parliament of Iran	-	1	-	-
	Bam's mayor	-	1	-	-
	Heads of architectural consultancies in Bam	-	-	3	-
	Heads of involved NGOs	1	-	-	-
Total		**12 interviews**			

Interviews are the most important source of evidence in this research. Answers to questions are carefully analyzed and discussed throughout four articles, three of which have already been published. Table 1.2 breaks down interviews based on their use in each article and based on the year they were conducted.

Table 1.2: Interviews and their contributions to the 4 articles. Source: author.

Interviewees		Chapter 2 (Article 3)				Chapter 3 (Article 2)				Chapter 4 (Article 1)				Chapter 5 (Article 4)			
		2008	2011	2012	2014	2008	2011	2012	2014	2008	2011	2012	2014	2008	2011	2012	2014
Households	Pre-disaster house-owners	-	-	x	x	x	x	x	x	x	x	x	-	-	-	-	x
	Members of extended families	-	-	x	x	x	x	-	x	x	x	-	-	-	-	-	x
	Young married couples	-	-	x	x	-	-	x	x	-	-	x	-	-	-	-	x
	Apartment-owners	-	-	x	x	x	x	-	x	x	x	-	-	-	-	-	x
	Pre-disaster tenants	-	-	x	x	x	x	-	x	x	x	-	-	-	-	-	x
	Informal settlers	-	-	x	x	-	-	x	x	x	-	x	-	-	-	-	x
Officers and authorities	HFIR's key managers	x	-	x	x	x	-	-	x	x	-	x	-	x	-	-	x
	Bam's representative in the Parliament	-	x	-	-	-	x	-	-	-	x	-	-	-	x	-	-
	Bam's mayor	-	x	-	-	-	x	-	-	-	x	-	-	-	x	-	-
	Architectural consultancies	-	-	x	-	-	-	x	-	-	-	x	-	-	-	x	-
	NGOs	x	-	-	-	x	-	-	-	x	-	-	-	x	-	-	-

Documents

Secondary data sources contributed information regarding the overall recovery and reconstruction program. Secondary data was collected from more than 32 reports and six policy documents, including project meeting minutes, press releases and construction documents, and the BRDP's eleven thematic reports. Documents were used to provide further information on the specifics of the recovery efforts. These documents were useful for understanding reconstruction management tasks, available resources, recovery and reconstruction policies, and statistical information on the number of reconstructed houses and the loan amounts given to households (Table 1.3).

Table 1.3: List of collected policy documents from different resources and at different times. Source: author.

Policy documents	Date	Content
Approvals of the cabinet of ministries	Feb. 21, 2004	- Reconstruction management tasks and available resources
	Mar. 18, 2004	- The Reconstruction Supervision and Policymaking Association (RSPA)
Approvals of the Reconstruction Supervision and Policymaking Association (RSPA)	May 24, 2004	- The initial housing reconstruction policy proposed by the HFIR
	June 21, 2004	- Financial aid and loans to the reconstruction of residential and commercial buildings in urban and rural areas - Proportion of funding and international aid is transmitted to the housing sector
	July 20, 2004	- HFIR's responsibilities in managing and monitoring the transitional and permanent housing programs - Modification of Bam's master plan
	April 11, 2005	- The revised policy with the emphasis on providing ownership rights for tenants and members of extended families
Minutes of project meetings: 1) the National Disaster Task Force (NDTF), 2) Bam's RSPA – local committee, and 3) the provincial government of Kerman	Jan. 5, 2003 – Dec. 26, 2006	- Permanent housing reconstruction management: review of opportunities and obstacles - Recognition of vulnerable families and seeking solutions for their better recovery - Finding solutions for tackling critical problems such as debris removal, shortage of construction materials, complexity of inherited properties, severe depression, and mental illnesses, and families' lack of intention for reconstruction of houses
Press releases	May 25, 2005	- "How to rebuild Bam?" *The Iranian Daily Hamshahri*
	Feb. 10, 2005	- "Temporary housing camps and their inhabitants two years after the earthquake in Bam" *Mehr News Agency*
	Dec. 24, 2006	- "The fifth anniversary of the earthquake: debris of broken promises" *Tabnak News Agency*
The Bam Reconstruction Documentation	Between June 2008 and Aug. 2014	- Relief and rescue process, - Debris removal process - Temporary housing process,

Project (BRDP) – (conducted by the HFIR)		- Participatory approach in Bam reconstruction, - Project management in Bam reconstruction, - Resource management in Bam reconstruction, - Permanent housing process (planning and designing), - Involved NGOs in Bam reconstruction, - Needs assessment and damage assessment, - Control and monitoring techniques, and - Indexing resources
The HFIR's monthly reports of the housing projects	6 reports between May 10, 2004 and Sep. 9, 2006	- Statistics on the number of reconstructed houses and the amount of given loan every month

1.3.6. Data analysis

In this research, data analysis procedures followed three different kinds of analysis: *pattern matching, qualitative content analysis*, and *data triangulation*.

Pattern matching

This explanatory case study benefits from the pattern matching technique to analyze qualitative-quantitative data, interpret results, produce findings, and contribute to theory. According to Yin (2003, p. 116), "the pattern matching technique compares an empirically based pattern with a predicted one"; if the pattern coincides, the results can help in the analytical generalization of findings – theory development.

In this research, four theoretical propositions (analytical framework and hypotheses) formulate expected patterns and specify the values of variables (either independent or dependent). For instance, the analytical framework in the third article recognizes different scales of vulnerability and resilience at which the system (and its subsystems: economy, social, natural environment, built environment, governance, and information and communication) can be analyzed. Also, the framework predicts that a system adopts adaptive characteristics through sufficient performance criteria. Using the Process of Enhancing Resilience model, this research assesses the impact of different temporary housing strategies on families' resilience in Bam (see chapter 3). Similarly, Articles 1, 2, and 4 develop different theoretical propositions and test predicted patterns in the case of the housing reconstruction program in Bam.

Qualitative content analysis

The qualitative content analysis method lets researchers create a database and identify patterns in the data (Gläser & Laudel, 2013). In this study, the interviews and documents were analyzed

using the qualitative content analysis method. The qualitative content analysis starts by extracting the data from the original text and "systematically reduces the amount of information, and structures it according to the aim of the investigation" (p. 30). To initiate the qualitative approach, interviewees' responses and documents were classified under key themes (called descriptive or topic codes) and entered into an Excel spreadsheet. In the extraction step, the descriptions of informants' information and texts were replaced by their reformulation in an analytic language, which is precise and better adapted to the research questions. Also, the link between the extracted information and the original descriptions was kept in order to return to original materials at any point during the research.

Interviews were coded using open coding, which is an inductive process and makes links between data in the interviews and previously identified theoretical concepts, as well as emerging patterns and trends (Richards & Morse, 2012). According to Warren and Karner (2005), an open coding process identifies repetitive patterns or themes and attempts to "construct a cohesive representation of the data" (p. 218). These repeated themes were then linked to the theoretical frameworks to interpret the level of occurrence of the phenomena in the case study.

Data triangulation

According to Miller and Fox (2004), triangulation involves “using several methods to reveal multiple aspects of a single empirical reality [...] a discovery process designed to get at an objective truth that may be systematized as a formal theory of social structure and process” (p. 81). Triangulation is an approach that allows multiple viewpoints to contribute to the same topic or phenomena under study. As a result, in this research project, triangulation provides an opportunity to explore the different perceptions and experiences of post-disaster housing reconstruction within the context of the 2003 earthquake in Bam, Iran.

The use of multiple sources of evidence helps the researcher to support facts and hypotheses. To verify and corroborate information collected from the interviews, the researcher reviewed reports and policy documents and conducted some field visits and made direct observations. This triangulation of data decreased the risk of personal interpretation and distorted memories of interviewees, minimizing the danger of incomplete and conflicting reports – or “converge[d] lines of inquiry” Yin (2008, p. 98). Using the triangulation of data and methods, the research could create a coherent narrative of the events and decisions made in the reconstruction project

over ten years. The triangulation of data permitted not only following-up on the implementation of different policies over time, but also the effects of these policies over a 10-year period, providing unique information about the reconstruction process.

1.4. Bam before the disaster

This section explains the socio-economic, geographic, built-environment, and historical conditions of Bam before the disaster. A holistic, but brief, review of life before the disaster is essential to better understanding the impact of the recovery and reconstruction interventions on Bam after the disaster. I visited the city of Bam for the first time only *after* the disaster; however, many interviews with survivors, discussions with friends and family members who toured the city before its destruction, and an audiovisual documents review gave me an accurate perception of the pre-disaster life in Bam. Later, in the conclusion section of this dissertation, I will draw on information from this chapter and explain how the reconstruction program failed in helping the city and its households to recover from economic, social, cultural, and environmental dimensions.

1.4.1. Geography and history

After 19-hour bus rides in the inhospitable Lut desert from Tehran, or 12-hour bus rides through twisting mountains from Shiraz, visitors entered a peaceful air that smelled of palm leaves and lemon flowers. The city of Bam lies on the southern edge of the deserts on the Iranian plateau and on the elevation of 1060m above sea level (Figure 1.6). Bam has an arid climate with temperatures ranging from +49°C to −9°C (Armanshahr, 2006). Despite the location of the city near Lut desert, Bam had a garden-like city structure, consisting of large garden homes with palm groves and citrus orchards.

Figure 1.6: Bam in southwestern Iran

Pre-disaster visitors recall the slow pace of life in the city and explain how people all knew each other and recognized visitors immediately. They were greeting visitors on the streets by slightly bowing heads, putting hands on their hearts, and saying *khosh amadi* (welcome, in English). The first and the most important place to visit was the original old city and its grand citadel—*Arg-é Bam*. Taxi drivers, who mostly were the Baluchi people of southeast Iran, carried passengers to the citadel through a side road to let them discover *Arg-é-Bam* from its most dramatic view. For visitors, the sudden appearance of the majestic mud-brick complex set against the desert background was breathtaking (Figure 1.7). The citadel might be the best representative of the 2500-year old history of the city, which has its origin in the Sassanian Empire around 300 A.D.

Curious tourists were able to learn more about the history of Bam in a museum near the entrance of the citadel. Bam has a very rich and long history. By the 10th century A.D., Bam was a prosperous trading city, producing quality silk and cotton garments at the crossroads of the south-western Asian roads, described as "Silk" or "Spice" roads for the past centuries (Towhidi, 2002). The city and its inhabitants have experienced the repeated trauma of invasions and cultural shocks. The Turkish and Mongol invasions severely affected the city and its trading and garment industry between the 12th and 14th centuries. Bam succeeded once again as a center for silk and cotton garments and came to occupy a strategic role in the region between the 16th and 18th centuries (Misra, 2008). During this period, according to Towhidi (2002), the city grew, and many buildings with significant architectural value appeared out of *Arg-e-Bam*. In the 1720s, the

Afghan invasions again impacted the city and its position in the region. This adverse trend continued even when the Persians conquered the invaders in the 1750s (Forouzandeh, 2014).

Almost all visitors seemed surprised when they discover that the citadel was populated up until two hundred years ago. In the 1830s, Bam's inhabitants gradually moved out to their gardens and date groves about one kilometer southwest of the citadel and formed a new settlement. The citadel was maintained only for military use by the local government. The citadel was eventually completely abandoned in the 1890s (UNESCO, 2004).

Figure 1.7: Bam Citadel (*Arg-é-Bam*) before the earthquake - Photo by: E. Andaroodi

Figure 1.8: Bam Citadel (*Arg-é-Bam*) after the earthquake - Photo by: M. Fayazi

1.4.2. Socio-cultural characteristics

Bam's social and cultural characteristics were formed throughout many centuries and help define its population's collective identity. Pre-disaster tourists and survivors of the earthquake have many memories of life before the disaster. Almost every interviewee interviewed for this

research project recalled the active life and events and ceremonies that were organized on *Imam Khomeini* street, in the center of the city, and in all four seasons. For instance, people remember public assemblies for the remembrance of *Muharram* (the *Battle of Karbala* and the death of *Husayn ibn Ali)* that was organized on this street every year. The commemorations was centered around rather sad events, in which participants congregated in public processions for ceremonial chest-beating as a display of their devotion to *Husayn ibn Ali*, in remembrance of his suffering. In regular evenings, the street was busy with pedestrians who would shop, or young men who would spend time with friends in cafés or small restaurants.

Depending on the season, different activities were taking place in the yards and gardens; so many ceremonies and feasts brought families together several times every year. The longest night of the year (*Shab-e Yalda*), the Northern Hemisphere's winter solstice, was one of the main traditions in Bam. "*All my friends and family members knew that I was waiting for them to come to my place every Shabe-Yalda. I served them with nuts and fruits, mostly pomegranates and watermelons, and we were eating, dancing, and reading poetry* [mainly from Divan-e Hafez] *until well after midnight of Shab-e Yalda,*" said Bibi Zahra. Many Bam families also celebrated *Eid-e Alafe* on the March 22nd*,* a day before the Iranian new year (*Nowruz*), to support the spiritual journey of deceased family members and friends. On that day, families' female members would gather in the yard of the eldest one and would cook together. Men and young boys were responsible for packaging and distributing the food to the poor. They believed that by feeding the poor, they brought happiness to souls of their loved ones. In the evening and after the distribution of food, inhabitants would then visit the cemeteries and read the Quran.

Thirteen days after every Nowruz, families in Bam would celebrate *Sizdah Be-dar* in their date palm groves when all Iranians would leave their houses to join nature, spending the day outdoors, and tying lawn leaves to express their wish to reach certain dreams. The house-garden structure of houses before the disaster in Bam allowed for most of Bam's population to celebrate the day of nature (*Sizdah Be-dar)* in their yards with their community members.

Bam's society is still famous for its hospitality. Families strive to provide good food, comfort, and entertainment for their guests, and at the end of the party, hosts usually escort guests out of their home, wishing them a safe return. In Bam, people believe that God leads guests to their home, and they display profound respect and entertain guests without any expectations of

remuneration or hope of the favour being returned. During one of my trips to Bam in 2008, a young couple described their wedding party in one of their parents' house before the disaster. Alireza described the wedding party as: "*The large yard of my parents' house let us organize a very big wedding party, hanging lights and decorations from every palm tree, setting 50 round tables, and hosting 350 guests."* Similarly, Samira recalled the *Hanna-Bandan* party the night before the wedding: "*We were about 50 people, our family, Alireza's family, and some of our very close friends were getting together in our yard* (at her parents' house). *I vividly remember when Alizara put henna on my hands and his family generously presented their gifts to my parents."* The list of traditions and ceremonies in Bam continue. However, this brief review helps uncover the correlation between the built environment and socio-cultural traditions in Bam.

1.4.3. Economy and livelihood resources

Bam's geopolitical location and its rich built heritage offered considerable economic opportunities for Bam over the years. Bam's population conserved the citadel with respect as a proud piece of cultural heritage that became a well-known national and international tourism destination. During the year before the earthquake, the citadel along with many other historic sites, and the unique and harmonic architecture of the city drew in about 15,000 foreign tourists and three times as many Iranian visitors (Statistic Center of Iran, 2003). Before the disaster, the tourist industry provided great job opportunities for many Bam inhabitants such as Ali Agha.

Almost all those who visited the citadel before the earthquake remember Ali Agha, a longtime Bam guide whose white hair and mustache contrasted sharply with his walnut-colored skin. Ali Agha was a proud father of four and had 11 grandchildren. After many years of guiding people up and down the steps of the citadel, he was still fit and in good health. With the help of Ali Agha, visitors explored a bazaar, a mosque, a temple, military barracks, and horse stables, among other things, within the citadel's walls. All these were made of mud and straw, and remained exceptionally intact. Pre-earthquake visitors recall Ali Agha's old *Kermani* folk songs or poems among many courtyards and terraces of the citadel and how he believed that the acoustics inside the citadel equaled that of any concert hall in Iran.

Extensive citrus fruit orchards and palm groves also provided an important part of Bam's economy and supported contemporary life before the disaster. An ancient water supply system (Qanat), fertile soil, and its unique microclimate provide suitable conditions for harvesting date

and citrus as well as grains such as barley, wheat, and soy. Rather than livelihood resources, the gardening and agricultural activities were important components in the population's culture. Families' male members, with the help of neighbors and friends, would plant, prune, irrigate, and spray palms and citrus trees and harvest vegetables between the beginning of winter and the end of summer each year. Meanwhile, families' female members and neighboring ladies were busy raising kids and doing housekeeping activities. From the beginning of July until the end of September, all family members with the help of their friends and neighbors would harvest, sort, package, and transform fruits into domestic products such as date molasses, lemon juice, and dried fruits (Figure 1.9). With the help of young fellows, elder family members would then be responsible for delivering and selling products on the market – a demanding task that often required about five months of enormous collaborative efforts. Before the disaster, the production of *Mazafaty*, a cultivar of the date, was about 120 thousand tons, of which more than three thousand tons were exported abroad every year.

Figure 1.9: Community member collaboration in the date packaging process - Photo by: Ali Mardanlu

Before the disaster, many automatic and traditional factories were emerging in an industrial area 10 km east of the city, *Arg-é-Jadid*, packaging and transforming dates and fruit into secondary goods. Despite its potential adverse impacts on the culture and traditions, *Arg-é-Jadid* presented significant opportunities for economic advancement. Also, this industrial area provided a portion

of Iran's auto industry, which provided employment for many skilled and unskilled labourers from all around the province.

1.4.4. Urban fabric and architecture

Before the disaster, the city of Bam contained three distinctive urban fabric types with recognizable physical and spatial structures (Figure 1.10). After the citadel, visitors would visit the old Bazaar in the center of the city. The long-vaulted bazaar was situated near the mosque and the main square of the city, supplying handicrafts, fabrics, clothes, household items, Persian rugs, spices, copper, etc. Before the main entrance, ladies from nearby villages would trade local confectionery products, letting the smell of rosewater, cardamom, and cinnamon hang in the air. Inside the bazaar, similar goods were grouped in sub-bazaars – called Rast-é bazaars. The bazaar was an architectural beauty; it was easy for visitors to spend half the day there. In general, the historical center of the city and its immediate periphery had a dense fabric with the network of narrow streets called *koocheh* (Figure 1.11).

Figure 1.10: **Three different urban fabric types of the city – Source: Naqsh-e-Jahan-pars (2004)**

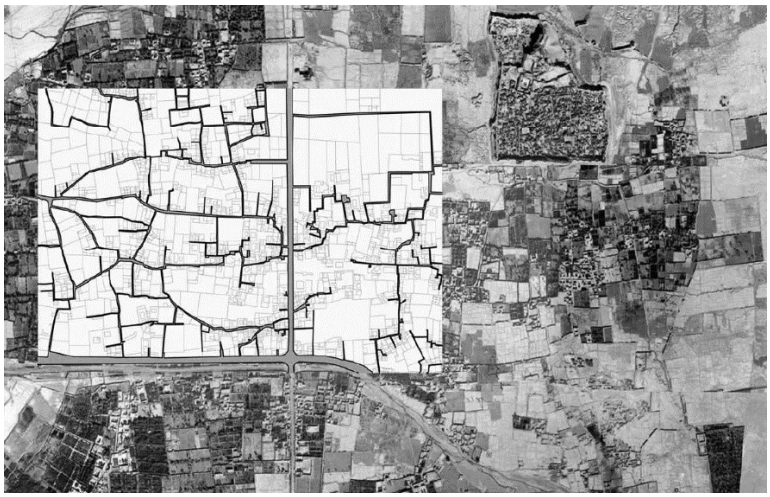


Figure 1.11: Street network in Bam's historical center – Source: Naqsh-e-Jahan-pars (2004)

The heart of the city contained a wide variety of houses with different forms and locations of buildings in their yards. The morphology of pre-disaster houses shows a significant number of O-shaped buildings with enclosed small garden courtyards, making up the dense historic core of the city (about 14 percent). The I-, U-, or L-shape yards were also part of this dense area, but this historic core had a small proportion of yards compared to other neighborhoods. Almost all the buildings were built using vernacular technologies and materials, and very few houses were constructed using steel-framed, brick-steel, or reinforced-concrete technologies.

Large gardens and scattered houses surrounded the historic core of the city. Narrow alleys, curved walls plastered with mud and straw, and date groves and citrus gardens behind the walls are common images of the house-garden neighbourhoods. Visitors who were invited into the gardens of residents would discover three-storey gardens: floating palm leaves on top, citrus trees in the middle, and flowers and vegetables on the ground. They listened to stories about how the citadel residents gradually moved to gardens, built houses, and formed a garden-house urban fabric in the 19th century. The urban landscape in the house-garden neighbourhoods was based on dispersed houses in large gardens and a curvilinear network of streets (Figure 1.12). The pre-disaster house morphology shows the common pattern of I-form buildings to the north, south or center of extensive gardens (more than 90 percent). In less than ten percent of cases, gardens surrounded the buildings from three sides (Table 1.3). In general, palm groves and citrus orchards covered more than two-third of the lands in the house-garden neighborhoods.

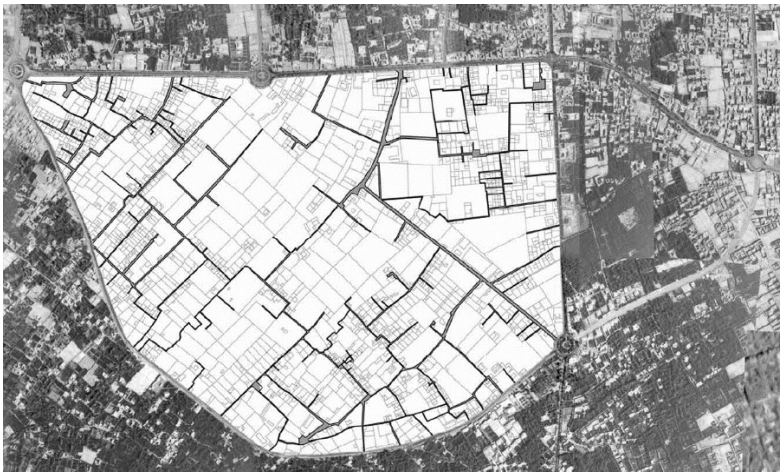


Figure 1.12: Curvilinear network of streets in Bam's house-garden neighborhoods – Source: Naqsh-e-Jahan-pars (2004)

Finally, the last urban fabric with its grid network of streets and rectangular land plots appeared by the end of the 20th century on the western and southeastern side of the city. Land plots had the north-south orientation and houses were mostly located on the northern side of yards (about 75 percent). See Figure 1.13 and Table 1.3.

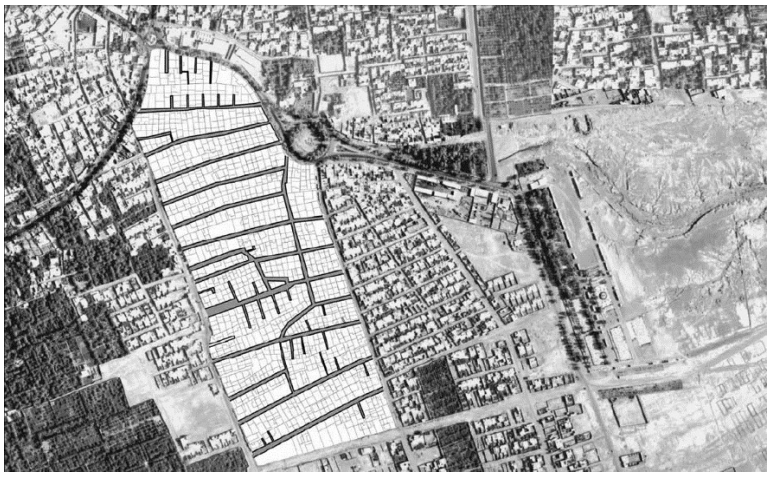
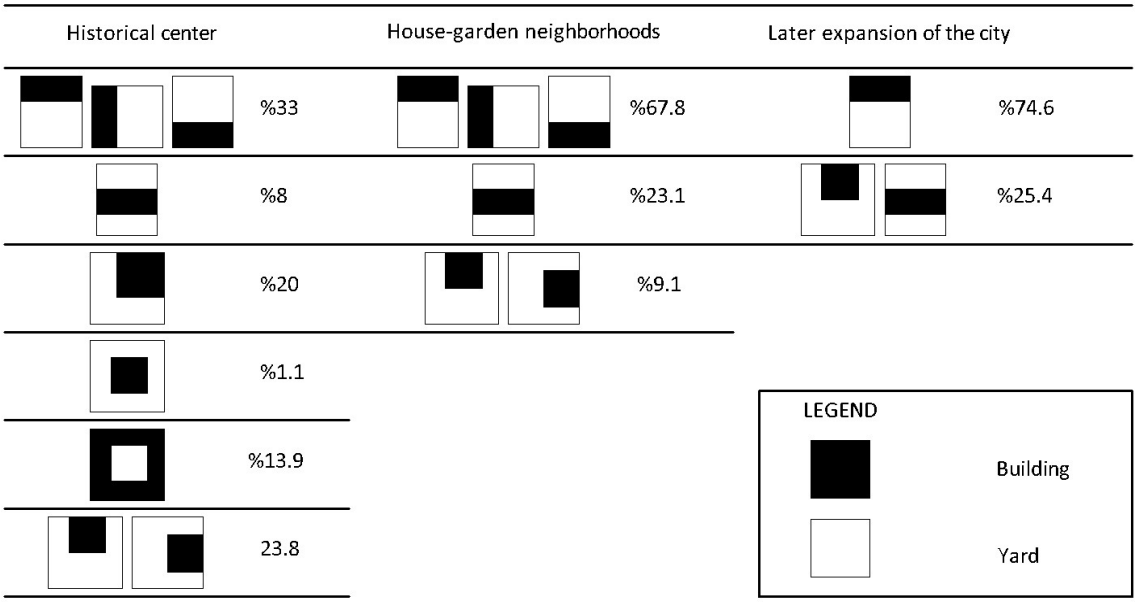


Figure 1.13: Grid network of streets in the later expansion of the city – Source: Naqsh-e-Jahan-pars (2004)

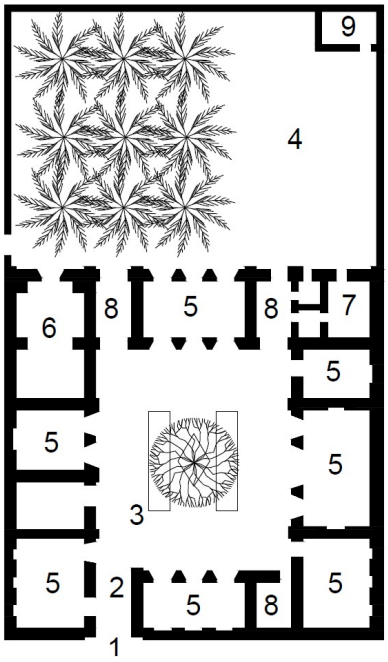
Table 1.4: Different forms and distribution of pre-disaster houses in different neighbourhoods – Sources: Naqsh-e-Jahan-pars (2004) and Golpayegani (2004)



Corresponding to Bam's diverse urban fabric, the architecture of houses also displayed a great diversity. Despite varieties in size, location, and proportion between built and open spaces, all houses in the traditional and house-garden neighborhoods consisted of interior and exterior sections with one or two courtyards. Almost all houses in Bam, except those in the later expansion of the city, were composed of the following features and elements:

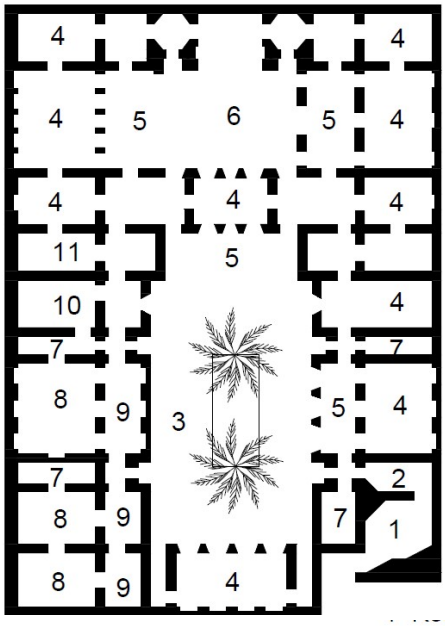
- A small enclosed transitional space before entering the doorway of the house, called a *hashti*.
- A rectangular hall or space with one end entirely open and walled on three sides, called *eyvān*. This was a transitional space between the inside and the courtyards.
- Inhabitants had convenient access to every part of the house.
- Small gardens contained citrus and palm trees surrounding central pools (*howz*) in the courtyards,
- Different parts of the house were carefully arranged between the exterior (*biruni*) and the interior (*andaruni*) sections to provide the maximum privacy for inhabitants,
- Various parts of the house faced either toward or away from *Mecca*.

Four traditional houses in Bam are demonstrated below to facilitate a proper understanding of Bam architecture and the arrangement of its essential elements. Figure 1.14 and 1.15 show two houses from the historical center of the city.



1- Entrance (*hashti)*
2- Corridor *(dalan-e vorudi)*
3- Courtyard & pond *(howz)*
4- Garden
5- Room
6- Washroom *(howz-khaneh)*
7- Kitchen *(matbakh)*
8- Corridor
9- Furnace *(tanour)*

Figure 1.14: House of Mahmoud Badié-o-Zaman in Bam – Source: Golpayegani (2004, p. 4)



1- Entrance (*hashti)*
2- Corridor *(dalan-e vorudi)*
3- Courtyard & pond *(howz)*
4- Room
5- Room (*ivan)*
6- Washroom *(howz-khaneh)*
7- Storage (*pastoo*)
8- Service

Figure 1.15: House of Gholi Khane Saad-el-duéleh – Source: Golpayegani (2004, p. 5)

Figure 1.16 and 1.17 illustrate the traditional architecture of houses in the house-garden neighborhoods.

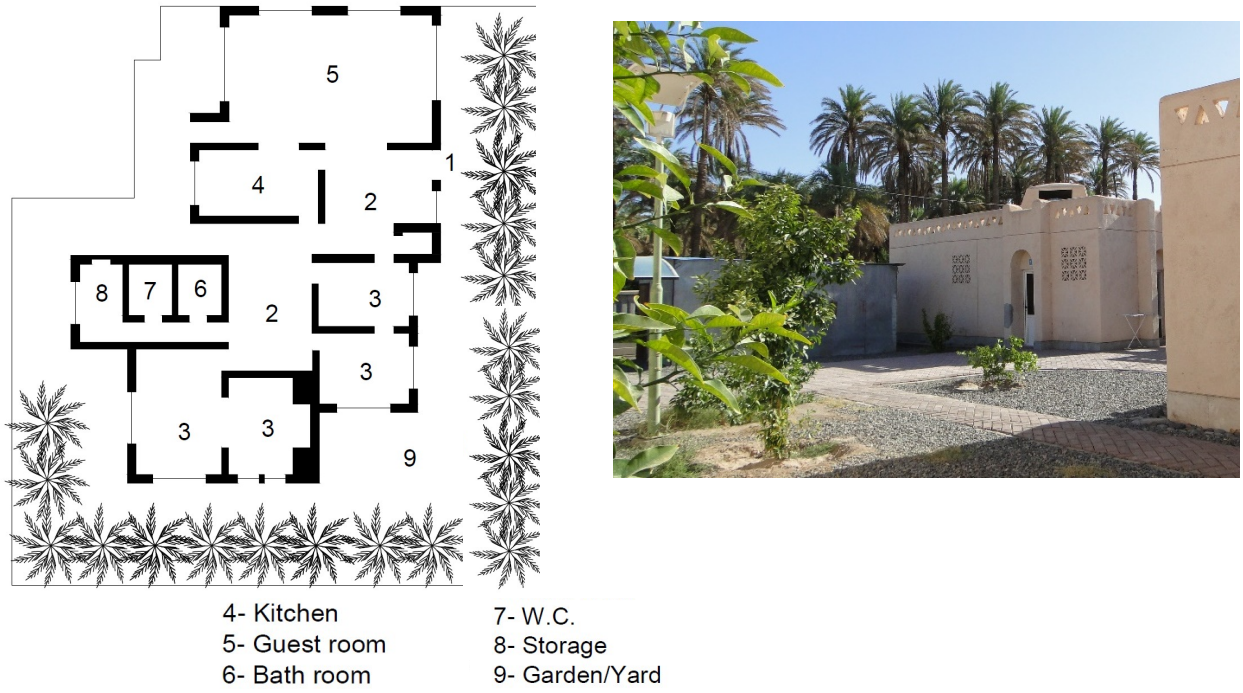


Figure 1.16: House of Dr. Ismaili – Source: Golpayegani (2004, p. 29)

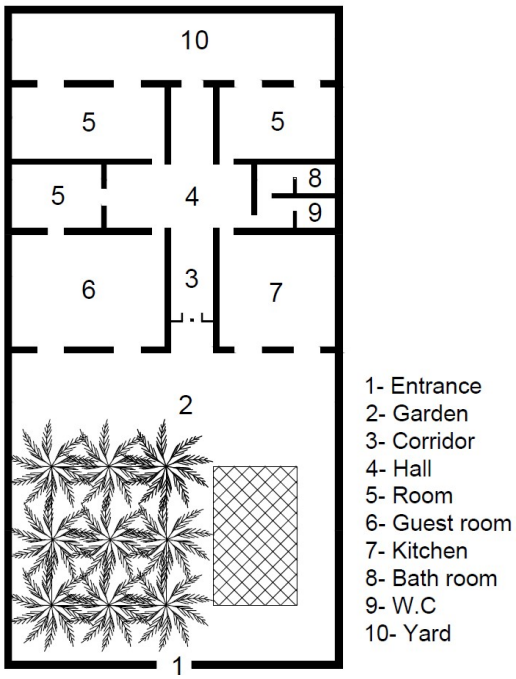


Figure 1.17: A simple house in the house-garden neighborhoods in Bam – Source: Golpayegani (2004, p. 22)

All in all, pre-disaster life in Bam had a steady rhythm, with a close relationship with nature and local resources, and was based on the collaboration among clan members who were living in a neighborhood. During my last trip to Bam in 2014, an elderly lady, Masoumeh – who lost two of her sons, her oldest daughter, three grandchildren, and some of her distant relatives on the night of the earthquake – paints a vivid picture of life in Bam before the disaster:

> "*We were living in a house where its limit was far from walls around the yard; my home was as big as a neighbourhood, in which my distant and immediate relatives were living. I hardly remember a lunch that Ismaeel* [her husband]*, kids, and I had alone on our soffreh* (a piece of textile that they put on the rug and is used for serving meals). *We all raised, lived, celebrated, and grieved together. However, we are isolated islands now, with broken pre-disaster bonds, and struggling with the absence of loved ones.*"

1.5. Summary

This introductory chapter aimed at outlining an overview of the context of disaster research as well as a sketch of typical problems in recovery programs. It presented the research objectives and questions, research purpose and significance, and research methodology concisely. It concluded by presenting the socioeconomic, geographic, built-environment, and historical conditions of Bam before the disaster. It reviewed life before the disaster, letting the reader better understand the impact of the recovery and reconstruction interventions on Bam. The evaluation of many reconstruction experiences worldwide reveals the tendency of repetitive failures; for instance, the reconstruction programs are often insensitive to survivors' real needs and desires, ignore their priorities, disrupt community ties, exclude families from decision-making processes, and eventually fail in helping them to recover equally and sufficiently. To understand causal factors behind these challenges, the researcher decided to break Bam's housing reconstruction program into four separate levels and investigate them distinctly. Chapter 2 examines causal factors behind conflicts among underlying principles and core values that often appear in reconstruction programs. Chapter 2 also develops the analytical framework of underlying and intensifying factors of conflicting objectives and helps position how disaster managers and authorities can prevent the conflicts.

CHAPTER TWO

Conflicts between Recovery Objectives: The Case of Housing Reconstruction after the 2003 Earthquake in Bam, Iran

[Article 3]

Fayazi, M., & Lizarralde, G. (2017).
International Journal of Disaster Risk Reduction (In press).

This chapter explains causal and intensifying factors related to conflicts and reveals how disaster management programs can prevent them. Relying on a comprehensive body of knowledge about reaching decisions with multiple objectives, this inquiry examines common conflicts between reconstruction objectives. In fact, the chapter two explains tensions between underlying principles and core values, thereby investigating the initial steps in a recovery and reconstruction program. Results discover the lack of participatory decision making before and after disasters as well as tensions between involved stakeholders as primary causal factors of conflicts between recovery objectives. Findings bridge critical knowledge gaps and explain possible threats to every recovery and reconstruction programs.

The first author played the main role in the whole process of research, editing and writing. He extensively reviewed the literature in the public participation, project management, and post-disaster reconstruction fields. He then developed an analytical framework, explaining causal factors of conflicts between recovery objectives. Under the supervision of, and in collaboration with, the second author (Dr. Gonzalo Lizarralde), he conducted the case study, tested the analytical framework, and analyzed findings. Using the comments and help of Dr. Lizarralde, the first author developed the discussion and conclusions.

To have access to this chapter please refer to the published article using the following link: https://doi.org/10.1016/j.ijdrr.2017.10.017

Abstract

Disaster management studies have demonstrated that reconstruction programs often set up conflicting objectives. Yet, insufficient knowledge still exists about *how* conflicts between objectives appear and escalate during the reconstruction process. The purpose of this article is to explain the causes and consequences of these conflicts and to reveal how disaster management programs can prevent them. After developing the analytical framework of *underlying and intensifying factors of conflicting objectives*, this qualitative inquiry examines the housing reconstruction program conducted after the 2003 earthquake in Bam. Empirical results show three sets of conflicts between economic, social, cultural, and built environment objectives, and reveal how they led to repeating simple modular housing units, which partially destroyed a rich and historic architectural landscape, ignoring households' needs, identities, culture, and traditions and damaging irreversibly Bam's unique urban fabric. Results reveal unsolved controversies in the post-disaster reconstruction field and the lack of participatory decision-making before disasters as the underlying factors of such conflicting objectives. On the other hand, conflicts between stakeholders as well as challenges in participation processes during the reconstruction process intensified conflicts between recovery objectives. Findings recommend preventing the rapid establishment of new organizations in the post-disaster stage and finding a balance between professionals' and lay community's knowledge to fulfill short and long-term recovery objectives.

Keywords: Housing reconstruction, Recovery, Conflicting objectives, Public participation, Bam, Iran

2.1. Introduction

Disaster recovery and reconstruction programs are highly complex processes. According to Rubin (1985), recovery is a "complex process with an ill-defined endpoint and no agreed upon measure of success." Reconstruction and recovery managers and decision-makers often overlook complex relationships and trade-offs between the economic, environmental, social, and cultural variables. For instance, overemphasizing economic imperatives at the expense of socio-cultural issues ultimately led to public dissatisfaction over the recovery program after the 1970 Gediz earthquake in Turkey (Aysan & Oliver, 1987). Barenstein (2006a) and Oliver Smith (2007) have found similar conclusions respectively in Tamil Nadu, after the 2004 Indian tsunami, and in Peru, after the 1970 earthquake-avalanche. Similarly, numerous researchers have explored common underlying problems and drawbacks in recovery programs. Lizarralde and colleagues (2016), for instance, examined six cases in Honduras, El Salvador, Colombia, Iran, Tunisia, and Haiti to identify common problems in responding to housing shortages in the aftermath of disasters. They reveal how ill managed complexity in disaster recovery programs often

materialize in common patterns, notably the neglect of the informal sector, community services, and cultural and environmental conditions. However, they fail to explore the causal factors underlying these complexities, such as the rivalry between recovery objectives, which – as we shall see later – often underpins common problems. Despite the general understanding of complexity in recovery programs, there is still insufficient knowledge regarding potential conflicts between recovery objectives, and in turn, their contributing and intensifying factors. This knowledge gap hinders the success of recovery programs and masks situations that often require difficult compromises and trade-offs.

This research aims at bridging this knowledge gap through a detailed, qualitative study of the reconstruction experience after the destructive earthquake in Bam, Iran, on December 26, 2003. For this purpose, this study combines three bodies of knowledge – public participation, project management, and post-disaster reconstruction – and develops an analytical framework, explaining how challenges in public participation, conflicts between stakeholders, and dilemmas on reconstruction management underlie and intensify conflicts between recovery objectives. This paper is divided into four sections. The first section reviews the most important contributions in recent literature and develops an analytical framework. The methodology section follows this literature review and explains applied methods for studying conflicting objectives in the case of Bam. The third section reports research findings and describes how conflicting objectives generated two significant problems in Bam: (a) the repetition of simple modular housing units that ignored architectural traditions, modes of living, and families' diversities; and (b) the degradation of Bam's urban and architectural heritage. Finally, the discussion and conclusion sections further elaborate on the theoretical and practical implications of the research findings.

2.2. Decision-making processes and conflicting objectives

Conflicts between interests, benefits, and objectives are inevitable in a complex world where dynamic systems are in constant interaction (Morin, 1992, 2008). Conflict management requires comprehensive insight about the consequences of various courses of action (Bell et al., 1977). Extensive research in some disciplines has been conducted, and numerous methods and algorithms have been developed, to reach the optimal solutions for dealing with conflicts (Cesari, 2012; Gonzalez-Vallejo, 2002; Pindyck, 1977). In fact, the literature on methods for reaching decisions with multiple objectives has shown exponential growth in social sciences in recent

years (Gregory et al., 2012; Hwang & Yoon, 2012; Merkhofer, 2012; Tan & Platts, 2003). A consensus on methods for reaching optimal solutions, however, remains unattainable. Herbert Simon's (1972) theory of *bounded rationality* effectively explains the hurdles against building consensus and reaching optimal solutions. He recognizes humans' "cognitive limits" in processing all the required information in different problem-solving situations and explains how individuals seek a "good enough" solution (a satisficing solution in his own terms), although it may not necessarily be optimal (Simon, 1972).

Conflicting objectives are pervasive and are at the heart of many public policy controversies. Conflicts between objectives sometimes indicate rivalry between some groups' benefits at the expense of others' benefits or interests, underlying issues of equity and exclusion (Beall, 2002). Decision- and policy-makers, whose actions affect the lives of others, must pay attention to stakeholders' expectations and needs, as they may be forced to make difficult trade-offs (Keeney & Raiffa, 1993). In capitalist economies, market mechanisms already operate several trade-offs through what economists call "an invisible hand" (Frieden & Kennedy, 2006; Jenkins & Wilkinson, 2002). However, social scientists deplore that market mechanisms are quite often insufficient and lead to socially undesirable solutions (Beall, 2002). For instance, market mechanisms promote a capitalist global network in which benefits are sometimes concentrated (Castells, 1999). Market-driven economies often certain social groups in a state of exclusion, with limited access to regular jobs, income, or social welfare (Jenkins & Wilkinson, 2002; Sassen, 2004). Given the socially-undesirable outcomes of market mechanisms, social scientists advocate for the need for socially-just institutions where open and transparent public participation in decision-making processes is possible, thereby minimizing the risk of exclusion.

2.2.1. Public participation

Since the emergence of "public participation" in governance analysis in the 1960s, solutions for resolving conflicts between stakeholders' needs and expectations often rely on their involvement in decision-making (Young, 2002). Some decision-makers consider public participation as a *means*, while others see it as an end in itself. The former argue that public participation helps to understand "public" problems, recognize common interests, and support equitable distribution of limited resources, thus advancing social justice (Innes & Booher, 2010; Quick & Bryson, 2016). Other decision-makers often emphasize "participation" as an *outcome* that expands knowledge,

strengthens relationships, enhances trust, and builds social capital (Connick & Innes, 2003; King et al., 1998). However, public participation does not always guarantee resolving conflicts between stakeholders, and its benefits depend on some critical factors. Arnstein's ladder of participation (1969) describes eight levels of public involvement in decision-making processes, ranging from citizens' control to the manipulation of public opinion and involvement. Her findings explain how public participation may serve authorities – and not citizens – when people merely receive information and approve or caution decisions that were already made by professionals or experts. Later studies recognize critical factors of any successful public participation, including legitimacy of public governance and participation, the inclusion of an appropriate range of interests, the use of expert knowledge in decision-making process, and design of a proper process of participation (Hassenforder et al., 2015; Quick & Bryson, 2016).

Quick and Bryson (2016) echo the concept of "legitimacy" in the context of public governance and participation. Legitimacy in this context concerns the "normative evaluation" of the "interactive processes through which society […] is steered towards collectively negotiated objectives" (Ansell & Torfing, 2016, p. 197). In fact, the concept of legitimacy applied to public governance and participations lead us to consider the delegation of authority and power from governments to citizens. According to Jacobs et al. (2009), in every legitimate participation, participants explain themselves clearly, use logical arguments, and utilize valid criteria for evaluating options and outcomes. Regarding the quality of the process, Quick and Bryson (2016) recognize "justice" and "rationality" as two main characteristics of every legitimate participation. For them, a procedurally just process embodies values such as "fairness, transparency, attentiveness to stakeholders' concerns, and openness to public input." (p. 161). Procedural rationality (or rationality in Quick and Bryson terms) refers to collecting, analyzing, and using relevant information to make decisions (Innes & Booher, 2010), ensuring that "final choices make sense on many grounds, including […] technical, administrative, legal, ethical, and stakeholders' support" (Quick & Bryson, 2016, p. 161).

Another key challenge in participation is to include an appropriate range of interests, perspectives, identities, and institutional boundaries (Young, 2002). This fuels a controversy over the use of expertise versus the public influence over choices. Public participation may produce solutions that specialized experts consider too costly and technically infeasible (Poteete et al., 2010). Also, public participation creates spaces where citizens can voice their opposition to

projects, policies and programs that the greater public needs. In the urban planning literature this criticism of public participation is well-known under the acronym of "not-in-my-back-yard" NIMBY.

Designing a participation process is challenging and depends on unique contextual features. Although there is no single formula for stakeholder involvement, extensive research on public participation uncovers important generalizations (Hassenforder et al., 2015). These include, for instance, the accessibility to a physical space for participation, the level of participants' effort and their influence on decisions, the distribution of power among stakeholders, and the influence of government on the process (Rowe & Frewer, 2004). Table 2.1. summarizes the main challenges in public participation. In this study, public participation is both a process and an outcome; as we will explain in following sections, any failure in public participation either underlies or intensifies conflicts.

Table 2.1: Summary of challenges in participatory decision-making. Source: authors

Challenges	Characteristics		References
Legitimacy of participation	Legitimate discourse	Participants explain themselves clearly, use logical arguments and valid criteria for evaluating options and outcomes.	(Jacobs et al., 2009), (Quick & Bryson, 2016), (Beierle & Cayford, 2002), (Hassenforder et al., 2015)
	Legitimate process	Procedurally just process: embodies values such as "fairness, transparency, attentiveness to stakeholders' concerns, and openness to public input." Procedurally rational process: collecting, analyzing, and using relevant information to the decision.	(Quick & Bryson, 2016), (Innes & Booher, 2010), (Dean & Sharfman, 1993), (Simon, 1996)
	Legitimate outcome	The process of participation must generate positive results – such as equity – to be acceptable and address the needs of the public.	(Ozawa, 2012), (Quick & Bryson, 2016), (Midgley et al., 2013), and (Connick & Innes, 2003)
Diversity and inclusion (wide range of experts and lay community members)	Inclusion of appropriate rates of interests (experts and lay community members) and participants with different perspectives, identities, and institutional boundaries.		(Young, 2002), (Innes & Booher, 2004), (Quick & Bryson, 2016), (King et al., 1998) and (Poteete et al., 2010)
Quality of the process	The accessibility to participation space, the level of efforts, the influence participants have on decision-making, the distribution of power among stakeholders, the influence of government on the process, and other avenues for influence on decisions.		(Hassenforder et al., 2015), (Quick & Bryson, 2016), and (Rowe & Frewer, 2004)

2.2.2. Conflicts between stakeholders

Stakeholders' conflicts in their roles and responsibilities are well-recognized in the construction and project management fields (Fayazi et al., 2017; Gottlieb & Haugbølle, 2013; Rutten et al., 2009). Davidson et al. (2007), for instance, explain how in every construction project, various interests exist between community members, governments, civil society organizations, private sectors, and professionals and experts. The diversity of stakeholders in terms of interests, experience, and capabilities often causes serious challenges in construction projects, such as: discontinuity of activities, fragmentation in resource delivery, and overlapping roles and responsibilities (Dulaimi et al., 2002; Ofori, 2000).

Borrowing the stakeholder definition proposed by Freeman (1983), stakeholders in reconstruction projects are persons, groups, and organizations who are either influenced by post-disaster interventions or who may have an impact on projects, playing different roles and having varied responsibilities. In post-disaster conditions, decision-making and setting objectives among participants with conflicting interests is challenging. Overlapping stakeholders' roles, reduced time scales, resource scarcity, lack of collaboration, and scant sharing of knowledge among participants are common and create competition for limited resources and conflicts on social, economic, and environmental objectives in post-disaster reconstruction programs (Asgary et al., 2006b). For instance, Hayles (2010) explains how competition on available resources and over emphasis on specific dimentions of housing reconstruction (such as earthquake resistance and constuction quality), often cause inappropriate solutions. Also, frequent obstacles, such as the temporary character of the participation of humanitarian organizations, hinder learning and prevent knowledge and experience sharing (Norling, 2013).

2.3. Dilemmas in decision-making processes after disasters

Hazard-related studies reveal common dilemmas in decision-making processes after disasters that typically mislead officials in making effective policy. Here we aim at bringing few examples of common dilemmas, emphasizing how they can threaten recovery processes and cause unexpected outcomes.

Preservation vs. change: Several researchers and practitioners in the post-disaster reconstruction field typically consider reconstruction projects as an opportunity for achieving disaster risk reduction and development (Kennedy et al., 2008; Lloyd-Jones, 2007; Lyons et al., 2010). In this

sense, the recovery period is seen as suitable to look at much more than just a return to the pre-disaster conditions and reproduction of pre-disaster vulnerabilities (Alexander, 2006). On the other hand, some researchers and practitioners sometimes prefer that post-disaster reconstruction programs or projects help affected areas and communities to return to pre-disaster conditions (Jigyasu, 2008). Reconstruction policy can in fact lead to both preservation and change, but defining the adequate balance between change (including common desires for "modernisation", "upgrading" and "innovation") and preservation (including common desires for "continuity", "stability" and "tradition") is often challenging.

Trying to integrate these two approaches, Davis and Alexander (2015, p. 158) defend the improvement of building technologies and infrastructure along with the preservation of pre-disaster settlement layouts and building typologies. However, this equilibrium is not always easily achieved. Pendall et al. (2010) refer to Hurricane Katrina in 2005 as an example in which some of the most affected communities did not find the pre-event situation as an acceptable and desirable condition to which they wanted to return. On the other hand, some scholars see the return of affected families to disaster-affected areas as an indicator of communities' resilience capacity (Pendall et al., 2010). Again, finding the adequate amount of change and preservation remains a source of conflict between recovery objectives.

Rapid reconstruction vs. long-term recovery: Surviving families after disasters are often impatient about the reconstruction of permanent houses. There is always a legitimate appeal for rapid reconstruction after disasters, as every delay may, to name a few, loosen pre-disaster social ties, cause extra transportation costs, and threaten livelihood resources, thus impacting the recovery processes. Also, those who moved away to find safe accommodation will be unlikely to come back and reconstruct their houses if reconstruction processes take a long time after disasters (Pendall et al., 2010). Donors' attention, political will and funds may also disappear rapidly (Jha et al., 2010). On the other hand, revising building codes, training professionals and builders, improving land-use planning, building sustainable infrastructure, and encouraging public participation in decision-making processes and implementation are lengthy – but for many stakehodlers, absolutely necessary (Campanella, 2006; Comerio, 2014; Lizarralde et al., 2016). In fact, post-disaster policy making requires a difficult-to-achieve balance between the necessity of rapid reconstruction and the need to follow (accept) lengthy processes for achieving sustainable long-term recovery.

Need for transitional sheltering: Defenders of transitional sheltering argue that immediate shelters are often required to temporarily settle affected families, given that the reconstruction of permanent houses often takes years to complete. Decision-makers sometimes believe that transitional shelters provide safe and healthy environments, preserve affected families' dignity, and allow them to resume daily and domestic activities during the phase of permanent reconstruction (Johnson, 2007). On the other hand, opponents of this approach often argue that transitional sheltering must be avoided for several reasons. They believe, for instance, that the production of transitional shelters is highly expensive, their poor quality and remote location often perpetuate economic, social, and environmental problems (Sanderson & Burnell, 2013; UNDRO, 1982; Wisner et al., 2012), and the lack of families' land rights on transitional shelters exacerbates their vulnerability (Vembulu et al., 2008).

Equal compensation vs. compensation based on actual losses: Many decision-makers, researchers and practitioners often defend the allocation of equal compensation to affected families. Others believe, however, in the advantages of compensating families' actual losses. Equal compensation refers to the uniform distribution of resources across all affected families, regardless of their actual losses, previous conditions or disparate disaster impacts. Some decision-makers argue that the distribution of equal compensation can help bridge pre-disaster social gaps and empower the most vulnerable families to recover effectively and have equal access to resources (Jha et al., 2010; Oliver Smith, 2007; Sanderson & Burnell, 2013). After the 2004 tsunami in Indonesia, the distribution of uniform aid packages resolved pre-disaster land tenure and ownership problems and helped tenants and informal settlers to fully reconstruct their houses (Jha et al., 2010; Steinberg, 2007). On the other hand, the compensation based on actual losses in Gujarat after the 2001 earthquake optimized the use of resources and encouraged families to repair damaged houses (Barenstein, 2006b). However, the allocation of compensation based on actual value of losses is challenging; inadequate damage assessments and identification of real beneficiaries can intensify inequalities and exacerbate pre-disaster problems. For instance, the Road Home assistance package after the 2005 Hurricane Katrina provided qualified Louisiana residents with grants of up to $150,000 for uncompensated storm-related damage to their homes (Kahan, 2006). The plan provided subsidies for the repair of houses or selling properties to the state at a pre-disaster fair market value. Residents had two options: either finance personally or move out from their community if a high proportion of homeowners in

their neighborhoods chose not to invest in their homes. Simunovich (2008) expresses how this approach caused inequality and excluded the most vulnerable families from the recovery program in New Orleans.

2.4. Analytical framework

Our approach hypothesises that several factors, including dilemmas in the reconstruction literature, stakeholders' conflicts of interests, and challenges in participatory decision-making processes underlie and intensify conflicts. For instance, controversies over welfare programs and social inequalities potentially generate tensions between equal compensation and the compensation regarding actual losses after disasters. Also, literature suggests that the diversity of stakeholders, their conflict of interests, discontinuity of activities, overlapping roles and responsibilities, lack of collaboration, and their competitions for benefits and resources may play critical roles in generating conflicts. Drawing on public participation, project management, and post-disaster reconstruction literature, this research develops an analytical framework to explain the underlying and intensifying factors of conflicts between recovery objectives (Figure 2.1).

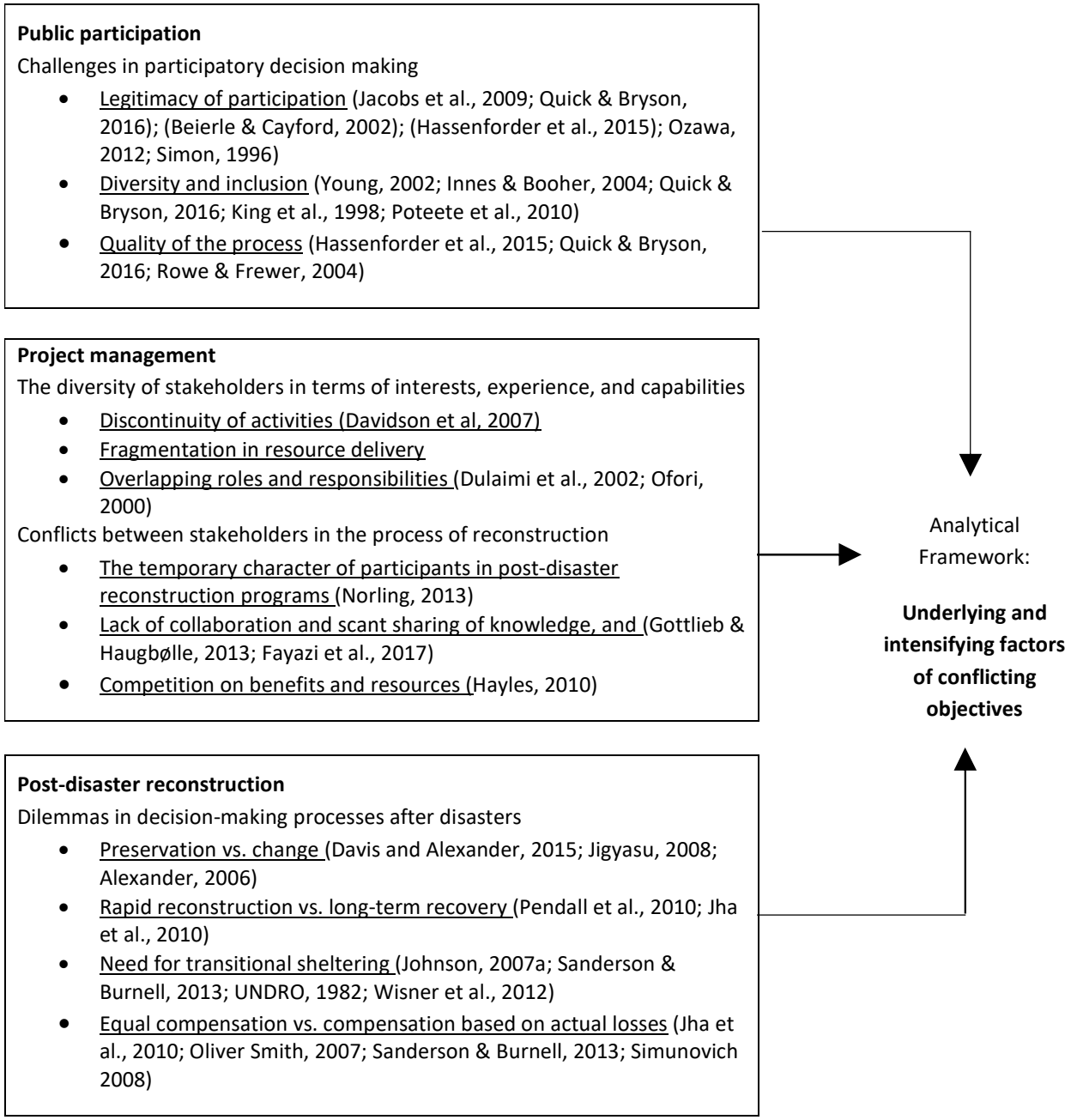


Figure 2.1: Constructs employed in the analytical framework, based on the literature on public participation, project management, and post-disaster reconstruction - Source: authors.

More specifically, Figure 2.2 illustrates the relationship between the lack of participation in collective decision-making process before disasters and fragile relationship between community members, government agencies, and other stakeholders during the reconstruction processes. This fragile and distrustful relationship may aggravate conflicts during the reconstruction processes. If

we consider public participation as an outcome, then the experience of the involvement in decision-making processes can result in strengthening relationships and trust, empowering participants to solve future problems too. Thus, the lack of participation in collective decision-making before disasters causes more challenges in arriving at a consensus over recovery objectives. Also, by considering the public participation as a process, any challenges in participatory decision-making (such as the exclusion of a group of beneficiaries from the participation, the omission of expertise, and problems in designing the participation process) can intensify conflicts between recovery objectives during the recovery and reconstruction programs. Figure 3.2 illustrates the hypothetical links between underlying and intensifying factors of conflicting objectives, which this research seeks to verify by examining Bam's housing reconstruction experience after the 2003 earthquake.

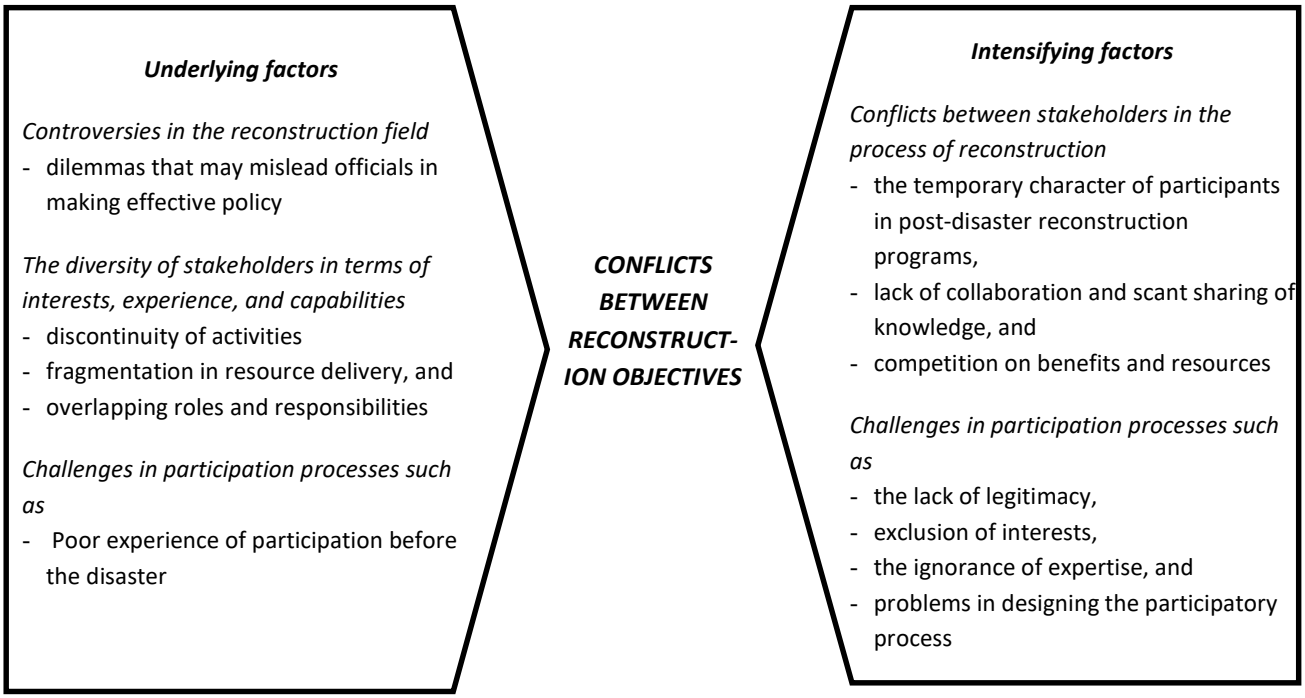


Figure 2.2: Hypothetical underlying and intensifying factors of conflicting objectives - Source: authors.

2.5. Methodology

In order to answer the question of "how do conflicts of objectives arise in reconstruction processes and what are their impacts?" this research adopts an explanatory approach, based on a qualitative case study of the housing reconstruction program conducted after the 2003 earthquake that hit the city of Bam in Iran. Deductive reasoning underlies the analytical strategy in this research. According to Creswell (2013), conducting a case study is one of the most appropriate

methods to confirm or contrast a theoretical expectation and to generalize research findings. In the first step of this study, and based on an extensive review of the literature, we developed an analytical framework to identify potential underlying and intensifying factors (constructs) of conflicting objectives in reconstruction programs.

Different sources of evidence have been used to collect data. In order to understand the overall housing reconstruction program and recognize how reconstruction objectives were established, we interviewed 12 officers and authorities including: key managers of the Housing Foundation of the Islamic Republic (the sole housing reconstruction exclutor), heads of involved NGOs, heads of achitectural consultancies, and local and regional representatives in the Islamic Parliament of Iran, at the time of the disaster. In parralel, and in order to understand causal components of conflicts and their impacts during planning and implementation processes, we analyzed 32 reports, policy documents, press releases and construction documents, and the 11 thematic reports of the Bam Reconstruction Documentation Project (BRDP) conducted by the HFIR.

The case study is longitudinal (Yin, 2008). The first author conducted five different field trips to Bam over ten years (between 2004 and 2014) to follow up on conflicts between objectives during the reconstruction process. During the first trip in 2004, the first author documented the impact of the disaster on affected households, their participation in designing the reconstruction program, and involved stakeholders' roles in the primary steps of the reconstruction. Between 2004 and 2005, he was involved in planning 6500 temporary housing units provided by the HFIR, and subsequently, he worked closely with housing beneficiaries and provided architectural design support to 500 households who were reconstructing their houses. Between 2008 and 2012, he was also involved in the Bam Reconstruction Documentation Project (BRDP) conducted by HFIR, and assisted in documenting the reconstruction experience in Bam from different perspectives. Direct involvement in the housing reconstruction program let the researcher monitor hurdles against recovery objectives. He observed how conflicts between recovery objectives caused at least six major challenges during the recovery process. However, some limitations, such as restricted access to documents and to some stakeholders, prevented him from studying all of these conflicts. For instance, the researcher observed the emergence of a permanent town of high-quality prefabricated units provided by the Japanese government for transitional sheltering, but they were provided two years after the earthquake when they were not

needed anymore. It is likely that the over-emphasis on providing ownership rights and constructing earthquake-resistant units convinced authorities to develop a town of prefabricated units. However, the lack of access to documents and officers within the Japanese organisation prevented the researcher from conducting further investigation on this potential conflict.

The research project adopted triangulation of data and methods to converge lines of inquiry (Yin, 2003, p. 98) (see in Table 2.2 the main sources of data used). In fact, data triangulation decreased the risk of the investigators' personal interpretation and minimized the danger of relying on incomplete information. In order to analyze data and generalize findings, a pattern matching technique was applied to compare empirical results with the predicted pattern of the analytical framework and to explain conflicts between economic, social, cultural, and environmental objectives in the reconstruction program in Bam.

Table 2.2: The sources of evidence - qualitative and quantitative data. Source: authors

Sources	Details	Qualitative and quantitiative data
Interviews	Officers and authorities (12 interviews)	- Recovery and reconstruction objectives - The structure of governance and process of establishing reconstruction objectives - Overall housing reconstruction program - Conflicts between objectives and causal factors of conflicts - Conflicts between stakeholders
Documents	Policy documents	- Approvals of the cabinet of ministries - Approvals of the Reconstruction Supervision and Policymaking Association (RSPA)
	Meeting minutes	- Minutes of the National Disaster Task Force's (NDTF) meetings - Minutes of the RSPA's meetings in Bam - Minutes of the disaster management committee's meetings in Kerman
	The Bam Reconstruction Documentation Project (BRDP)	- Participatory approach in Bam reconstruction, - Project management in Bam reconstruction, - Resource management in Bam reconstruction, - Permanent housing process (planning and designing), and - Control and monitoring techniques,
Field studies	1) July – August 2004, 2) November 2008, 3) January 2011, 4) March 2012, and 5) June – July 2014	

2.6. Results

On December 26th 2003, a 6.7 magnitude earthquake claimed 22,400 lives, made more than 75,000 residents homeless, and destroyed nearly 93% of urban buildings in the city of Bam, Iran

(Ghafory-Ashtiany & Hosseini, 2008; Statistic Center of Iran, 2003). During about five years after the disaster, about 26,900 houses and 2,300 apartment units in 50 multi-story residential complexes were provided to settle the affected families (Arefian, 2016; Fayazi & lizarralde, 2016). Immediately after the earthquake, the Iranian government, set up the Reconstruction Supervision and Policymaking Association (RSPA), which has extensive power paralleling that of the president's cabinet to manage the reconstruction program in total (Fallahi, 2007; Fayazi, 2012; Fayazi & Lizarralde, 2013). The RSPA made all decisions related to the recovery and reconstruction phases, including the establishment of recovery objectives and the adoption of strategies. The RSPA established three primary goals for the general reconstruction program in Bam, and then later, regarding the housing reconstruction in particular, the RSPA also emphasized the economic recovery of disaster-affected households. In total, four major recovery and reconstruction objectives were defined:

A. *Cultural objective:* Safeguarding Bam's cultural identity and architectural fabric,
B. *Built-environment objective:* Constructing earthquake-resistant buildings,
C. *Social objective:* Mobilizing disaster-affected people and their participation, and
D. *Economic objective:* Empowering disaster-affected people by providing ownership rights and equal compensation for all households.

2.6.1. Conflicting Objectives in the Bam Reconstruction Program

The longitudinal investigation of the housing reconstruction program in Bam reveals three sets of conflicts between the four reconstruction objectives. Results also explain how conflicting objectives generated two effects: a) the production of simple rectangular houses, which disregarded their inhabitants' diversities in terms of needs, identities, culture, and tradition; and b) the destruction of Bam's unique urban fabric.

Reconstruction of earthquake resistant buildings at the expense of safeguarding Bam's cultural identity and architectural culture

The city of Bam was famous for its unique vernacular architectural and urban qualities, which were inherited from a long history of civilization in a desert on the southern side of the Iranian high plateau since 6th to 4th centuries BC (UNESCO, 2004). According to Misra (2008), Bam's prime time was from the seventh to 11th centuries, when it was known for the production of silk and cotton garments, and it was located on "silk road", at the crossroads of trade routes. The city

of Bam is also unique because its life depends on “the underground irrigation canals, the Qanāts, of which Bam has preserved some of the earliest evidence in Iran and which continue to function till the present time” (UNESCO, 2004).

After the earthquake, the general public and national and international professionals (such as UNESCO and ICOMOS) paid particular attention to preserving Bam’s cultural heritage. For instance, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) registered the city of Bam, and its ancient Citadel on the World Heritage List and the List of World Heritage in Danger in 2004 in order to mobilize international efforts to preserve its cultural heritage (UNESCO, 2004). In parallel, the RSPA created the Bam Architectural and Urbanism Council (BAUC), an expert committee to safeguard Bam’s architectural identity and its cultural landscape (Omidvar et al., 2010). The BAUC was responsible for the architectural and urban fabric of Bam and was mandated to ensure that all activities in Bam were design-based and reflected cultural principles. The BAUC, in collaboration with an architectural consultancy firm, referred to as the ‘Mother Consultancy’ (MC), developed architectural codes, urban planning regulations, recommendations, and guidelines (Meskinazarian, 2011). In terms of the architectural codes, these organisations systematically identified Bam’s pre-disaster housing diversities regarding their location, access, direction, size, and floor numbers. Then, they provided design guidelines for housing reconstruction, and indicated the size, form, materials, and orientation of every reconstructed house (HFIR, 2005; Joodi, 2010). Also, the BAUC’s urban planning regulations advised authorities and reconstruction managers to preserve Bam’s pre-disaster urban land-use and the proportion of green spaces. The BAUS also recommended authorities to prevent unreasonable widening of roads and passages (Arefian, 2016).

In order to reach the social and built environment objectives, the RSPA provided assistance to households, and engaged families to participate in the design and reconstruction of their permanent houses (Gharaati, 2006; Tafti & Tomlinson, 2013). About 11 of the HFIR’s provincial branches (Setads), 44 architectural consultancies, and 211 contractor teams were located in Bam to assist households in rebuilding their houses, a process that included design and construction phases (Babaie & Kabiri, 2011).

In practice, about 25,000 households collaborated closely with experts in local branches of 28 architectural firms located in Bam and participated directly in the architectural and structural

designs of their houses (Babaie & Kabiri, 2011). Using the BAUC's architectural codes, local consultancies developed various housing designs before beginning the collaboration with families in the design of their houses. The beneficiaries' participation in design process began when Setads and the municipality referred them to local consultants. Given the available budget, the number of family members, and their lifestyle, households chose between the already designed plans and continued the collaboration with experts to adapt the plan to their lands. The initial designs followed the BAUC's architectural guidance, respecting architectural traditions and addressing households' economic, social, and demographic conditions.

On the other hand, the RSPA identified the Kerman Construction Engineering Organization (KCEO) responsible for supervising the construction process, developing local retrofitting capacities (Saemian & Erfanian, 2011). The KCEO revised the existing building codes and imposed severe technical restrictions to seismic regulations for the Bam area (Ghafory-Ashtiany & Hosseini, 2008). For instance, the KCEO's building codes forbade the use of vernacular materials, floor-to-ceiling windows, asymmetrical plans, and changes in building volume at different floor levels.

Also, the KCEO was responsible for controlling plans to ensure they complied with the newly issued seismic regulations and building codes (Babaie & Kabiri, 2011). Architectural designs, which were provided by a collaboration between households and local consultants had to receive the KCEO's approval stamp before starting the construction phase. The KCEO refused most of the house designs because of the conflict between KCEO's and BAUC' regulations and building codes. For instance, the KCEO rejected most of the house designs with vernacular techniques such as mud layers (Chineh) and vaulted and domed structures (Pope, 1976; Sharifi & Murayama, 2013), which were recommended by the BAUC's architectural codes and guidelines (Arefian, 2015; Joodi, 2011).

Observations during the reconstruction period revealed four to eight month delays in the design stage, which understandably led to frustration amongst beneficiaries (Arefian, 2015, 2016). The delays and frustrations stemmed from conflicts between the social, cultural, and built-environment objectives that emerged early in the design phase, causing lengthy waiting times before starting the construction phase. The source of this conflict lay in the conflict of interests between two main reconstruction participants and the lack of participation in the decision-

making process. The conflict of interests between the BAUC and KCEO created two opposite poles in the reconstruction process, expressing architectural and technical aspects of reconstructed houses distinctly. The conflict could probably have been avoided if the architectural design process had involved KCEO's experts and received their feedback in the initial steps of the design process. Also, imposing technical restrictions while collaborating with other reconstruction participants, architectural experts and households, in particular, could have resolved conflicts by informing technical experts about the socio-cultural dimensions of housing and letting them find alternative solutions. In fact, the lack of participation in making decisions, and the exclusion of interests from participation processes both generated and intensified conflicts (see Figure 2.3 and Figure 2.4).

Figure 2.3: An example of simple house designs without the characteristics of Bam's traditional architecture – Photo by: M. Fayazi.

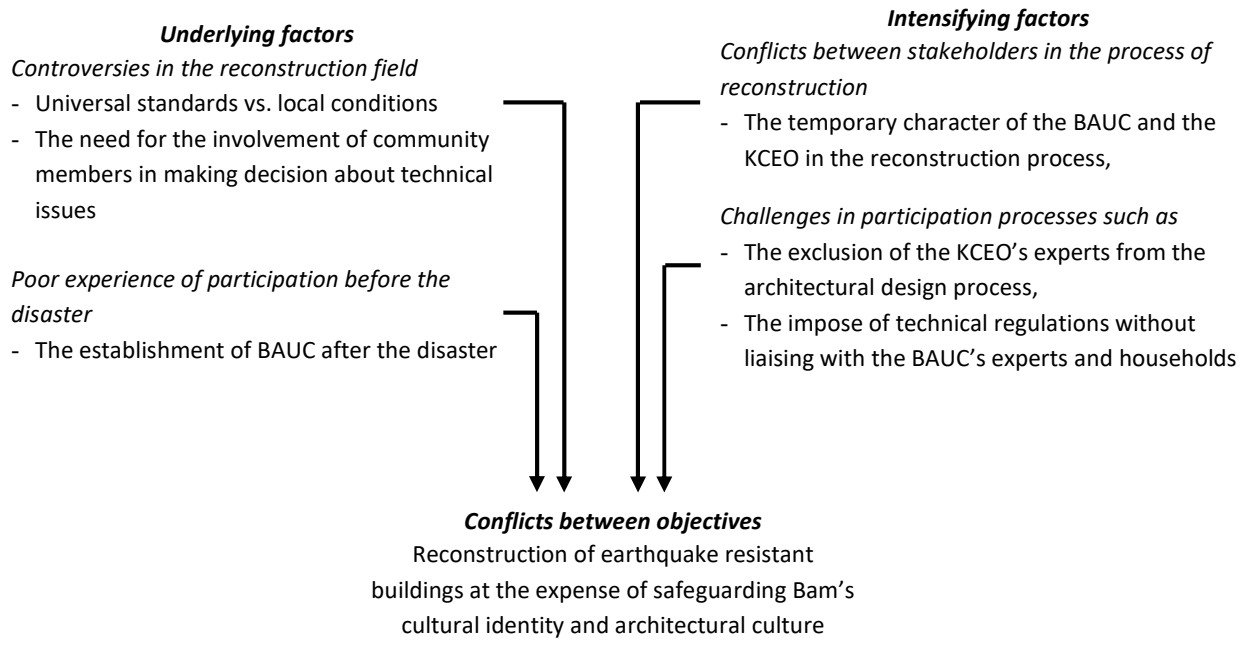


Figure 2.4: Conflicts between cultural and built environment objectives; reconstruction of earthquake resistant buildings at the expense of safeguarding Bam's cultural identity and architectural culture - Source: authors.

Limiting house design options by offering equal compensation and imposing severe technical restrictions

In order to empower and mobilize disaster-affected families in the housing reconstruction program, the government provided equal compensation (5% interest loans of about $10,000) to house-owners and encouraged families to participate in decision-making and implementation processes (Ghafory-Ashtiany & Hosseini, 2008). The HFIR established an exhibition to help families select their construction technology and materials among those already approved by the KCEO. The exhibition objective was to introduce available products, technical and engineering services, and show sample houses provided by different companies and NGOs (Figure 2.5).

Figure 2.5: Some of the sample houses provided and exposed by different companies and NGOs – Photo by: M. Fayazi.

The HFIR also introduced a house design, which was affordable and acceptable according to the KCEO's restrictions. The HFIR's long-term experience in providing affordable dwellings to low-income families and post-disaster survivors led it to suggest an 80m^2 house design that was affordable for most of the families – and cost about $11,000 while the rest of provided models cost between $13,000 and $22,000 in 2005 (Joodi, 2014). Consequently, available financial aid along with the severely technical restrictions dictated households to select the HFIR's modestly designed houses and trade their rights to free decision-making. In fact, the conflicts between the social objective (involving families in the decision-making process), the economic objective (providing equal compensation), and the built-environment objective (constructing earthquake-resistant buildings) resulted in the complete lack of understanding of households' diversities in terms of needs, identities, culture, and tradition by the production of simple housing designs (see Figure 2.6).

The source of this conflict lay in an illegitimate public participation process. Households hardly had the chance to explain their needs and expectations, and the participation process was

inattentive to families' concerns about their houses. In fact, the economic conditions (available loans) and severe technical restrictions left households with no choice other than the HFIR's house design and construction technique. This process gave the lowest level of participation role to households; it only informed families and received their approval without letting them make decisions and negotiate their needs and expectations. "*This process was simply a useless show; they set the scene [...] with so many beautiful buildings. But, only the simplest and cheapest one was available for us ...*" said one of the houseowners. The outcome thus discluded families in the reconstruction of their houses.

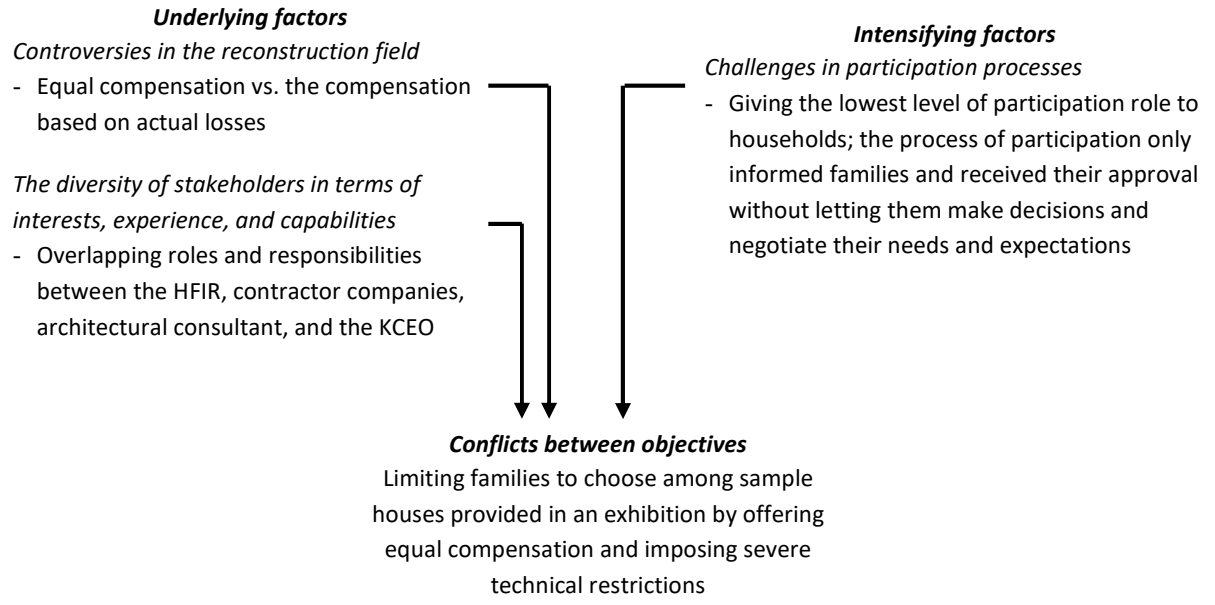


Figure 2.6: The conflict between objectives: Limiting families to choose among sample houses in an exhibition, offering equal compensation and imposing severe technical restrictions - Source: authors.

Preventing relocation, preserving social bonds, and providing ownership rights at the expense of Bam's cultural identity and its landscape

Conflicts between economic, social, and cultural objectives of the reconstruction program resulted in the splitting of large land plots and date palm groves into smaller ones, destroying Bam's unique urban fabric. The provision of equal compensation regarding the number of destroyed houses led to the replacement of big houses with smaller ones that were designed for single families. This change in size left pre-disaster renters and members of extended families in either temporary housing camps or in temporary units located in the yards of reconstructed houses. Two years after the disaster, a grant of $10,750 US was provided to tenants, members of

extended families, and young couples who married after the disaster to start the reconstruction of their houses. The prerequisite for receiving the grant was to own land in the city or to be able to use a plot of land with the agreement of its owner. According to Joodi (2014), the solution was first suggested by members of extended families and pre-disaster tenants who were living in the transitional housing camps in the outskirts of the city for almost two years following the disaster. Despite opposition from the BAUC, the HFIR suggested the idea to the national and local governments and received the approval to split land and reconstruct more houses. By using the provided grant, many of pre-disaster tenants were able to buy a piece of land, and many young couples could receive their parents' agreement to split their lands and construct new houses. Figure 2.7 shows a typical example of the 4,950 houses that were built after splitting properties.

Figure 2.7: The split of land and reconstruction of two houses in the same yard. Photo by: M. Fayazi.

The splitting of properties was in favour of the reconstruction program's social and economic objectives; however, it went against its cultural objectives (See Figure 2.9). Splitting lands supported the economic objective, as it empowered households by preserving and providing ownership rights for members of extended families and young couples who married after the disaster, in particular. Social objectives encouraged splitting of properties to prevent relocation and preserve social bonds between family members, neighbours, and community members. However, the BAUC warned of the possible damage to Bam's cultural identity and its landscape. Splitting properties resulted in destroying date palm groves and in the shrinking of green spaces, for which the city was known. Date palm groves are significant components in shaping Bam's cultural landscape; they moderate harsh climate conditions in the middle of the desert and provide a remarkable source of families' livelihoods. Finally, as properties were split, more houses were reconstructed, and significant amounts of palm groves were cut down. Two photos of Bam taken by satellite in 2004 and 2014 shows the extent of the damage to date palm groves

ten years after the disaster (see Figure 2.8). It is estimated that about 40% (roughly 300 ha) of date grows in Bam was destroyed in that period of time (Mahmoudi, 2014).

The primary source of this conflict between social and economic objectives on the one hand and cultural objectives on the other hand can be attributed to unresolved tensions between expert (i.e., certified, specialized, and codified) knowledge and lay (i.e., locally specific, context-based, and empirical) knowledge in decision-making. While specialized experts of the BAUC opposed the splitting of properties, the public perceived the idea as a solution for the recovery of extended family members and pre-disaster tenants. Moreover, several other factors such as the lack of public participation experience prior to the disaster, the gap between research and practice, and the diversity of stakeholders' interests and experience stopped the BAUC from preventing irreversible impacts on Bam's cultural landscape.

Figure 2.8: About 40% of date palm groves (roughly 300 ha) were destroyed between 2004 (left) and 2014 (right) in Bam - Source: *Google-Earth (03. 2004, 09. 2014).*

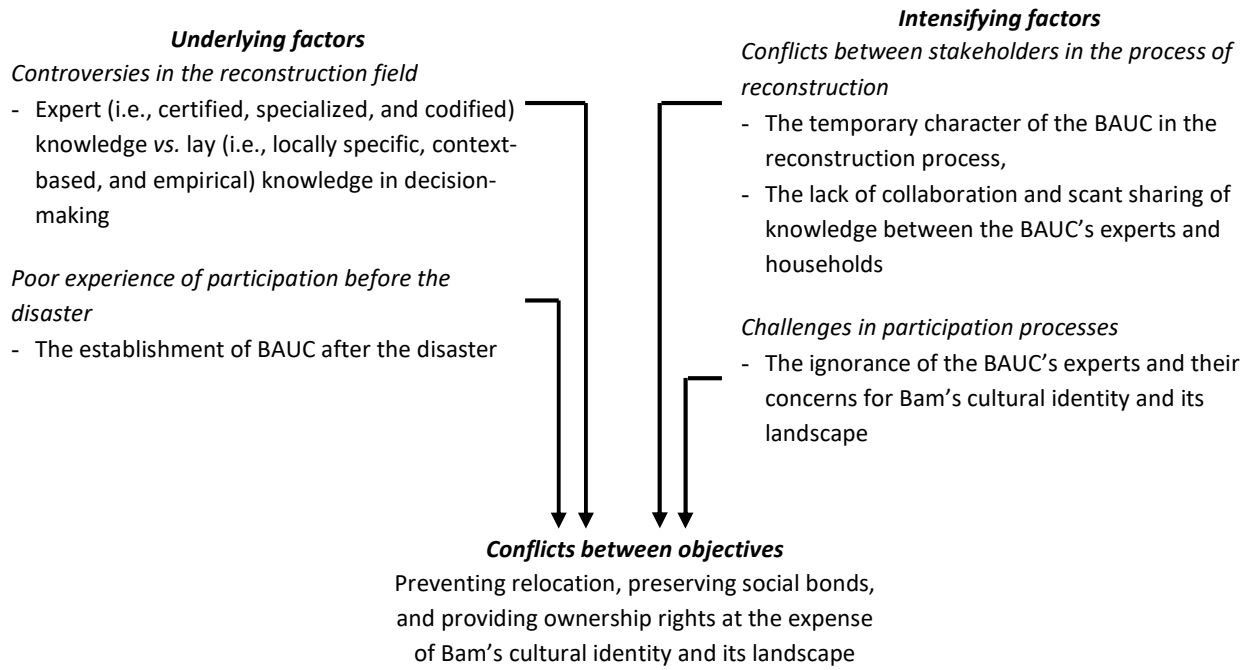


Figure 2.9: The conflict between economic, social, and cultural objectives and its impacts on the recovery program - Source: authors.

2.7. Discussion

This study developed a framework for explaining how conflicting objectives appeared and escalated in post-disaster recovery programs. Variables presented in the framework attempt to reveal underlying and intensifying factors of conflicts between recovery objectives. By testing the framework in Bam, empirical results show three sets of conflicts between reconstruction objectives that affected the recovery program in general, and households' recovery, in particular. First, conflicts between the construction of earthquake-resistant buildings, the preservation of Bam's cultural heritage, and the involvement of families in the decision-making process generated an intense dispute between stakeholders that ended up in the production of simple modular (rectangular-shaped) houses, ignoring households' diverse needs, expectations, lifestyle, culture, and tradition. Second, providing equal compensation and imposing technically strict regulations pushed households to select the HFIR's modestly designed houses, thereby limiting families' right to participate in decision-making and expressing their needs and expectations freely. Finally, the emphasis on maintaining social ties and providing ownership rights for all affected households resulted in replacing date palm groves with residential buildings, destroying Bam's cultural identity and its landscape.

By testing the theoretical framework in the investigation of conflicting objectives in Bam, we reveal underlying factors and intensifying causes of every set of conflicts. Results show critical problems related to public participation. A lack of pre-disaster participation experience between reconstruction stakeholders established mostly after the disaster was a critical cause of conflicts. The KCEO imposed restricted technical regulations without considering Bam's architectural traditions and households' desires and expectations. Also, the BAUC was mandated after the disaster to preserve Bam's cultural identity and landscape, but had negligible knowledge about safety and technical issues. Regarding the importance of "participation" as an outcome that expands knowledge, strengthens relationships, and provides resources for facilitating future problem-solving, active pre-disaster collaboration between households and stakeholders could have reached a more appropriate solution, addressing both technical and architectural issues and avoiding conflicts after the disaster. In fact, rapid establishment of reconstruction agencies after the disaster and the absence of pre-disaster relationships are associated with the lack of collaboration with other stakeholders and the emergence of conflicts during reconstruction programs.

Also, the lack of participation and the exclusion of interests from participation processes generated conflicts during the reconstruction process. The exclusion of the KCEO's technical experts from the participatory design process and imposing technical restrictions without the involvement of households and the BAUC's experts also generated conflicts. In addition, a successful participatory process requires households' contributions to making decisions and their freedom of choice, unless, according to Arnstein (Arnstein, 1969), participation processes only serve authorities if people merely receive information and approve decisions. The exhibition of sample houses failed to engage households' participation, as the HFIR's design was the only feasible solution regarding the economic conditions and the imposed technical restrictions.

There is a significant theoretical implication of these results. They highlight that several causal and intensifying factors created and escalated, otherwise unnecessary, conflicts between recovery objectives. The lack of participation experience before a disaster increases the risk of conflicts, which may be intensified by challenges in the participation process during the reconstruction programs, including the omission of local interests, the ignorance of expertise, and the low level of households' involvement in decision-making. Also, findings recognize unsolved controversies in the post-disaster reconstruction field (that mislead decision-makers) and the diversity of

stakeholders as causal factors of conflicts between recovery objectives. Moreover, conflict of interests between stakeholders, such as their competition for benefits and resources, intensifies conflicts between objectives.

There are also relevant practical implications of these results. First, the establishment of new organizations during reconstruction can potentially increase the risk of conflicts between stakeholders and needs to be avoided. Newly founded agencies (the BAUC in Bam, for instance) build a weak relationship with other stakeholders because of their absence in pre-disaster participation processes and their potential lack of knowledge of pre-disaster challenges and common interests. Second, results show that authorities can benefit from promoting participatory decision-making processes before disasters, as more participation experience equals better collaboration between stakeholders during the reconstruction programs and less risk of conflicts between recovery objectives. Authorities can ensure long-term recovery rather than short-term responses if they involve both experts and lay communities in decision-making processes.

These results, however, have to be applied carefully. In fact, this research experienced several limitations. The researchers had very limited access to information about the collaboration between households and local consultants. More importantly, this research did not examine participation methods in housing design process in Bam. More research needs to be conducted to explain the link between participation methods and the level of conflicts in reconstruction programs.

2.8. Conclusion

Post-disaster housing reconstruction is highly complex in terms of the diversity of, and relationships between, recovery objectives. There is still a knowledge gap concerning the conflicts between recovery objectives, which often necessitate compromises over households' recovery in post-disaster reconstruction programs. By investigating the housing reconstruction experience after the 2003 earthquake in Iran, this study reveals conflicts between reconstruction objectives and explores their causal and intensifying factors. Results highlight the lack of stakeholders' involvement in pre-disaster decision-making processes as a causal factor of conflicts between recovery objectives during reconstruction programs. Also, findings recognize challenges in post-disaster participation processes, such as the exclusion of local interests, as intensifying factors of conflicts. Moreover, this study explores how unsolved controversies in the

post-disaster reconstruction field often mislead decision-makers and eventually underlie conflicts between objectives. At the practical level, these results call for promoting participatory decision-making processes before disasters. Newly emerged organizations may find the collaboration with other stakeholders difficult during the reconstruction projects, thereby increasing the chance of conflicts between objectives. Results also encourage public participation before disasters, as more participation experience increases the chance of better collaboration between stakeholders and mitigates the risk of conflicts between recovery objectives. More research, however, must be conducted to compare the reconstruction programs and explain the most effective solutions for avoiding and managing conflicts between recovery objectives.

CHAPTER THREE

The Impact of Post-Disaster Reconstruction Policies on Different Beneficiary Groups: The Case of Bam, Iran

[Article 2]

Fayazi, M., & Lizarralde, G.

This chapter has not been submitted to a journal yet

The third chapter is an under-review article, focusing on post-disaster housing reconstruction policies. By studying the housing reconstruction experience after the 2003 earthquake in Iran, this article shows how housing reconstruction policy often oversimplifies pre-disaster conditions and overlooks the diversity of households, eventually benefiting some groups of households while having the opposite effect on others. This research is built on a comprehensive analysis of general housing (pre-disaster) policy and housing reconstruction policies in developing counties.

The first author played a leading role in conducting the research and writing the article. He developed the analytical model for analyzing the impacts of policies on different categories of households. He categorized a variety of households in ten main groups after analyzing the data gathered from the fieldwork in summer 2014. After developing an analytical model and analyzing the data, he interpreted results and drew conclusions under the supervision of Dr. Gonzalo Lizarralde (second author).

Abstract

Disaster management studies have demonstrated that housing reconstruction programs often lead to different levels of community recovery. Yet, insufficient knowledge still exists about how reconstruction policies and decisions produce diverse impacts among different social groups. The purpose of this paper is to explore *why* and *how* housing reconstruction policies impact households in different ways. This research focuses on low-income housing programs implemented in response to disasters. It examines post-disaster reconstruction policies through the lenses of a comprehensive body of knowledge about the evolution of housing policy in developing countries over the last seven decades. Using a set of indicators from pre- and post-disaster conditions among six household categories, the qualitative enquiry examines the housing reconstruction program conducted after the 2003 earthquake in Bam. Empirical results show that the scant attention to different categories of tenancy, families' socio-economic conditions, and demographic changes (before and after the disaster) led authorities to adopt housing reconstruction policies that benefited some groups of households, while having the opposite effect on others. *Single-family house-owners*, for instance, rebuilt their permanent houses quickly and resumed normal activities in a relatively short period of time. *Members of extended families* – who before the disaster relied on a complex social fabric based on proximity – were instead adversely affected by policies that allocated them a unit in a residential complex located in the city outskirts. Results reveal the inefficiency of the one-policy-for-all approach in housing reconstruction. The coexistence of a multiplicity of measures and programs can allow households to choose the solution that best fits their needs, conditions and expectations. Findings also highlight a gap between general housing and housing reconstruction policies in developing counties. Pre-disaster policies must be constantly assessed to identify and understand their effectiveness and drawbacks in reducing vulnerabilities. Post-disaster reconstruction brings an opportunity to do this and ensure a sustainable development based on resilience enhancement and disaster risk reduction.

Keywords: Housing Reconstruction, Recovery, Policy, Households, Bam, Iran.

3.1. Introduction

In the last few decades, disaster and reconstruction-related studies have made considerable endeavors to determine the variables behind the failure and success of housing reconstruction programs. Numerous studies have examined the short- and long-term impacts of interventions to pave the way for improving reconstruction policy (Alexander, 2008; Barenstein, 2006a; Comerio, 1998). Duyne-Barenstein (2006), for instance, explores how housing reconstruction after the 2004 tsunami in Tamil Nadu paid inadequate attention to the social-cultural and environmental conditions of the local population, thereby affecting peoples' cultural identity and livelihood resources. Other authors have found that reconstruction policies adopted after

disasters often neglect the variety of beneficiaries and the diversity of their needs and desires (Aysan & Oliver, 1987), and fail to consider how they affect communities differently (Aldrich, 2012; Davidson et al., 2007). Despite the existence of consensus over the uniqueness of every disaster and the need for the adoption of an appropriate reconstruction policy, little is still known about *how* and *why* policy causes different levels of recovery among affected families.

This study aims at bridging this gap. It is based on a detailed, qualitative case study of the permanent housing reconstruction program conducted after the devastating earthquake that struck the historic city of Bam in Iran on December 26, 2003. This chapter is divided into four sections. First, the main approaches to housing policy in developing countries, reconstruction policy, and the importance of housing reconstruction policy in the process of recovery, are reviewed. A section about the methods used to examine the evolution of pre- and post-disaster conditions among different household types affected by the disaster follows. The third section reviews the adopted policies in Bam and describes how the policies impacted different categories of households, confirming that pre-disaster vulnerabilities and conditions (that vary significantly among household groups) largely determine the success or failure of policies. Finally, the discussion and conclusion sections further elaborate on the theoretical and practical implications of these findings.

3.2. Housing policy in developing countries: From turnkey projects to Habitat III

A better understanding of housing reconstruction policies and their impact requires first to review the comprehensive body of knowledge about housing policy evolution in developing countries, which, as we shall see, is deliberately associated with international policy reforms.

From the end of World War II to 1972, policy largely prioritized the state's role as the provider of public housing, which often took the form of standardized residential complexes. Relying on research in Latin America conducted by Turner (1967) and Mangin (1967), the World Bank formulated in 1972 the *self-help policy*, which is now considered the first generation of international housing policy. It emphasized the positive effect of self-help activities without direction from centralized bureaucracies (World-Bank, 1974). According to Pugh (1994), this phase of the Bank's policy expressed the intention of achieving affordability, the use of budget limits to define feasible standards, and resource allocation for land acquisition and infrastructure.

However, this policy was seen by many as simplistic and narrow in its understanding of the relationship between the Sate, markets, and households' roles in housing, thus insufficient to tackle the underlying qualitative and quantitative housing deficits that affect developing countries in general (Burgess, 1978; Lizarralde, 2015).

The second generation policy (1983-1989) went beyond the narrow emphasis on housing and brought shelter into a closer relationship with macroeconomic and development policy (Pugh, 1992). Conditionality clauses were attached to international loan agreements with governments, aiming at stabilizing macro- and micro-economic indicators. Their influence, according to (Lizarralde, 2015), resulted in the formulation of neoliberal policies, pushing governments to reduce their involvement in housing and to transfer increased responsibilities to municipalities, which often lacked adequate financial mechanisms and administrative structures. The second generation of policy – *Market Enabling Policy* – was soon accused of creating 'adjustment poverty,' putting more than 30% of the urban population in developing countries in poverty (Pugh, 1992). In response, the third generation of World Bank housing policy – *Well-Functioning Housing Policy*– was pursued from 1992 to the 2000s. This policy emphasized the growth and development of the whole housing sector in its urban and national context (World-Bank, 1992). It extended housing development to social objectives, including poverty and health alleviation (Jenkins et al., 2006). The overall package of reforms required strict administration and complex systems of cooperation. For the majority of developing countries, however, the achievement of this comprehensively envisaged reform was rather unlikely (Zanetta, 2004).

International policy reforms continued in the late 20th century. World conferences such as the Second United Nations Conference on Human Settlements – Habitat II in 1996 (Turkey), the United Nations Convention on Climate Change in Kyoto in 1997 (Japan), and the Millennium Summit Conference in 2000 (United States) broadened the scope of international policy, promoted sustainable development objectives, warned about climate change, and established Millennium Development Goals to be achieved by 2015 (Jenkins et al., 2006). More recently, the Third United Nations Conference on Human Settlements – Habitat III in Quito (Equator) in 2016 reinvigorates the global commitment to housing and sustainable urbanization, assesses accomplishments, and identifies emerging challenges towards sustainable development. Regarding current challenges such as population growth, urban sprawl and informal settlements, and unprecedented displaced populations, Habitat III establishes new urban agendas to reaffirm

global commitments to sustainable development. It emphasizes, for instance, enhancing the public supply of land for affordable and sustainable housing in central and consolidated areas of cities, strengthening municipal finance and local fiscal systems, and encouraging mixed-income development to promote social inclusion and cohesion.

3.3. Reconstruction policy in general

The increased frequency and severity of natural disasters is a radical challenge to the sustainable development of human settlements (CRED, 2016). The World Bank considers reconstruction policy as a source of reform in the power relationship or allocation of resources within society (Pugh, 1995; Zanetta, 2004). When disasters occur, reconstruction policy lays out the rules for recovery (programs, and projects), defining how different actors will coordinate, provide various forms of support, and adopt risk reduction measures against future disasters. Academics and practitioners in the field commonly believe that a holistic policy must address, among others, institutional and financial strategies, the role of stakeholders (international, national and local governments, NGOs, and Civil Society Organizations), mechanisms of coordination and financing, modes of communication, approaches to relocation, resettlement and transitional sheltering, infrastructure reconstruction, training, environmental management, land use planning, and economic development.

The emergence of reconstruction policy began in parallel with the appearance of self-help housing policy in developing countries in the 1970s. Davis (1977,1978) recognized housing reconstruction as "a human social process as much as a technical one" and considered survivors as "active participants" instead of passive "victims." This insight grounded a move from top-down towards people-centered and participatory approaches. About two decades later, in 1994, the World Conference on Natural Disaster Reduction, in Yokohama (Japan) recognized community involvement and participation as a necessary component in every effective recovery program. Since then, numerous studies and world conferences have encouraged the development of comprehensive reconstruction policy and implementation. In the early years of the 21st century, the adoption of the resilience approach was consolidated. This approach integrated the holistic consideration of the natural, built, and social environments, stressing how society can deal with (and adapt to) disturbances caused by extreme events. Bosher (2008), for instance, encouraged a shift from "resistance" to "resilience" and emphasized the need to recover rapidly

but sustainably. The World Conference on Disaster Risk Reduction in Hyogo in 2005 (Japan) provided critical guidance to building the resilience of nations and communities to disasters (UNISDR, 2005). More recently, resilience policy has also been encouraged by other international programs such as Rockefeller Resilient City Program (Rockefeller Foundation, 2016) and the UNISDR program of Making Cities Resilient (UNISDR, 2012).

The trend of increased emphasis on reconstruction policy was consistent in the late 2000s. Lyons et al. (2010) and Lizarralde et al. (2010) recognized reconstruction as an opportunity to reduce vulnerabilities and enhance sustainable development, in what is now called the owner-driven housing reconstruction policy. According to them it is an efficient and ethically appropriate approach that can help to reduce risks, enhance preparedness and build back better (Jha et al., 2010; Lizarralde et al., 2010; Lyons et al., 2010). Lately, the Third United Nations World Conference on Disaster Risk Reduction in Sendai in 2015 (Japan) argued for a better integration of research findings into policies, plans, and programs, to help governments and relevant stakeholders identify risks and invest properly in improving resilience. See more about the evolution of reconstruction and housing policies in Table 3.1.

Table 3.1: Housing and post-disaster reconstruction policies since the 1950s. Source: authors

HOUSING POLICIES IN DEVELOPING COUNTRIES	POST-DISASTER RECONSTRUCTION POLICIES	
	LITERATURE (selected literature)	WORLD CONFERENCES
• **Procurement and turnkey policy (1950-1972)** Provision of public housing in the form of standardized residential complexes • **Self-help policy (1972-1983)** Self-help activities with minimum direction from centralized bureaucracies • **"Market Enabling" policy (1983-1989)** Housing and macroeconomic and development policy, and the emergence of neoliberal policies • **"Well-Functioning Housing" policy (1992-2000s)** Development of the whole housing sector in its urban and national context • **Second United Nations Conference on Human Settlements – Habitat II (1996)** Improvement of human settlements on sustainable basis; economic reforms, social investment, improvements to the environment, and democratic governance • **United Nations Convention on Climate Change in Kyoto (1997)** Emission reduction • **Millennium Summit Conference (2000)** Millennium Goals • **Third United Nations Conference on Human Settlements – Habitat III (2016)** (a) Public supply of land for affordable and sustainable housing in central and consolidated areas of cities, (b) strength of municipal finance and local fiscal systems, (c) mixed-income development to promote social inclusion, and etc.	• **Emergency Shelter (Davis 1977)** • **Shelter after Disaster: Guidelines for assistance – (UNDRO, 1982; Davis 1978)** (a) Local authorities are the most capable to manage reconstruction programs, (b) surviving families have motivations for the reconstruction of their houses, (c) relocation is rarely feasible, (d) reconstruction is an opportunity for disaster risk reduction, and (e) avoid foreign ill-adapted solutions • **Hazards and the Built Environment: Attaining Built-in Resilience (Bosher, 2008)** A shift from *resistance* to *resilience*, being capable to both resist *and* recover rapidly • **Building Back Better – Delivering people-centered housing reconstruction at scale (Lyon et al, 2009)** (a) Reconstruction is as opportunity to reduce vulnerabilities and reach development, (b) people-centered housing (owner-driven in particular) is efficient and ethically appropriate. • **Rebuilding After Disasters: From Emergency to Sustainability (*Lizarralde et al.* 2010)** (a) Problems have to be tackled within their real complexity, and (b) a system approach is necessary to understand complexities and to develop an appropriate organization, (c) Owner-driven reconstruction approach is efficient and ethically appropriate, (d) shift from tactical to strategic planning • **Safer Homes, Stronger Communities – A handbook for reconstruction after natural disasters (Jha et al, 2010)** (a) Emphasis on civil society and private sector, (b) assessment and monitoring can improve reconstruction outcomes, (c) community members should be partners in policy making and leaders of local implementations, and (d) sustainable reconstruction ensures long-term development	• **World Conference on Natural Disaster Reduction, Yokohama, Japan (1994)** (a) Disaster prevention, mitigation, preparedness and relief into development plans, (b) international cooperation in technology transfer and information sharing, (c) appropriate technology and data, (d) community involvement and participation • **Second World Conference on Disaster Risk Reduction, Hyogo, Japan (2005)** (a) Strengthen institutions, (b) monitor disaster risks and enhance early warning, (c) knowledge, innovation and education to build a culture of safety and resilience, (d) reduce the underlying risk factors; (e) strengthen disaster preparedness • **Third World Conference on Disaster Risk Reduction, Sendai, Japan (2015)** (a) Understand disaster risk, (b) strengthen disaster risk governance, (c) invest in disaster risk reduction for resilience, (d) enhance disaster preparedness and "build back better"

3.4. Housing reconstruction policy in particular

Housing reconstruction can be singled out as an important, if not the most important, ingredient in the recovery of households after disasters (Alexander, 1993; Quarantelli, 1999). Housing reconstruction policy evolved under the influence of reforms in reconstruction and housing policies in developing countries (see Figure 3.1). Post-disaster reconstruction literature often recognizes the following approaches in housing reconstruction policy:

Procurement and turnkey policy: It typically refers to replacing damaged houses with houses provided by governments or reconstruction agencies. This approach relies on standardization, technology-oriented solutions, and the use of professional developers to increase the speed of reconstruction, keep costs down, and ensure the quality of final products. However, final products are often the repetition of a basic-module that takes little account of the beneficiaries' capacities and skills, tends to neglect cultural and local conditions, and disregards users' real needs (Barenstein, 2006a). Dikmen et al. (2012) studied the reconstruction program after the Dino earthquake in 1995 (Turkey) and explained how an inadequate fit between beneficiaries' way of life and the basic model houses caused users' dissatisfaction, which eventually led to leaving houses vacant. Housing reconstruction using the turnkey policy caused similar outcomes in Bou'in-Zahra, Iran after the 1962 earthquake (Fallahi, 1993), Yemen after the 1982 earthquake (Barakat, 1993), and Abruzzo, Italy after the 2009 earthquake (Bologna, 2010).

Community-Driven Reconstruction (CDR) policy: This policy gives increased rights to affected communities to play active roles in planning the reconstruction processes and take crucial decisions in resource investment (Maskrey, 1989). Jha et al. (2010) explain that the role of a community in reconstruction may vary considerably. Reconstruction after the 1983 earthquake in Popayán, Colombia was one of the earliest and successful examples in which community members played leading roles. Communities were organized in groups of 15–20 families, under the direction of a locally elected coordinator, a treasurer, and a secretary. In this case, around 87% of participants occupied the houses they had built, and roughly 84% were satisfied with the size and design of their houses, and the building materials used (Barakat, 2003). Despite its strengths, the CDR policy typically opens the door for different interpretations of the degree of community participation. According to Barenstein (2010, p. 98), the CDR also permits that agencies consult only with community elites and leaders "whose views do not reflect those of

community." Similarly, agencies can impose restricting standards and regulations, limiting families' preferences and ignoring their expectations (Hidellage & Usoof, 2010; Karunasena & Rameezdeen, 2010).

Cash grant policy: This policy stands on the belief that the distribution of cash (as a replacement for 'in kind' assistance) helps empower beneficiaries, decreases dependency on reconstruction assistants, and gives residents additional freedom to make decisions (Davis & Alexander, 2015). The cash approach gives beneficiaries the choice to use the assistance based on their priorities, which may not necessarily be housing. The pendulum (trust vs. control) model explains the fact that if leaders "place more trust in their workforce, fewer controls are needed" (Handy, 1995). Drawing on the pendulum model, Davis and Alexander (2005, p.105) explain how disaster managers may assume that "beneficiaries will use the money prudently and not on the purchase of non-essential goods." In Pakistan after the 2005 earthquake, cash grants acted as leverage, ensuring the compliance of new buildings with building standards and introducing families to banking – an essential entry point to further economic development (Davis & Alexander, 2015). On the other hand, many researchers warn some potential risks such as corruption, reproduction of pre-disaster vulnerabilities, the use of financial assistance for not housing-related requirements, and the lack of opportunity for labor training and introducing better techniques and materials (Barenstein & Iyengar, 2010; Karunasena & Rameezdeen, 2010; Pugh, 1995).

Owner-Driven Reconstruction (ODR) policy: This approach consists on providing conditional financial assistance under strict control and supervision (Davis & Alexander, 2015). In an ODR program, families are expected to reconstruct their houses and managing the process of reconstruction using a combination of financial and technical assistance. The ODR policy first appeared during post-disaster reconstruction in the 1999 earthquake in Colombia (Lizarralde, 2010) and the 2001 earthquake in Gujarat (Barenstein & Iyengar, 2010). The ODR policy aims at enabling families to return to normal life faster and helping people who have been through a trauma restore their sense of pride and well-being. Barenstein and Iyengar (2010) explain that the adoption of ODR policy in Gujarat led to empowering disadvantaged and marginalized communities, upgrading technical solutions, and improving socio-cultural practices and local self-governance. They emphasize that the success of ODR relies on providing an enabling environment that can be created by subsidizing the price of, and strengthening access to, key building materials, ensuring administrative support to the most vulnerable, developing relevant

technical guidelines, and facilitating technical assistance and training (Barenstein & Iyengar, 2010, p. 165).

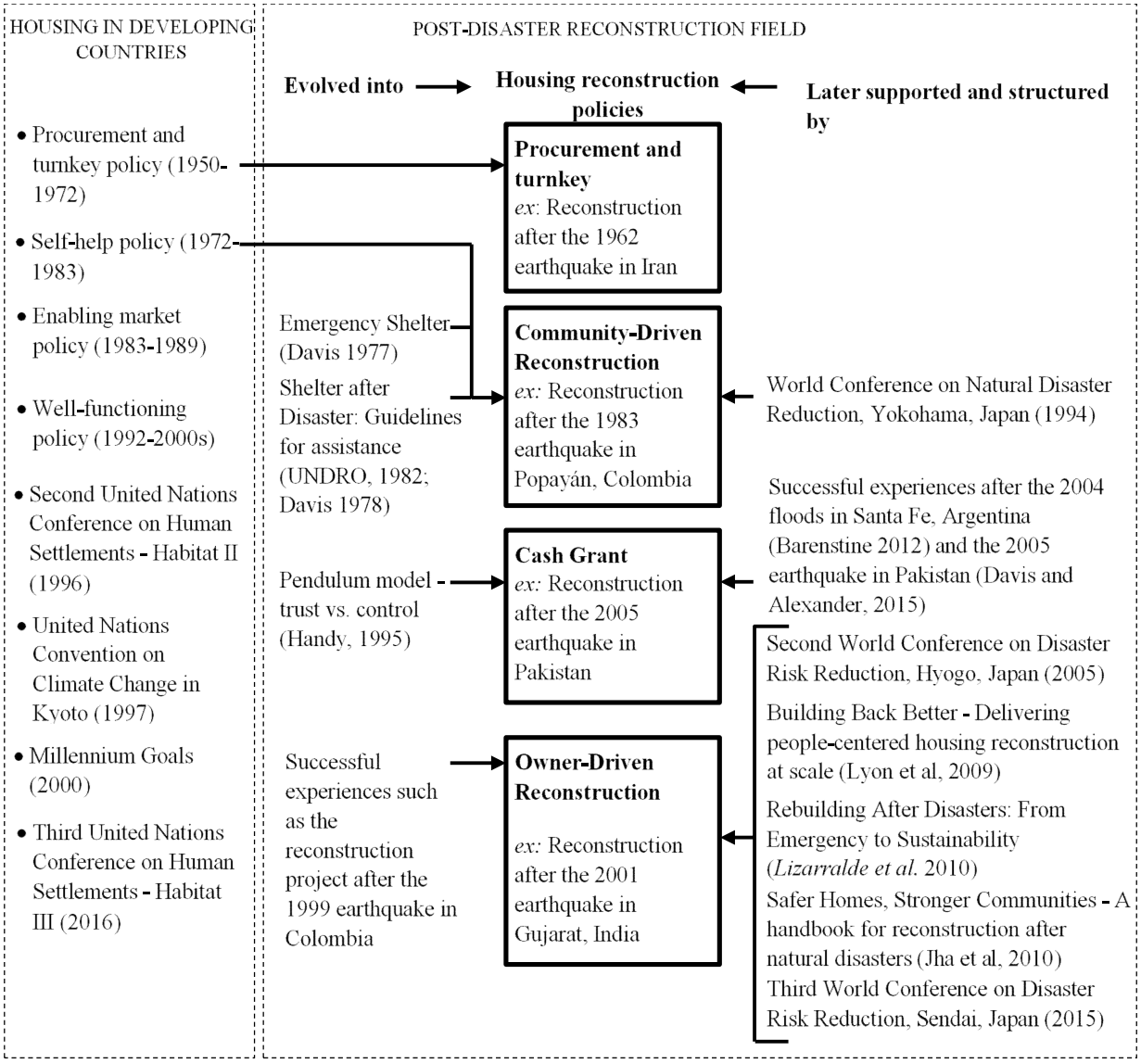


Figure 3.1: Links between housing reconstruction policies and reforms in both reconstruction and housing policies in developing countries – Source: authors.

The ODR policy is often conceived as "the most empowering and dignified approach" to household's recovery (Barenstein, 2010, p. 95). However, given the potentially dissimilar impact of disasters on households and their unequal capacity to recover, *how* can housing reconstruction policies, and the ODR policy in particular, cater to the needs of different social groups and promote social equity after disasters?

3.5. Methodology

In order to answer this question, this study adopts a deductive reasoning strategy, which according to Babbie (2012), includes *pattern matching,* that is, a research proposition that might be logically or theoretically expected, and observations that examine whether the expected pattern actually occurs. Conducting a case study, as part of the experimental research, is an appropriate method to confirm or contrast the theoretical expectation (hypothesis) and produce research findings (Creswell, 2013). This study is based on a detailed, longitudinal, qualitative-quantitative case study of the housing reconstruction program conducted after the earthquake that struck the city of Bam in Iran on December 26, 2003. The case of Bam was selected for its diversity of housing reconstruction policies and the different levels of recovery among various groups of households, so as to observe the impacts of distinct policies – from owner-driven to subsidized programs- adopted.

In the first steps of the study, a detailed and extensive review of housing policies in developing countries, and post-disaster housing reconstruction policies in particular, led to the formulation of a hypothetical proposition. The main proposition (predicted pattern) is that the adoption of a single policy is hardly likely to lead to the recovery of all variously affected households. This recovery instead is largely influenced by a number of variables such as ownership rights, social connections, lifestyle, and livelihoods (see more in Table 3.4). In a second stage, empirical findings from the case of Bam were matched with the predicted patterns described above. The results highlight the effects of housing policies on different categories of households, and validated (but also nuanced) the theoretical proposition. The findings then contribute to theory building, or what Yin (2003, p. 33) describes as an "analytical generalization," that is, a generalization to "the theoretical propositions rather than to populations or universes".

Data collection occurred over five separate field trips to Bam: 1) July – August 2004, 2) November 2008, 3) January 2011, 4) March 2012, and 5) June – July 2014. Data was collected using 12 interviews with officers and authorities in Bam and Tehran and 70 interviews with residents in Bam (see Table 3.2). Interviews with households took about 45 minutes, and those with officers and authorities, regarding their responsibilities in the reconstruction program, varied from 30 minutes to two hours.

Table 3.2: Number of interviews with households, officers and authorities. Source: authors

Interviewees		Number of interviews per fieldwork					Type of information
		2004	2008	2011	2012	2014	
Different household groups	Pre-disaster house-owners	-	10	5	1	17	- Demographic characteristics, number of losses, pre- and post-disaster source of livelihood, - Location and quality of temporary houses - Location and quality of houses before and after the disaster - Participation in housing reconstruction processes - Lifestyle and social connection before and after the disaster - Land tenure and ownership rights - Access to information during the process of reconstruction and later - Knowledge of disaster risk reduction requirements
	Members of extended families	-	4	4	-	4	
	Young couples who married after the disaster	-	-	-	1	1	
	Apartment-owners	-	2	1	-	4	
	Pre-disaster tenants	-	1	3	-	10	
	Informal settlers	-	-	-	1	1	
Total		**70 interviews**					
Officers and authorities	HFIR's key managers	-	1	-	2	3	- Decision-making process and the structure of governance - Primary objectives and strategies - Roles of various organizations involved in the housing reconstruction projects - Housing reconstruction policies and reasons for the adoption of several sets of policies in different periods of time - Impediments to the attainment of objectives
	Bam's representative in the Islamic Parliament of Iran	-	-	1	-	-	
	Bam's mayor	-	-	1	-	-	
	Heads of architectural consultancies in Bam	-	-	-	3	-	
	Heads of involved NGOs	-	1	-	-	-	
Total		**12 interviews**					

Secondary data was also collected from more than 32 reports and six policy documents, including minutes of project meetings, press releases and construction documents, and the eleven thematic reports of the Bam Reconstruction Documentation Project (BRDP) conducted by the Housing Foundation of Islamic Republic (HFIR). See more in Table 3.3.

Table 3.3: The most important policy documents analysed in this study. Source: authors

Policy documents	Date	Content
Approvals of the cabinet of ministries	Feb. 21, 2004 Mar. 18, 2004	- Reconstruction management tasks and available resources - The Reconstruction Supervision and Policymaking Association (RSPA)
Approvals of the Reconstruction Supervision and Policymaking Association (RSPA)	May 24, 2004 June 21, 2004	- The initial housing reconstruction policy proposed by the Housing Foundation of the Islamic Republic (HFIR) - Financial aid and loans to the reconstruction of residential and commercial buildings in urban and rural areas - Proportion of funding and international aid is transmitted to the housing sector

	July 20, 2004 April 11, 2005	- HFIR's responsibilities in managing and monitoring the transitional and permanent housing programs - Modification of Bam's master plan - The revised policy with emphasis on providing ownership rights for tenants and members of extended families
Minutes of project meetings: 1) the National Disaster Task Force (NDTF), 2) Bam's RSPA – local committee, and 3) the provincial government of Kerman	Jan. 5, 2003 – Dec. 26, 2006	- Permanent housing reconstruction management: review of opportunities and obstacles - Recognition of vulnerable families and seeking solutions for their better recovery - Finding solutions for tackling critical problems such as debris removal, shortage of construction materials, complexity of inherited properties, severe depression, and mental illnesses, and families' lack of intention for reconstruction of houses
The HFIR's monthly reports of the housing projects	6 reports between May 10, 2004 and Sep. 9, 2006	- Statistics on the number of reconstructed houses and the amount of given loan every month

The use of multiple sources of evidence helps support facts and hypotheses. In order to verify and corroborate information collected from the interviews, we reviewed reports and policy documents and conducted some field visits and direct observations. This triangulation of data decreased the risk of personal interpretation and distorted memories of interviewees, minimizing the danger of incomplete and conflicting reports – "converge[d] lines of inquiry" Yin (2008, p. 98). Using the triangulation of collected data and methods we could create a coherent narrative of the events and decisions made in the reconstruction project during 10 years. This permitted to follow-up not only the implementation of different policies over time, but also the effects of these policies over a 10-year period, providing unique information about the reconstruction process.

3.6. Results

3.6.1. The 2003 Bam Earthquake in Iran and first response

On December 26th, 2003, a 6.7 magnitude earthquake severely struck the city of Bam, Iran (Ghafory-Ashtiany & Hosseini, 2008). Because of the intensity of the earthquake, the time of occurrence, and the instability of traditional mud-straw houses, the event led to a high rate of casualties and damages: approximately 22,400 people died, more than 75,000 residents were left homeless, and nearly 93% of urban buildings were destroyed (Statistic Center of Iran, 2003). Immediately after the earthquake, the Iranian government set up the Reconstruction Supervision and Policymaking Association (RSPA), an inter-ministry organization headed by the Minister of Housing and Urban Development with extensive power paralleling that of the president's cabinet

(Fallahi, 2007; Fayazi, 2012; Fayazi et al., 2013a). The RSPA made all decisions related to the recovery and reconstruction phases. Setting recovery objectives and defining reconstruction policies were among these decisions. The Housing Foundation of Islamic Republic (HFIR) was quickly identified as the sole housing reconstruction executor. To prevent the emergence of parallel organizations and excessive bureaucracy, the RSPA designated the HFIR to coordinate the relationship between contractors, banks, affected families, and the municipality.

3.6.2. Household Types

For the purpose of this study, affected households were classified according to a set of three indicators that address their most significant pre-disaster conditions, one indicator of impacts of the disaster on households, and one indicator about the way the program responded to these conditions. The five indicators are: pre-disaster ownership rights, (2) lifestyle, (3) quality and location of houses, (4) casualties and emotional impacts of the disaster, and (5) type and quality of temporary houses received after the disaster. By a combination of all variables, beneficiaries could be categorized in more than one hundred types. However, the detailed observation of social constructs on the ground, the experience of the main researcher with Bam social groups, the identification of the most significant communities, the responses of interviewees regarding social groups and the analysis of demographic data (notably the social groups identified by the Statistics Center of Iran), revealed that six main types of beneficiaries can be considered socially representative in the city (Table 3.4).

Table 3.4: Categories of beneficiaries according to the set of five indicators. Source: authors

Variables		Household Categories					
		1	2	3	4	5	6
Pre-disaster ownership status	House owners	X					
	Apartment owners				X		
	House tenants		X			X	
	Apartment tenants						
	Without legal ownership rights			X			X
Pre-disaster Lifestyle	Single families	X			X	X	X
	Extended families	X	X				X
Pre-disaster Location	Inner-city (downtown)	X	X	X	X	X	
	Affluent neighbourhood	X	X	X		X	
	Low-income neighbourhoods	X	X	X	X	X	
	Informal settlements (in city outskirts)						X
Loss of bodies and emotional impacts of the disaster	Minor impacts (no loss of family members)	X	X	X	X	X	X
	Major impacts (loss of family members and/or depression)	X	X			X	X

Temporary solution offered after the disaster	Temporary units in the yard of destroyed houses	X	X	X		X	X
	Camps in the outskirt of the city or inside the city			X	X	X	X

The main six categories of beneficiaries are: (1) pre-disaster house-owners (about 42% of the population), (2) members of extended families (17%), (3) young couples who married after the disaster (3%), (4) pre-disaster apartment owners (10%), (5) pre-disaster tenants (20%), and (6) informal settlers (3%).

3.6.3. Reconstruction policy in Bam

The recovery program assumed that enabling people to have a leading role in the reconstruction of their houses and supporting them with assistance would lead to overall recovery. In practice, however, the recovery of heterogeneously affected households needed the adoption of three sets of policies in different periods of time, leading to varied levels of recovery.

The initial policy: The provision of a financial and technical aid package for house owners

Relying on the learnt lessons from previous experiences in Iran, the RSPA adopted the ODR policy about two months after the earthquake, recognizing house-owners as managers in the reconstruction process of their houses and enabling them to recover faster. Equal compensation and distribution of the same resources (5% interest loans of about $10.750 US) were provided to all affected house-owners. Families were responsible for consulting with designers to choose a plan, supplying the needed materials, inspecting the construction, optimizing the construction materials usage, and cooperating with the inspection authorities throughout the different reconstruction phases (Omidvar et al., 2010).

Two years after the disaster, investigations showed that only 44% of the population was able to reconstruct their houses (Figure 3.2), and about a third of pre-disaster house-owners had not reconstructed their houses (see Table 3.5). Before the disaster, members of extended families or renters were sharing dwellings with parents or landlords. The provision of equal compensation regarding the number of destroyed houses led to the replacement of big houses with small ones that were designed for single families. This change in size left pre-disaster renters and members of extended families in either temporary housing camps or in temporary units located in the yards of reconstructed houses. According to Tafti and Tomlinson (2013), families who started

building more than one unit (one for their housing and another for rent or family members) were less likely to finish the rebuilding of their own houses.

Figure 3.2: An example of the ODR reconstructed houses – Photo by: M. Fayazi

The initially adopted policy could only help single family house-owners (about 32% of the population) start reconstruction of their houses quickly, participate actively in design and implementation, and receive sufficient training about safe construction technologies and the use of new materials. These residents also had a chance to stay in touch with their neighbours and friends and take care of their date palm groves, which often provided their primary source of livelihood (Rafieian & Asgary, 2013).

After the emergency phase, the adverse conditions (including harsh climate conditions) and the expectation of a long process of reconstruction forced authorities to move affected families to temporary units until permanent reconstruction could be completed. Around 37,900 units were ultimately built by adopting distinctive strategies, including temporary housing camps and separated units on the yard of destroyed houses (Fayazi & Lizarralde, 2014). The quality of temporary houses that were developed was critical in the recovery. “Temporary” units made of masonry (with safe construction techniques) eventually provided an extra bedroom or an area for conducting domestic businesses after the reconstruction of permanent houses on the same lot. Prefabricated units, instead, did not last long and became rapidly dilapidated and of little use for residential purposes (see Figure 3.3).

Figure 3.3: Pre-fabricated temporary units (up). Temporary units made of masonry materials (down) – Photos by: M. Fayazi.

Some owners found additional struggles in reconstructing their homes. The loss of family members, and heads of families in particular, caused long delays, additional costs and other difficulties in the reconstruction process. The value of financial aid provided by the government decreased because of rising inflation at the time, which then eroded the households' capacity to reconstruct their houses. Thus, about 3% of house owners were never able to reconstruct their houses and eventually remained in the temporary camps almost two years after the disaster. Abdolreza was a house-owner who never reconstruct his house. He expressed:

> *"We lost everything; my two daughters, brother, and parents in law. My wife and I were so depressed, felt lonely, and didn't want to continue* [our life]. *Zahra* [his wife] *didn't want to go out of our tiny cabin* [temporary housing unit] *for days and talk to nobody, even me. We had tough days for almost eighteen months. When we came to reconstruct our house, everything was too expensive, and the financial aid was hardly enough for the construction of a 40m^2 unit. We thought if we wait longer, prices will return to normal conditions; but that never happened."*

Likewise, the vast majority of pre-disaster apartment owners lived in the temporary camps for more than two years. They met significant technical, logistic and legal challenges in the reconstruction of their buildings – such as the complexity of dealing with inheritance laws when neighbours died. One of the pre-disaster apartment owners said *"... two out of our five neighbors died, and their children inherited their apartments. I begged them to reconstruct the building, but they were reluctant. They live in Kerman and Tehran and have no intention to reconstruct that building"*. A revision of policy was then necessary (see Table 3.5).

Table 3.5: The impact of the initial policy on different beneficiary groups and the estimated demographic distribution in each category. Source: authors

The beneficiary groups		The initial policy: the provision of financial and technical aid package for the house owners – 2004	Proportion of the population
1	Pre-disaster house-owners	Single family house-owners could reconstruct their houses	About 32%
		Extended family house-owners replaced big houses with small ones that were not enough for pre-disaster inhabitants	About 12%
		Some could not reconstruct because of the loss of family members, long delay, and the rise of inflation at that time	About 3%
2	Members of extended families	Stayed in temporary housing units located in the yards of destroyed houses or in the temporary housing camps	About 17%
3	Young couples who married after the disaster	Not considered as beneficiaries of aid	About 3%
4	Apartment-owners	Lived in temporary camps for more than two years; met significant technical, logistic and legal challenges in the reconstruction of their buildings	About 10%
5	Pre-disaster tenants	Stayed in temporary housing camps	About 20%
6	Informal settlers	Not considered as beneficiaries of aid	About 3%

The revised policy: Ownership rights

Two years after the earthquake, a grant of $10,750 US was provided to tenants, members of extended families, and young couples who married after the disaster to start the reconstruction of their houses. The prerequisite for receiving the grant was to own land in the city, or to be able to use a plot of land with the agreement of its owner (NDTF, 2014; Tafti & Tomlinson, 2013). While a total of 4,950 residential units were built using this grant, it insufficiently addressed the most vulnerable households, low-income tenants in particular. Those who received this assistance were among wealthier and middle-class tenants, apartment owners, and extended family members.

Before the disaster, hundreds of young couples lived in their parents' houses. Even though many stayed with their parents in temporary shelters after the disaster, some were able to reconstruct

new houses in the same yard (about 12 % of the population). Many of young couples from wealthier families were able to buy a piece of land and build a new house, while others received their parents' agreement to split their lands and construct new houses. Instead, those who could neither afford land nor split their parents' land had to stay in temporary shelters (about 5% of the population). According to one resident:

> *"…we* [my parents, my wife, children and I] *have to live together, it's our lifestyle. My mother takes care of our kids when we* [my wife and me] *work on our inherited date palm groves. Using the financial aid and our savings, we could only afford the reconstruction of a small house* [about 60m2] *for our parents. Many families could reconstruct an extra house in the same yard, but our yard is too small and doesn't let us build anything more. My wife and I still sleep in the cabin* [temporary housing units in the yard] *and wish to sleep in our real house one night"* (see Figure 3.4).

Figure 3.4: A temporary unit occupied by members of extended family members – Photo by: M. Fayazi.

The second policy failed to reach the majority of tenants (Tafti & Tomlinson, 2013). While few better-off tenants could shift their tenure to ownership, others stayed in the temporary housing camps, or migrated from the city, or to new informal settlements. In fact, with hopes of receiving funds to build new houses, some pre-disaster-tenants rushed to buy land at low prices in the outskirts of the city, in Janbazan Town. However, the municipality did not give them permission to construct new houses in this area. *"Nobody told us that this is a forbidden land. I gave all I saved during the last ten years, and now this is all I have: living in a Cabin* [temporary unit] *afraid of eviction"* said one inhabitant of Janbazan Town in 2014. It is estimated that more than 100 affected families carried their prefabricated temporary housing units from the camps to Janbazan and formed an informal settlement (Figure 3.5).

Figure 3.5: Informal settlement (Janbazan) in the outskirts of the city – Photo by: M. Fayazi.

The impacts of this second-generation policy for pre-disaster apartment owners varied. The affluent ones could purchase a land and construct their house, while lower income apartment owners could not receive the grant. Given the rising inflation at that time, and the fact that households had to pay for purchasing land as well, this policy only helped wealthier tenants, part of extended families' members, and the apartment owners who could provide land. It confined lower-income tenants, informal settlers, and much of new couples to camps and temporary housing units. Please see Table 3.6.

Table 3.6: The impacts of the revised policy on different beneficiary groups and the estimated demographic distribution in each category. Source: authors

	The beneficiary groups	2nd generation policy: the provision of ownership right – 2006	Proportion of the population
1	Pre-disaster house-owners	Stayed in temporary housing units	About 3%
2	Members of extended families	Split land and reconstructed in the yard of parents' houses	About 12%
		Purchased a piece of land and built a new house	About 5%
3	Young couples who married after the disaster	Stayed in temporary housing units because their parents' land was not big enough and they could not afford a piece of land	About 3%
4	Apartment-owners	Purchased a piece of land and built a new house	About 8%
		Stayed in temporary housing camps	About 2%
5	Pre-disaster tenants	Purchased a piece of land and built a new house	About 13%
		Stayed in temporary housing camps	About 5%
		Migrated from the city	About 1%
		Formed a new informal settlement	About 1%
6	Informal settlers	Not considered as a beneficiary of the allocated aid and supports	About 3%

Third-generation policy: Residential complexes located in the periphery of the city

Three years after the disaster, a significant number of the most vulnerable, low-income households were still living in temporary housing camps (about 15 percent of the population).

The first ODR policy and the subsequent modification could not reach them. The following policy was an agency-driven reconstruction plan in a relocated site. The HFIR in collaboration with the Ministry of Housing and Urbanism built about 4,300 apartment units located in 50 multi-storey residential complexes on the eastern side of the city called Razmandegan Town (Figures 3.6 and 3.7). Almost all the units were completed seven years after the disaster. During the construction process of the residential complexes, the households had to register for the program by providing about $6,650 USD. This down payment was affordable for many, and families could pay it from the grant provided by the government. The families also had to pay $150 USD per month for ten years. In total, every apartment unit cost $24,650 USD that must be paid in ten years. However, the units were generally more expensive than the owner-driven reconstructed houses and the relocation imposed increased transportation costs for residents (see Figure 3.7).

Figure 3.6: Residential complexes located in the periphery of the city (Razmandegan Town) – Photo by: M. Fayazi.

This policy considered informal settlers equal to the rest of vulnerable families in Bam. Before the disaster, a still unknown number of families lived in an informal settlement on the eastern side of the city. They became eligible to financial aid and an apartment in the residential complexes. The government also gave them equal access to basic services, reducing their pre-disaster socio-economic vulnerabilities.

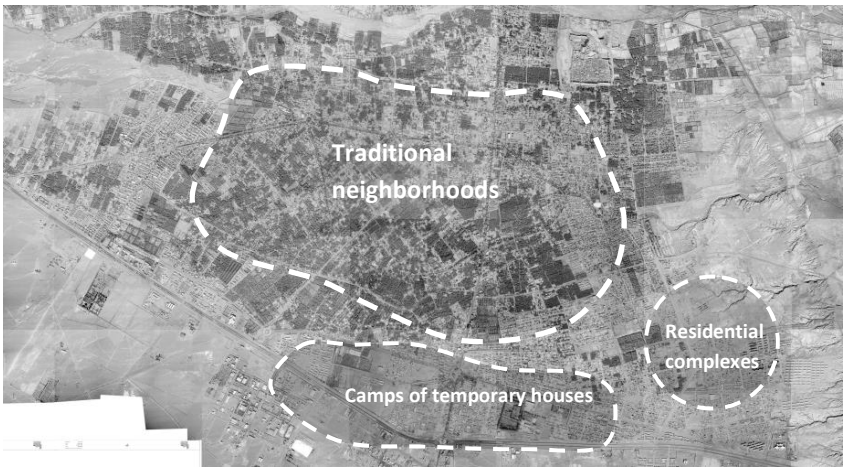


Figure 3.7: Location of the main areas – Source: Fayazi et al. (2015)

Though pre-disaster informal settlers enjoyed feeling the sense of ownership of their new apartment, pre-disaster tenants and apartment owners who could not afford a piece of land and were economical, socially, and emotionally dependent on their neighbours, extended family, and communities, were adversely affected when they moved into the new residential complexes (Fayazi, 2012). They addressed this issue several times during the interviews. For instance, one of the pre-disaster apartment owners said: *"we live on an island, disconnected from our community. We finally received a roof, but lost our friends, families, and neighbors."*

Different pre-disaster conditions, priorities, and needs caused various levels of recovery among households. While the acquisition of a new apartment decreased tenants' vulnerabilities in different dimensions, for many of them, living in residential complexes meant being excluded from their communities. Many of them deplored the increase in transportation costs, loss of social networks and limited capacity to receive support from family and friends (see Table 3.7).

Table 3.7: The impact of the third-generation policy on different beneficiary groups and the estimated demographic distribution in each category. Source: authors

	The beneficiary groups	3rd generation policy: provision of residential complexes located in the periphery of the city – 2007	Proportion of the population
1	Pre-disaster house-owners	Received an apartment in residential complexes located on the eastern side of the city	About 3%
2	Members of extended families	N.A.	
3	Young couples who married after the disaster	Received an apartment in residential complexes located on the eastern side of the city	About 3%
4	Apartment-owners	Received an apartment in residential complexes located on the eastern side of the city	About 2%

5	Pre-disaster tenants	Received an apartment in residential complexes located on the eastern side of the city	About 5%
6	Informal settlers	Received an apartment in residential complexes located on the eastern side of the city	About 3%

3.7. Discussion

The importance of sheltering and housing reconstruction in the recovery of affected families after disasters is well recognized in hazard-related literature. An appropriate sheltering and housing program can stimulate risk reduction, foster social structures, and achieve development in the broader sense. In practice, however, housing reconstruction programs seldom help all different beneficiary groups recover in the same way, and result in unexpected heterogeneities. Given various pre-disaster vulnerabilities and resilience levels, every disturbing event impact different groups of families in distinct ways. Low-income families and informal settlers are typically more fragile than affluent ones who live in less vulnerable areas and more resistant buildings. Loss of family members (and heads of families, in particular) causes serious problems and radically hampers recovery. Seemingly chaotic conditions after disasters often involve supposedly similar families losing their loved ones and looking for help, but survivors are always very different and have diverse needs, desires, and expectations for recovery. Numerous studies have tried to understand the exact impacts of undesirable events on society and find solutions for addressing the diversity of needs and expectations in the reconstruction of houses (Barenstein, 2008; Bolin, 1982; Caporale, 1989); however, such an understanding still remains inadequate.

Our empirical results show that the initially adopted ODR policy in Bam helped merely single-family house-owners and the core of extended families to reconstruct their houses. The modification of land issues in the revised ODR policy failed to cover all different groups of households and excluded the most vulnerable families: tenants, apartment-owners and informal settlers. Encouraging families to buy land and rebuild their houses generated a new informal settlement, exacerbated social gaps, and increased vulnerabilities and inequalities. The third policy was a retreat to the procurement and turnkey approach, which provided apartments for those who remained in transitional sheltering camps four years after the disaster. However, residential complexes in the outskirts of the city increased transportation costs, expelled families from their communities, and limited their capacity to receive support from family and friends.

The main challenge for policy makers in Bam was the recognition of households' diversity and the adoption of appropriate housing policies to address the specific conditions of every group of

households. The housing reconstruction program in Bam overlooked the diversity of affected households regarding their pre-disaster status and the impact of the disaster on them. In addition, the intervals between different policies in Bam, which were at least one year, caused insecurity, frustration and a sense of "being excluded" from the housing reconstruction program among some households. In the period of time between policies coming to effect, disappointed families took irrevocable decisions, permanent migration or unsafe reconstruction in vulnerable areas, which ultimately affected their recovery. The Bam case shows us how crucial it is to develop effective housing reconstruction policies that respect diversities and heterogeneities, allowing households to choose a set of solutions that fit their conditions, priorities, and needs.

There are important theoretical implications of these results. First, they highlight the fact that the one-policy-for-all approach cannot effectively lead to the recovery of affected families. Reconstruction policy needs to include all types of households, respecting their contextual and specific conditions. Second, results show the gap between pre-disaster housing and post-disaster housing reconstruction policies. National governments and international agencies sometimes establish housing reconstruction policies based on insufficient knowledge about both pre-disaster conditions and the disaster's impact on families. There is often a need for a better integration of housing reconstruction and general housing policies, ensuring equal recovery and preventing the reproduction of vulnerabilities. In fact, housing reconstruction policies can ensure sustainable development, resilience enhancement, and disaster risk reduction by addressing pre-disaster deficits and vulnerabilities, such as providing ownership rights, increasing access to services in informal settlements, reducing social gaps, and mitigating disaster risks.

There are also relevant practical implications of these results. First, authorities can make better decisions if they reassess pre-disaster policies, evaluate their impacts on households' vulnerability, and conceive housing reconstruction programs as an opportunity to address pre-disaster deficits. Second, policy makers can issue sets of policies and initiatives at the same time to help different categories of households choose the most suitable solution to their conditions. These results, however, have to be taken with prudence, given that this research experienced several limitations, including scarce information about general housing and urban policy before the disaster in Iran. Pre-disaster policies were not examined, and results cannot explain how the housing reconstruction policies could tackle pre-disaster barriers and deficits. More research is still needed to bridge this methodological gap.

3.8. Conclusion

Post-disaster reconstruction experiences show varied levels of recovery among different groups of households, which sometimes exacerbate pre-disaster social conditions such as poverty, social exclusion, and marginalization. By studying the housing reconstruction experience after the 2003 earthquake in Iran, this article reveals how housing reconstruction policy often oversimplifies pre-disaster conditions and overlooks diversity of households after disasters. Scant attention to families' socio-economic conditions and demographic changes before, and after, the disaster led authorities to adopt housing reconstruction policies that benefited some groups of households while having the opposite effect on others. Theoretical implications of these findings point to the inefficiency of the one-policy-for-all approach in housing reconstruction after disasters. Results indicate how crucial is to issue multi initiatives and solutions at the same time, letting households choose the most appropriate solution. The results also call for the integration of general housing and housing reconstruction policies to address causal factors related to pre-disaster vulnerabilities, reveal households' diversities, and ensure long-term recovery, sustainable development, and disaster risk reduction. At the practical level, results call for the reassessment of pre-disaster conditions before the adoption of reconstruction policies; notably to prevent the preservation of vulnerabilities and inequalities. Further studies must be conducted in the housing, urban development, and post-disaster housing reconstruction fields to bridge the gaps between pre- and post-disaster policies.

CHAPTER FOUR

The Role of Low-Cost Housing in the Path from Vulnerability to Resilience

[Article 1]

Fayazi, M., & Lizarralde, G. (2014).
International Journal of Architectural Research (published).

The third chapter is an under-review article, focusing on post-disaster housing reconstruction policies. By studying the housing reconstruction experience after the 2003 earthquake in Iran, this article shows how housing reconstruction policy often oversimplifies pre-disaster conditions and overlooks the diversity of households, eventually benefiting some groups of households while having the opposite effect on others. This research is built on a comprehensive analysis of general housing (pre-disaster) policy and housing reconstruction policies in developing counties.

The first author played a leading role in conducting the research and writing the article. He developed the analytical model for analyzing the impacts of policies on different categories of households. He categorized a variety of households in ten main groups after analyzing the data gathered from the fieldwork in summer 2014. After developing an analytical model and analyzing the data, he interpreted results and drew conclusions under the supervision of Dr. Gonzalo Lizarralde (second author).

To access to this chapter please refer to the published article using the following link: http://dx.doi.org/10.26687/archnet-ijar.v7i3.56

Abstract

It is well known that low-cost housing not only reflects, but also greatly influences the vulnerability of a community. This means that post-disaster housing programs can improve the living conditions of affected families or make them even more vulnerable. However, it is still unclear how different post-disaster housing strategies enhance community resilience. This article seeks to bridge the theoretical gap that exists between vulnerability and resilience theories and to clarify *how* post-disaster housing programs can potentially enhance community resilience. Four different housing strategies used after the 2003 earthquake in Bam, Iran, illustrate the role of housing in the path that can potentially lead communities from a vulnerable state to resilience. These strategies include: (A) Prefabricated units built on temporary camps located in the city and in the outskirts and developed by the central government, (B) Masonry units built by a public stakeholder on the yards of destroyed houses, (C) Prefabricated units built by the central government in partnership with a private firm and located in the yards of destroyed houses, and (D) High-tech imported units built on the outskirts of the city. Analysing these strategies through the lens of a new framework based on a systems approach permits to identify the different impacts of post-disaster housing programs. Whereas strategies A, C and D had negative consequences in various sub-systems of the affected community, strategy B positively enhanced community resilience. The findings of the study provide insightful information that can help architects and decision makers identify the appropriate housing strategy to be implemented after disasters.

Keywords: Post-Disaster Housing, Resilience, Iran, Reconstruction, Vulnerability, Systems.

4.1. Introduction

First contributions in disaster management literature (and in architectural studies interested in this field) attempted to explain *why* disasters occur. They ultimately created the vulnerability theory, which demonstrated that disasters are not 'natural' but created by societies (Adger, 2006; Susan L Cutter et al., 2003; Gallopín, 2006). According to this theory, societies accumulate unsafe conditions (such as poverty, unsafe use of land, lack of insurance) that become disastrous when triggered by a natural hazard. Nonetheless, later contributions noted that some communities do not necessarily accumulate unsafe conditions but also develop appropriate mechanisms of adaptation to the environment (Adger, 2000; Coles & Buckle, 2004). This argument has been consolidated in the emergent theory of resilience. Some authors now argue that rather than being contradictory, the two theories can in fact be complementary (Cutter et al., 2008; S.L. Cutter et al., 2003). This implies that it is theoretically possible for a community to evolve from a state of vulnerability to a state of resilience. However, the relationship between enhancing resilience and effective vulnerability reduction has been insufficiently explored in

disaster literature (Djalante et al., 2011; Miller et al., 2010). In response, this article seeks to illustrate how housing can contribute to move communities from a state of vulnerability to resilience. In order to do this, the study examines the case of post-disaster housing solutions developed after the earthquake that destroyed the city of Bam, Iran, in 2003.

However, this objective implies developing an analytical framework that combines the concepts of vulnerability and resilience and that relates them to post-disaster housing. This framework is explained in the first section. Given that General Systems Theory has been usefully applied to the understanding of vulnerability (Cutter et al., 2008; S.L. Cutter et al., 2003), resilience (Alexander, 2013) and post-disaster housing (Johnson et al., 2006; Lizarralde et al., 2009), and given the advantages of examining the complex relationships between elements and their environment (Von Bertalanffy, 1973), this framework adopts a systems approach. The second section presents the qualitative research methods used for the empirical work. We then present the results in the form of a qualitative assessment of community resilience. Finally, in the section of discussion, we present practical and theoretical implications of this study and the principal findings in the section of conclusions.

4.2. Vulnerability

Although different definitions of vulnerability exist, the term is broadly used to define the potential and the degree of loss for a given system resulting from the occurrence of a natural phenomenon (Cutter, 1996). The vulnerability of a system corresponds to sensitivity to disorders and difficulties to recover the functions of a system (DHA, 1992; Mehta & Dastur, 2008; Pelling, 2003). Several contributions in the field attempt to identify and assess the conditions that make people and assets vulnerable to natural events (Anderson, 1995; d'Ercole et al., 1994; Thouret & D'Ercole, 1996). The vulnerability theory – and notably the Pressure and Release Model – presupposes that root causes (often historic economic, political and social conditions) lead societies to dynamic pressures (such as rapid rural migration, lack of infrastructure and poverty) that eventually materialize in unsafe conditions that put people and assets at risk (Blaikie et al., 1994; Hewitt, 1997). These unsafe conditions (created by the society itself) can be sparked by a natural hazard to create a disaster.

4.3. Post-disaster low-cost housing

Post-disaster housing interventions often take three distinct forms: emergency shelters, temporary units and permanent houses. Emergency shelters (often more or less sophisticated tents), attempt to deal with, and moderate, the particularly hostile post-disaster conditions. However, the long term use of the tents, their uncomfortable conditions, their elevated cost (compared with locally produced houses) and difficulties in their distribution are frequent drawbacks found in this first stage of recovery (Davis, 1977; Duyne, 2010; UNDRO, 1982).

Temporary housing is often simultaneously regarded as a challenge for long-term sustainable reconstruction and as a necessary step to settle temporarily the affected families *during* and *after* a disaster (Fayazi, 2011; Johnson, 2007). In fact, it is often an expensive investment that can delay the construction of permanent solutions. Besides, it usually consists of sub-standard solutions that become permanent, perpetuating vulnerable conditions and stigmatization. However, it might also enable the families to resume daily activities (Jha et al., 2010; Johnson, 2007), to plan for future living solutions and to create the conditions for recovery (Quarantelli, 1995). In order to succeed, temporary housing must not only provide a roof, but also enhance community capacities that create income, consolidate social ties, avoids social segregation and permit long-term development in general (Fayazi & Lizarralde, 2013; Lizarralde et al., 2009).

Permanent housing often appears as a third step in the process. However, permanent solutions are often too expensive for poor households to afford and thus they are largely subsidized. Other common drawbacks include the use of unfamiliar technologies, and of the rubberstamped repetition of a basic module, that often ignores different family size, income, priorities and expectations (Aysan & Oliver, 1987; Barenstein, 2010; Fayazi & Lizarralde, 2013). Duyne Barenstein (2010) identifies five approaches of housing reconstruction: cash approach, owner-driven reconstruction, community-driven reconstruction, agency-driven reconstruction in-situ and, agency-driven reconstruction in relocated sites. She highlights in particular the positive effects of owner-driven reconstruction, a strategy that has proved to help reduce costs; improve safety; restore livelihoods; empower affected households, and enhance capacity building.

4.4. Resilience

The concept of resilience – first introduced in ecology and disaster-related research by Holling (1973) – has multiple definitions often used interchangeably (Klein et al., 2003). Initial

contributions emphasized preservation in ecological systems and adaptation enhancement in communities (Alexander, 2013). More recent contributions highlight the capacity of a system to withstand, mitigate, recover and adapt to a disturbing event (see Table 4.1). 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 them as well as adaptive processes that allow it to reorganize, change, and learn (Adger et al., 2005; Klein et al., 2003).

Resilience includes pre- and post-event measures (Bruneau et al., 2003; Tierney & Bruneau, 2007), hence implying inherent qualities that function well during non-crisis periods, and adaptive capacities in response to disasters (Cutter et al., 2008). In fact, several authors now accept that community resilience emerges from adaptive capacities (Norris et al., 2008) – that is, dynamic attributes of resources that are robust, redundant or rapidly accessible and that allow the system to adjust to change, moderate the effects, and cope with a disturbance (Brooks et al., 2005; Burton et al., 2002). Consequently, Norris et al. (2008, p. 130) argue that resilience is "a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance".

Table 4.1: Relevant definitions of resilience. Source: authors

Authors	**Definitions**	**Emphasis on the ability to:**			
		withstand against hazard	mitigate impacts of hazard	recover after hazards	adapt the community's capacities
Brown and Perkins (1992)	The ability to recover from or adjust easily to misfortune or sustained life stress.	X			
Sonn and Fisher (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 minimize social disruption and mitigate the effects of future earthquakes.		X	X	
Ganor and Ben-Lavy (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 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 and Shamai (2004)	Individuals' sense of the ability of their own community to deal successfully with the ongoing political violence.	X	X		
Coles and Buckle (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 and Bruneau (2007)	Pre-event measures to prevent hazard-related damage and losses (preparedness) and post-event strategies to help cope with and minimize 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 and Anderies (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 reorganize 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 measures according the response and recovery.		X	X	

4.5. Analytical Framework: The Process of Enhancing Resilience (PER)

A system adopts adaptive characteristics through sufficient performances during a continuous Process of Enhancing Resilience (PER). This process might start from a vulnerability state, which corresponds to limited or insufficient access to 'hard' and 'soft' resources (material and non-material assets) (Lizarralde et al., 2009). The system is often composed by several

subsystems including; economy, social, natural environment, built environment, governance, and information and communication. These subsystems correspond to adaptive capacities and dimensions of resilience that have been identified by Arner-Erly and Lizarralde (2013), Fayazi and Lizarralde (2013) and Cutter et al. (2008).

However, there are also different scales of vulnerability and resilience at which the system can be analyzed: individual, family, community, city and national scales. They eventually interact with each other; for instance, community resilience enhances or diminishes the resilience of individual families – and vice versa. Arguably, these dimensions are not static, they evolve before, during and after the disaster: physical destruction and loss of lives and damages, for instance, influence people's attitudes towards risk in the immediate phase after the disaster. Keeping in mind these dynamic attributes, and the scales of the system and its subsystems, we propose a first model that relates the different variables that must be considered in a holistic assessment of the system (see Figure 4.1). This first model recognizes that the subsystems interact between each other at different scales – much like Russian puppets of different sizes embedded in each other.

A second model represented in Figure 4.2 borrows a basic concept of the Pressure and Release model proposed by Blaikie et al. (1994) and Hewitt (1997), to illustrate that the complex system represented in Figure 4.1 can become vulnerable because of their deeply rooted economic, political, social and environmental conditions (originally called by the authors "root causes"). These conditions lead the system to dynamic pressures (such as inefficient government or infrastructure, increased social inequality), which eventually translate into unsafe conditions (such as instable building structures, informal settlements in flood-prone areas, and other dangerous situations). These unsafe conditions make the system more or less vulnerable to three types of exposures that might happen separately or that interact with each other: (1) continuous exposure, including threats such as air and noise pollution; (2) recurrent exposure, that corresponds to periodic threats such as seasonal floods and tropical storms; and (3) sudden exposure which includes high-impact events that cause immediate severe damages, such as hurricanes, earthquakes and tsunamis (note that in Figure 4.2, the system of the first model is represented as a white circle).

For example, an informal settlement (certainly a complex system) located in a flood-prone area (in an unsafe condition) is vulnerable to seasonal floods (a recurrent exposure). Its sub-systems' vulnerabilities can include, for instance: 1) unstable structures and infrastructures (built environment subsystem), 2) flood prone shorelines (natural environment subsystem), 3) illiterate households (social subsystem), 4) lack of investment due to the threat of seasonal floods (economic subsystem), 5) unenforced urban planning codes and construction standards (institutional subsystem), and 6) lack of communication between households and responsible organizations (communication and information subsystem). Arguably, these conditions make the system vulnerable to other threats (earthquakes, hurricanes, droughts, or even man-made threats such as crime).

The exposures can spark or not a disaster. If a disaster does not occur, the system can benefit from actions that can lead to a state of preparedness, becoming less vulnerable and more resilient. These actions range in a continuum between institutionalized measures and vernacular ones. They might include policy-making and enforcement, plans, programs and projects that increase access to material and immaterial resources. If a disaster does occur, recovery might include three phases: emergency action, temporary solutions and permanent reconstruction (Warfield, 2008; Wisner & Adams, 2002). Our model captures this principle and illustrates that the system requires a period of recovery before developing preparedness measures. The system ultimately becomes resilient when it adopts the following characteristics in the last step of the PER model: redundancy, robustness, and resourcefulness. Even though both processes are closely related, it should not be assumed that vulnerability reduction is equivalent to resilience development. In fact, resilience is enhanced by actions that help develop adaptive capacities of the system to withstand, recover from, and reorganize in response to crises, and maintain its function in the event of a disturbance (Howell, 2012; Martin-Breen & Anderies, 2011). Vulnerability reduction occurs when there is increased access to 'soft' and 'hard' resources that create safe conditions for the system (within the system and its environment). Given this framework of analysis, what is the role of post-disaster housing in the different steps of the process of enhancing resilience?

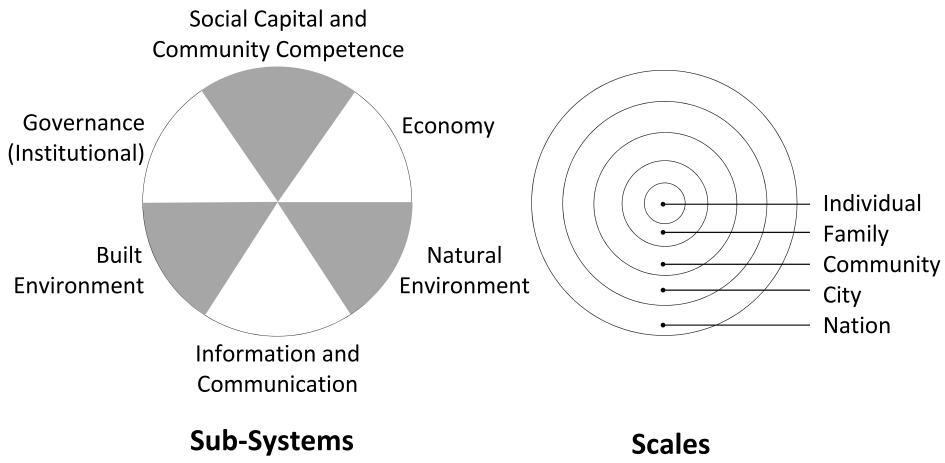


Figure 4.1: The variables of the system: scales and sub-systems - Source: authors

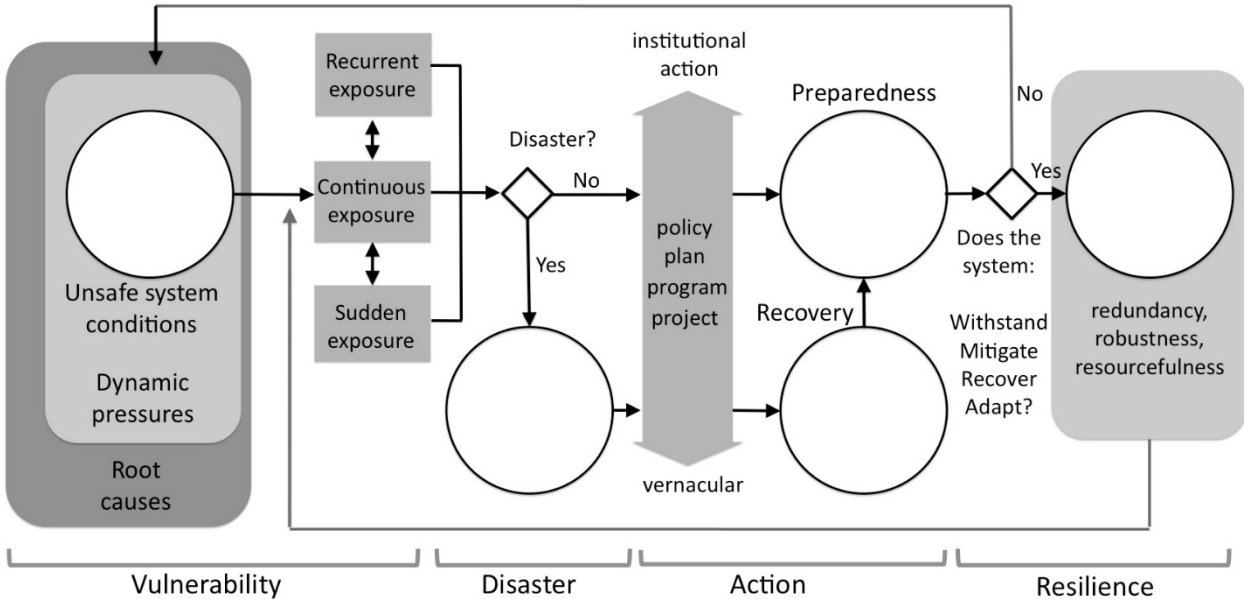


Figure 4.2: The Process of Enhancing Resilience (PER) Model - Source: authors

4.6. Research Methods

In order to answer this question, we conducted an empirical study that examined the effects of different housing strategies used in the reconstruction after the earthquake that significantly destroyed Bam, Iran, in 2003. Case study methodology, through qualitative analysis, is the most suitable for this study because it allows an empirical approach to complex social and human phenomena within its own context (Yin, 2008). Information for building this case was obtained from the following five sources:

- The Bam Reconstruction Documentation Project (BRDP), conducted by the Housing Foundation of the Islamic Republic (HFIR). The HFIR is responsible for providing affordable houses to low income families, and for post-disaster reconstruction in the country. The BRDP was published in eleven thematic reports[1]; the first author of this article was involved in the BRDP and supervised the sub-project "Temporary Housing project after Bam earthquake 2003" between 2008 and 2012.
- Additional printed information, including 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.
- Narrative reports which explain chronologically the phases of reconstruction.
- Answers to 85 questionnaires (conducted within the sub-project "Temporary housing project after Bam earthquake 2003" of the BRDP) given by temporary housing residents. These questionnaires had three main sections: demographic information, questions related to the temporary housing process, and open-ended questions to address the residents' opinions.
- Data obtained from interviews aimed at understanding the planning, decision-making and implementation process. They include: interviews with members of the Reconstruction Supervision and Policymaking Association (RSPA)[2], the HFIR's managers, officers of the local government, presidents of private companies, members of the city council and 33 interviews with affected families.

The qualitative analysis assessed specific indicators in each of the sub-systems (economy, social, natural environment, built environment, governance, and information and communication). These indicators were subdivided into variables that assessed the particular role of temporary

[1] - The publications by the BRDP project include the following themes: 1- Relief and rescue process, 2-Debries 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 Organizations (NGOs) in Bam reconstruction, 9- Needs assessment and damage assessment, 10- Control and monitoring techniques, and 11- Indexing resources.

[2] - The RSPA consisted of the Iranian vice president, the ministers of 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 Organization, and additional experts.

housing in each sub-system, which were subsequently broken down into analytical criteria. See Table 4.2 for an example of the analysis of the economic subsystem indicator; this table compares the four strategies of temporary housing according to the chosen variables and criteria. A similar table was prepared for each of the subsystems but they are not presented in this paper. They are included in Fayazi and Lizarralde (2013).

Table 4.2. Example of the analysis of the economic subsystem indicator, including a comparison of the four strategies. Source: authors

Indicators	Variables of temporary houses	Criteria of analysis of the variables		Strategies				Comments on the criteria
				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. 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 on emergency shelters. Allocating different types of temporary houses to distinctive groups of vulnerable communities reinforced differences between social groups and exacerbated vulnerabilities.
		Remained after temporary housing phase	Use as secondary space		X	X		
			Use as secondary living space		X			
			Use as permanent houses				X	
	Waiting time for receiving temporary houses	Less than 2 months		X				
		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	Level & diversity of temporary houses	Location	Camps outside of city	X			X	
			Camps within the city	X				
			The yard of destroyed houses		X	X		
		Material and structure	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	

4.7. Research Results

On December 26th 2003, a 6.7 magnitude earthquake severely damaged the city of Bam, Iran (Ghafory-Ashtiany & Hosseini, 2008). The majority of houses were destroyed, and more than

75000 residents were left homeless (Gharaati, 2006). Because of the earthquake intensity, the time of occurrence and the instability of traditional mud-straw houses, the event led to high rate of casualties and damages: approximately 25500 people died, more than 75000 residents were left homeless, and nearly 93% of urban buildings were destroyed (Statistic Center of Iran, 2003).

During the emergency phase, several camps of tents were set up to settle survivors. Afterward, the adverse conditions (including harsh climate conditions) forced the national and the local authorities to move affected families to temporary units until permanent reconstruction could be completed. However, demographic changes complicated the temporary housing efforts. A large number of low-income families arrived in Bam from other settlements and villages with the hope of obtaining financial aid. They were settled among affected families in the camps of emergency tents in the primary weeks after the earthquake. The rapid arrival of so many immigrants made difficult the assessment of needs and, consequently, led to poor management of the limited resources available. Around 37900 houses were ultimately built by adopting four distinctive strategies to settle affected families (Fallahi, 2005), each of them are explained below. Table 4.3 summarizes the main characteristics of the units built in each strategy.

Strategy A: In order to facilitate the removal of debris in affected urban areas, national authorities first opted for the construction of temporary shelters in camps. About twenty sites in the city and in the outskirts were selected for building 9050 prefabricated units. The majority of these units (around 8100) were assembled by the national government in partnership with the Defense Industrial Organization (DIO) and a private company called Consulting Engineers of Rashestan Co. They were located in 16 camps developed six months after earthquake. The rest of the units (around 950) were assembled by the regional government of eleven provinces[3] in four sites located in the city (see Figure 4.3).

[3] - Tehran, Yazd, Khorasan,Kordestan, Isfahan, Gilan, western and eastern Azarbaijan, Mazandaran, Boshehr and Sistan-Balochestan

Figure 4.3: Camps consisting of prefabricated units – Photos by: M. Fayazi

Strategy B: Despite the large number of prefab units built by the government, the majority of native families refused to move to the camps, stayed on their emergency tents, and requested to live near their remaining assets and destroyed houses. In response, authorities proposed, almost three months after the earthquake, the construction of temporary shelters on the yards of destroyed houses. Around 5800 masonry units were then built by the HFIR during a period of five months. The specific location of these units within existing yards was selected by the landlord with the supervision of a representative of the municipality and HFIR experts (see Figure 4.4). Despite their modest design, the units were designed to be used after the temporary housing phase besides the permanent reconstructed houses (Ghafory-Ashtiany & Hosseini, 2008).

Figure 4.4: Units made of steel frame and masonry walls in the yard of destroyed houses – Photo by: M. Fayazi

Strategy C: In response to the beneficiaries' refusal to settle in the camps, the national government also opted – about six months after the earthquake – to transfer about 2500 units developed in strategy A and that were not occupied by the beneficiaries to the yards of affected houses (see Figure 4.5). Moreover, the government built additional prefab units (identical to the ones built in strategy A) in the yards of new beneficiaries.

Figure 4.5: Prefabricated units assembled in the yard of destroyed houses – Photo by: M. Fayazi

Strategy D: Three donor countries donated 1400 high-tech units imported from Turkey, Japan, and South-Korea. They were built at "*Dosty"*, a camp located in the outskirts of the city, about 2kms away from the Bam city center. These units arrived in Iran about 15 months after the earthquake, when temporary shelters were no longer needed. Inevitably, these units settled permanently the families who did not have had access to any sort of temporary shelters and had stayed on their emergency tents up to that time (see Figure 4.6).

Figure 4.6: Complete high-quality units – Photos by: M. Fayazi

Table 4.3: Main characteristics of the units developed in strategies A, B, C, and D. Source: authors

	Strategy A	**Strategy B**	**Strategy C**	**Strategy D**
Number of units built	9050	5800	21655	1400
Location	20 camps in the city and outskirts	Yards of destroyed houses	Yards of destroyed houses	Camps in the outskirts of the city
Beginning of construction	Two months after the earthquake	Three months after the earthquake	Six months after the earthquake	12 months after the earthquake
End of construction	Six months after the earthquake (all dismantled by 2009)	Eight months after the earthquake (remained permanent)	Nine months after the earthquake (some dismantled)	15 months after the earthquake (remained permanent)
Built area	19m^2 (6×3.17)	18 m^2 (6×3) and 20 (6×3.34) m^2	19m^2 (6×3.17)	45 m^2 (5×9) (units provided by Japan and Turkey). 36 m^2 (4×9) (units provided by South-Korea)
Area of the plot	Users do not own the land	Units in existing yards	Units in existing yards	Users do not own the land
Number of bedrooms	1	1	1	1
Indoor kitchen	No	Yes	No	Yes

Indoor washroom	No	Yes	No	Yes
Area for washing clothes	Yes (outside of the unit)	No	No	No
Foundations	10 cm thick slab-on-grade	Spread footing in concrete	10 cm thick slab-on-grade	Spread footing in concrete
Structure	Frame of rectangle box profiles	Frame of rectangle box profiles	Frame of rectangle box profiles	Various pre-fab systems
Walls	Sandwich panels of galvanized sheets and polyurethane foam	Clay brick with mortar and covered with plaster (a few units built with panels)	Sandwich panels of galvanized sheets and polyurethane foam	Sandwich panels of galvanized sheets and polyurethane foam (units provided by Japan and Turkey) Cement panels (units provided by South-Korea)
Roof	Sandwich panels of galvanized sheets, polyurethane foam and plaster	Sandwich panels of galvanized sheets, polyurethane foam and plaster	Sandwich panels of galvanized sheets, polyurethane foam and plaster	Sandwich panels of galvanized sheets and polyurethane foam (units provided by Japan and Turkey) Clay roof tiles (units provided by South-Korea)
Access to running water	Yes	Yes	Yes	Yes
Access to electricity	Yes	Yes	Yes	Yes
Access to public sewage	Yes	No	No	Yes
Access to telephone line	No	No	No	No
Access to schools in the camps	No	N/A	N/A	No
Access to health care centers in the camps	Yes (just in eight camps)	N/A	N/A	Yes
Access to public transportation in the camps	No	N/A	N/A	No

In the following section, the four strategies will be compared through the lens of the PER framework with a particular emphasis on the recovery and reconstruction phases. This empirical comparison explains the potential contribution of different post-disaster housing strategies on the different steps of the PER model. Table 4.4 summarizes the indicators that were used for the analysis and the most relevant references that have previously examined them.

Table 4.4: Indicators used to assess each of the six subsystems of the PER framework. Source: authors

Economy	**Social** (Social Capital and Community Competence)	**Natural Environment**	**Built Environment**	**Governance** (Institutional)	**Information and Communication**
Equity in the distribution of resources (Norris et al., 2008) Fairness of risk and vulnerability to hazard (Norris et al., 2008) Level and diversity of resources (Norris et al., 2008)	Citizen participation (Norris et al., 2008) Community action (Norris et al., 2008) Flexibility and creativity (Norris et al., 2008) Collective efficacy empowerment (Norris et al., 2008) Social capacities to respond to the alerts received (Norris et al., 2008) Place attachment (Norris et al., 2008) Sense of community (Norris et al., 2008) Critical reflection and problem-solving skills (Norris et al., 2008)	Environmental risk mitigation, particularly disaster mitigation (Lizarralde, 2008) Reduction of environmental impacts (Adger et al., 2005; Lizarralde, 2008) Optimization of resources and conservation of natural resources (Bell & Morse, 2008; Lizarralde, 2008)	Flexible and adaptable functions (Cutter et al., 2010) Appropriate access to community services such as; schools, health centers, community centers, mosques, recreational facilities, etc. (Lizarralde et al., 2010) Appropriate access to infrastructure such as; roads, water, sewage, electricity, etc. (Lizarralde et al., 2010)	Allied institutional arrangements in risk management process (Cutter et al., 2008) Empowered and coordinated institutions (Norris et al., 2008) Connection with auxiliary (assistance) institution to maintain function (Norris et al, 2008) Experienced institutions (Cutter et al., 2008)	Reliable information sources (Norris et al., 2008) Effective narratives (Norris et al., 2008)

4.7.1. Housing and Economy

Arguably, housing solutions – as a primary physical and financial aid distributed to affected families – have economic impacts on economic resilience. "The capacity to distribute post-disaster resources to those who most need them seems vitally important for resilience" (Norris et al., 2008, p. 137). Three indicators (equity of resource distribution, level and diversity of resources, and fairness of risk and vulnerability to hazard) are examined in 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 new immigrants. It was then necessary to respond to two target groups: the native affected families (landowners, and tenants), and the temporary low-income immigrants (Farhoudian et al., 2006). This demographic distortion led to fictitious assessments of needs, increased demand and a competitive atmosphere. It eventually kept out of the program hundreds of affected families,

many of which lost the head of the family and faced psychological problems (mostly in strategy D). This diversity of beneficiaries also reflected on different attitudes towards the various types of temporary houses. Whereas native landowners preferred to settle near their destroyed houses (mostly in strategies B and C), native tenants and low-income immigrants (mostly in strategies A and D) did not have any choice but to accept the temporary units in the camps. Hundreds of immigrants – mostly in strategy D – were settled permanently in the high-tech units provided by donor countries (Fayazi, 2012).

Allocating different types of temporary houses to distinctive groups of vulnerable communities, ultimately reinforced differences between social groups. All affected families did not have the same opportunity to receive temporary units timely. Instead, there was unequal benefit duration, and inequity of resources distribution, greatly affecting overall resilience.

4.7.2. Housing and the Social Sub-System

Two capacities are analyzed in this subsystem: Social Capital and Community Competence. The former is, according to Norris et al. (2008), a capacity that forges a sense of community, place attachment, and creative and active public participation. The latter is a critical resource that enables the community to learn about their risks and options, and work together flexibly and creatively to solve problems (Edelstein, 1988; Norris et al., 2008).

Considering social capital, it can be argued that the pre-existing sense of community helped the native affected families expose their concerns about the temporary units provided in the camps and eventually challenge (in strategies B and C) the authorities. It also helped them present their own solution to live temporarily in proximity to their destroyed houses. These temporary houses built besides the destroyed houses facilitated the native inhabitants' emotional, physical, and financial connection to place. In contrast, the lack of sense of community among immigrant families led them to inevitably occupy the camps (mostly in strategies A and D). Moreover, the large number of immigrants exacerbated the hostile conditions. Native tenants expressed their preference to live in proximity to their rented houses and even besides their pre-disaster landlords. However, the mix of opportunistic immigrants and native (affected) tenants did not permit to identify deserving beneficiaries and thus the solution was rejected by the authorities. The immigrants were less prepared and could not support native tenants' attempts to challenge the authorities, to expose their needs and to propose alternative solutions.

Place attachment and connection to place also helped the native affected families (mostly in strategies B and C) to keep their connection with their previous social organizations and to continue their livelihood activities[4]. Whereas native owners who settled beside their destroyed houses had a quick adaptive recovery process, the other groups of families (immigrant families, temporary residents and native tenants) struggled with security problems, public health issues (including an epidemic of cholera), lack of jobs, and social troubles in the camps.

Not surprisingly, native owners also had increased participation on formal decision-making processes and their involvement in formal organizations eventually accelerated the recovery process. Results show that temporary units built besides the destroyed houses were the most successful to enhance social capital capacities and that proximity played an important role in creating emotional, physical and financial connection to place.

Not always, but typically, a community is a social entity that shares geographic boundaries and common features (Norris et al., 2008; Sliwinski, 2010). The different responses given by communities to the housing strategies became themselves indicators of community competence. The community action against the inconvenient camps reflected the collective effort in identifying common problems and reacting to them. Expansion and modifications to the units are additional indicators of community competence among the residents of units built in the yard of destroyed houses (see Figure 4.7). The residents of units built besides the destroyed houses (strategies B and C) were more easily involved in the reconstruction process, and played critical roles on planning, designing, managing and building their permanent houses. They were responsible for choosing the plan and structure (among solutions provided by private companies), managing the allocated financial aids 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 further promote their capacities. The flexibility and creativity demonstrated by native residents contrasted with the immigrants' and native tenants' lack of choices to make decisions about their own living conditions (Fayazi & Lizarralde, 2013).

However, at the end of the temporary housing phase, and after the Statistical Center of Iran and the Iranian Red Crescent had finally distinguished between tenants and immigrants, the native

[4] - Most traditional houses in Bam include a "Date garden" which plays a critical role on livelihoods.

tenants recovered their community competence and demanded that the authorities recognized their differences and particular needs. They eventually pushed the national and local authorities to allocate resources for building housing projects especially for them. These residential complexes were ultimately built on land owned by the local government on the eastern side of the city (Fallahi, 2007).

Figure 4.7: Modified temporary units by their inhabitants (up), and expanded temporary units using local materials (down) – Photos by: M. Fayazi

4.7.3. Housing and the Natural Environment

The resilience of a natural environment is, according to Cutter et al. (2008), influenced by factors such as biodiversity, redundancies, response diversity and spatiality. However, in order to analyze the particular role of housing in the resilience of this subsystem we adopted indicators that involve the fragile relations between the natural, the built and the human environments. They include environmental risk mitigation, reduction of environmental impacts, optimization of resources, and conservation of natural resources and ecosystems (Bell & Morse, 2008; Cutter et

al., 2008; Lizarralde, 2008). All these indicators assess the pressure of the intervention on the ecosystem and natural resources.

In strategy A, the government built two crowded camps (one in Amir-Kabir with 750 residents, and one in Golestan with 248 residents) that negatively impacted vital water sources in Bam (Fayazi, 2012). In fact, sewages polluted the soil and, according to a health report and to Kouadio et al. (2012), also water sources. The disposal of non-recyclable materials of the dismantled prefab units also polluted pieces of land in the outskirts of the city. Arguably, the relentless pressure on natural resources through building masonry units (in strategy B) also had an irrecoverable impact on the natural environment (particularly due to the extraction of sand and gravel from the edge of the Poshtrood River in the north of Bam and the production of clay bricks).

4.7.4. Housing and the Built Environment Sub-System

Three indicators are particularly examined here: (1) flexibility and adaptability of uses, (2) appropriate access to community services, including schools, health centers, community centers, mosques and recreational facilities, and (3) appropriate access to infrastructure, including roads, water provision, sewage and electricity. In terms of flexibility, there was an important contrast between strategies B and C and strategy A. The capacity of masonry units (strategy B) and prefab units built on the yard of destroyed houses (strategy C), to be adapted to permanent secondary living spaces, storage, or parking augmented the useful lifespan of these solutions. Instead, the prefabricated units built in the camps (strategy A) were dismantled in the following years (Fayazi & Lizarralde, 2013).

All strategies address the access to services and infrastructure in a different manner. The camps located in the outskirts of the city (in strategy A) involved some sort of community services – health centers, community centers, prayer rooms, and primary schools. On the other hand, the beneficiaries of the camps located inside the city (strategy A), and the dispersed units (strategies B and C) used the community services that were provided in temporary prefab buildings located besides the destroyed or affected facilities. The residents of the permanent camps –in strategy D- suffered the lack of community services (except a health care center and a prayer room located in the camp).

The camps located in the outskirts of the city (strategies A and D) were provided with new roads and sewage systems at the time of the delivery of housing units. Electricity and running water were provided temporarily (through diesel portable generators and tanks of drinkable water) until connection to public services and network was completed. On the other hand, the residents of temporary units located within the city (in strategies B, C, and partially in strategy A) benefited from traditional water supply systems (water wells and aqueducts) before the reconstruction of the water supply network. In addition, they had access to the electricity network, which was repaired before building the units in strategies B and C.

4.7.5. Housing and Governance

Resilience can be enhanced through institutional empowerment in planning, inter-organizational collaboration, the development of flexible and adaptable structures, and the consolidation of necessary resources (Cutter et al., 2008; Tierney & Bruneau, 2007). We adopted the following indicators in this subsystem: organizational structure, organizational collaboration, and organizational experience and knowledge (Tierney & Bruneau, 2007).

Strategy B was developed by a performing organizational structure within the HFIR. The local units of the HFIR received the collaboration of eleven auxiliary departments (ad-hoc contributions by other regional offices) that worked under the supervision of a local department in Bam and the national headquarters in Tehran. The integration of auxiliary departments and the local and national departments reinforced the HFIR institutional capacities, notably by reinforcing organizational experience, training, and structure. Moreover, the organizational capacities of the HFIR were also enhanced through its official responsibility for building permanent houses. In fact, its continuous responsibility from the temporary to the permanent housing phases created a good opportunity to learn from the effects of different temporary housing strategies on the reconstruction program. This experience reinforced the professional experiences, knowledge, and organizational structure of the HFIR, and subsequently its institutional resilience. In contrast, the private companies and the organizations deployed by donor countries (notably in strategy D) had a negligible effect on enhancing the capacities of local institutions to respond to disasters flexibly and adaptively.

4.7.6. Housing and Information and Communication

Information may be one of the most important primarily resources that enable community members to recover adaptively. 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). Yet, the different housing strategies in Bam promoted different levels of access to information and communication.

The communities who had access to the 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 consciously 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 fictions or incomplete information. Access to reliable information published by responsible organizations played a critical role on reducing the uncertainties of residents. Indicators show that the native owner families – mostly in strategy B – were constantly informed about the reconstruction plans, the amount of financial aid available (including loans), time tables, involved companies and contractors, and about the process of design and construction of permanent houses. They also enjoyed access to HFIR technical support, something that beneficiaries of strategies A, C and D did not have.

Communication among the community of native owners became an important asset. It is important to underscore here that social scientists agree that community recovery depends partly on collectively telling the story of the community's experience and response (Landua & Saul, 2004). The variables explain that native owners –in strategy B- adapted quickly to post-disaster challenges by sharing their understandings of reality and experiences among their neighbors. In contrast, families living in camps had limited chance to make narrative communication with their unfamiliar neighbors, and thus to adapt to the new challenges. Isolated tenants and immigrant families, according to Farhoudian (2008), suffer strongly from post-traumatic stress disorder and its symptoms (Farhoudian et al., 2006). This argument is supported by our own study. In fact, the tenants who lived among the immigrant families in camps had limited possibilities to make communication with others and thus to reduce their post-traumatic stress disorder.

4.8. Discussion

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 in the development of community resilience. Despite these important contributions, insufficient knowledge still exists about how the recovery process, particularly the housing process, can enhance community resiliency. 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 (Cutter et al., 2013; Howell, 2012)

The variables presented in the PER framework attempt to assess the role of post-disaster housing in the construction of community resiliency. The results show that housing strategies that addressed housing solutions closer to the original affected units (such as the units made of masonry materials and built in the yard of destroyed houses in strategy B) were more successful in enhancing community resilience in Bam. The prefabricated units assembled in the yard of destroyed houses (strategy C) had the second highest capacity to enhance resilience. In contrast, the prefabricated units built in remote camps (notably in strategies A and D) represented the lowest capacity to enhance community resilience.

These results demonstrate that not all low-cost housing strategies influence in the same manner short-term recovery and long-term development. 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 housing program to achieve community resilience. Furthermore, 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. Moreover, housing strategies have significant environmental impacts notably through disposal of non-recyclable materials used for temporary solutions and through relentless pressure on natural resources due to exploitation of construction materials. Flexibility and adaptability also play a fundamental role in building resilience, notably by optimizing the use of resources and allowing a smooth transition from temporary solutions to permanent ones. A continuous organizational engagement from the temporary to the permanent housing phases (as seen in strategy B) creates an opportunity to reinforce professional experiences, knowledge,

and organizational structures, enhancing in this way institutional resilience. Finally, results also show that low-income immigrants (some would say "opportunistic immigrants") might cause demographic distortions and logistic difficulties. They certainly create ethical debates regarding who is a deserving beneficiary of post-disaster housing projects – an issue that still needs further analysis in the literature.

The cause-effect relationships between the characteristics of housing strategies and the development of adaptive capacities cannot be easily demonstrated by this study (it is difficult to distinguish the direction of causality between these variables). However, the study identifies relevant relationships between these variables, which eventually have both practical and theoretical implications. From the practical point of view, the study shades light on the advantages and disadvantages of different housing strategies. From the theoretical point of view, the results not only illustrate the importance of the theoretical framework for the analysis of 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 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 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 households.

4.9. Conclusions

This study presents a framework for assessing the impact of post-disaster housing programs on community resilience. By doing so it adopts an adaptive systems approach and examines six dimensions of adaptive capacities identified in the literature (and adopted here as subsystems). The low-cost 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 housing process and its final outcome have important effects on resilience by affecting the primarily resources and capacities of the affected community.

Four types of housing strategies were used in Bam, each with different benefit duration, timelines and outcomes. These strategies were all affected by a demographic change that

eventually distorted the assessment of needs and thus the scope of the housing program. The inequity and diversity of houses led to increased social and economic differences among beneficiaries and generally decreased the capacity of economic development in the city. The strategy that opted for constructing permanent units in the yard of destroyed houses had a positive relationship with community resilience; this strategy eventually brought opportunities to owners to increase their social capital. This was in part the result of their possibility to settle within their own land and community. This proximity to their community helped them to adapt quickly, sharing their understandings of reality and their experiences. Furthermore, access to reliable information, through closed relationship with responsible local organizations, facilitated their recovery process. This strategy also helped involve the affected families in making decisions collectively and flexibly, and subsequently enhanced community competence. The permanent structures and appropriate location of low-cost units in this strategy permitted flexible and adaptable uses after the temporary housing phase. Also, the continuous engagement of the HFIR in this strategy (from providing temporary units to developing permanent solutions) created a good opportunity for reinforcing institutional frameworks and structures.

On the other hand, the strategies that relied on construction of camps in the outskirts of the city brought negative consequences to the development of social capacities (notably to the development of collective narratives and meanings and thus psychological recovery) and in environmental impacts. Even though they provided community services and infrastructure, these strategies did not create a smooth transition from temporary solutions to permanent ones.

Architects and other decision makers are responsible for examining the long-term consequences of low-cost housing strategies. As such, they must consider the capacity of the strategy to enhance adaptive capacities that can conduct to long-term resilience. If resilience is to be achieved in post-disaster action, scholars and advocates still need to refine frameworks and units of assessment of community resilience and to adapt them to the particular context of housing development.

CHAPTER FIVE

Managing Institutional Fragmentation and Time Compression in Post-Disaster Reconstruction – The Case of Bam

[Article 4]

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International Journal of Disaster Risk Reduction (published).

The fourth article explains significant obstacles to collaboration and to sharing both knowledge and experience in post-disaster reconstruction projects. This paper illustrates four different levels of fragmentation (in the construction industry, project procurement, design and construction work) and explains their causes and impacts on the housing recovery program after the 2003 earthquake in Bam, Iran. This study explains stakeholders' roles, their sequence of interventions, and the variety of expertise, knowledge and interests they bring into the transitional sheltering and permanent housing reconstruction programs. Results reveal unexpected consequences of the generalized fragmentation and the limited time available in the post-disaster reconstruction projects, which consequently cause insufficient collaboration and knowledge sharing among stakeholders.

In this paper, the first author managed and revived a research project that was initiated by Dr. Johnson in 2012. The initial idea was to investigate transitional sheltering, permanent housing, and housing construction after the end of the reconstruction program in Bam, Iran. Because of theoretical and practical challenges, the study stopped after one year. In 2015, the first author developed a new theoretical framework and invited two key people involved in the reconstruction program in Bam, Iran and three other scholars from Université de Montréal and University College of London to the research. In the research, two practitioners helped with collecting and analyzing data. The first author played the main roles in developing the theoretical framework, analyzing data, interpreting results, and writing the article. Dr. Lizarralde and Dr. Davidson also supervised all the process and helped with editing and revising the paper.

To access to this chapter please refer to the published article using the following link: https://doi.org/10.1016/j.ijdrr.2017.01.012

Abstract

Several studies have revealed the difficulties often found in defining stakeholders' roles in post-disaster reconstruction projects. Insufficient and ill-timed collaboration are typically identified as the principal source of problems. Borrowing the concept of Institutional Fragmentation (IF) from the field of project management, this paper examines significant obstacles to collaboration and to sharing knowledge and experience in post-disaster reconstruction projects, revealing the causes and effects at four levels of fragmentation: the construction industry, project procurement, design and construction work. The case of the reconstruction program conducted after the 2003 earthquake in Bam (Iran), illustrates these different levels of fragmentation and their short and long-term impacts. Results show that three of the four levels of fragmentation caused unexpected outcomes during program implantation and afterwards; fragmentation increased the divergence between the many stakeholders with their interests and expectations, during and after their intervention. Conflict and confrontation between two controller organizations led to an excessive emphasis on technical requirements at the expense of heritage preservation. Results also explain how specific conditions after the disaster – such as lack of time coupled with socio-political pressures – increased fragmentation. Post-disaster reconstruction projects require systematic and comprehensive procurement to cover the interfaces that will enable tasks to be conducted effectively. The study proposes a conceptual approach to fragmentation that can help academics, practitioners, and decision-makers understand the origins and consequences of institutional fragmentation on the timely use of resources, and to develop governance structures and mechanisms that can help reduce it in post-disaster reconstruction initiatives.

Keywords: Bam (Iran); Case histories; Institutional fragmentation; Organizational design; Reconstruction; Learning organizations; Time compression.

5.1. Introduction

Lack of collaboration and scant sharing of knowledge between participants in a supply chain exist in various business sectors, including manufacturing (Christensen et al., 2001), aviation (Haller et al., 2008) and pharmaceutics (Powell, 1996). The problem is particularly acute in construction (Ofori, 2012), and also in post-disaster reconstruction (Amaratunga et al., 2009). In this paper, we examine this common challenge using the lens of Institutional Fragmentation, borrowed from the field of project management. We focus on the case of the reconstruction of the city of Bam (Iran), after the 2003 earthquake, to illustrate common obstacles to collaboration and to the sharing of knowledge and experience. The case of transitional sheltering and permanent housing reconstruction in Iran helps us explain stakeholders' roles, their sequence of interventions, and the variety of expertise, knowledge and interests they brought. This case helps us also to reveal some unexpected consequences of the generalized fragmentation that prevails in

post-disaster reconstruction, enabling us to address the leading causes and potential outcomes of insufficient collaboration and knowledge and information sharing in reconstruction projects, particularly regarding the use of the limited time available.

This chapter is divided into four sections. First, the concept of Institutional Fragmentation and time compression in the construction sector is explained. This section also addresses critical concepts about stakeholders' roles in the construction industry and in post-disaster reconstruction. The methods section explains data collection and analysis strategies and tools used for the case study. The third section summarizes the main elements of the reconstruction experience in Bam after the 2003 earthquake and presents the stakeholders involved, in the order in which they intervened in the transitional sheltering and permanent housing reconstruction phases. The discussion section further elaborates on the theoretical and practical implications of the research findings and explores the unexpected outcomes of fragmention and time compression, including the impacts a few years after the disaster. The last section summarises the main findings of the study and highlights future research avenues.

5.2. Fragmentation in the construction sector

Many studies have demonstrated that the construction sector is significantly affected by fragmentation in stakehodlers' roles and responsibilitues. The Royal Institute of British Architects (RIBA) found in 1964 that "In the traditional organisation of building, the various interests are usually confined to their own compartments. Demand has been isolated from design, demand and design from the manufacture of components and all three from construction on site" (RIBA, 1964, p. 8). The traditional building team is a "temporary grouping of independent entities brought together by certain contracts […] characterized by its dispersion and its discontinuity" (Davidson, 1988, p. 512). More recently, Mohsini and Davidson (1992) found that inter-firm conflict (a consequence of fragmentation) was a contributing factor to loss of efficiency. Other authors reach similar conclusions. For Groák (1994, p. 291) fragmentation is a "normal and familiar attribute of the industry". According to him, it arises from the "intrinsic complexity of the building process – in terms both of techniques and of organization" and the industry has learnt to "cope with this fragmentation, despite the problems of interfacing that it involves" (p. 346). Other authors have identifyied four types of fragmentation (see Table 5.1):

- Construction industry fragmentation refers to the existence of a large number of design and

consulting firms and contractors and enterprises that work for different (short) periods of time on any one project (Pries & Janszen, 1995; Rutten et al., 2009; Yates & Battersby, 2003). Numerous studies explain the principal reasons and possible consequences of this kind of fragmentation. Ofori (1992) and Alwi and Hampson (2003) argue that poor coordination among project participants leads to inefficiency, waste, and quality and safety problems. Gottlieb and Haugbølle (2013) point to the practice of competitive tendering for subcontracted work within projects – which further contributes to, and formalizes fragmentation. These authors also find that the high division of labor caused by over-specialization, and generalized subcontracting of work hinder the coordination and transfer of knowledge and learning from one actor to the next.

- Traditional procurement fragmentation creates confrontational relationships between parties. According to Ling (2003), design–bid–build contracting is a prime example of how traditional procurement causes fragmentation. The typical relationships in conventional procurement methods motivate participants to prioritize their own economic interests, seemingly regardless of whether their actions would hurt other project players or jeopardize the project as a whole. Forgues and Koskela (2009) find that traditional procurement fragmentation reinforces socio-cognitive barriers and hinders the team efficiency that is essential for the emergence of collaboration and innovation. In response, Dulaimi et al. (2002) affirm that the (less common) design-build methods enable companies to increase substantial collaboration and decrease the impact of contractual and statutory constraints. Mohsini et al. (1995), however, found that innovative procurement strategies often produce a counter effect, since they upset the habitual reliance on traditional knowledge about roles and practices. Nonetheless, current studies go so far as to suggest that "integrated design," that increases the involvement of clients in the process, encourages pre-planning of design, and enables team members to share knowledge for continuous learning (Leoto et al., 2014).
- Design project fragmentation: the involvement of different professions, accompanied by the increasing specialization of roles, leads to fragmentation in the design process (Brown & Duguid, 2001). A number of studies point out the difficulties with the sequential approach to design development. Huovila and colleagues (1997) identify duplications and unnecessary constraints, the lack of leadership and accountability, and the ensuing waste of time and

resources as the main symptoms of fragmentation in design processes. Löhnert et al. (2003), therefore, suggest redefining the design process, changing it from a sequential to a collaborative one, so that it becomes possible to establish long-term relationships within the design team and thence stimulate value generation. In this vein, Katsanis and Davidson (2001) propose the pertinence of, and potential for, informal groupings of professionals who are used to working together and are able to call upon each other when appropriate openings arise; they call these "Rolodex© firms."

- Construction work fragmentation occurs when the realization of a project depends on the participation of numerous certified trades (Lizarralde et al., 2008). For instance, more than 20 certified professions work in the construction of a normal single-family house in Quebec, Canada (CCQ, 2015). Although the growth of the number of trades aims at increasing the quality of work, and ensuring safety and security, it formalizes fragmentation, reputedly slowing down projects, increasing costs and hiding the complete picture of the project, even to project participants. Although construction work fragmentation is common in developed countries, it can also be seen to a certain degree in developing ones as well (Lizarralde et al., 2008).

These four types of fragmentation (which can best be described here as institutionalized fragmentation) lead to difficulties in managing time in construction projects (projects are often reported as being finished long after the expected hand-over dates). In the particular case of reconstruction projects, this is an acute issue, as is explained below.

Table 5.1: Fragmentation; causes and effects (with emphasis on the effects on time compression). Source: authors

Fragmentation	Causes	Effects
Construction industry fragmentation	- Competitive tendering for subcontracted works (Gottlieb & Haugbølle, 2013). - Extreme specialization of functions and involvement of various professions (Kulatunga et al., 2006).	- Poor coordination among project participants (Ofori, 1992). - Specialization leads to increased speed of work. - Large number of participants leads to delays.
Traditional procurement fragmentation	- The design-bid-build method of procurement (Ling, 2003). - Temporary project settings, a strong division of labor, separation of design and production, and competition on cost rather than on optimization of value (Thomassen, 2003).	- Stifled innovation and collaboration (Latham, 1994). - Reinforcement of socio-cognitive barriers that hinder team efficiency (Forgues & Koskela, 2009). - Confrontational relationship. - Separate contracts impede rapid decision-

	- Isolation of contractors and consultants (Gann & Salter, 2000).	making and contract procedures take time up front (Mossman et al., 2010).
Design project fragmentation	- Sequential design rooted in professional codes of practice (Brown & Duguid, 2001). - Current trends for working in isolated silos, with no real integration of the participants' collective wisdom (Lichtig, 2006).	- Epistemic barriers, eliminating the results from collaborative work (Brown & Duguid, 2001). - Sub-optimal solutions. - Poor constructibility and operability. - Rework in design and construction, and lack of innovation (Huovila et al., 1997). - Separation of design from construction inhibits innovation for speedier construction processes
Construction work fragmentation	- The increase of certified trades in construction (Lizarralde et al., 2008).	- Delay in the process of construction, increase in prices, and creation of a vague picture of the project, hindering the transfer of information and knowledge. - Interfaces between trades lead to delays - Separation of manufacture from construction prevents time-saving innovation

5.3. Stakeholders' roles and interests in post-disaster reconstruction

Borrowing the stakeholder definition proposed by (Freeman, 1983), stakeholders in reconstruction projects include persons, groups and organizations, singly or as a system, who are either likely to be influenced by post-disaster interventions or who may have an influence on the project, playing different roles and having varied responsibilities (Hidayat & Egbu, 2010; Smith, 2014). According to Davidson et al. (2007) and Asgary et al. (2006a), stakeholders in a reconstruction process usually include representatives of: 1) the impacted community; 2) governments (national and local), including public and semi-public entities in a wide range of sectors and roles; 3) civil society organizations including NGOs, community groups, and voluntary associations; 4) private sector (i.e., business and industry groups); 5) professional groups, such as academic, training organizations, and consulting firms; and 6) media.

The diversity of stakeholders in terms of interests, experience, and resources often causes serious challenges in post-disaster reconstruction projects such as: discontinuity of interventions, fragmentation in aid delivery, and overlapping agencies' roles in the emergency response phase. Asgary et al. (2006a), for instance, reveal rivalities between NGOs and explain how an international NGO with a specific focus on sheltering female-headed households provided inappropriate houses and excluded vulnerable families from aid programs after the 2003 earthquake in Bam, Iran. Similarly, Hayles (2010) notes that permanent housing reconstruction

projects led by international aid organizations and NGOs are often discontinuous, and suffer from inadequate experience and limited knowledge of local conditions. In fact, coordination among stakeholders is necessary, and potential competition, rivalry, and fragmentation between them need to be considered in advance.

5.4. The construction industry in a post-disaster context

The work of the construction industry after disasters is different from regular conditions. Firstly, the recovery process does not begin with the disaster event; it "is influenced by the existing uses of space and political economy of an area" (Olshansky et al., 2008, p. 199), which are obviously outside the control of individual participants in the reconstruction program. The key difference is "time compression", which, according to Norling (2013), refers to a compressed timeframe for the reconstruction of destroyed buildings and infrastructure. Olshansky et al. (2012) comment that planning for and implementing post disaster reconstruction has to face (i) the urgency and seriousness of the situation where decisions have to be made in a compressed timeframe and (ii) in a context where many local resources have been disrupted or destroyed. As a consequence, post-disaster reconstruction is likely to suffer from escalation in construction costs (Chang et al., 2010) and shortage of available resources (Le Masurier et al., 2006), which reduce the real value of aid funds, threatening project quality, and delaying the recovery processes (Bosher & Dainty, 2011; Ofori, 2002; Witt et al., 2014).

Difficult relationships thus typically exist between suppliers of aid and the construction industry. Aid organizations often lack appropriate technical and managerial expertise and fail to analyze local conditions and do not work either with local construction industries (VonMeding et al., 2013), or with the local informal sector (Lizarralde, 2015). Furthermore, international donors – in particular – have rigid standards for design and construction that are often disconnected from local capacities (Lizarralde, 2015). Also, the temporary character of the participation of humanitarian organizations hinders learning and sharing knowledge with construction organizations (Norling, 2013). As a consequence, the specific conditions after disasters exacerbate the existing fragmentation in regular construction projects and generate difficult relationships between the construction industry and other stakeholders.

5.5. Research Methods

In order to answer the question: how does fragmentation affect the reconstruction process and what are the causes of it? this study adopts an explanatory approach, based on a detailed longitudinal case study of the housing reconstruction program conducted after the earthquake that struck the city of Bam in Iran on December 26, 2003. Note that programs are considered here as a group of coordinated projects (PMI, 2015). This research project borrows the concept of institutional fragmentation to explain how the reconstruction program was organized and managed by lead agencies, notably the National Disaster Task Force (NDTF) and the Housing Foundation of the Islamic Republic (HFIR), while taking into account the concept of time compression. Effects on time compression – assumed to be desirable – are also noted.

In the first steps of the study, a detailed and extensive review of the project management and disaster management literature in general, and post-disaster housing reconstruction literature in particular, led to the formulation of a hypothetical proposition. The predicted pattern in this research is that four common levels of fragmentation in regular construction projects (mentioned above) cause highly significant obstacles to collaboration and to knowledge- and experience-sharing in post-disaster reconstruction projects. The main proposition, in fact, is that *lessons can be learned from a case that is relevant to other reconstruction projects in other contexts*. In a second stage, empirical findings from the case of Bam were matched with the predicted patterns described above. The results were then validated, adding a nuance to the theoretical proposition and contributing to theory, or what Yin (2003, p. 33) describes as an "analytical generalization."

To validate the proposition, the transitional and permanent housing reconstruction phases within the overall reconstruction *program* were studied to explore what was particular about each of them, who was involved, in what order did stakeholders intervene, and what expertise and knowledge were provided by, and expected of, them, drawing on first-hand experience of professional participants. Qualitative and quantitative data were collected from different sources (see table 5.2)

Table 5.2: The sources of information (qualitative and quantitative). Source: authors

Sources	Detail	Qualitative and quantitiative data
Interviews (Total 144 interviews were conducted by Fayazi, Arefian, and Garaati)	Families (89 interviews)	- Location, size, and quality of temporary houses - Location, size, and quality of houses before and after the disaster - Participation in housing reconstruction processes - Lifestyle and social connection before and after the disaster
	Officers and authorities (41 interviews)	- Sheltering and housing reconstruction processes, involved stakeholders, and their roles - The structure of governance - Impediments to the collaboration between different stakeholders - Conflicts between stakeholders
	Local masons and general contractors (14 interviews conducted by Garaati)	- Traditional construction technology and materials - Knowledge of disaster risk reduction requirements - Lessons learned from the reconstruction experience
Documents	Policy documents	- Approvals of the cabinet of ministries - Approvals of the Reconstruction Supervision and Policymaking Association (RSPA)
	Meeting minutes	- Minutes of the National Disaster Task Force's (NDTF) meetings - Minutes of the RSPA's meetings in Bam - Minutes of the disaster management committee's meetings in Kerman
	Executive reports	- The HFIR's monthly reports of the housing projects (statistics on the number of reconstructed houses, involved stakeholders in every step of reconstruction, and the amount of given loan every month)
	The Bam Reconstruction Documentation Project (BRDP)	- Temporary housing process, - Participatory approach in Bam reconstruction, - Project management in Bam reconstruction, - Resource management in Bam reconstruction, - Permanent housing process (planning and designing), and - Control and monitoring techniques,
Field studies (11 field trips were conducted by Fayazi, Arefian, and Garaati)	1) July – August 2004, 2) February 2005, 3) February 2007), 4) February-March 2008, 5) November 2008, 6) January 2011, 7) June-August 2011, 8) March 2012, 9) January-February 2013, 10) May-April 2013, and 11) June – July 2014	

Information about stakeholders, their roles in the reconstruction processes, their policies, decision-making and implementation processes was collected through 144 number of interviews with key participants, including affected families, the HFIR's key managers, heads of involved NGOs, heads of achitectural consultancies, and local and regional representatives in the Islamic Parliament of Iran, at the time of the disaster.

In order to follow the impact of variables in the short, mid and long-terms, data collection occurred during ten years and over the course of 11 field trips to Bam (see Table 5.2). In order to triangulate information obtained from direct sources, more than 30 reports and six policy documents were also analyzed. Documents included project meeting minutes, press releases and construction documents, and the 11 thematic reports of the Bam Reconstruction Documentation Project (BRDP) conducted by the Housing Foundation of Islamic Republic (HFIR). Reports and policy documents, findings from field visits, and direct observations helped us verify, contradict or corroborate information collected from the interviews. Data and methodological triangulation, according to Yin (2003, p. 98) helps to "converge lines of inquiry." In fact, interviews, as a source of evidence, are often associated with personal interpretation and the distorted memories of interviewees. Likewise, incomplete and conflicting reports can also threaten the construct validity of the study. Triangulation of collected data and methods allowed us to create a coherent narrative of the events, decisions made, and actions in the reconstruction project over 10 years.

5.6. Research Results

5.6.1. First response after the 2003 earthquake in Bam

The devastating earthquake that shook Bam in the early hours of the morning on 26 December 2003 killed more than 22,400 people and injured more than 9,400. The population in the Bam area before the earthquake was 142,000 people. Thus, it is estimated that one person in five died in the earthquake. In total there were about 75,000 people left homeless (Statistic Center of Iran, 2003).

Since the 1962 earthquake in Bou'in-Zahra in Iran, various organizations at different scales and with various responsibilities have been appointed to manage post-disaster reconstruction programs. Having suffered from major disasters, such as the 1990 Manjil-Rudbar earthquake, Iran has developed an organizational system for post-disaster reconstruction, vested in the National Disaster Task Force (NDTF) and the Housing Foundation of Islamic Republic (HFIR). The NDTF was an internal organization of the Ministry of Interior Affairs, responsible for managing the chaotic conditions after a disaster and for cordinating all reconstruction activities. The HFIR had long been recognized for being primarily responsible for providing affordable houses to low income families, and for post-disaster reconstruction. While there was no specific

pre-disaster (operational) planning, there has been consistent learning from past experiences, and the establishment of principles underpinning reconstruction programs.

The Bam earthquake, however, was the first large-scale urban earthquake in a historic city, drawing considerable national and international attention. Immediately after the disaster, the national government set up the Reconstruction Supervision and Policymaking Association (RSPA), an inter-ministry organization headed by the Minister of Housing and Urban Development (MHUD) with extensive power only similar to the president's cabinet (Fallahi, 2007; Fayazi, 2012; Fayazi & Lizarralde, 2014). The RSPA consisted of the Iranian vice president, nine ministers, the governor-general of the Kerman province, and parliamentary representatives of Bam. It quickly appointed the HFIR as the sole housing reconstruction executor, arguing the long experience of the HFIR in low-cost housing and the provision of transitional and permanent shelters after disasters. To prevent the emergence of parallel organizations and excessive bureaucracy, the RSPA designated the HFIR to coordinate the relationship between contractors, banks, affected families, and the municipality (Babaie & Kabiri, 2011; Omidvar et al., 2010).

In order to split the workload, authorities subdivided the affected areas – including the city of Bam, the suburban center of Baravat, and a few surrounding villages – between groups of officials at the deputy governor level. Initially, each group was responsible for managing the search and rescue operations immediately after the earthquake – a decision based on the group members' general knowledge of the area, the extent of damage and the capacity of each rescue team. These same zones were subsequently used by the HFIR for organizing the removal of rubble and, more importantly, for reconstruction planning (Arefian, 2015). To cope with the extraordinary workload – from debris removal to reconstruction – the HFIR called on its provincial branches (the "Setads").

There were several principal stakeholders within the housing reconstruction project. All had decision-making and supervisory roles at different levels or at different stages within the project. Before the reconstruction in Bam began, the RSPA formed the Bam Architectural and Urbanism Council (BAUC). Indeed, there was a need for a body to respond to pressure from the government and the professional bodies, as well as from the general public, to pay special attention to the architectural and urban qualities that Bam had been famous for. The BAUC was

mandated to ensure that all activities in Bam were design-based and reflected the principle of safeguarding its urban fabric and cultural identity. The RSPA also identified the Kerman Construction Engineering Organization (KCEO) as the main entity responsible for providing continuous supervision over the actual construction, increasing retrofitting capabilities and avoiding any improper activities (Babaie & Kabiri, 2011).

Thus, the RSPA, the HFIR, the BAUC and KCEO, plus a number of international, national and private companies and NGOs – each with their specific priorities – were all involved in participating in, or identifying and monitoring all the projects that had to be undertaken (see Figure 5.1).

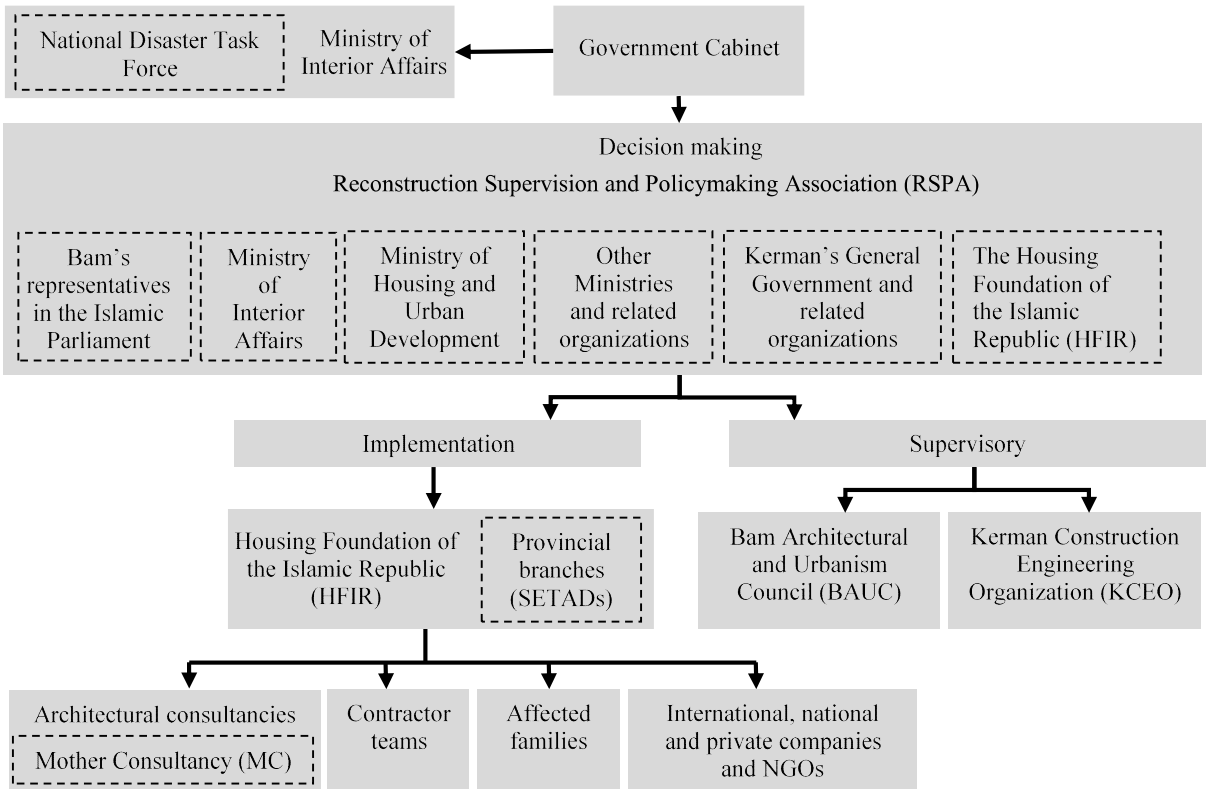

Figure 5.1: Stakeholders involved in the Bam reconstruction program - Source: authors

5.6.2. Transitional Sheltering Phase

Prior to initiating the reconsstruction program, the Iranian government appointed the National Disaster Task Force (NDTF), an internal organization of the Ministry of Interior Affairs, as the principal entity responsible for policymaking and executive operations regarding transitional sheltering. In the chaotic stages of emergency relief and transitional sheltering, the NDTF invited all possible organizations, private companies, and NGOs in the country to participate in

providing shelters. Based on their logistic support and experience, the HFIR and the Defense Industry (dependent on the Ministry of Defense), as well as six more private companies, agreed to provide around 28,000 units (NDTF, 2004).

The urgent need for settling survivors in safe shelters, facilitating distribution of aid and services, and accelerating the debris removal program, led the NDTF to make rapid decisions. Within less than three months after the earthquake, it adopted policies of providing camps of transitional shelters inside and on the outskirts of the city (Fayazi, 2012). Unforseen challenges, however, hindered the process of implementation and forced the participants to react accordingly. In fact, by the end of March 2004 (four months after the earthquake), suppliers could only provide 2,033 units (KDTF, 2004). Common challenges included distinguishing native Bam families from opportunistic immigrants, selecting appropriate materials and construction techniques, and reaching a fair distribution of units and services. Moreover, most of the families refused to move to the temporary camps and preferred to stay in emergency tents near their remaining assets, and far from the harsh conditions on the outskirts of the city (the camps were unsafe and occupied by a large number of immigrants who arrived in Bam in the hope of obtaining financial aid and services) (Fayazi & Lizarralde, 2014). In response, the HFIR, based on lessons learned from its previous experiences, suggested providing transitional shelters in the yards of destroyed houses (Joodi, 2011; Mahdian, 2010; NDTF, 2014).

Although this decision addressed the majority of challenges and respected the families' needs and desires, it had the immediate effect of breaking the work into short batches, requiring many short-run work packages and increasingly complex and time-consuming management, thus putting more financial pressure on the participating suppliers, forcing them to stay longer in Bam than they had anticipated, and forcing changes to their organizational structures. Because of their short time horizons, some participants could hardly accept the changes and continued providing shelters in the camps, while decreasing their commitments (KDTF, 2014). The HFIR then agreed to design and develop 7600 modest units using earthquake-resistant steel structures and masonry walls (see Figure 5.2). The units were planned to be used after the transitional sheltering phase alongside the permanently reconstructed houses (Ghafory-Ashtiany & Hosseini, 2008).The HFIR tackled the issues of higher costs and delays through: 1) involving families in the construction process; 2) establishing a distributed organizational structure in Bam, including 10 provincial branches (the Setads) and one specialized office in Tehran, and 3) assuring easy and unrestricted

access to construction materials. Given the HFIR's main role as the key executor in the reconstruction of *permanent* houses, providing masonry-built units in the yards of destroyed houses led it to articulate the transitional sheltering and permanent housing phases into a single continuous process. In fact, the inhabitants of these units started the permanent reconstruction phase faster than those who lived in the camps (Fayazi & Lizarralde, 2014).

Utimately, five of the six transitional shelter suppliers agreed to provide their committed transitional units in the yards of destroyed houses, but at increased costs and over a longer period of time. Although the prefabricated units permitted settling the families close to their remaining assets, they paid virtually no attention to the possibility that affected families participate in building the units. Furthermore, not only were these units made of low quality materials but also, they could hardly be adapted to be used later alongside the permanently reconstructed houses.

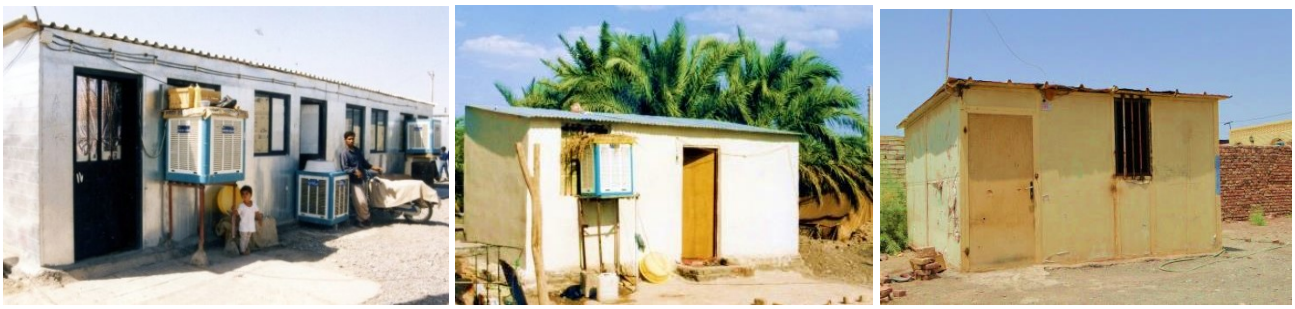

Figure 5.2: Camps of prefabricated units (left); units made of steel frames and masonry walls (center); prefabricated units in the yards of destroyed houses (right) - Photos by: M. Fayazi

Studies conducted at the end of the longitudinal research show that the HFIR's strategy led to long-term positive effects on the recovery of households, notably in the economic, social, environmental, and political dimensions (Fayazi & Lizarralde, 2014). Proximity to their community allowed the families to communicate with their pre-disaster neighbors, sharing their worries, and adapting quickly to the adverse conditions. Permanent housing reconstruction was also facilitated by the families' participation and their close relationship with the responsible local organizations, all of which subsequently enhanced the levels of community satisfaction (Fayazi et al., 2015). However, the transitional sheltering experience in Bam reveals several problems. First, it exacerbated the existing social gaps between the home owners who had a chance to live in the yards of their destroyed houses, and those who were tenants before the disaster and who were forced to live in the camps for almost two years. Second, this approach created a dramatic difference between those who received masonry shelters and those who

received the prefabricated ones. Third, it led to there being almost 3100 unoccupied (wasted) units in the camps (KDTF, 2014). The institutional fragmentation in the transitional sheltering programs is shown in Table 5.3.

5.6.3. Permanent Housing Phase

Given the particular condition of the disaster, and the lessons learnt from previous experiences, the RSPA established three underpinning objectives for permanent housing reconstruction in Bam: a) safeguarding its cultural identity and architectural fabric, b) constructing earthquake resistant buildings; and c) taking advantage of the participation of disaster-affected people. In order to do so, authorities adopted the owner-driven reconstruction approach (Barenstein, 2010) for mobilising disaster-affected people and developed guidelines for achieving the second and third objectives. The owner-driven reconstruction approach was sucessful in previous reconstruction programs, such as the Manjil reconstruction (Joodi, 2010). But beneficiaries would have to be supported during the reconstruction of their houses if the two other reconstruction objectives were to be achieved. The HFIR, as the exucutive body for reconstruction, invited a variety of organizations to provide financial, technical and administrative support to residents for permanent reconstruction, such as the MHUD, the BAUC, the KCEO, and the provincial branches of the HFIR as assistant organizations (the 'Setads', mentioned above). Architectural consultancies and contractors were also invited. At one stage, about 11 of the HFIR's provincial branches, 44 architectural consultancies, and 211 contractor teams were appointed in Bam and Baravat to assist around 25,000 households in rebuilding their houses, in a process including design and construction phases (Babaie & Kabiri, 2011). Before the start of the program, preparations were made to ensure the smooth delivery of housing units, and thus, regular monthly meetings and two workshops were held to help on this. For example, prior to opening the program to beneficiaries, local consultancies, and the MHUD developed various housing typologics that could reflect different living conditions, while also taking national siesmic regulations into account (Arefian, 2015).

Working closely with beneficiaries and Setads, 28 number of architectural firms established local branches in Bam to help beneficiaries in the architectural, structural, mechanical, and electrical design of houses. These so-called "local consultancies" provided "free design and technical services" for the beneficiaries, but were in reality paid by the HFIR. Their services started when

Setads and the municipality referred a beneficiary to them, and continued by preparing all required designs, site and technical plans, until the planning permission for the houses was granted and the construction activities could be started. They were not engaged in construction activities.

In order to harmonize activities by these achitectural consultancies, their work had to receive approval from two controllers. The first one was another architectural consultancy firm, referred to as the 'Mother Consultancy' (MC), which had to approve architectural designs to make sure they complied with BAUC's architectural codes and recommendations. The second controller was the KCEO, which assured compliance with seismic regulations and building-related codes (Babaie & Kabiri, 2011; Saemian & Erfanian, 2011).

However, real-time observations during the reconstruction period, from the perspective of an architectural consultancy who worked with 2,100 beneficiaries, and from later studies, revealed significant delays in the design stage and the ensuing frustration among beneficiaries, who were desperate to return to their houses (Arefian, 2015). The delays and frustrations mainly stemmed from a conflict between the MC and the KCEO that emerged early in the design phase, causing lengthy waiting times for the local consultancies to obtain the required stamps of approval from both controllers while coping with the beneficiaries' expectations to start the construction phase as soon as possible (Arefian, 2015, 2016). This became a major problem, given the importance that was given by the government to rapid solutions (Meskinazarian, 2011; Saemian & Erfanian, 2011).

The source of this conflict lay in the fact that, at an early stage during reconstruction, the KCEO imposed further technical restrictions to the existing national seismic regulations, to be applied in the Bam area. This was done without liaising with other reconstruction participants. As a result, architectural designs under the BAUC's initial architectural guidance and approval by the MC, could not receive approval from the KCEO and *vice versa* (Arefian, 2015, 2016). As was documented later, the HFIR tried to tackle the problems, but even mediations by the HFIR were not sucessful (Saemian & Erfanian, 2011). One of the solutions which ended this conflict and removed this bottleneck was that the MC, finally and reluctantly, accepted the newly introduced KCEO's restrictions (Arefian, 2015, 2016). Nonetheless, this conflict had a major influence on how housing reconstruction worked from then on. Figure 5.3 shows a typical example of a fully

completed house as approved by the controllers. Thus, the housing reconstruction program ended up in the production of simple rectangular houses. Although these houses still followed a few basic architectural guidance rules, e.g. by preserving the palm trees and using local materials, the completed houses were far from the initial ideas envisioned by the BAUC that were based on traditional architecture in Bam (Arefian, 2016).

Figure 5.3: A typical example of a reconstructed house, lacking the architectural qualities that characterized historic architecture in Bam - Photo by: F. Arefian

Later studies linked the emergence of this major conflict to the number of participants in housing reconstruction, to treating program objectives in isolation, to the failure in identifying and harmonizing functional interconnections (Arefian, 2016), and to a lack of mutual understanding of priorities (Arefian, 2015). All this is an elaborated, but unfortunately typical example of intituional fragmentation that characterized the permanent housing experience in Bam. See more in Table 5.3.

Table 5.3: Fragmentation in the transitional sheltering and the permanent housing programs in Bam

Fragmentation	Fragmentation in the Transitional Sheltering Program	Fragmentation in the Permanent Housing Reconstruction Programme
Construction Industry Fragmentation	Competition on the number, time, and cost of units.	Conflict and confrontation between two controler organisations (MC & KCEO)
	The existence of different experts in low-cost housing, Defense Industry, pre-fabricated unit designers and developers.	The existence of too many organizations for undertaking technical, financial and administrative tasks
Procurement Fragmentation	Invitation of organizations, companies, and NGOs to provide shleters fast and low-priced.	Seperate design and construction phases
	An instance of Defense Industry and one private company on the provision of camps of pre-fabricated units rather than separated units in the yards.	Numerous small contractor teams

	The existence of a weak link between the HFIR, as an experienced contractor, and the other contractors who had no particular experience in the reconstruction.	Lack of contact between consultancies and contractor teams,
Design Project Fragmentation	The fragmented design of pre-fabricated units, camps, and isolated units located in the yards.	Sequential approach to design and construction phases
Construction work fragmentation	Despite previous experience, there was a change in policy regarding the types and locations of transitional housing half way through the program, thus leading to a break down of planned production work.	Difficulty in planning and managing the construction processes after the delays in the approval stages. Lack of a responsible supervising architect familiar with the designs.

Taken together, the results shown in Table 5.3 highlight the extremely negative consequences of deviating from an established plan. These consequences cascade from one level to the next, where it becomes increasingly difficult to carry out any effective corrective measures. Of course, in the circumstances that prevail after a disaster, it is only to be expected that there be changes; the lesson is that plans – particularly those established in anticipation of a possible disaster – should include a management strategy that allows for uncertainty and consequent variations in time and place.

5.6.4. Mid-term and long-term impacts of the reconstruction program

The theoretical concepts associated with institutional fragmentation in construction can be systematically applied to the individual phases of a reconstruction program such as the provision of transitional sheltering and permanent housing, as we have shown. However, one has to ask what happens at the end of the "official" reconstruction program, when the organizations that had been put in place with their skills and know-how, withdrew or were closed, bearing in mind that "recovery is a complex process with an ill-defined endpoint and no agreed upon measure of success" (Rubin, 1985, cited by Johnson and Hayashi 2012, p. 215). Is there then a transition to a state of normality, in which construction continues "as usual", that is to say as prior to the earthquake with its endemic fragmentation? This issue is important in a project management perspective, where projects have determined beginnings and ends, and are devised to attain set objectives. In reconstruction, stakeholders deal with programs (groups of coordinated projects), the endpoints of which are not necessarily well established. What happens afterwards is a question which somewhat naturally falls outside the scope of conventional project management and conventional views of institutional fragmentation.

Looking at the reconstruction program of Bam at first, it appeared that all the new houses that were being built during the reconstruction phase were rigorously complying with the seismic building codes and one could therefore assume that they would withstand earthquakes – if only because of the HFIR-appointed inspectors' work. But the biggest challenge turned out to be the long term continuity of building with earthquake-resistance and the concomitant understanding by all implicated builders of how to so.

The seismic building codes were severely enforced by continuous inspections from KCEO during the reconstruction period; however, a driving force for subsequently maintaining the appropriate implementation remained unaddressed. How could it be ensured that contractors would maintain the proper practice of implementation when the rigorous external controls are removed? How can the continuity of earthquake-safe building knowledge be maintained in a context such as Bam?

Careful observations from within contractor firms, and by field studies and interviews over a longer period after the official end of the reconstruction program, show that the builders received a considerable degree of information about safe construction, but the practice of safe-construction lacked meaning for them. They knew which components were important for reinforcing the structure against seismic shocks, but they did not necessarily understand what were the underlying principles for using those components. As a result, structures were overdone, under the misconception that the bigger the structural elements, the stronger the building (see Figure 5.4) and over-sizing concrete reinforcing was a very common practice in the popular housing sector. In other words, although it seemed that the local masons and general contractors knew what measures to take to build in anticipation of earthquakes, they did not appear to comprehend the concepts behind these principles.

Figure 5.4: Improper use of reinforcement illustrates the lack of safe-construction knowledge – Photos by: M. Gharaati

This situation clearly demonstrated the well-known distinction between "knowing" and "knowledge". Once again, new techniques were put into practice within the community of builders without knowing sufficiently why they were doing what they were doing, but unlike the situation that prevailed before the earthquake when insufficient *and* improper techniques were used, now they used more than sufficient technical features, but improperly and wastefully. Although the local builders' understanding of the earthquake-resistant construction (*what to do*) was present, the reconstruction program failed to transfer the knowledge of earthquake-resistant construction (*why and how to do it*).

5.7. Discussion and conclusion

The reconstruction of Bam took place in an environment that was expected to be conducive to collaboration between participants. The reconstruction program shows how the HFIR benefited from its accumulated experience as a longer-term intervener, thus leading to a higher chance of success and to the creation of better solutions. In fact, accumulated experience vested in the lead agency (HFIR), feedback from previous reconstruction programs, and the backing of a central government willing to become involved, combined to establish a framework within which administrators, professionals and enterprises should be able to work in harmony. Observations show, however, how in spite of policies, institutional fragmentation after the disaster hindered collaboration between participants in two different phases. The endemic construction-related institutional fragmentation could not be easily brushed aside. For example, the administrative agencies had difficulty in agreeing on common principles and applying them in a coordinated

fashion; as a result, the professionals, as reported, had to cope with changes to the ground rules in a situation that was already – by its very nature – fraught with complexities.

Some implications in practice and theory can be drawn from studying the reconstruction experience in Bam. First, empirical findings show that there is a significant difference between the publicly shared vision of a national effort to reconstruct in the context of a historic site, and the realities of arranging for construction work to be done in the field rapidly, whether by professionals or enterprises. This difference is reflected in the contractual arrangements that are established between the parties – at the level of the reconstruction program as a whole and at the level of the individual projects that make it up. These are the contracts that define who does what and under what conditions; together they form the procurement system.

Second, results reveal that the specific conditions after disasters such as the scale of projects, emphasis on time, emphasis on reducing future disaster risks, and socio-political pressures make *institutional fragmentation* highly inevitable in post-disaster reconstruction projects. For instance, the emphasis on providing transitional shelters during the shortest time possible after the disaster in Bam required inviting a large number of construction unit designers and developers with distinct capacity and experience levels. In order to ensure the provision of required units on schedule, the government intensified the competition on the number, time, and cost of units, causing *construction industry* and *procurement* fragmentation during the transitional sheltering phase. Similarly, socio-political pressures along with the emphasis on reducing future disaster risks led to conflict and confrontation between two controller organizations (MC and KCEO) during the permanent housing phase. Again, the emphasis on time separated design and construction phases, involved numerous small contractor teams, and broke off contact between consultancies and contractor teams.

This research explains three out of four different levels of fragmentation in post-disaster reconstruction in Bam, including: *construction industry fragmentation*, *traditional procurement fragmentation*, and *design project fragmentation*. However, the findings have to be taken with prudent. This study suffered from several limitations, including difficulty accessing key participants, and scarce information about the involved NGOs. However, one of the most important limits of this study is that the regular construction projects in Iran were not examined, and results cannot explain how the institutional fragmentation that was found in this

reconstruction program compares with regular construction projects in Iran. Construction work fragmentation, even though it is included in our conclusions, should be regarded as tentative; in any case it is strongly influenced by procurement fragmentation. Indeed, further studies need to be conducted to compare institutional fragmentation between regular and post-disaster construction projects in a similar context.

This study explores leading causes of the absence of collaboration and the lack of the sharing of knowledge and experience in post-disaster reconstruction. It examines the reconstruction project after the 2003 earthquake in Bam, Iran, and explains how fragmentation appeared in Bam. Results show how these levels of fragmentation led to the reported outcomes, which were very different from the publicly shared vision of the reconstruction program. Conflict and confrontation between two controller organizations (MC and KCEO) ended in the excessive emphasis on technical requirements at the expense of designs aimed at respecting and preserving the cultural heritage, as reported regarding the permanent housing program. Findings also point to specific conditions that prevail after disasters – such as time and socio-political pressures, and the involvement of numerous stakeholders with different interests and expectations – all of which increase the effects of fragmentation, however endemic, and lead to consequences on the ability to manage the compression of time.

In traditional circumstances, institutional fragmentation in the construction sector is circumvented by the fact that everyone knows that everyone knows what they are supposed to be doing. In reconstruction, however, this is almost inevitably not the case if only because of the number and variety of participants, and it is clear that in such a context, procurement must be systematic, inclusive and comprehensive, covering not only expectations about each participant's tasks, but also about the interfaces – both hierarchical and transversal – that will enable those tasks to be conducted effectively.

Examining the different phases of the Bam case (including the post-program phase) shows that many aspects of project-related work were improvised in response to events that could, or should have been anticipated. That these events can be attributed to fragmentation does not relieve everyone's responsibility to ensure (i) commonly accepted definitions of tasks, (ii) advance identification of interfaces and (iii) proportioned recognition of each participant's knowledge requirements. Instead, there is a need for a clear all-embracing organizational structure, termed

“meta-procurement” by Johnson et al. (2005). Successful reconstruction of Bam – and elsewhere – must pass through this meta-procurement filter.

CHAPTER SIX

CONCLUSION

This chapter outlines the theoretical contributions and the practical implications, which are followed by research limitations and the description of specific opportunities for recommended future research.

6.1. Contributions to theory

Research findings contribute to theory in the post-disaster reconstruction field in the following ways:

6.1.1. Underlying and intensifying factors related to conflicts between recovery objectives

The research in this dissertation recognizes the underlying and intensifying factors related to conflicts between recovery objectives. It identifies several factors. First, the establishment of recovery objectives is a highly complex process and is often affected by unsolved conflicts in the post-disaster reconstruction field, such as rapid reconstruction versus long-term recovery or equal compensation versus compensation of actual losses. Second, the lack of participation in decision-making before disasters increases the risk of conflicts during recovery and reconstruction, as pre-disaster public participation experiences can expand knowledge, strengthen relationships, provide resources for facilitating future problem-solving, and ultimately avoid conflicts after disasters. On the other hand, challenges in the participation process during the reconstruction programs, including the exclusion of local interests, the omission of local expertise, and the low level of households' involvement in decision-making may escalate the risk of conflicts. Moreover, findings recognize the diversity of stakeholders, their temporary characters, lack of collaboration, conflict of interests, and their competition for benefits and resources as both causal and intensifying factors of conflicts between objectives.

6.1.2. Linking post-disaster housing reconstruction, disaster resilience and vulnerability

This research defines a vulnerability-to-resilience process and explains how the wake of a disaster can threaten the resilience enhancement process. However, findings show that post-disaster housing reconstruction programs can potentially help affected families to move from the state of vulnerability to resilience. This study explores the fact that housing reconstruction programs must contribute to increasing households' adaptive capacities in six different dimensions (economy, social, natural environment, built environment, governance, and information and communication) in order to increase their resilience and reduce vulnerabilities. For instance, housing reconstruction programs benefit from involving households in decision-making and implementation processes to forge a sense of community (as a social indicator of

resilience) and train disaster risk reduction requirements to ensure the production of safer houses that eventually decrease vulnerabilities. Also, this investigation points to the fact that resilience enhancement is not equivalent to vulnerability reduction, even though both processes are closely related. Resilience is enhanced by developing households' adaptive capacities to withstand, recover from, and adapt to a disturbing event. However, vulnerability reduction occurs when there is increased access to 'soft' and 'hard' resources that create safe conditions to live and reduce future disaster risks. This research contributes to theory, demonstrating the links between housing reconstruction, resilience enhancement, and vulnerability reduction.

6.1.3. The ineffectiveness of a one-policy-for-all approach

The investigation of Bam's housing reconstruction program reveals the fact that the one-policy-for-all approach cannot effectively lead to different household types' recovery. The post-disaster reconstruction literature recognizes different housing reconstruction policies (*procurement and turnkey, community-driven reconstruction, cash grant,* and *owner-driven reconstruction-ODR),* and recent studies in the post-disaster reconstruction field acknowledge the ODR policy as "the most empowering and dignified approach" to household's recovery. However, the findings of this research show that the ODR policy, as a single policy, has unequal impacts on households and fails to cater to the needs of different social groups and promote social equity after the earthquake in Bam.

Findings point to the fact that reconstruction policy needs to include all household types and respect their contextual and specific conditions. The ODR policy was supposedly adopted in Bam in order to enable families to return to normal life faster, improve socio-cultural practices, and help people, who have been through a trauma, restore their sense of pride and well-being. However, the ODR policy merely helped single-family home-owners and the core of extended families to reconstruct their houses. The ODR policy failed to cover all different household types and excluded the most vulnerable families – tenants, apartment-owners and informal settlers. In fact, slight attention to families' socio-economic conditions and demographic changes before, and after, the disaster led authorities to adopt policies that benefited some household groups while having the opposite effect on others. In fact, these findings point to the inefficiency of the one-policy-for-all approach in housing reconstruction after disasters.

6.1.4. Gaps between general housing and housing reconstruction policies

The investigation of post-disaster reconstruction policies through the lenses of a comprehensive body of knowledge about the evolution of housing policy in developing countries shows the gap between housing policies before and after a disaster. Findings point to the fact that general housing policies (*pre-disaster* housing policies) must constantly be assessed to identify and understand how they can contribute to reducing vulnerabilities. In fact, there is often a need for a better integration of housing reconstruction and general housing policies to prevent the reproduction of risks and vulnerabilities.

Furthermore, findings confirm that the integration of before and after disaster housing policies can promote sustainable development, resilience enhancement, and disaster risk reduction. National governments and international agencies typically establish housing reconstruction policies based on insufficient knowledge about pre-disaster conditions and often fail to promote equal recovery. However, appropriately-formulated housing reconstruction policy based on the profound knowledge of pre-disaster conditions can ultimately address pre-disaster deficits and vulnerabilities, as an appropriate housing policy provides ownership rights, increases access to services in informal settlements, reduces social gaps, and mitigates disaster risks, for instance. In fact, research results call for the integration of general housing and housing reconstruction policies to address the causal factors related to households' vulnerabilities and ensure a sustainable development based on resilience enhancement and disaster risk reduction.

6.1.5. Obstacles to collaboration and knowledge- and experience- sharing in post-disaster reconstruction projects

The research investigates the governance structure of Bam's reconstruction program and relationships between partners throughout the lens of *institutional fragmentation* borrowed from the field of project management. Results reveal the causes and effects at four levels of fragmentation in the construction industry, project procurement, design, and construction work. Research results reveal the fact that specific conditions after disasters such as the scale of projects, emphasis on time, and socio-political pressures make fragmentation highly inevitable in post-disaster reconstruction projects. This study proposes a conceptual approach to help understand the origins of fragmentation and develop mechanisms to reduce it in post-disaster reconstruction initiatives.

6.2. Implications in policy and practice

The following discussion synthesizes the research findings and reviews their implications in policy and practice. The argument includes a) arguments that have been expressed in the four articles, for which it is necessary to restate their importance in the overall findings of the research and b) arguments that emerged during the general synthesis.

6.2.1. Transitional strategies

The examination of four different transitional housing strategies in Bam results in the following implications for practice and policy:

Authorities can address pre-disaster social gaps by offering adequate transitional shelters. Transitional sheltering must be sensitive to the diversity of family types and needs and provide equal opportunities for different household groups. However, offering different types of sheltering might increase social and economic differences and reduce beneficiaries' recovery capacities.

Offering sheltering solutions close to the affected houses and letting families keep their emotional, physical, and financial connections to place are important. Affected families maintain their contacts with their former social organizations and continue their livelihood activities if they stay near their destroyed houses. Living near destroyed homes also permits households to have access to reliable information about the reconstruction program – for instance, about the amount of financial aid, timetables, companies and contractors involved, and design and construction processes for permanent houses. Proximity to pre-disaster communities helps households to adapt quickly to post-disaster challenges by sharing their experiences with their neighbours.

In contrast, isolated families living in camps have limited chances to communicate with their unfamiliar neighbours and share personal narratives. Findings show that camps' inhabitants have limited possibilities to make contact with others and thus to reduce the severity of post-traumatic stress disorder. The relocation and the denial of pre-disaster social connections cause security problems, public health issues, lack of jobs, and social troubles in the camps, to name a few. Again, decision-makers and authorities must provide transitional sheltering solutions near the destroyed houses to facilitate families' recovery and enhance their resilience capacities.

Appropriate strategies allow a smooth transition from temporary to permanent solutions. The provision of transitional shelters in the yards of the destroyed houses leads families to shift from transitional to permanent phases smoothly. Safe and earthquake-resistant transitional shelters located in households' properties can stay long after the reconstruction phase, optimize the use of resources, and provide extra rooms for their inhabitants.

Reconstruction agencies' involvement in transitional to permanent sheltering phases is important. The research findings point to the fact that reconstruction agencies who participate both in transitional and permanent housing phases benefit from the long-term impacts of short-term housing solutions, which eventually reinforce their knowledge and professional experiences. Thus, empirical findings call for the continuous involvement of reconstruction agencies from transitional to permanent housing reconstruction projects.

6.2.2. Reconstruction and recovery policies

Empirical findings from the investigation of Bam's housing reconstruction policies point to the following implementation in policy and practice.

Housing reconstruction programs need to consider the diversity of affected households regarding their pre-disaster status and the impact of disasters have on them. Overlooking households' diversity typically prevents authorities from adopting appropriate policies and addressing specific conditions of every household group. Supposedly similar households during the chaotic conditions are very different with respect to their pre-disaster conditions and the impact of disasters on them. Bam's housing reconstruction experience shows how authorities failed in recognizing households' diversities, which led to the adoption of housing reconstruction policies that benefited some groups of households, while having the opposite effect on others.

The coexistence of a multiplicity of measures and programs can allow households to choose the solution that best fits their needs, conditions and expectations. The investigation of Bam's housing reconstruction policies reveals at least one-year intervals between different policies in Bam, which caused insecurity and frustration among some household groups. In the period in between policies coming into effect, disappointed families made irreversible decisions, permanently migrating elsewhere or unsafely reconstructing their homes in vulnerable areas, which unsurprisingly affected their ability to recover. The Bam case shows us how essential it is

to develop effective housing reconstruction policies that respect diversities and heterogeneities, allowing households to choose a set of solutions that fits their conditions, priorities, and needs. In fact, findings call for the initiation of policy sets at the same time to help different categories of households choose the most suitable solution to their conditions.

A Housing reconstruction program is an opportunity to address pre-disaster vulnerabilities. Authorities make proper decisions on permanent housing reconstruction if they reassess pre-disaster policies and evaluate their roles in creating pre-disaster deficits and vulnerabilities such as populated hazard-prone areas, the lack of ownership rights, and restricted access to public services. The reassessment of pre-disaster housing policies and the investigation of their impacts on households' vulnerabilities can help authorities to adopt better policies for housing reconstruction after disasters and address pre-disaster vulnerabilities.

The protection of extended-families' structure is important after disasters. Extended families traditionally give one or more rooms of their houses to their married children, who are often economically, socially, and emotionally dependent on their families and neighbours. While extended family members – parents and their married children – have a common sense of ownership to their pre-disaster house, reconstruction policies often provide compensation to rebuild single-family-size houses. As the case of Bam illustrates, reconstruction policies often replace multi-family houses with small units and ignore young married children, causing undue socio-economic stress on young couples. Findings call for the reconstruction of multi-family houses to settle their pre-disaster inhabitants, preserve pre-disaster social networks, and accelerate their recovery processes.

6.2.3. Reconstruction governance structures and mechanisms

There is an association between the rapid establishment of new agencies during recovery programs and the lack of participation between stakeholders. Research findings reveal the fact that newly founded agencies during the recovery and reconstruction programs may increase tensions between stakeholders, as they may have very limited experience of collaboration with others in decision making. According to the public participation literature, participation experience produces knowledge, strengthens relationships, enhances trust, and provides resources for future problem-solving to address future issues (Hassenforder et al., 2015; Quick &

Bryson, 2016), whereas, newly established agencies during recovery programs lack participation experience before disasters and may build weak links with other stakeholders. Also, their temporary character prevents knowledge-sharing and increases competition for benefits and resources. In fact, empirical findings reveal the association between new agency establishment and the growth of conflicts between recovery objectives. Results call for the use of pre-disaster existing agencies – as much as possible – to minimize tensions between stakeholders and prevent conflicts between recovery objectives.

A systematic and comprehensive procurement is required to cover the interfaces that will enable tasks to be conducted effectively. Empirical findings reveal a significant distinction between the publicly shared vision of a national effort to preserve Bam's historical value, and the realities of arranging for construction work to be done in the field rapidly. The examination of the reconstruction program and contractual arrangements reveals the difference between vision and reality. In fact, a systematic and comprehensive procurement system is required to define who does what and under what conditions to ensure the implementation of objectives.

Institutional fragmentations can be managed by controlling time and socio-political pressures after disasters. The compressed timeframe for the reconstruction of destroyed houses in Bam required inviting a large number of construction unit designers and developers with distinct capacity and experience levels. In order to ensure the provision of required units on schedule, the government intensified the competition on the number, time, and cost of units, causing different types of fragmentation. In other words, the over-emphasis on short-term recovery hindered collaboration between participants during Bam's reconstruction program. In fact, decision-makers can avoid institutional fragmentations by controlling time and socio-political pressures.

Sufficient collaboration and knowledge- and experience-sharing among stakeholders require the integration of design and construction phases; the combinations of technical, financial, and administrative organizations; and contact between consultancies and contractor teams. The examination of Bam's housing reconstruction experience shows design-to-construction gaps as critical obstacles to the collaboration between stakeholders. Consultancies' discontinuous involvement in reconstruction processes prevents contact between designers and contractors and avoids knowledge- and experience- sharing. In response, authorities must encourage households to be involved in design and construction processes and preserve designer-contractor links. Also,

the existence of too many organizations for undertaking technical, financial and administrative tasks exacerbated institutional fragmentation in Bam. In fact, reconstruction programs must use multidisciplinary teams to be able to perform several projects tasks.

6.3. A broad overview of the findings

Post-disaster reconstruction programs are complex, involve many stakeholders, and impact affected households in very different ways. Despite the complexity of reconstruction programs and their multidimensional nature, findings in this research project reaffirm a simple fact: an effective and appropriate reconstruction program begins long before the strike of a disaster. Results in this research explore many deficits and failures in Bam that could be prevented or at least minimized by planning and preparedness before the catastrophe.

The lack of pre-disaster planning and preparedness led to the emergence of unrealistic and conflicting objectives in Bam. Authorities could have made appropriate decisions and prevented tensions among stakeholders by estimating the scale of potential damages, discovering survivors' priorities, and managing available resources before the disaster. Emergency managers were unprepared and therefore provided different transitional sheltering solutions, which later caused serious disagreements and resulted in different policies for permanent housing reconstruction. Moreover, debates on equal compensation during the transitional sheltering phase led to tensions among decision-makers about how to help young members of extended families (who were camp-settlers two years after the disaster), and how to recover in a broad sense. Together, local authorities, families, architects, and construction engineers eventually move families to the city fringes and replaced date grove gardens with small buildings that destroyed the pre-disaster social structure and Bam's unique urban fabric.

Research findings also reveal that relocation and displacement of the affected population occurred at different scales. In Bam, affected families moved to the outskirts of the city under the influence of two policies: the provision of transitional sheltering camps and the allocation of financial support to landowners. Learning from prior experience and predicting policies' possible side-effects before the disaster could have prevented undesirable relocations, however. Research findings also emphasize the importance of forming dedicated disaster recovery organizations in both national and local governments to manage different stakeholders' responsibilities, define appropriate objectives, and design effective recovery policies.

6.4. Reflecting on the transformation of the city

In Bam, the post-disaster reconstruction and recovery interventions, despite their purposes, have had adverse impacts on households' recovery from different dimensions. Drawing on the comparison of life before and after the disaster, this section draws conclusions about the sociocultural, economic, and built environment impacts of the housing reconstruction interventions on the city of Bam.

6.4.1. Socio-cultural impacts

Lessons from Bam highlight the complexity of identity recovery. Though experts in built heritage recognize the reconstruction of *Arg-é-Bam* (the citadel) a real success, the housing reconstruction program failed to rescue the city's historical identity because of ignoring architecture traditions, importing unfamiliar housing designs, introducing different lifestyles, relocating households, and destroying date grove gardens. As previously described in the first chapter, tribal culture and living in large family units were dominant in Bam. Families with strong bonds were willing to live communally and create neighborhoods with the populations from the same origins. Inhabitants had a strong attachment to the land, and Bam residents valued land ownership as their family heritage and identity rather than its monetary worth. However, pre-disaster extended families with close relationships with neighbors became isolated units whose younger family members lived on the outskirts of the city.

The housing recovery and reconstruction program overlooked the sociocultural impacts of its interventions. The housing reconstruction program affected Bam's sociocultural characteristics by replacing traditional houses with small units, destroying pre-disaster family structures, destroying gardens and big yards, relocating households to the outskirts of the city, and breaking pre-disaster social bonds. The long distance between members of extended families, the small size of new houses, and disappeared yards and gardens make it impossible to keep *Shabe-e Yalda, Sizdah De-dar, Eid-e Alafe, and Hana Bandan* (pre-disaster ceremonies and feasts) alive. Though Bam's population may find a solution to rescue their identity and traditions in the future, the lack of attention to their sociocultural characteristics in the housing reconstruction program significantly hindered their recovery process. Findings reaffirm the importance of rescuing affected communities' culture and identity in order to enable a meaningful recovery.

6.4.2. Economic impacts

More than ten years after the disaster, Bam still struggles with attracting national and international tourists. Bam's traditional urban fabric was destroyed and not recovered. The long-vaulted bazaar and its traditional architecture was replaced with a concrete-structure mall, narrow alleys were widened, walls were covered with culturally inappropriate / non-traditional materials, date gardens shrank in size, and Bam's traditional architecture disappeared.

The destruction of Bam's traditional urban fabric along with the long-term recovery process of *Arg-é-Bam* affected many families whose livelihood depended on tourism. In my last trip to Bam in 2014, I found Ali Agha - the longtime Bam guide who I introduced in the first chapter. He looked much older. I found him in a small apartment in one of the residential complexes developed on the outskirts of the city. Because of the new housing policies, he was relocated from the historical center of the city. He had lost his wife, had given all of his land to his sons, and now lived alone. Ali Agha and many of his friends - tour guides and taxi drivers - lost their jobs and never recovered after the disaster.

Post-disaster interventions affected survivors' livelihoods in different ways. The modest date gardens that remained after the disaster no longer required the collaboration of family members, neighbours, and relatives in gardening activities. Many households lost their revenues, and many packaging and exporting factories closed because of the destruction of date gardens. Despite the absence of official reports, the high rate of unemployment is noticeable in the city. Many of the elderly interviewees voiced their worry about the younger population's involvement in drug dealing because of the high unemployment rate. Indeed, the adverse impact of housing reconstruction policies on households' economic circumstances is profound, and further studies are required to discover the real extents of these adverse impacts.

6.4.3. Impacts on urban fabric and architecture

The impact of housing reconstruction programs on Bam's urban fabric and traditional architecture is enormous. As the previous chapters described in different ways, the housing reconstruction program gave the city a new and unfamiliar face. This non-uniformity stands in stark contrast to the harmonic visage of the city before the disaster. In the historic center of the city, the *Bazaar* is completely destroyed, *Koocheh*es are wider, and all L-, I, and O-shaped houses were replaced with smaller units. In fact, the reconstruction process failed to rescue

Bam's architectural heritage. The house-garden neighbourhoods lost a significant proportion of date groves and citrus gardens. The city experienced great sprawl after the disaster, and new residential complexes appeared in the east side of the city.

Three major impacts on the Bam's built environment can be identified: growing urban sprawl, the loss of traditional architecture, and the destruction of urban fabric. The adverse impacts of the housing recovery program began by developing transitional sheltering camps on the outskirts of the city. As explained in Chapter four, some camps, such as *Doosti* on the south side of the city, turned into permanent neighbourhoods and expanded the city in undesirable areas known for their arid, inhospitable climate and lack of access to *Qanats* (Bam's traditional water supply). Also, the permanent housing phase of reconstruction caused sprawl to the east of the city, near the earthquake fault lines. Chapters two and three – sections 2.6.1 and 3.6.3 – described the undesirable living conditions of recently-developed residential complexes in this eastern area, including the dry and hot weather conditions, the lack of vegetation, as well as the difficult and expensive access to the city center. Also, rather than formal expansion, an informal settlement, called *Janbazan,* emerged on the east side of the city at least partially as a result of housing reconstruction policies.

Bam's traditional architecture was adversely affected by the housing reconstruction program. The modest pattern of reconstructed dwellings replaced the detailed and sophisticated designs of pre-disaster houses. The use of unfamiliar materials and imported construction technologies gave a heterogeneous and disordered face to the city. The modest, imported design of reconstructed houses ignored inhabitants' needs, desires, and their pre-disaster lifestyles. The housing reconstruction program failed in providing enough living space and in respecting their inhabitants' pre-disaster lifestyle. Small reconstructed houses detached extended families from their cores, affecting their identity, living conditions, and social statuses. In addition, the reconstructed houses failed in considering climate conditions, which had been well-considered in the city's traditional architecture.

The housing reconstruction program also affected Bam's urban fabric. Chapter two explained the shrinking process of date groves and citrus gardens, which happened in parallel with the split of lands and the reconstruction of small separated houses after the disaster. Rather than its

catastrophic impacts on the socioeconomic aspects of the city, the loss of gardens impacted Bam's urban fabric, known as a garden-city in the country.

In conclusion, this study reaffirms the complexity of recovery and reconstruction programs, and in particular, the findings reveal challenges for housing reconstruction programs in historic cities with unique characteristics. Survivors' voices may better express the impact of housing reconstruction interventions. Despite the image of living in houses without walls, painted by Masoumeh in the first chapter, the thick walls designed in the small reconstructed houses left families feeling isolated and detached. Masoumeh continued and said,

> *"We are not the same anymore. Everything changed! I do remember when I lost my mother* [many] *years ago; my neighbours surrounded me and let me cry on their shoulders. Only after seven days, they took me to their houses, sung many bitter and sweet folk songs, and kept me busy with gardening tasks, which helped me to accept the loss and return to a normal life. The day after the disaster, we found [*everybody*] – dead or alive – and hung around. We had to […] stay together, but* [the authorities] *didn't let us.* [They] *imposed different [*housing policies]*, scattered our kids and neighbours in the desert* (the city firings). *Hossein* (her son) *and Nazanin* (her granddaughter) *live within only a 20 minute walking distance; but, it is more than two months that they have not come to see me. Yadoulah* (her husband) *and I feel lonely. The tiny houses and few remaining Nakhles* (date groves) *left no ways to gather together again like before."*

6.5. Limitations

As with every research, this study confronted a mixture of challenges and limitations, and findings have to be taken prudently. This study suffered from several limitations, including difficulty accessing key participants, interviewing families with psychological problems, and scarce information about the involved NGOs. First, most of the data and information regarding the transitional sheltering process was gathered after the end of the transitional sheltering phase (five years after the earthquake). Hence, the researcher did not have access to accurate information, as most transitional camps had been demolished by the time th fieldwork was undertaken. However, this limitation was effectively reduced by interviews with households and authorities and collection of secondary information (including meeting minutes, executive reports, and reports provided by the Bam Construction Documentation Projects).

Second, the researcher found very scarce information about housing and urban policy before the disaster in Iran. In the second article, findings highlight a chronical gap between pre-disaster housing and post-disaster housing reconstruction policies. However, the researcher had very limited access to housing and urban policies before the disaster in Iran, in general, and in Bam, in particular. Thus, pre-disaster policies were not examined, and results cannot explain how the housing reconstruction policies could tackle pre-disaster barriers and deficits.

Third, there was scant information about public participation methods in housing design and construction processes in Bam. The researcher had limited access to information about the participation methods that were applied by the HFIR's provincial divisions (11 Setads) and 28 local architecture firms branches. Although research findings highlight problems in public participation, the limited access to participation methods in Bam prevents the research from advancing knowledge about appropriate participation methods in post-disaster reconstruction programs.

Fourth, despite conducting certain interviews with authorities and heads of architectural consultancies, NGOs, and contractors in Bam, the researcher found very limited information about pre-disaster relationships between different stakeholders. Findings show that the experience of participation and collaboration between stakeholders in the process of reconstruction could strengthen their relationships, enhance trust, and expand knowledge. Also, the experience of pre-disaster participation could reduce stakeholders' conflicts and decrease conflicts between recovery objectives. Nonetheless, more information was required to explain the potential role of pre-disaster collaboration between stakeholders in reducing conflicts during the reconstruction process and ultimately in increasing the fulfillment of recovery objectives.

Fifth, findings explain different fragmentation levels in the governance structure of post-disaster reconstruction in Bam. However, this research did not examine regular construction projects, and results cannot explain how the institutional fragmentation that was found compares with regular construction projects in Iran.

6.6. Future research

More research is required for three reasons. First, further research must be conducted to address the experienced limitations and challenges were encountered in this research. Second, this study recommends further research to address unsolved controversies and issues in the post-disaster

reconstruction field. Finally, research findings offer fresh perspectives in the post-disaster reconstruction field that require more investigations on the theoretical and practical grounds.

Further research is required to explain who is a deserving beneficiary of post-disaster housing projects when there is a conflict between native affected families and migrants who arrive in impacted areas after a disaster. In Bam, a large number of low-income families (or opportunistic immigrants) arrived in affected areas with the hope of receiving financial and in-kind aid. The rapid arrival of so many immigrants made the assessment of needs difficult and, consequently, led to poor management of the limited resources available for housing reconstruction. On the other hand, using vulnerability theory, one can recognize the immigration of low-income families as a result of dynamic pressures created by public policies, which pushed vulnerable families to immigrate to affected areas. This research concludes that recovery programs must treat all affected families; however, further research is required to explain whether recovery programs must still equally treat those who are affected by a disaster *directly* and *indirectly*. Thus, this research recognizes the question about recipients' merit as an ethical debate and calls for further analyses.

Findings also call for further research into how interventions in enhancing families' resilience can affect resilience and vulnerability of a human settlement at different scales. For instance, more analysis is required to explain how families' resilience increases or diminishes the resilience of a city – and vice versa. This research examines households' resilience in six different dimensions (economic, social, political, environmental, ecological, and communication dimensions) and explains how recovery programs can contribute to every resilience dimension. However, more research must be conducted to reveal relationships between resilience and vulnerability indicators at different scales; interventions in strengthening cities' institutional resilience may affect local strategies for social resilience-building. Recent studies raise serious doubts about the theory of resilience and its usefulness (Bosher et al., 2014; Bousbaine & Bryant, 2015; Joseph, 2014; Weichselgartner & Kelman, 2014; White & O'Hare, 2014). Opponents of resilience note, for instance, that neoliberal governments take over the concept of resilience to justify a responsibility shift from the state towards the private sector and communities (Bosher et al., 2014). Thus, future research must explain the concept's usefulness.

Further research is also needed to bridge the gap between regular housing policies and housing reconstruction policies after disasters. Research findings explore how the integration of pre- and post-disaster housing policies not only can prevent the reproduction of vulnerabilities, but also this combination ensures a more sustainable development trajectory based on resilience enhancement and disaster risk reduction. However, findings scarcely approach housing policies convergence from practical standpoints. Further studies are required to explain how exactly general housing policies can contribute to disaster risk reduction requirements, and how housing reconstruction policies can secure long-term recovery and sustainable development.

Later studies can also address participatory decision-making challenges in post-disaster reconstruction programs. Findings call for addressing some critical factors such as legitimacy, the inclusion of an appropriate range of interests, the use of expert knowledge, and design of a proper participation process; however, results do not provide practical guidance as to addressing these critical factors in post-disaster situations. Stakeholders' temporary character, disproportionate power distribution among stakeholders, and families' impatience, to name a few, are particular hurdles of participatory decision-making in post-disaster conditions. Indeed, further research is required to investigate the impact of these challenges on recovery programs and reveal solutions to overcome them in practice.

6.7. Concluding remarks

The research sets forth to explain why and how housing reconstruction programs typically fail to fulfill recovery objectives. This study contributed to further knowledge on disaster risk reduction and resilience, and highlighted how improvements could be made to future disaster recovery efforts. More specifically, this research reveals challenges in helping affected households recover sustainably and more efficiently during recovery programs. This inquiry investigates the housing reconstruction program conducted after the 2003 earthquake in Bam, Iran from different perspectives – recovery objectives, policy, strategy, and implementation – and contributes to theory, practice, and policy. Thus, this research contributes to understanding housing reconstruction programs and requirements for households' sustainable and effective recovery in future disaster events.

Returning to problems and questions expressed in the introductory chapter, where the post-disaster housing reconstruction programs were characterized by "the insensitive design of low-

income houses to their inhabitants' lifestyle, culture, personal needs and local climate conditions" (Davis & Alexander, 2015; Duyne, 2010; Lizarralde et al., 2010; Oliver Smith, 1991), the following observations can be made. First, the one-policy-for-all approach cannot adequately lead to the recovery of all affected families. In fact, housing reconstruction policy must include all household types and respect their contextual and specific conditions. Second, housing recovery begins long before the wake of a disaster, as pre-disaster housing policies have a direct impact on structural vulnerabilities. Likewise, post-disaster housing reconstruction policies must pursue sustainable development based on resilience enhancement and disaster risk reduction requirements. Third, the fulfillment of recovery objectives is highly dependent on stakeholders' active participation in decision-making processes. A trusting relationship between community members and government agencies, for instance, can potentially prevent conflicts and establish commonly acceptable recovery targets. Fourth, housing reconstruction programs require a clear and contextually sensitive governance structure to define stakeholders' roles and ensure the fulfillment of tasks. More generally, findings confirm the complexity of housing reconstruction programs, as many variables such as pre- and post-disaster conditions, the sensitivity of recovery policies to diversities, families' active participation in decision-making, and successful collaboration between stakeholders determine the quality of households' recovery. Finally, this research opens new horizons in the post-disaster reconstruction field, which requires further research and inquiry into its theoretical and practical grounds.

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ANNEXES

ANNEX I

Main concerns and questions that generate open interviews with affected households during four different field visits

Main concerns	Questions	Field visits and interviews			
		November 2008	January 2011	March 2012	June and July 2014
Bam before the disaster	- How was your life before the disaster? (Traditions, social relationship, and demographic conditions)	-	x	x	x
	- Where was the location of your house in the city before the disaster?	-	x	x	x
	- How many people were living with you in the same house?	x	x	-	x
	- Were you living in a big house with your extended family members before the disaster?	x	x	x	x
	- How was your neighborhood before the disaster? Please explain socio-spatial structure, facilities, neighbors, and social activities.	-	-	-	x
The disaster circumstances	- Did the disaster destroy you house? How bad?	x	x	x	x
	- Did you lose any of your family members at the night of the earthquake?	x	x	x	x
Used materials and applied construction methods	- Did you reconstruct your house? If so, please explain materials and the construction method applied in your reconstructed house?	x	x	x	-
	- Did you use any of traditional methods and vernacular materials in the reconstruction of your house? If not, why?	x	x	x	-
	- How did you choose materials and the construction method of your new house? Were you familiar with the new methods and materials?	x	x	x	-
Access to resources and distribution of aids	- Did you receive any loan and financial aid? How much? And under what conditions?	x	x	x	x
	- How long after the disaster did you have access to the loans and financial aids?	x	x	x	x
Controls and supervisions	- Did any body or any organization supervise your housing reconstruction process? How?	x	x	x	x
Community involvement and their participation	- Did you participate in any decision-making process? Such as the design process, the choose of materials and the location of your house, etc.	x	x	x	x
	- Did you feel any restriction that prevent you from participation?	-	-	-	x
	- Are you satisfied with the participation in decision making processes? How does this help you to recover?	x	x	x	x
Different types of tenancy (distribution of the right of ownership)	- Did you own a house before the disaster or you were a tenant?	-	x	x	x
	- Could you preserve your ownership after the disaster? If not, please explain why?	-	-	-	x
	- Did you receive the ownership right after the disaster?		x	x	x
Location and	- Are you still living in your temporary housing unit?	x	x	-	-

relocation	- Where is (was) your temporary house located?	x	x	x	-
	- How long did you live in your temporary house?	x	x	x	-
	- Who was living with you in your temporary house?	x	x	x	-
	- Did your pre-disaster neighbors, relatives, and the extended family members were living with you or near you during the temporary housing phase?	-	x	x	-
	- Where is your permanent house? Did you relocate from your pre-disaster neighborhood?	-	x	x	x
	- Do you keep your contact with your family members? Pre-disaster neighbors? And extended family members?	-	-	-	x
	- Did you decide to relocate or it was the only available solution?	-	-	-	x
	- How many of your extended family members are still living with you in the same house, or at least in the walk distance with you?	-	-	-	x
House designs and life-styles	- How different is your new house with your house before the disaster? Size, design, materials, location, space arrangement, etc.	x	x	x	x
	- Does your new house have any element of Bam's traditional architecture?	-	x	x	x
	- Did your new house change your life-style too?	-	x	x	x
Livelihood	- What was your main livelihood activity before the disaster? Was that related to the agricultural or gardening activities?	-	x	x	x
	- What is your livelihood activity after the disaster? What is preventing you from returning to your pre-disaster livelihood activity?	-	-	-	x
	- If you rent your house, please let me know how much has the price changed after the disaster? Do you know the causal factors?	-	-	-	x
	- Did the housing reconstruction policies affected your access to livelihood resources and life expenses?	-	-	-	x
Learning and knowledge transformation	- Do you know why did the shakes of the earthquake destroy your pre-disaster house? What was (were) its weakness(es)?	-	-	-	x
	- Do you know whether your reconstructed house is safe against next potential earthquakes? What are the risk reduction requirements?	-	-	-	x
	- Did you learn how to construct a safe house in the future?	-	-	-	x

Main concerns and questions that generate open interviews with officials during four different field visits

Main concerns	Questions	Field visits and interviews			
		November 2008	January 2011	March 2012	June and July 2014
The housing reconstruction management	- What was the role and responsibility of your organization, institute, department, or NGO on the housing reconstruction and recovery program?	x	x	x	x
	- How was the relationship between your organization, institute, department, or NGO with other stakeholders involved in the process of recovery and reconstruction?	x	x	x	x
	- Did you or your organization, institute, department, or NGO have any conflict or problem with other stakeholders during the recovery and reconstruction process?	-	-	-	x
	- Which organization, institute, department, and NGO were involved in different phases of housing recovery? (transitional sheltering and permanent housing)	x	x	x	x
	- What were the main objectives of the housing reconstruction program? How were the objectives identified?	x	-	x	x
Housing policies and recovery objectives	- What was the role of the national government, the local governments, and the rest of organizations such as HFIR in issuing and modification of recovery policies?	x	x	x	-
	- What was the role of Bam's municipality, in particular, in the process of housing reconstruction?	-	x	-	-
	- How many and when different housing policies were issued?	x	x	x	x
	- How many, and when, were different housing policies applied? Any conditions?	-	-	x	x
	- What was the financial policy of the housing reconstruction program? How much was the given loan and financial aid to households? And how they could claim and have access to the pledged loans?	x	-	x	-
The disaster and post-disaster circumstances	- How many houses destroyed?	x	-	-	-
	- How many families affected?	x	-	-	-
	- How many houses had to be reconstructed?	x	-	-	-
Used materials and applied construction methods	- What were construction methods and materials used?	x	x	x	-
	- Were pre-disaster construction methods and materials used in the reconstructed houses?	-	x	x	-
	- Were the introduced construction methods and materials familiar to the families?	x	x	x	x
Access to resources and distribution of aids	- How much compensation was allocated to each family?	x	x	x	-
	- Who was eligible to receive the compensation? equal or unequal	x	-	x	x
	- How was the compensation distributed among the affected families? (the policy)	-	x	x	x
	- How long later after the disaster did the families receive the compensations? Any delay could decrease the value of the compensation via high inflation rate.	-	-	x	x

Controls and supervisions	- Who supervised the post-disaster housing reconstruction? (under supervision of what organization)	x	x	-	-
	- What was the mechanism? And how was controlled?	-	-	x	x
	- How was the reconstruction process controlled over its design, distribution of aids, quality of materials, quality of construction, etc.?	-	-	x	x
Community involvement and their participation	- How did families participate in decision making and implementation processes?	x	x	x	x
	- Who did participate? (inclusion and exclusion)	-	-	x	x
	- What was the achievement? (possible change and transformation)	-	-	-	x
Different types of tenancy	- Did the housing reconstruction policies change the types of tenancy that existed pre-disaster? And how?	-	-	-	x
	- How did different types of tenancy change via the housing reconstruction policies?	-	-	-	x
Location and relocation	- Where did temporary houses locate?	x	-	-	-
	- Where did permanent houses locate?	x	x	x	x
	- Did the housing reconstruction policies relocate families?	-	-	-	x
	- Did families participate in relocation process? For example, participation in decision making or land acquisition.	-	-	x	x
	- Were the houses reconstructed in the same or relocated site?	-	-	x	x
	- Were the families settled in the same area and live with same neighbors?	-	-	x	x
House designs and life-styles	- How much did house designs change after disaster? (In comparison between pre- and post-disaster)	-	-	x	x
	- Why did the housing reconstruction program fail to preserve Bam's traditional housing design?	-	-	-	x
	- Are inhabitants like the new design of their houses?	-	-	-	x
	- Did the life-style change too? Why?	-	-	-	x
	- What was the role of families in changing the designs and the order of spaces in the houses?	-	-	-	x
Livelihood	- Did the housing reconstruction policies affect the families' livelihood?	-	x	x	x
	- Did the housing reconstruction policies affect the cost of rent?	-	-	x	x
	- Did the housing reconstruction policies change the number of available houses for rent?	-	-	x	x
Learning and knowledge transformation	- Did you and your organization give any lesson, instruction, or manual to the affected families and construction workers to teach them how to use the new construction methods and materials in future?	x	x	-	-
	- Did the families and organizations learn how to reduce future disaster risks, manage next disasters, and reduce vulnerabilities?	-	x	x	x

ANNEX II

Authorization Request for Writing Thesis by Articles

1- Student identity

Mahmood Fayazi
FAYM19078405

2- Academic unit

Faculté de l'Aménagement

3- Program

3-005-1-0 Ph. D. Aménagement

4- Research objectives

It has been well documented in the literature that low-cost housing policies (before and after disasters) can potentially contribute to resilience enhancement and vulnerability reduction. It is, however, less known how the policies – which might be seen as "fair" and "just" – can potentially affect different groups of households having heterogeneous economic, social, environmental and political conditions. This research aims at exploring *how* adopted policies for housing reconstruction after disasters provide different impacts on diverse household groups. To this purpose, this research develops a theoretical model consisting of three theoretical lenses: resilience, vulnerability and disaster risk reduction. The model, helps understanding the relationship between vulnerability and resilience; and disaster risk reduction. Based on this model, this research explains the role of post-disaster housing reconstruction in resilience enhancement and vulnerability reduction of affected households (see Diagram 1).

Diagram 1: Main concepts adopted in the theoretical framework

The research shows *how* pre-disaster conditions such as land tenure, livelihood conditions and access to social support and public services play significant roles in achieving resilience and reducing vulnerabilities. Findings reveal *why* adopted policies in reconstruction after disasters sometimes fail in the recovery of affected households. Findings help academics and practitioners understand the role of reconstruction policies in resilience enhancement and vulnerability reduction. They facilitate designing appropriate policies based on different needs and conditions of affected households. This project aims at answering the following questions:

1) *What* is the relationship between resilience and vulnerability on the grounds of theory and practice?
2) *How* can Post-Disaster Housing Reconstruction (PDHR) programs contribute to move affected households from the state of vulnerability to resilience?
   - *What* is the role of PDHR in enhancing the capacity of affected households and families *to withstand* undesirable events and shocks?
   - *How* can PDHR enhance the capacities of affected households and families *to adapt* to future disturbing events?
   - *How* can PDHR help households and families *prepare* for future disturbing events?
3) *How* can PDHR make different groups of households resilient, knowing that they have heterogeneous economic, social, environmental and political conditions?
   - *Why* do policies adopted in reconstruction processes often fail in the recovery of affected households?

5- List of proposed articles

This research includes three steps, associated with publishing three articles. First, in order to understand the variety of provided temporary houses and to reveal the preliminary impacts of policies on households, this research examines the temporary housing program conducted after the 2003 earthquake in Bam, Iran. Then, after developing the analytical framework, the second step of this research examines the impacts of permanent housing reconstruction policies on different categories of households in Bam. In order to validate the research findings, approaches and methods and in order to generalize findings, the third step of this research compares findings from the case of Bam in Iran with other cases reported in the literature. The following diagram shows the interrelationships between the three steps of the research and their roles in addressing the research objectives. (See diagram 2)

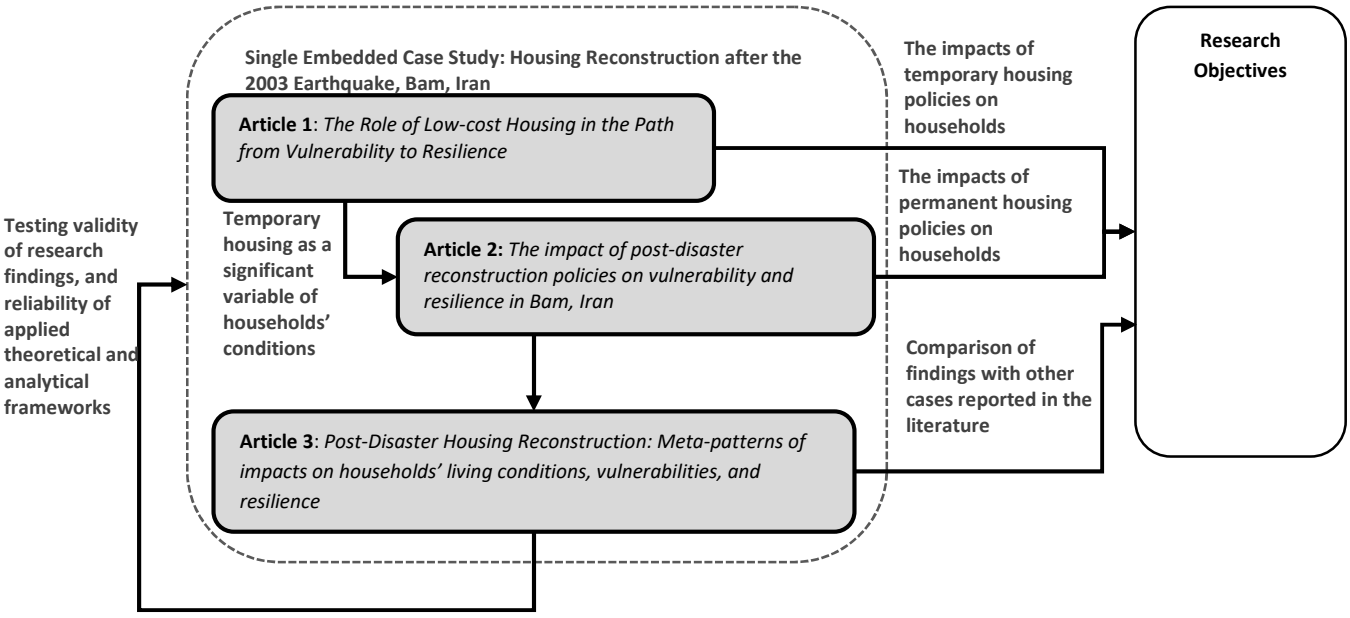

Diagram 2: Relationship between three articles

The list of proposed articles:

- Fayazi, M, & Lizarralde, G. (2014). The Role of Low-Cost Housing in the Path from Vulnerability to Resilience *International Journal of Architectural Research, 7* (3), 146-167.
- Fayazi, M, & Lizarralde, G. (2015). The Impact of Post-Disaster Reconstruction Policies on Vulnerability and Resilience in Bam, Iran,
- Fayazi, M, & Lizarralde, G. (2015). Post-Disaster Housing Reconstruction: Meta-patterns of impacts on households' living conditions, vulnerabilities, and resilience.

Diagram 3 illustrates how these three articles will articulate a coherent thesis. For establishing the links between the articles and the essential components of a traditional thesis, three more chapters will be included. The first chapter introduces the research gaps in theory and practice "problematique", the concepts of resilience and vulnerability, and the theoretical model and analytical framework developed in this research. The second chapter introduces the case: the housing reconstruction program conducted after the 2003 earthquake in Bam, Iran. It also contains details about research strategy, and applied methods of gathering and analyzing data. The first two chapters in the thesis by articles replace the chapters in a traditional thesis describing the problems, theories, hypothesis, objectives, methods, and case study identification. Following the three articles, the last chapter discusses and synthesizes findings and draws final conclusions.

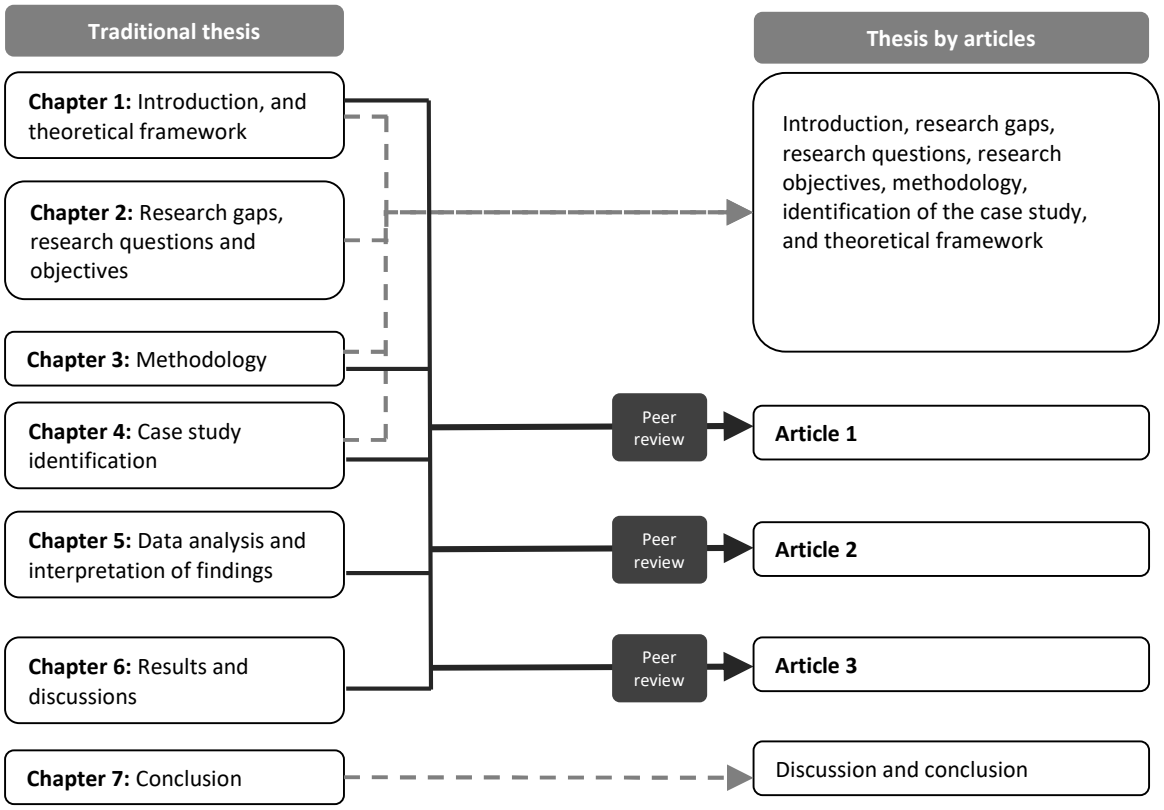

Diagram 3: Comparison between the order of chapters in a traditional thesis and a thesis by articles

This research provides both theoretical and practical implications. The findings can help academics and practitioners understand the important role of reconstruction policies in resilience enhancement and vulnerability reduction. Furthermore, the findings provide insightful information and recommendations for better intervention in reconstruction after disasters worldwide. Writing the thesis while publishing three articles will lead to rapid and wide distribution of findings among the academic communities and practitioners in the field of post-disaster reconstruction around the world.

6- Student's statement about the articles

This section describes the three articles individually. Brief summaries, followed by the description of authors' contributions to the articles, are provided below.

Article 1

Fayazi, M, & Lizarralde, G. (2014). The Role of Low-Cost Housing in the Path from Vulnerability to Resilience *International Journal of Architectural Research, 7* (3), 146-167.

- **Article description:** this article begins by explaining the existing gaps in theories and practices in the field of low-cost housing in general, and temporary housing after disasters in particular. It seeks to bridge the theoretical gap that exists between vulnerability and resilience theories and to clarify the potential role of temporary housing in enhancing community resilience. Four different temporary housing strategies used after the 2003 earthquake in Bam, Iran, illustrate the role of housing in the path that can potentially lead communities from a vulnerable state to resilience. These strategies include: (A) Prefabricated units built on temporary camps located in the city and in the outskirts and developed by the central government, (B) Masonry units built by a public stakeholder on the yards of destroyed houses (C) Prefabricated units built by the central government in partnership with a private firm and located in the yards of destroyed houses, and (D) High-tech imported units built in the outskirts of the city. Analyzing these strategies through the lens of a new framework based on a systems approach permits to identify the different impacts of post-disaster temporary housing programs. Whereas strategies A, C and D had negative consequences in various sub-systems of the affected community, strategy B positively enhanced community resilience. Findings of this study provide insightful information about the role of temporary housing in recovery. This research, furthermore, reveals the impacts of different temporary housing strategies on a variety of households, providing the context for examining the role of permanent housing policies on different categories of households in the second article.

- **Authors' contributions:** the first author played the leading role in this article. He conducted the literature review and developed the theoretical framework. He gathered data by reviewing printed reports, minutes of project meetings, contractual documents, and construction documents. Moreover, the first author conducted 85 questionnaires and 70 interviews with authorities, decision makers, and residents. He analyzed data and draw conclusions using the developed theoretical model, under the supervision of the second author, Dr. Gonzalo Lizarralde. The second author supervised and controlled the whole process of research, editing and writing.

Article 2

Fayazi, M, & Lizarralde, G. (2015). The Impact of Post-Disaster Reconstruction Policies in Vulnerability and Resilience in Bam, Iran,

- Article description: This article first explores why disasters occur and how societies can either avoid them or reduce their impacts. Then, it discusses the potential role of reconstruction policies in vulnerability reduction and resilience enhancement. It challenges existing knowledge about how reconstruction policies can potentially affect different groups of families and households. The purpose of this paper is to bridge existing gaps in the literature and explore how policies made in permanent housing reconstruction programs can affect different groups of households in different ways. It studies the case of permanent housing reconstruction after the 2003 earthquake in Bam, Iran. The case is analyzed through a set of variables that assess the evolution of pre- and post-disaster conditions among ten different household types affected by the disaster. The results explain how reconstruction policies had different impacts in the vulnerability and resilience of these different household types showing that policies do not achieve the same results when pre-disaster vulnerability conditions are different. The findings can help academics and practitioners understand the important role of reconstruction policies in resilience enhancement and vulnerability reduction.

- Authors' contributions: the first author plays a leading role. He develops the analytical model for analyzing the impacts of policies on different categories of households. He categorized a variety of households in ten main groups after analyzing the data gathered from the fieldwork in summer 2014. After developing an analytical model and analyzing the data, he interprets results and draws conclusions under the supervision of Dr. Gonzalo Lizarralde (second author).

Article 3

Fayazi, M, & Lizarralde, G. (2015). Post-Disaster Housing Reconstruction: Meta-patterns of policy impacts on households' living conditions, vulnerabilities, and resilience.

- Article description: By using the analytical frameworks developed in the first two articles, the third article compares the findings from Bam (Iran) with seven cases in Asia, Middle-East, South and North of America previously documented in literature. This article aims at theoretically validating the findings, models, and methods presented in the first two articles. By doing so, this article also reveals drawbacks and opportunities in housing reconstruction processes after natural and human-induced disasters worldwide. Every reconstruction process is – of course – unique and responds to contextual conditions. However, this survey of cases shows how the adoption of policy impacts different groups of households diversely. This ensures the generalization of findings and brings counterexample(s) leading to the modification of the developed theoretical models and assumptions. If this study confirms our previous findings, it will highlight patterns in reconstruction process that can help anticipate challenges and opportunities in policy and planning.

- Authors' contributions: the first author plays the main role in conducting research and writing the article. He reviews the literature and several reports of reconstruction projects in different countries. He derives the required information from reliable and accessible resources. Under supervision of, and in collaboration with, the second author (Dr. Gonzalo Lizarralde), he develops

a systematic method for comparing different cases and analyzing findings. Using the comments and help of Dr. Lizarralde, the first author develops the discussion and conclusions.

7- Statement and signature of the research supervisor

Le directeur de recherche fait part de ses commentaires pour chaque article et expose son avis général sur le projet de la thèse par articles ci-dessous :

Mahmood Fayazi a été le leader dans les activités de préparation de cette recherche; et cela dans tous les articles de sa thèse. Sa contribution inclut : (a) la recherche de la littérature (incluant l'identification, l'analyse et la synthèse des articles et des livres); (b) la recherche empirique (incluant le montage des activités de recherche), (c) l'analyse de données (incluant les activités de réalisation des tableaux, des diagrammes, des documents de synthèse, des identification des témoignages, etc.) , (d) la rédaction du texte (chaque texte est souvent réalisé sur plus de 6 versions), (e) la planification et l'organisations des activités de recherche (incluant les visites des projets, les entrevues, la collecte des documents, la prise des photos, l'analyse des plans, etc.), (f) le suivi du dépôt, de la révision et de l'édition lors de processus de publication. Il est pour cette raison le premier auteur dans tous les documents.

J'ai contribué à : discuter le cadre d'analyse, proposer des lectures, suggérer des stratégies et des méthodes, réviser le texte et proposer des alternatives pour l'analyse des données.

Avis général sur la thèse par articles : À mon avis, le projet de thèse par articles soumis répond aux critères d'excellence qu'une thèse de troisième cycle se doit de respecter. La thèse regroupe trois articles dans des revues scientifiques de haut calibre et ayant chacune un comité de lecture très rigoureux. Je recommande sans hésitation que ces articles soient inclus dans la thèse de doctorat de M. Fayazi. Le candidat réalisera aussi trois sections additionnelles, tout en mettant en perspective chacun des articles. De plus, M. Fayazi est un candidat hautement organisé, professionnel et critique. Je le sais tout à fait outillé pour compléter avec succès une thèse par articles. C'est pourquoi je recommande l'acceptation du projet de la thèse par articles de M. Fayazi.

Signature ---------- **Date** ----------

Dr. Gonzalo Lizarralde
Le directeur de recherche

ANNEX III

Consent form for certain categories of participants (in French)

Titre de la recherche : Le rôle des programmes de reconstruction de logements après une catastrophe dans l'amélioration de la résilience des communautés et la réduction de la vulnérabilité – Le cas de Bam en Iran, après le séisme de 2003.

Chercheur : Mahmood Fayazi étudiant au doctorat, Faculté de l'aménagement, Université de Montréal, Canada

Directeur de recherche : Gonzalo Lizarralde Ph. D. Professeur adjoint, école d'architecture, Faculté de l'aménagement, Université de Montréal, Canada

A) RENSEIGNEMENTS AUX PARTICIPANTS

1. **Objectifs de la recherche.**
   Cette recherche tente de clarifier comment un programme de reconstruction de logements après une catastrophe peut potentiellement créer des conditions de vie favorables qui respectent les besoins sociaux, économiques, culturels et environnementaux de la communauté affectée. La recherche a également pour objectif de développer des recommendations qui aideront à concevoir des programmes appropriés de reconstruction de logements. Par ailleurs, elle contribuera à combler les lacunes théoriques qui existent entre les concepts de vulnérabilité et de résilience et à clarifier ces concepts dans le contexte de reconstruction après une catastrophe.
2. **Participation à la recherche**
   Votre participation consiste à faire une entrevue (par téléphone, par vidéoconférence, ou par rencontre personnelle) à un moment et dans un lieu que vous choisirez. Cette entrevue portera sur votre expérience personnelle de la reconstruction de logements qui a été réalisée après le séisme de 2003 à Bam, en Iran. La durée de l'entrevue est environ une heure et demie. Un questionnaire identifié peut être envoyé pour compléter l'information. Vous pourriez être recontacté pour répondre à quelques questions par un questionnaire identifié. L'entrevue pourrait être enregistrée si le participant vous l'autorisez.
3. **Confidentialité**
   Les renseignements que vous nous donnerez demeureront confidentiels. Les entrevues seront transcrites et les enregistrements effacés. Aucune information permettant de vous identifier en tant qu'individu ne sera publiée. Le document ne comprendra pas les conflits d'ordre personnel (disputes et tensions entre individus) survenus pendant le projet. Cependant, l'étude de cas peut présenter des informations susceptibles d'identifier les personnes morales et les organisations qui participent au projet, si ces informations sont nécessaires à la compréhension de son déroulement. Certains postes clés pourront être mentionnés, par exemple : «les membres du comité directeur pour la reconstruction de Bam ont organisée une activité de …». Les entrevues ne peuvent collecter des informations sur la vie privée des participants au projet. Ils cherchent à collecter exclusivement les informations liées à la réalisation de projet de reconstruction des logements après la catastrophe et à la participation des personnes et des organisations. Ces renseignements personnels seront détruits 7 ans après la fin du projet, dans le bureau du groupe de recherche IF, Université de Montréal, dans la ville de Montréal, Canada. Seules les données ne permettant pas de vous identifier seront conservées après cette date, le temps nécessaire à leur utilisation.
4. **Avantages et inconvénients**
   En participant à cette recherche, vous pourrez contribuer à l'avancement des programmes de reconstruction et de réhabilitation après désastres naturelle. En participant à cette recherche, vous pourrait être identifié comme une personne morale et/ou un membre d'organisations qui participent au projet.

5. **Droit de retrait**
   Votre participation est entièrement volontaire. Vous êtes libre de vous retirer en tout temps sur simple avis verbal, sans préjudice et sans devoir justifier votre décision. Si vous décidez de vous retirer de la recherche, vous pouvez communiquer avec le chercheur, au numéro de téléphone indiqué ci-dessous. Si vous vous retirez de la recherche, les renseignements qui auront été recueillis au moment de votre retrait seront détruits.
6. **Compensation**
   Les participants ne recevront aucune compensation.
7. **Diffusion des résultats**
   La thèse imprimée et des copies numériques seront livrées à l'Université de Montréal, Canada. Aussi, des articles académiques seront publiés dans des revues scientifiques. De plus, si vous désirez recevoir un résumé vulgarisé des résultats de recherche en persan, laissez vos coordonnées dans un espace prévu en dessous.

☐ par courrier : ----------

☐ par courrier électronique : ----------

B) CONSENTEMENT

Je déclare avoir pris connaissance des informations ci-dessus, avoir obtenu les réponses à mes questions sur ma participation à la recherche et comprendre le but, la nature, les avantages, les risques et les inconvénients de cette recherche.

Après réflexion et un délai raisonnable, je consens librement à prendre part à cette recherche. Je sais que je peux me retirer en tout temps sans aucun préjudice, sur simple avis verbal et sans devoir justifier ma décision.

	Oui	Non
J'accepte l'enregistrement audio ou vidéo pour cette entrevue.	☐	☐
J'accepte la divulgation d'information concernant mon poste au programme de reconstruction	☐	☐

Signature : Date :
Nom : Prénom :

Je déclare avoir expliqué le but, la nature, les avantages, les risques et les inconvénients de l'étude et avoir répondu au meilleur de ma connaissance aux questions posées.

Signature du chercheur : Date :
Nom : Prénom :

Pour toute question relative à la recherche ou pour vous retirer du projet, vous pouvez communiquer avec Mahmood Fayazi (Candidat au doctorat), au numéro de téléphone : XXXXXXXXXXX (en Iran) et +1 XXXXXXXXX (au Canada) ou à l'adresse courriel: XXXXXXXX

Un exemplaire du formulaire d'information et de consentement signé doit être remis au participant

Consent form for heads of families (in French)

Titre de la recherche : Le rôle des programmes de reconstruction de logements après une catastrophe dans l'amélioration de la résilience des communautés et la réduction de la vulnérabilité – Le cas de Bam en Iran, après le séisme de 2003.

Chercheur : Mahmood Fayazi étudiant au doctorat, Faculté de l'aménagement, Université de Montréal, Canada

Directeur de recherche : Gonzalo Lizarralde Ph. D. Professeur adjoint, école d'architecture, Faculté de l'aménagement, Université de Montréal, Canada

A) RENSEIGNEMENTS AUX PARTICIPANTS

7. Objectifs de la recherche.

Cette recherche tente de clarifier comment un programme de reconstruction de logements après une catastrophe peut potentiellement créer des conditions de vie favorables qui respectent les besoins sociaux, économiques, culturels et environnementaux de la communauté affectée. La recherche a également pour objectif de développer des recommendations qui aideront à concevoir des programmes appropriés de reconstruction de logements. Par ailleurs, elle contribuera à combler les lacunes théoriques qui existent entre les concepts de vulnérabilité et de résilience et à clarifier ces concepts dans le contexte de reconstruction après une catastrophe.

8. Participation à la recherche

Votre participation consiste à faire une entrevue (par téléphone, par vidéoconférence, ou par rencontre personnelle) à un moment et dans un lieu que vous choisirez. Cette entrevue portera sur votre expérience personnelle de la reconstruction de logements qui a été réalisée après le séisme de 2003 à Bam, en Iran. La durée de l'entrevue est environ une heure et demie. Un questionnaire anonyme peut être envoyé au hasard pour modifier et compléter l'information. L'entrevue pourrait être enregistrée si le participant vous l'autorisez.

9. Confidentialité

Les renseignements que vous nous donnerez demeureront confidentiels. Les entrevues seront transcrites et les enregistrements effacés. Aucune information permettant de vous identifier en tant qu'individu ne sera publiée. Les entrevues ne peuvent collecter des informations sur la vie privée des participants au projet. Ils cherchent à collecter exclusivement les informations liées à la réalisation de projet de reconstruction des logements après la catastrophe et à la participation des personnes et des organisations. Ces renseignements personnels seront détruits 7 ans après la fin du projet, dans le bureau du groupe de recherche IF, Université de Montréal, dans la ville de Montréal, Canada. Seules les données ne permettant pas de vous identifier seront conservées après cette date, le temps nécessaire à leur utilisation.

Du plus, quelques photos peuvent être prises à partir de votre résidence qui pourrait éventuellement vous identifier dans l'éventualité où le lieu illustré sur la photo serait reconnu.

10. Avantages et inconvénients

En participant à cette recherche, vous pourrez contribuer à l'avancement des programmes de reconstruction et de réhabilitation après désastres naturelle. En participant à cette recherche, vous pouvez être identifié par les photos qui seront prises à partir de votre résidence.

11. Droit de retrait

Votre participation est entièrement volontaire. Vous êtes libre de vous retirer en tout temps sur simple avis verbal, sans préjudice et sans devoir justifier votre décision. Si vous décidez de vous retirer de la recherche,

vous pouvez communiquer avec le chercheur, au numéro de téléphone indiqué ci-dessous. Si vous vous retirez de la recherche, les renseignements qui auront été recueillis au moment de votre retrait seront détruits.

12. Compensation

Les participants ne recevront aucune compensation.

7. Diffusion des résultats

La thèse imprimée et des copies numériques seront livrées à l'Université de Montréal, Canada. Aussi, des articles académiques seront publiés dans des revues scientifiques. De plus, si vous désirez recevoir un résumé vulgarisé des résultats de recherche en persan, laissez vos coordonnées dans un espace prévu en dessous.

☐ par courrier : ----------

☐ par courrier électronique : ----------

B) CONSENTEMENT

Je déclare avoir pris connaissance des informations ci-dessus, avoir obtenu les réponses à mes questions sur ma participation à la recherche et comprendre le but, la nature, les avantages, les risques et les inconvénients de cette recherche.

Après réflexion et un délai raisonnable, je consens librement à prendre part à cette recherche. Je sais que je peux me retirer en tout temps sans aucun préjudice, sur simple avis verbal et sans devoir justifier ma décision.

	Oui	Non
J'accepte que des images qui ont été pris à partir de ma résidence puissent apparaître sur le document de recherche	☐	☐
J'accepte l'enregistrement audio ou vidéo pour cette entrevue.	☐	☐

Signature : Date :

Nom : Prénom :

Je déclare avoir expliqué le but, la nature, les avantages, les risques et les inconvénients de l'étude et avoir répondu au meilleur de ma connaissance aux questions posées.

Signature du chercheur : Date :

Nom : Prénom :

Pour toute question relative à la recherche ou pour vous retirer du projet, vous pouvez communiquer avec Mahmood Fayazi (Candidat au doctorat), au numéro de téléphone : XXXXXXXX (en Iran) et XXXXXXXXX (au Canada) ou à l'adresse courriel: XXXXXXXX

Un exemplaire du formulaire d'information et de consentement signé doit être remis au participant

Consent form for certain categories of participants (in Farsi)

موافقت نامه مسئولین

عنوان رساله دکتری: نقش برنامه های بازسازی مسکن پس از سوانح در ارتقاء تاب آوری جامعه و کاهش آسیب پذیری آن در مقابل سوانح طبیعی. مورد مطالعه: بازسازی شهر بم در ایران پس از زلزله دیماه 1382

پژوهشگر: محمود فیاضی، دانشجوی دکتری، دانشکده طراحی محیط زیست، دانشگاه مونترال، کشور کانادا

استاد راهنمای پژوهش: دکتر گونزالو لیزارالده، دانشیار دانشکده معماری، دانشکده طراحی محیط زیست، دانشگاه مونترال، کشور کانادا

1) اطلاعات برای شرکت کنندگان در این پژوهش

1-1-اهداف پژوهش

این پژوهش بدنبال آن است تا مشخص کند که چگونه بازسازی مسکن پس از سانحه با احترام به الزامات اجتماعی، اقتصادی، فرهنگی و محیطی یک جامعه می تواند شرایط زیست ایمن و مطلوبی را فراهم کند. این پژوهش می‌خواهد الزامات و اصول لازم برای طراحی یک برنامه کارآمد بازسازی مسکن پس از سوانح را ارائه نماید. به علاوه، این پروژه قصد دارد تا برخی از ابهامات پیرامون مفهوم واژگان همچون تاب آوری و آسیب پذیری و ارتباط انها با یکدیگر را مشخص کند.

1-2-مشارکت کنندگان در این پژوهش

مشارکت در این پژوهش به معنای انجام یک مصاحبه (از طریق تلفن، ویدیو کنفرانس، و یا از طریق ملاقات شخصی) در زمان و مکانی است که شما انتخاب می‌کنید. این مصاحبه بر اساس تجربه شخصی شما در بازسازی مسکن پس از سانحه بم پس از زلزله دیماه 1382 صورت می‌پذیرد. مصاحبه حدوداً یک ساعت و نیم بطول خواهد انجامید. در صورت لزوم، احتمالا یک پرسشنامه به نام شما برای تکمیل در اختیار تان اطلاعات قرار خواهد گرفت. در واقع در صورت نیاز از طریق ارسال یک پرسشنامه با شما ارتباط دوباره برقرار خواهد شد تا به سوالات احتمالی پاسخ دهید. این مصاحبه فقط در صورت موافقت شما صورت خواهد پذیرفت.

1-3-رعایت اصل محرمانه بودن اطلاعات

اطلاعات شما کاملا محرمانه باقی خواهد ماند. متن مصاحبه نوشته خواهد شد و پس از آن نوار ضبط شده پاک خواهد گردید. هر شخص مشارکت کننده در این پژوهش به یک عدد ارتباط داده خواهد شد و تنها پژوهشگر و افراد کلیدی در این پژوهش به لیست افراد مشارکت کننده و اعداد تعلق یافته بدانها دسترسی خواهند داشت. هیچ اطلاعاتی مبنی بر معرفی شما به عنوان یک شخص حقیقی ارائه نخواهد گردید. اسناد گردآوری شده، درگیری های شخصی (نزاع و تنش بین افراد) را که در طول این پروژه رخ داده است را دربر نخواهند گرفت. این مصاحبه ها هرگز به جمع آوری اطلاعات شخصی و خصوصی افراد مبادرت نخواهد ورزید. با این حال، این مطالعات در صورت لزوم ممکن است اسنادی را در برگیرند که از طریق آن بشود سازمانهای درگیر و اشخاص حقوقی در بازسازی مسکن شهر بم را شناخت. همچنین به برخی از اشخاص ممکن است به صورت غیر مستقیم اشاره شود، به عنوان مثال "اعضای کمیته راهبردی بازسازی شهر بم تصمیم بر آن گرفتند که ...."، اطلاعات مورد نظر صرفا در خصوص درک مراحل مختلف بازسازی مسکن شهر بم، مشارکت مردم در روند تصمیم گیری و اجرا، و نقش سازمانهای درگیر در این پروژه می باشد. اطلاعات حاصل از این مصاحبه ها به مدت هفت سال پس از پایان پژوهش در دفتر گروه پژوهشی" *ایف- IF"* در شهر مونترال در کشور کانادا نگهداری خواهند گردید. پس از آن، تنها اطلاعاتی که در برگیرنده اطلاعات شما نمی باشند نگهداری می شوند.

1-4-مزایا و معایب

شما با مشارکت در این پژوهش به ارتقاء دانش مرتبط با سوانح و بازسازی پس آن کمک خواهید نمود. مشارکت شما در این پژوهش این فرصت را برای درک بهتر مسائل و بهبود عملکرد شما در برابر سوانح آتی فراهم خواهد نمود. با مشارکت در این پژوهش اطلاعات شخصی شما به عنوان یک شخص حقوقی و یا عضو یکی از سازمانهای درگیر در بازسازی شهر بم افشاء گردد.

1-5-حق بازپسگیری

مشارکت شما کاملا داوطلبانه است. شما خواهید توانست در هر زمان ممکن و به ساده ترین روش و بدون نیاز به هیچگونه توجیح از مشارکت خود در این پژوهش انصراف دهید. در صورتیکه شما تصمیم به بازپسگیری مشارکت خود نمودید، می توانید از طریق شماره تلفن و آدرس ایمیل ارائه شده در انتهای این فرم انصراف خود را اطلاع دهید. به محض انصراف شما، تمامی اطلاعات گردآوری شده از مشارکت شما پاک خواهد شد.

1-6-خسارت

مشارکت کنندگان هیچگونه خسارتی متحمل نخواهند شد.

1-7-انتشار نتایج

نسخه چاپی و دیجیتال رساله دکتری به کتابخانه دانشگاه مونترال تحویل داده خواهد شد و مقالات حاصل از این رساله نیز در مجلات معتبر قابل دسترسی و استفاده خواهند بود. در صورت تمایل می توانید اطلاعات پستی خود را در زیر وارد نمائید تا خلاصه ای از یافته های این پژوهش به زبان فارسی برای شما ارسال گردد.

☐ از طریق ایمیل : ----------

☐ از طریق پست : ----------

2) موافقت

تائید می‌کنم که اطلاعات فوق را مطالعه کرده ام، پاسخ سوالات را در مورد مشارکت در این پژوهش دریافت کردم و اهداف، طبیعت، منافع، مخاطرات و مزایای این پژوهش را متوجه شدم.

پس از تفکر و تعلق، بنده آزادانه به مشارکت در این پژوهش رضایت می دهم. من همچنین از این حق خود آگاهی دارم که می‌توانم در هر زمان ممکن و بودن نیاز به توجیح، از مشارکت خود در این پژوهش انصراف دهم.

	بله	خیر
- من به انتشار اطلاعاتی که منجر به افشاء مسئولیت من در بازسازی شهر بم گردد رضایت می دهم	☐	☐
– من به ضبط صوتی و تصویری این مصاحبه رضایت می دهم	☐	☐

تاریخ ------- امضاء ----------

نام و نام خانوادگی ----------

من اعلام می کنم که اهداف، طبیعت، منافع، خطرات، و معایب این پژوهش را با استفاده از حداکثر دانش خود برای مصاحبه شونده توضیح داده ام.

تاریخ امضاء پژوهشگر

نام نام خانوادگی

برای سوالات مرتبط و اعلام انصراف خود از مشارکت در این پژوهش، شما می توانید با محمود فیاضی (پژوهشگر) از طریق شماره تلفن XXXXXX (در ایران) و شماره XXXXXX (در کانادا) و یا از طریق آدرسهای ایمیل زیر ارتباط برقرار کنید.

یک کپی از اطلاعات و فرم امضاء شده رضایت نامه می بایست به مشارکت کننده در مصاحبه تحویل داده شود

Consent form for heads of families (in Farsi)

موافقت نامه سرپرست های خانوارهای آسیب دیده

عنوان رساله دکتری: نقش برنامه های بازسازی مسکن پس از سوانح در ارتقاء تاب آوری جامعه و کاهش آسیب پذیری آن در مقابل سوانح طبیعی. مورد مطالعه: بازسازی شهر بم در ایران پس از زلزله دیماه 1382

پژوهشگر: محمود فیاضی، دانشجوی دکتری، دانشکده طراحی محیط زیست، دانشگاه مونترال، کشور کانادا

استاد راهنمای پژوهش: دکتر گونزالو لیزارالده، دانشیار دانشکده معماری، دانشکده طراحی محیط زیست، دانشگاه مونترال، کشور کانادا

1) اطلاعات برای شرکت کنندگان در این پژوهش

13. اهداف پژوهش

این پژوهش بدنبال آن است تا مشخص کند که چگونه بازسازی مسکن پس از سانحه با احترام به الزامات اجتماعی، اقتصادی، فرهنگی و محیطی یک جامعه می تواند شرایط زیست ایمن و مطلوبی را فراهم کند. این پژوهش می‌خواهد الزامات و اصول لازم برای طراحی یک برنامه کارآمد بازسازی مسکن پس از سوانح را ارائه نماید. به علاوه، این پروژه قصد دارد تا برخی از ابهامات پیرامون مفهوم واژگان همچون تاب آوری و آسیب پذیری و ارتباط انها با یکدیگر را مشخص کند.

14. مشارکت کنند گان در این پژوهش

مشارکت در این پژوهش به معنای انجام یک مصاحبه (از طریق تلفن، ویدیو کنفرانس، و یا از طریق ملاقات شخصی) در زمان و مکانی است که شما انتخاب می‌کنید. این مصاحبه بر اساس تجربه شخصی شما در بازسازی مسکن پس از سانحه بم پس از زلزله دیماه 1382 صورت می‌پذیرد. مصاحبه حدوداً یک ساعت و نیم بطول خواهد انجامید. در صورت لزوم، احتمالا یک پرسشنامه بی نام و به صورت تصادفی نیز برای تکمیل در اختیار تان اطلاعات قرار خواهد گرفت. این مصاحبه فقط در صورت موافقت شما صورت خواهد پذیرفت.

15. رعایت اصل محرمانه بودن اطلاعات

اطلاعات شما کاملا محرمانه باقی خواهد ماند. متن مصاحبه نوشته خواهد شد و پس از آن نوار ضبط شده پاک خواهد گردید. هر شخص مشارکت کننده در این پژوهش به یک عدد ارتباط داده خواهد شد و تنها پژوهشگر و افراد کلیدی در این پژوهش به لیست افراد مشارکت کننده و اعداد تعلق یافته بدانها دسترسی خواهند داشت. هیچ اطلاعاتی مبنی بر معرفی شما به عنوان یک شخص حقیقی ارائه نخواهد گردید. اسناد گرداوری شده، درگیری های شخصی (نزاع و تنش بین افراد) را که در طول این پروژه رخ داده است را دربر نخواهند گرفت. این مصاحبه ها هرگز به جمع آوری اطلاعات شخصی و خصوصی افراد مبادرت نخواهد ورزید. اطلاعات مورد نظر صرفا در خصوص درک مراحل مختلف بازسازی مسکن شهر بم، مشارکت مردم در روند تصمیم گیری و اجرا، و نقش سازمانهای درگیر در این پروژه می باشد. اطلاعات حاصل از این مصاحبه ها به مدت هفت سال پس از پایان پژوهش در دفتر گروه پژوهشی" *ایف- IF*" در شهر مونترال در کشور کانادا نگهداری خواهند گردید. پس از آن، تنها اطلاعاتی که در برگیرنده اطلاعات شما نمی باشند نگهداری می شوند.

به علاوه، به منظور معرفی و مطالعه چگونگی روند بازسازی مسکن پس از سانحه تعدادی تصویر از مسکن بازسازی شده شما گرفته خواهد شد که ممکن است به دلیل مشخصات ظاهری ویژه آن به افشاء هویت شما منجر گردد.

16. مزایا و معایب

شما با مشارکت در این پژوهش به ارتقاء دانش مرتبط با سوانح و بازسازی پس آن کمک خواهید نمود. مشارکت شما در این پژوهش این فرصت را برای درک بهتر مسائل و بهبود عملکرد شما در برابر سوانح آتی فراهم خواهد نمود. مشارکت در این پژوهش تنها ممکن است به افشاء شدن هویت شما از طریق عکسهای گرفته شده از منزل بازسازی شده شما گردد.

17. **حق بازپسگیری**

مشارکت شما کاملا داوطلبانه است. شما خواهید توانست در هر زمان ممکن و به ساده ترین روش و بدون نیاز به هیچگونه توجیح از مشارکت خود در این پژوهش انصراف دهید. در صورتیکه شما تصمیم به بازپسگیری مشارکت خود نمودید، می توانید از طریق شماره تلفن و آدرس ایمیل ارائه شده در انتهای این فرم انصراف خود را اطلاع دهید. به محض انصراف شما، تمامی اطلاعات گردآوری شده از مشارکت شما پاک خواهد شد.

18. خسارت

مشارکت کنند گان هیچگونه خسارتی متحمل نخواهند شد.

19. انتشار نتایج

نسخه چاپی و دیجیتال رساله دکتری به کتابخانه دانشگاه مونترال تحویل داده خواهد شد و مقالات حاصل از این رساله نیز در مجلات معتبر قابل دسترسی و استفاده خواهند بود. در صورت تمایل می توانید اطلاعات پستی خود را در زیر وارد نمائید تا خلاصه ای از یافته های این پژوهش به زبان فارسی برای شما ارسال گردد.

☐ از طریق ایمیل : ----------

☐ از طریق پست : ----------

2) **موافقت**

تائید می‌کنم که اطلاعات فوق را مطالعه کرده ام، پاسخ سوالات را در مورد مشارکت در این پژوهش دریافت کردم و اهداف، طبیعت، منافع، مخاطرات و مزایای این پژوهش را متوجه شدم.

پس از تفکر و تعلق، بنده آزادانه به مشارکت در این پژوهش رضایت می دهم. من همچنین از این حق خود آگاهی دارم که می‌توانم در هر زمان ممکن و بودن نیاز به توجیح، از مشارکت خود در این پژوهش انصراف دهم.

	بله	خیر
- من موافق میکنم تا تصاویر تهیه شده از چگونگی بازسازی مسکن بنده در پژوهش مورد استفاده قرار گرفته و منتشر شود	☐	☐
– من به ضبط صوتی و تصویری این مصاحبه رضایت می دهم	☐	☐

تاریخ --------- امضاء ----------

نام و نام خانوادگی ----------

من اعلام می کنم که اهداف، منافع، خطرات، و منافع و معایب این پژوهش را با استفاده از حداکثر دانش خود برای مصاحبه شونده توضیح داده ام.

تاریخ امضاء پژوهشگر

نام نام خانوادگی

برای سوالات مرتبط و اعلام انصراف خود از مشارکت در این پژوهش، شما می توانید با محمود فیاضی (پژوهشگر) از طریق شماره تلفن XXXXX (در ایران) و شماره XXXXXXX (در کانادا) و یا از طریق آدرسهای ایمیل زیر ارتباط برقرار کنید.

یک کپی از اطلاعات و فرم امضاء شده رضایت نامه می بایست به مشارکت کننده در مصاحبه تحویل داده شود

ANNEX IV

Université de Montréal

Comité plurifacultaire d'éthique de la recherche

16 septembre 2015

Monsieur Mahmood Fayazi
Candidat au doctorat
Architecture et paysage - Faculté d'aménagement

OBJET: Approbation éthique (renouvellement)

M. Mahmood Fayazi,

Le *Comité plurifacultaire d'éthique de la recherche (CPER)* a étudié votre demande de renouvellement pour le projet de recherche intitulé « Le rôle des programmes de reconstruction de logements après une catastrophe dans l'amélioration de la résilience des communautés et la réduction de la vulnérabilité – Le cas de Bam en Iran, après le séisme de 2003. » et a délivré le certificat d'éthique demandé suite à la satisfaction des exigences qui prévalent. Vous trouverez ci-joint une copie numérisée de votre certificat; copie également envoyée à votre directeur/directrice de recherche et à la technicienne en gestion de dossiers étudiants (TGDE) de votre département.

Notez qu'il y apparaît une mention relative à un suivi annuel et que le certificat comporte une date de fin de validité. En effet, afin de répondre aux exigences éthiques en vigueur au Canada et à l'Université de Montréal, nous devons exercer un suivi annuel auprès des chercheurs et étudiants-chercheurs.

De manière à rendre ce processus le plus simple possible et afin d'en tirer pour tous le plus grand profit, nous avons élaboré un court questionnaire qui vous permettra à la fois de satisfaire aux exigences du suivi et de nous faire part de vos commentaires et de vos besoins en matière d'éthique en cours de recherche. Ce questionnaire de suivi devra être rempli annuellement jusqu'à la fin du projet et pourra nous être retourné par courriel. La validité de l'approbation éthique est conditionnelle à ce suivi. Sur réception du dernier rapport de suivi en fin de projet, votre dossier sera clos.

Il est entendu que cela ne modifie en rien l'obligation pour le chercheur, tel qu'indiqué sur le certificat d'éthique, de signaler au CPER tout incident grave dès qu'il survient ou de lui faire part de tout changement anticipé au protocole de recherche.

Comité plurifacultaire en éthique de la recherche (CPER)
Université de Montréal
TP/OS/os
c.c. Gestion des certificats, BRDV, Gonzalo Lizzaralde, Professeur adjoint, Aménagement, Faculté d'aménagement, , , Simone Zriel
p.j. Certificat CPER-14-082-P(1)

Université de Montréal

Comité plurifacultaire d'éthique de la recherche

N° de certificat
CPER-14-082-P(1)

CERTIFICAT D'APPROBATION ÉTHIQUE

- 1er renouvellement -

Le Comité plurifacultaire d'éthique de la recherche (CPER), selon les procédures en vigueur et en vertu des documents relatifs au suivi qui lui a été fournis conclu qu'il respecte les règles d'éthique énoncées dans la Politique sur la recherche avec des êtres humains *de l'Université de Montréal*

Projet	
Titre du projet	**Le rôle des programmes de reconstruction de logements après une catastrophe dans l'amélioration de la résilience des communautés et la réduction de la vulnérabilité – Le cas de Bam en Iran, après le séisme de 2003.**
Étudiant requérant	**Mahmood Fayazi** Candidat au doctorat, Architecture et paysage - Faculté d'aménagement
Sous la direction de	Gonzalo Lizzaralde, Professeur adjoint, Aménagement, Faculté d'aménagement, Université de Montréal
Financement	
Organisme	Non financé
Programme	--
Titre de l'octroi si différent	--
Numéro d'octroi	--
Chercheur principal	--
No de compte	--

MODALITÉS D'APPLICATION

Tout changement anticipé au protocole de recherche doit être communiqué au CPER qui en évaluera l'impact au chapitre de l'éthique. Toute interruption prématurée du projet ou tout incident grave doit être immédiatement signalé au CPER.

Selon les règles universitaires en vigueur, un suivi annuel est minimalement exigé pour maintenir la validité de la présente approbation éthique, et ce, jusqu'à la fin du projet. Le questionnaire de suivi est disponible sur la page web du CPER.

Olivier St-Laurent, Conseiller en éthique de la recherche
Comité plurifacultaire d'éthique de la recherche
Université de Montréal

16 septembre 2015
Date de délivrance du renouvellement ou de la réémission*

1er octobre 2016
Date du prochain suivi

30 juillet 2014
Date du certificat initial

1er octobre 2016
Date de fin de validité

*Le présent renouvellement est en continuité avec le précédent certificat