Socio-cultural characteristics and policies vis-à-vis seismic risk reduction throught post-quake rural reconstruction : a case study of Azad Jammu and Kashmir, Pakistan

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Socio-cultural characteristics and policies vis-à-vis seismic risk reduction through post-quake rural reconstruction : *A case study of Azad Jammu and Kashmir, Pakistan*

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Socio-cultural characteristics and policies vis-à-vis seismic risk reduction through post-quake rural reconstruction :

A case study of Azad Jammu and Kashmir, Pakistan.

Dedication

.....We do not make use of what we know and do not discover what we do not know. We do not fear disaster till it befalls ....[Ab-al Hasan, 601-661]

Dedicated to all those who make sincere efforts to reduce disasters.

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Abstract

This thesis is aimed at exploring the relation of socio-cultural characteristics and policies with post-quake reconstruction of rural areas of Azad Jammu & Kashmir, Pakistan. The primary concern of the study is limited to examine the traditional architectural practice ; dhajji-dewari and social composition of the community during and after reconstruction. It is analyzed that how the socio-cultural aspects of rural communities are affected by the policies, how policies are affected by the socio-cultural aspects of the community and how both of these can influence the final product.

The thesis was rooted in the fact that 80% of the 600,000 damaged/destroyed buildings during 8th October, 2005 Kashmir earthquake were rural temporary (Katcha) houses. It was hence to be investigated that how far the Rural Housing Reconstruction Program (RHRP) has reduced (or increased) the vulnerability of the area for future. The impact of any policy launched during this program was not limited to few housing units rather more than 0.1 million dhajji houses could be affected through this. The rural Kashmir reconstruction was commenced with the in-hand knowledge of several previous post-quake reconstruction programs and was appreciated widely by experts. It was yet to be explored that which mistakes were committed/repeated by the stakeholders during policy making, delivery, implementation and post implementation phases.

Covering the phases of policy making, delivery and implementation, the major findings of the thesis are categorized into three sections ; the sustainability generating aspects of reconstruction, vulnerability enhancing dimensions of reconstruction, and, those outcomes of reconstruction which are not yet categorized under ”sustainability” or ”vulnerability” by the experts focusing particularly rural Kashmir. Community satisfaction is given primary focus to rate different outcomes.

The study concludes that ignoring socio-cultural aspects of the community during reconstruction may lead to vulnerability in post-reconstruction scenario. Considering the post implementation phase, the current trends are observed by examining under-construction houses. By pictorially presenting the architectural details of these houses it is examined that deviations from guidelines are in practice. People start forgetting the disaster impacts after few years and their immediate needs drive their decision priorities. It is suggested that after reconstruction program ends up, some authorities must be present in the reconstructed area to guide people for their current requirements and future needs and also to control the spread of non compliant construction.

CHAPTER

1 Introduction

THIS thesis explores the relation of post quake rural reconstruction of Kashmir with socio-cultural characteristics and policies. The focus of the study remains particularly upon seismic resistant architecture and the social fabric of rural Azad Jammu & Kashmir (also called Pakistan Administered Kashmir, PAK). It is also analyzed that coexistence of sustainability and vulnerability ultimately determines the level of resilience in a society. The study investigates the reasons of possible shifts from the culture of safety.

In this chapter, the core issue which is targeted through the thesis is briefly discussed. The research questions succinctly introduce research aims and objectives. The social, scientific and academic significance of this study is expressed briefly. Following the chapter outline, research process is delineated in the last section of this chapter.

1.1 Problem statement

Earthquake is unavoidable natural hazard which becomes a disaster when not handled appropriately. Earthquakes caused the deadliest disasters in the past decade as 60 % of the people killed by disasters died because of them [CRED, 2010]. Though seismology and earthquake engineering had taken roots in late 19th century and disaster management had been a growing public concern throughout the 20th century, a decrease in building destruction and resultant mortality was expected during the 21st century. However the reality is contrary to this expectation which identifies the complexity of seismic risk reduction.

The damage and destruction caused by earthquakes is the confirmation of existing vulnerability in any affected community. Besides several other possibilities, post quake reconstruction provides a good opportunity for reducing its vulnerability and enhancing resilience for future disasters. However if reconstruction does not generate sustainable development, sometimes post quake situation becomes worse than pre quake scenario. Research conducted on different reconstruction programs shows that wherever community is not involved into reconstruction, people reject policies (see for example : [Arslan and Unlu, 2006] ; [Jigyasu, 2002b] ; [Barenstein, 2006]). Similarly relocation had adverse effects on the livelihood and living conditions of people in India after Gujarat earthquake and in Sri Lanka after Indian Ocean Tsunami (see for example : [Jigyasu, 2002a] ; [Fernando, 2010]). NGO/Contractor based reconstructed houses remained barren in India (See for example : [Barenstein and Iyengar, 2009]) or people showed lesser interest in them (See for example : [Arslan and Unlu, 2006]). The gradual improvement in reconstruction approaches resulted into Owner Driven Reconstruction (ODR) however it also had destructive effects when applied without technical assistance and inspection (See for example : [UNHABITAT, 2010a]).

The region where Pakistan is located has a long history of earthquakes but it was not till 8th October 2005 earthquake that seismic risk was taken as a threat for the country. This event caused 83,000 deaths which was the highest death toll since the existence of Pakistan ([EERI, 2006]). 80% damage/destruction of 600,000 buildings was of rural houses providing an indication of seismic vulnerability of rural communities ([EERI, 2006] ; [Reconstruction and Authority, 2007]). 314,474 rural houses which were destroyed only in Kashmir (SERRA Official Website) alarmed seismic experts about in practice construction techniques of the area.

Rural Housing Reconstruction Program (RHRP) launched by Earthquake Reconstruction & Rehabilitation Authority Pakistan (ERRA) to reconstruct rural areas of earthquake affected region was a descendant of several post quake reconstruction programs of the world. Research on these programs had already come up with numerous results showing positive aspects, mistakes and lessons learnt. Hence ERRA had a good database to take culturally compatible decisions for earthquake victims. Although ERRA approach towards rural reconstruction is considered good, its few inconsistent policies and negligence on some basic needs raised questions on sustainability of reconstruction. As RHRP was aimed to "build back better", vulnerability reduction was an expected outcome of reconstruction in rural areas of Kashmir.

Apart from authority's approach, a major factor which affects the vulnerability is culture. While authorities are responsible to deliver, culture of a community can keep practicing disaster resistant techniques in future. Cultural characteristics existed before earthquake and created after the event both can influence seismic vulnerability. If reconstruction strengthens the seismic resilient cultural characteristics and generates culture of protection without harming the identity of a community, it can commence sustainability.

The strong relationship of culture, policy and sustainability through reconstruction is difficult to examine but greatly influences seismic risk reduction.

1.2 Research objectives

One of the primary objectives of every reconstruction program is to make a community resilient for future disasters. Hence reducing vulnerability and enhancing capacity is essential part of these programs. However the extent of vulnerability in reconstructed houses for different disasters can not be measured immediately after the reconstruction program is over. Long term impacts of reconstruction become evident after few years of the termination of reconstruction programs. These impacts can be assessed by taking into consideration both the policies and cultural characteristics of the community.

ERRA showed a dislike for indigenous construction practices in its initial policy formulation. Reconstruction was allowed in RCC whereas timber based construction was considered poor in seismic resistance. It was only a combination of extremely slow progress in reconstruction and continuous feedback and lobbying from partners in the reconstruction such as UN-HABITAT that forced ERRA to accept, albeit reluctantly and one by one, other traditional construction systems as suitable for reconstruction. The shift in ERRA policies created chaos among people and resultant reconstructed houses showed several issues.

Another issue of policy was observed when ERRA disbursed guidelines for single storey house construction. Though ERRA did not prohibit second storey, it did not encourage it anyway. The absence of guideline material on vertical expansion compelled people to deviate from the prescribed rules. ERRA initial policy document included the inspection of roofs but this policy was not implemented. This phenomenon produced strong effects on reconstructed houses and a culture of novel roof was prevailed. Although the above discussed policy matters expressed their effects during reconstruction phase (2006-2010), long term impacts are yet to be identified. Present research is focused upon examining the effects of policy on social and built fabric of Kashmir. Simultaneously this study will also analyze the influence of culture upon policy. The evaluation of relation of both policy and culture will determine the broader picture of rural community resilience for disasters. Hence the main objective of research is :

to explore the effects of reconstruction policies and socio-cultural characteristics upon each other consequently influencing different types of vulnerability.

This main objective is linked with other objectives as :

1. to analyze the strengths produced by ERRA in rural communities through reconstruction.
2. to highlight major shifts in the architecture through reconstruction ; either due to authorities or owing to community.
3. to identify the socio-cultural characteristics of the community which are linked with reconstruction

4. to determine the vulnerability of reconstructed houses due to the absence of guidelines.

5. to determine the vulnerability of reconstructed/under-construction houses after the reconstruction programs

1.3 Research question

In order to fulfil the overall research objectives of assessing reconstruction and finding out the weak points leading to vulnerability, following research questions are concentrated upon in the thesis : The main research question is :

Which factors have influenced the vulnerability of rural communities of Azad Jammu & Kashmir during/after reconstruction?

To answer to this question, few additional questions are also addressed :

1. Which socio-cultural characteristics have influenced the reconstruction policies of AJK?

2. Which socio-cultural characteristics have been affected through reconstruction policies?

3. Which socio-cultural characteristics are strengthened by reconstruction policies?

4. Which factors can force the society to deviate from prescribed safe construction rules?

5. How social vulnerability will lead to seismic vulnerability?

6. Is post-quake AJK reconstruction a step towards sustainable development?

1.4 Research hypothesis

Research questions in relationship with literature review lead towards few hypotheses :

1. Strong and resilient cultural roots can change the policies.

2. Community would have found its own way of fulfilling its needs in the absence of culturally compatible policies.

3. Not only disaster but policies can also affect the cultural stability of a society.

4. Reconstruction program can enhance, though it is aimed to reduce, social, economic, physical and environmental vulnerability.

5. Community satisfaction on reconstruction is essential for sustainable development.

1.5 Significance of research thesis

The current study is significant for authorities, scientific community, and for society itself.

1.5.1 Significance for authorities

It is observed in many cases that while immediate outcomes of reconstruction are concentrated upon, less attention is paid on its long term impacts. This research on one hand confirms the sustainable solutions provided by the authorities and on other hand raises questions on the architectural and social future of earthquake hit area. The exploration of strong interdependence of culture, policy and architecture in the reconstructed areas provides rich information for the policy makers, donors, implementers and other authorities.

Revisiting the reconstruction programs has enabled to identify the repetition of mistakes.

1.5.2 Academic significance

In the region of Pakistan the link between research and development is somewhat weak. The researches conducted especially in the field of socio-cultural field are rarely being utilized by the implementing agencies due to the fact of non practical approach of researchers. The present thesis is contrary to these conventional studies. It opens up the doors for future scholars to generate results which can be helpful in cultural friendly policy making. As the outcomes of this study can be applied in the field during future reconstruction programs, the trend of development-based investigative study will be generated through current thesis.

1.5.3 Social significance

There is no direct social significance of this thesis. It is however assessed that its indirect influence will shape the society greatly. If the results of the research are taken as a reference by the authorities during policy making and implementation, society will become more resilient against disasters. It is observed that physical strength of the society is more stressed upon but cultural and social strengths are ignored. This study proposes that how engineered and tailored solutions must be translated into cultural language.

1.6 Chapter outline and sketch of research progress

This dissertation consists of eight chapters including introductory and concluding sections. Chapter 1 is about introduction of the study and states the focal problem which is targeted through research questions and hypotheses. Significance of the study for different fields is also mentioned here.

To address the research questions, chapter 2 provides theoretical approaches present in existing literature for risk reduction through reconstruction. The conceptual framework encompassing the vulnerability, sustainability and socio-cultural characteristics are also presented. The reconstruction programs of Turkey, India and Iran since 1999 to 2005 are reviewed to have a better understanding.

Chapter 3 presents the methods implied to conduct research. The whole period of study was divided into five phases. The sub sets of these phases provide the gradual progress in the research approach. Qualitative and quantitative nature of the study is amalgamated through triangulation method. The issues faced during field work are also discussed.

To provide the background of the 2005 earthquake event of Pakistan, chapter 4 reveals the seismic history of the region. It also describes the extent of destruction during Kashmir earthquake. The consecutive reconstruction program launched by the government is introduced along with details of agencies involved in reconstruction. This chapter explains the structure and objectives of Rural Housing Reconstruction Program by ERRA. A brief introduction of the surveyed areas is also provided. Chapters 5, 6 and 7 are extensively based on research results of this study. Here the effects of policy and socio-cultural characteristics on reconstruction are discussed in depth. Community responses upon different dimensions of reconstruction are widely focused upon. This way the issues faced by the people even through the ”sustainability generating factors” are mentioned which identifies the leakage.

Chapter 5 is dedicated to the policies of ERRA which have played a pivotal role in sustainability of reconstruction. The claims of ERRA regarding reconstruction approach are proven justified through field surveys of Kashmir. Two aspects which are targeted here are a) Indigenous construction practice ; dhajji dewari and b) Owner Driven Reconstruction (ODR). Both of these aspects are considered to be good for the society. However the related issues of these approaches are brought forward through this research to mitigate them in future.

The novel elements resulting from reconstruction are named as vogue/vague in chapter 6. This is because time is needed to define whether these changes are profitable for the sustainable society or not. However by elaborating merits and demerits of these aspects, the current study provides benchmark to name them “sustainable” or “vulnerable”. Tower Roof is the novelty in architectural practices of rural Kashmir. Its details are provided with several aspects. The second outcome is the shifting of family structure from Extended to Nuclear. It is described with reference to community discussions that this shift is differently welcomed by different age groups of the society. The reasons and outcomes of family system transformation are explained in this section. Besides good policy aspects and the time required results regarding sustainability, there are few matters which are purely threatening for the society. Chapter 7 examines these matters with reference to field surveys. Five aspects discussed here are a) Absence of guidelines for thermal insulation in houses b) Absence of guidelines for basic spaces in houses c) Absence of maintenance rules d) The vulnerable families and e) Deviations of community from guidelines. It is argued that all these issues can enhance the vulnerability of the society.

Chapter 8 concludes the research findings. 14 under-construction houses are discussed in relation to guidelines provided by authorities. These houses present the trend of construction in rural Kashmir so long term impacts can be deduced. The chapter provides suggestions for policy and implementation to reduce vulnerability in future. Future research prospects encompassing the relation of reconstruction policies and culture are presented in the end.

The overall research progress is shown in figure 1.1.

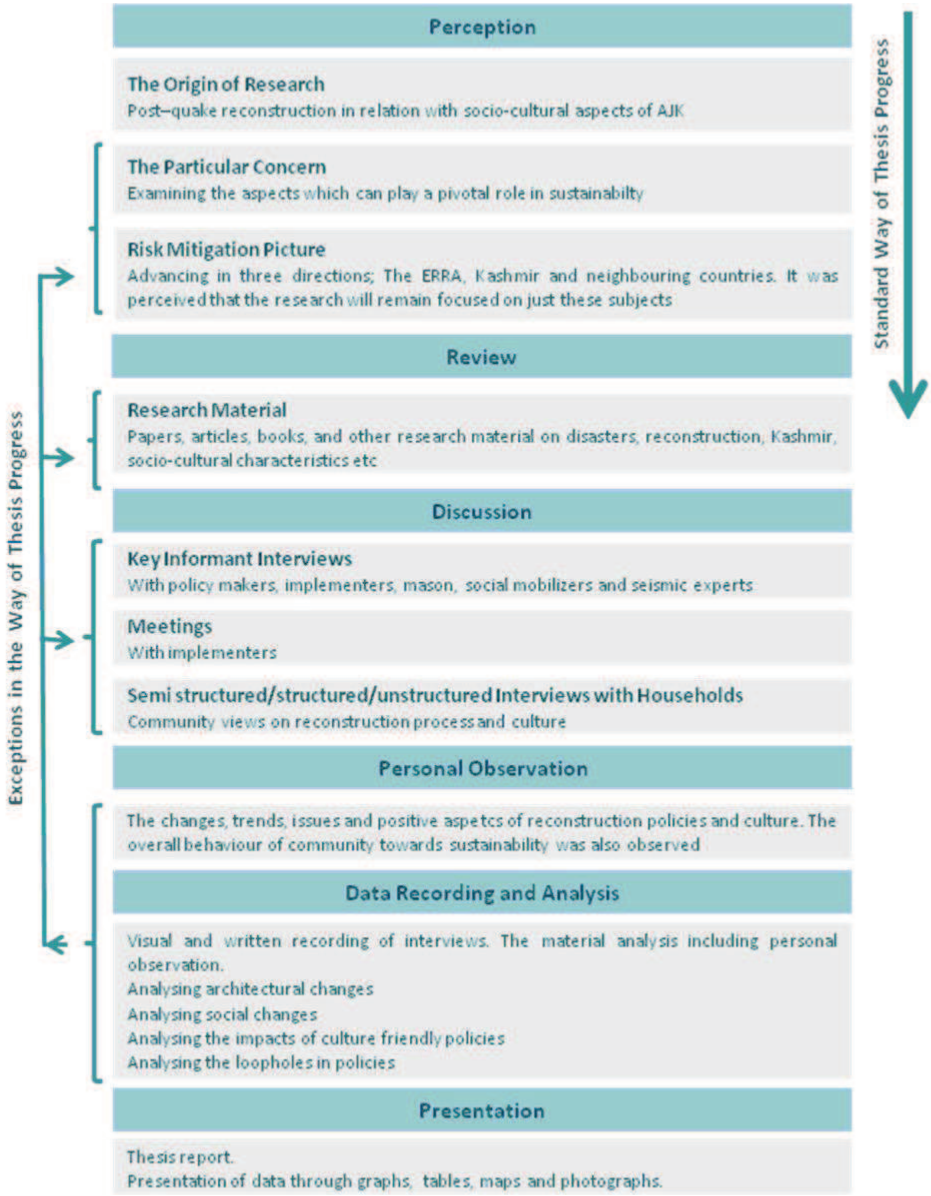


Figure 1.1 — Research Progress

CHAPTER 2 Risk reduction through reconstruction

RISK is a generic term used in several areas of life e.g., economy, health, information technology, psychology and disasters. However this thesis is focusing on just single field of risk named ”seismic risk” under the umbrella of ”disaster risk”. Disasters can be ”nature induced” or ”human induced” or a combination of both. These are the events which cause serious disruption, leading to widespread human, material or economic losses beyond the coping capacity of a given society ([Mulugeta *et al.*, 2007]). With growing knowledge and skills disasters were expected to be reduced however an opposite trend is observed (also see [BBC, 2009] ; [Kulatunga, 2010]).

It is observed in many cases that communities do not pay necessary attention to reduce disaster risk in ”peace time”. It is only in the aftermath of disasters that they start rating this risk among primary threats to their existence. In such cases the reconstruction process provides a good opportunity to produce resilience in the population against future disasters. The research emphasizes that such reconstruction programs should not only focus on just ”build back” but ”build back better” or ”build back safer” ([Associates, 2005] ; [ERRA, 2006]).

The reconstruction programs encompassing the theme of ”build back better” have shown major paradigm shifts from previous programs. Recent studies conclude that including communities in the reconstruction process and respecting their culture can result into acceptance of reconstruction process (including policies and implementation) to great extent ([Jigyasu, 2002b] ; [Duyne Barenstein, 2006] ; [Baumwoll, 2008] ; [Leersum, 2009] ; [Fernando, 2010] ; [Kulatunga, 2010] ; [ANH, 2012] ; [Anh *et al.*, 2013]). However the same time it is explored that less attention is paid on the sociocultural side of the communities during post-event reconstruction ([Jigyasu, 2002a] ; [Boen, 2005] ; [Jigyasu, 2010] ; [Barenstein, 2006] ; [Mercer *et al.*, 2012] ; [Maferetlhane, 2013])

This chapter provides the core terms used in the debate of disaster risk reduction (DRR) and post-event reconstruction which will set the resultant way to be followed by this thesis. First an introduction to the risk of hazards and its components ; hazard, exposure and vulnerability etc will be provided. . The successive section will be focused on reconstruction leading to sustainable development. It will then be discussed that how sociocultural characteristics of a particular community can be related to the post-quake reconstruction. Finally, a review of post-quake reconstruction programs of Turkey, India and Iran in relation to the formerly discussed sociocultural aspects will be presented. The lessons learnt after these programs will be taken as a beacon in this thesis for analyzing post-quake rural reconstruction of AJK.

2.1 Risk

To understand the field of DRR it is essential to first comprehend the meanings of ”risk”. In different dictionaries the ’risk’ is defined as ”a situation involving exposure to danger” (Oxford Dictionary) or ”possibility of loss or injury” (Merriam-Webster 2003) or ”the chance of something bad happening” (Cambridge Dictionary 2000). A generic definition of risk is ”the chance that someone or something that is valued will be adversely affected in a stipulated way by the hazard” ([HSE, 2001]).

However this is a complex phenomenon affected by several other aspects. Although, at times, hazard has been ascribed the same meaning as risk, currently it is widely accepted that it is a component of risk and not risk itself ([Cardona and Sinh, 2012]). Three elements are essential in the formulation of risk : a potential damaging event, phenomenon or human activity - hazard ; the existence of the community in the areas being affected by the hazards - exposure, and, the degree of susceptibility of the elements which experience the hazard -vulnerability ([UNDRO, 1979] ; [Dilley, 2005] ; [Birkmann, 2007] ; [Australia, 2012] ; [Porter, 2012]). Generally the risk is expressed in mathematical notation as :

$$Risk \;=\; Hazard \;\times\; Exposure \times\; Vulnerability \tag{2.1}$$

In this perspective vulnerability is mostly considered as an inherent feature of community, infrastructure, economic system and environment while the hazard is related to magnitude, duration, location, and timing of the event ([Villagrán, 2006]).

Talking about the relationship between risk, hazard and vulnerability frameworks presented in different studies, Juan Carlos Villagrán De León, ([Villagrán, 2006]) provides the mathematical expression of risk in different manners. One of which is :

$$Risk \;=\; Hazard\,\alpha\,Vulnerability \tag{2.2}$$

Where α represents the function that describes the combination between the hazard and the vulnerability. He further quotes that an example of such a function is the simple product, as proposed by [UNISDR, 2004] :

$$Risk \;=\; Hazard \;\times\; Vulnerability \tag{2.3}$$

Wisner has elaborated this formula through Pressure and Release (PAR) Model, as shown in figures 2.1 and 2.2 where he has presented the salient characteristics of the components of risk ([Wisner, 2004]). *This model was first introduced by Ian Davis in "Shelter after Disaster" in 1978 but was further refined in 1994 in Piers Blaikie, Terry Cannon, Ian Davis and Ben Wisner's book : 'At Risk, Peoples Vulnerability to Natural Disasters' ([Blaikie, 1994]). The model is descriptive rather than being an assessment tool. However an assessment methodology based on the concept of the model is being field tested in Eritrea and India in 2004 by Tearfund staff and their partner organisations ([Davis and Peppiatt, 2004]).* To present the "pressure" leading to risk Wisner has provided the root causes, dynamic pressures and unsafe conditions playing part in the progress of vulnerability on one hand while on the other hand he has considered the hazards as major component of risk. Both vulnerability and hazard are multiplied to achieve the level of risk in a society. For "release" the pressure, he has proposed the solutions through increasing safety in the society.

The function presented in equation 2 is expressed by UNDP ([UNDP, 2004]) in a different way :

$$Risk \ = \ Hazard \ + \ Vulnerability \tag{2.4}$$

Here the hazard is added in vulnerability to determine the risk level Villagrán quotes D. Alexander's (2000) definition of risk as *"the likelihood, or more formally the probability, that a particular level of loss will be sustained by a given series of elements as a result of a given level of hazard"*. Total risk would then consist of the sum of predictable casualties, damages and losses, represented via the equation :

$$TotalRisk = (\sum elements\ at\ risk) \times Hazard \times Vulnerability \tag{2.5}$$

Villagrán himself has defined the following relation for risk ([Villagrán, 2001]) :

$$Risk = Hazard \times Vulnerability \times Deficiencies\ in\ Preparedness \tag{2.6}$$

In this relation, deficiencies in preparedness refer to those pre-existing conditions which inhibit an institution, a community, a society, or a country to respond in an effective and opportune fashion once the event is triggering the disaster to minimize its impacts, in particular the loss of lives. Such deficiencies would include the lack of emergency committees

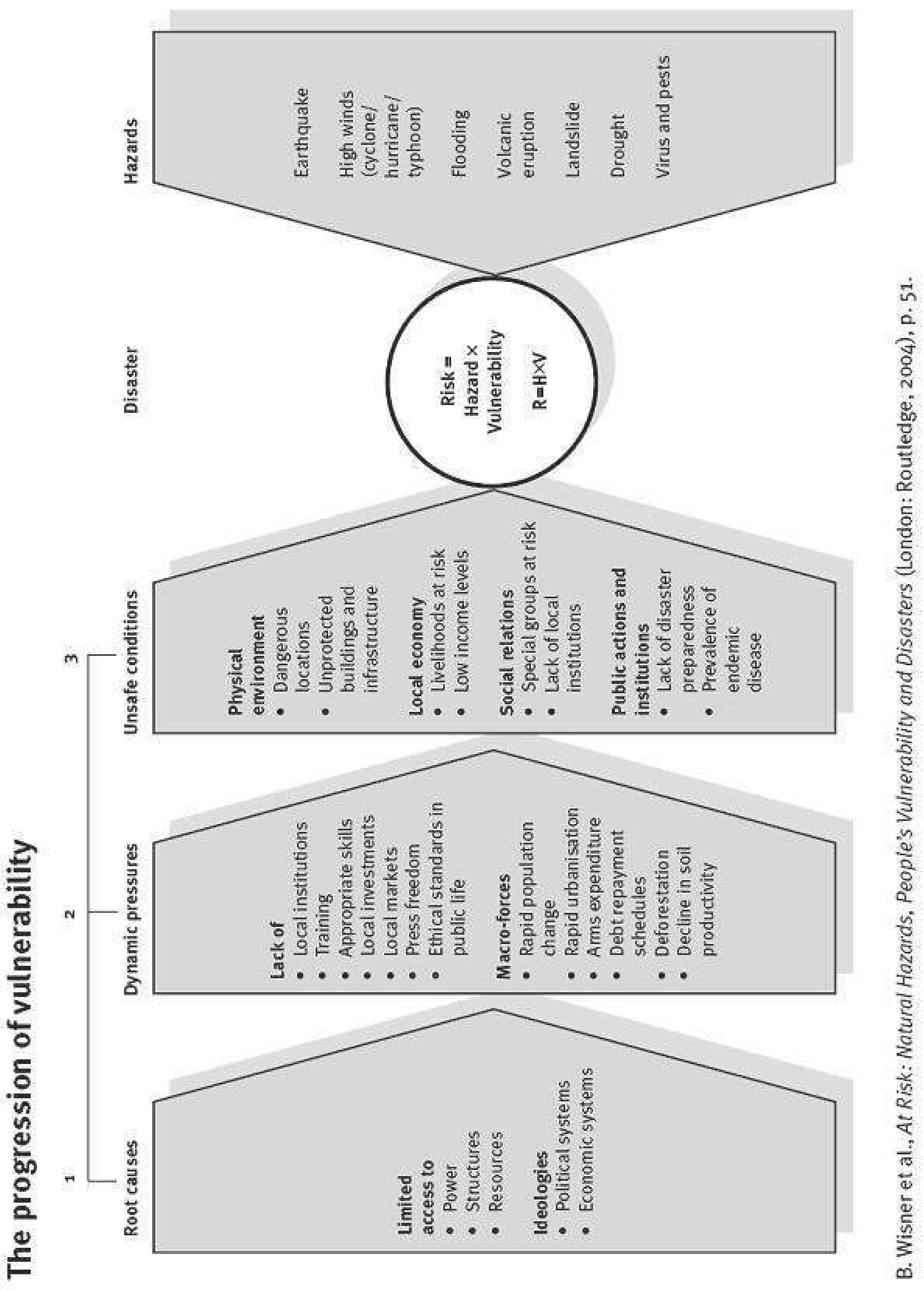


Figure 2.1 — Pressure and Release (PAR) model : The progression of vulnerability

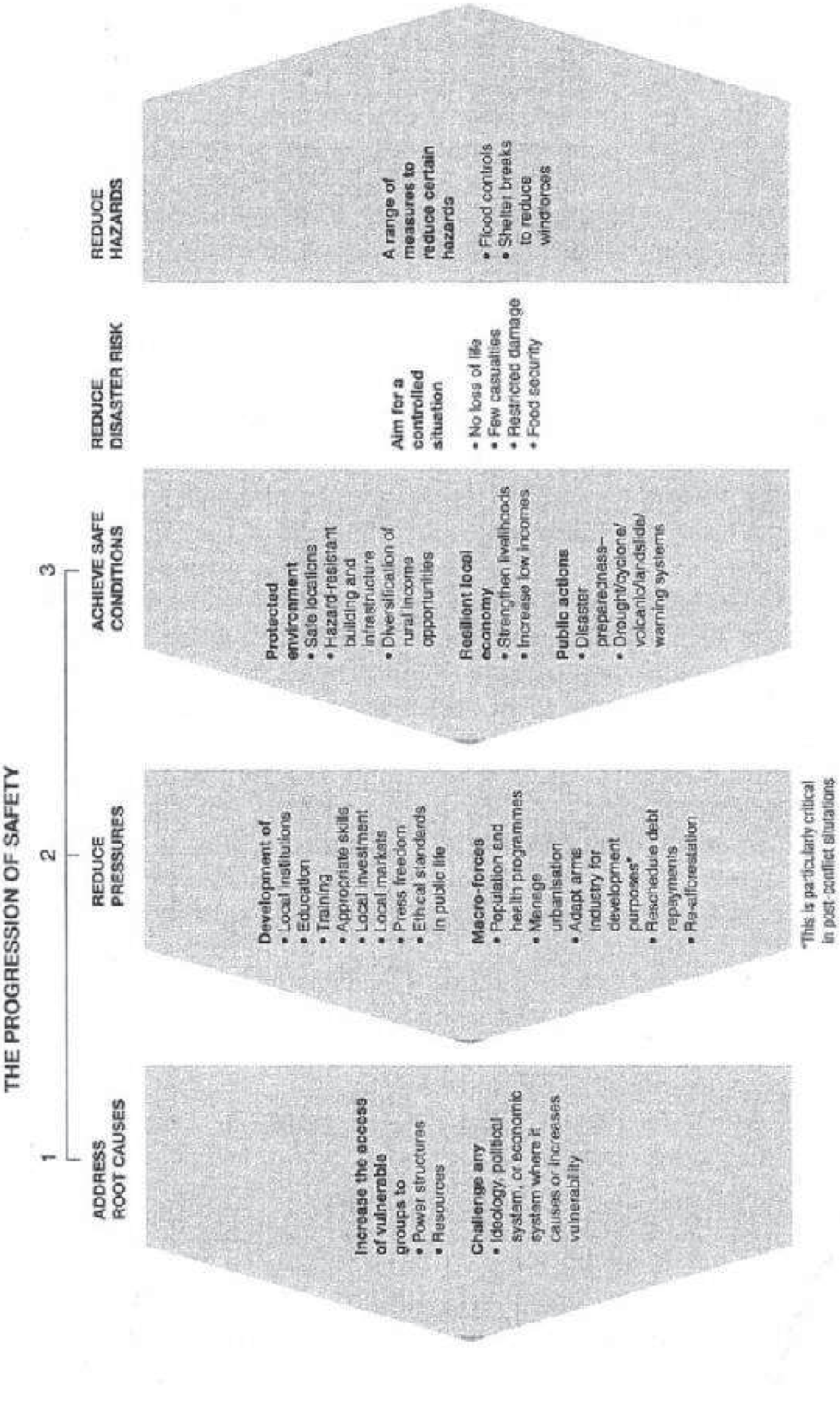


Figure 2.2 — Pressure and Release (PAR) model : The progression of vulnerability

and emergency plans, the lack of early warning systems, and related measures.([Villagrán, 2006]).

The above mentioned relations of risk with other aspects provide the augmenting trend. However experts have discussed few other components which can play a part as a risk reducing catalyst. Coping capacity and mitigation measures are two of them. Wisner ([Wisner, 2003] ; [Wisner and Uitto, 2009]) gives the relation of risk as :

$$Risk = [Hazard \times Vulnerability] - M \tag{2.7}$$

Where M represents the ability of government agencies, other groups and institutions, or households to prevent or mitigate, and prepare for, hazard events (M, as the shorthand for all these activities, is usually "mitigation").

Hahn ([Hahn and Villagran De Leon Ria Hidajat, 2003]) has developed a model in which risk is represented through the formula ([Villagrán, 2006]) :

$$Risk = Hazard + Exposure + Vulnerability - CopingCapacities \tag{2.8}$$

Villagrán says that another relation employed by many agencies is ([Villagrán, 2006]) :

$$Risk = \frac{Hazard \times Vulnerability}{Coping\ Capacities} \tag{2.9}$$

In this context, coping capacities refer to the means by which people or organisations use available resources and capacities to face adverse consequences related to a disaster. In general, such capacities involve management of resources before, during, and after the disaster. ([Villagrán, 2006])

Wisner ([Wisner and Uitto, 2009]) has provided another relation of risk as

$$Risk = \frac{Hazard \times Vulnerability - Mitigation}{Coping\ Capacities} \tag{2.10}$$

Although all these formulae generate a separate debate of "what should be" and "what should not be" the part of a society to avoid risk (and consequently avoid disasters), all of them have a common theme : how to measure the risk of hazard to overcome the fatal effects. Villagrán thinks that the risk is a dynamical process which increases as time elapses due to various social processes (figure 2.3). To summarize the above debate a definition of risk proposed by UNISDR is given here :

Figure 2.3 — Risk as a dynamical process, increasing as time elapses due to various social processes. Source : [Villagrán, 2006]

Risk should represent the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. ([UNISDR, 2004])

The different terms used in the expression of risk are discussed in following sub sections.

2.1.1 Hazard

Hazards are of many types including both natural and man made (figure 2.4). *Hazard is a potential threat to humans and their welfare. Hazards can be natural (such as earthquakes and droughts) or induced by human processes (such as industrial accidents). Some people use the term 'environmental hazards' as well* ([Twigg *et al.*, 2004]).

According to Kobler, *a hazard is a natural physical phenomenon which can lead to a loss of life or damage to objects, buildings and the environment. The hazard is measured and defined by its nature (type of hazard), location and extent, scope and intensity (damage potential) and its probability of occurrence, duration and frequency (repetition cycles). Examples : floods, earthquakes, droughts, landslides, etc.* ([et al]).

The United Nations had dedicated one decade (1990-1999) as UN International Decade for Natural Disaster Reduction (IDNDR) for promoting solutions to reduce risk from natural hazards. That decade ended with even more deaths from more disasters, involving greater economic losses and more human dislocation and suffering than when it began ([UNISDR, 2004]). This was an indication that the matter was not so easy to deal with. Natural hazards do (and will) occur as the planet we are living on is alive ([Miall, 2011]). Up till this discussion we should regard the hazards as ”constant” component of risk while other factors mentioned in section 2 ; exposure, vulnerability, coping capacity and mitigation, must be considered ”variables”. But these terms will be separately discussed for a better understanding that how seismic risk can be reduced.

2.1.2 Exposure

The exposure means elements at risk, an inventory of those people or artefacts that are exposed to a hazard. ([UNDP, 2004])

The economic value or the set of units related to each of the hazards for a given area. The exposed value is a function of the type of hazard. ([Network, 2006])

Theoretically natural hazards such as earthquakes, floods, drought, storms, tropical cyclones and hurricanes, wildfire, tsunami, volcanic eruptions and landslides can affect everyone but in practice, they tend to hurt the poor most of all. This is because the poor outnumber the rich and live in greater density in more poorly built housing on land most at risk. ([UNISDR, 2004])

Few experts consider the exposure and physical vulnerability as the same. As Brooks says, *”Exposure and the state of the environment within a system will be socially determined to a large extent. Exposure will depend on where populations choose to (or are forced to) live, and how they construct their settlements, communities and livelihoods.”* ([Brooks, 2003])

If we consider the ”exposure” as ”the presence of population on hazardous area”, we can conclude that this component of risk also behaves as ”constant”. The reason is that all the continents where population exists face the hazard threats (whether lesser or more). To shift the population from these areas to ”safer” areas is not at all possible solution to avoid risk. Here it can be concluded that the vulnerability, coping capacity and mitigation can determine

Hazard classification

HAZARD
A potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

NATURAL HAZARDS
Natural processes or phenomena occurring in the biosphere that may constitute a damaging event. Natural hazards can be classified according to their geological, hydrometeorological or biological origins.

ORIGIN	PHENOMENA / EXAMPLES
Hydrometeorological hazards Natural processes or phenomena of atmospheric, hydrological or oceanographic nature.	• Floods, debris and mudflows • Tropical cyclones, storm surges, wind, rain and other severe storms, blizzards, lightning • Drought, desertification, wildland fires, temperature extremes, sand or dust storms • Permafrost, snow avalanches
Geological hazards Natural earth processes or phenomena that include processes of endogenous origin or tectonic or exogenous origin, such as mass movements.	• Earthquakes, tsunamis • Volcanic activity and emissions • Mass movements, landslides, rockslides, liquefaction, sub-marine slides • Surface collapse, geological fault activity
Biological hazards Processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances.	• Outbreaks of epidemic diseases, plant or animal contagion and extensive infestations

TECHNOLOGICAL HAZARDS
Danger associated with technological or industrial accidents, infrastructure failures or certain human activities which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation, sometimes referred to as anthropogenic hazards. Examples include industrial pollution, nuclear release and radioactivity, toxic waste, dam failure, transport, industrial or technological accidents (explosions, fires, spills).

ENVIRONMENTAL DEGRADATION
Processes induced by human behaviour and activities (sometimes combined with natural hazards) that damage the natural resource base or adversely alter natural processes or ecosystems. Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards. Examples include land degradation, deforestation, desertification, wildland fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise and ozone depletion.

Figure 2.4 — Classification of hazards. Source : [UNISDR, 2004]

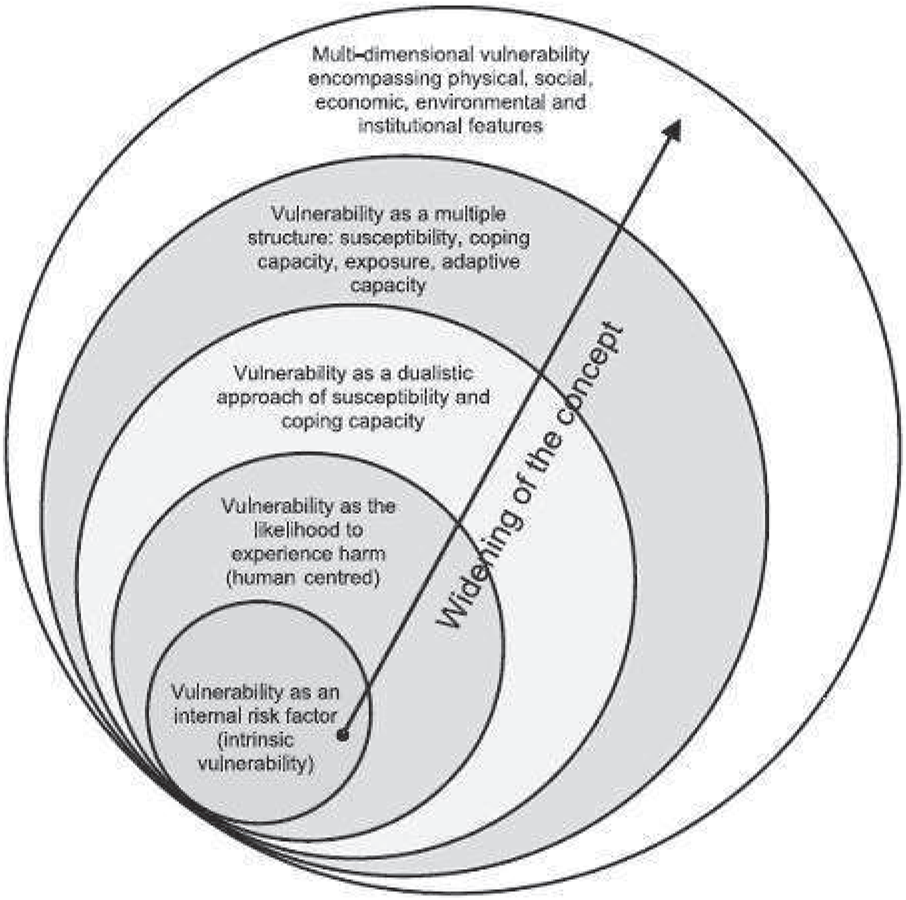


Figure 2.5 — Key spheres of the concept of vulnerability. Source : [Birkmann, 2005]

the measures to reduce risk in a given society.

2.1.3 Vulnerability

According to UNISDR, vulnerability is :

The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. ([UNISDR, 2004])

The United National Development Programme (UNDP) defines vulnerability as :

A human condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given *hazard.* ([UNDP, 2004])

Also :

Vulnerability refers to the inability of a person, a community or a social system to withstand the effects of a hostile environment. More specifically, the UNISDR defines vulnerability as 'the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.' ([UNISDR, 2009])

According to Birkmann ([Birkmann, 2006]), vulnerability is a concept that evolved out of the social sciences and was introduced as a response to the purely hazard-oriented perception of disaster risk in the 1970s (the statement was taken from Source : [Schneiderbauer and Ehrlich, 2004]). He has mentioned the widening of the concept of vulnerability through figure 2.5.

The United Nations considers that the starting point for reducing disaster risk and for promoting a culture of disaster resilience lies in the knowledge of the hazards. Similarly the knowledge of physical, social, economic and environmental vulnerabilities to disasters that most societies face is equally important. Moreover the ways in which hazards and vulnerabilities are changing in the short and long term, followed by action taken on the basis of that knowledge can set the benchmark for DRR ([Nations, 2005]).

By over viewing the key-terms of vulnerability and risk it is evident that the concept of vulnerability has achieved a high degree of recognition in different fields, such as disaster management, ecology, environmental studies and development studies. The concept is however still somewhat fuzzy and often used with differing connotations. In this context it might be misleading to try to establish a universal definition. Birkmann has provided an overview of the different spheres of the concept of vulnerability (2.5), without intending to be comprehensive.

Disaster Reduction Institute (DRI) in a report to the Department for International Development (DFID) of England has proposed the relation of vulnerability, exposure, susceptibility and coping capacity ([et al, 2005]). In this formulation, vulnerability itself is considered as a combination of other components as :

$$Risk = \frac{Exposure \times Susceptibility}{Coping\ Capacity} \tag{2.11}$$

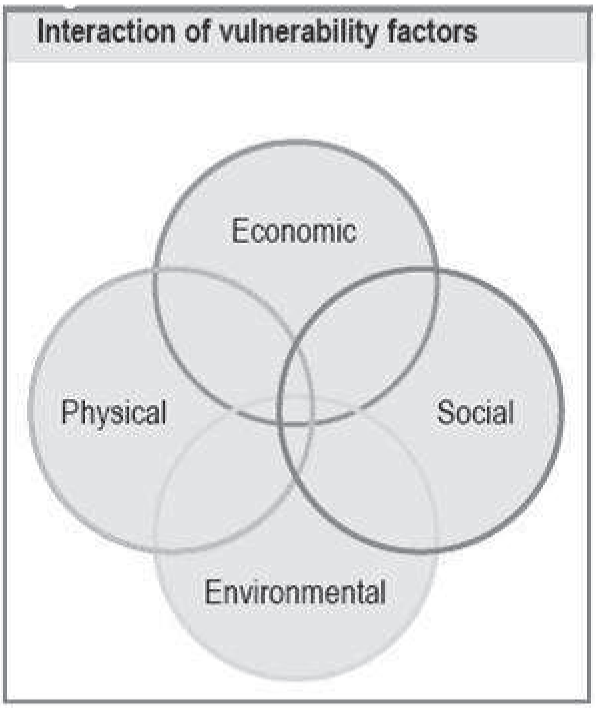


Figure 2.6 — The above figure illustrates the four broad areas in which different aspects of vulnerability can be grouped, depicted by intersecting circles to show that all spheres interact with each other. Source : [UNISDR, 2004]

It appears complicated in the literature that which terms are related to one another and how they pose an impact on each other. Vulnerability is subdivided into many factors however mainly four factors are discussed in the literature frequently (figure 2.6) ; physical, social, economic and environmental ([UNISDR, 2004] ; [Van Westen, 2009] ; [ODPM]).

2.1.3.1 Physical vulnerability

This factor of vulnerability becomes immediately evident in the aftermath of a hazard ; earthquake in particular. The destroyed built environment causing high death tolls and injuries is the indication of physical vulnerability of a community.

Van Westen defines it as : *"The degree of loss to a given element at risk or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude and expressed on a scale from 0 (no damage) to 1 (total damage)"*. ([Van Westen, 2009])

UNISDR defines the physical vulnerability as : *Vulnerability is analyzed per group of* *constructions (i.e. structural types) having similar damage performance ; It is an intrinsic quality of a structure and it does not depend on location. When a hazard hits any area, the structures which are physically less vulnerable, will cope with the impacts more* ([UNISDR, 2007]). It is obvious through many discussions that earthquakes don't kill people, (collapsed) buildings and their contents do ([USGS, 2013] ; [Reliefweb, 2013]). It can now be inferred that the seismic risk can be remarkably reduced if the buildings are constructed following the seismic resistant techniques.

2.1.3.2 Social vulnerability

Cannon considers vulnerability a major component of assessing risk ([Cannon, 2000]). What he explains about social vulnerability ([Cannon *et al.*, 2003]) :

It is especially important to recognize this social vulnerability as much more than the likelihood of buildings to collapse or infrastructure to be damaged. It is crucially about the characteristics of people, and the differential impacts on people of damage to physical structures. Social vulnerability is the complex set of characteristics that include a person's

- *Initial well-being (nutritional status, physical and mental health, morale) ;*
- *Livelihood and resilience (asset pattern and capitals, income and exchange options, qualifications) ;*
- *Self protection (the degree of protection afforded by capability and willingness to build safe home, use safe site) ;*
- *Social protection (form of hazard preparedness provided by society more generally, e.g. building codes, mitigation measures, shelters, preparedness) ;*
- *Social and political networks and institutions (social capital, but also role of institutional environment in setting good conditions for hazard precautions, people's rights to express needs and of access to preparedness).*

UNISDR defines social vulnerability as :

Social vulnerability is linked to the level of wellbeing of individuals, communities and society. It includes aspects related to levels of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity, positive traditional values, customs and ideological beliefs and overall collective organizational systems. ([UNISDR, 2004])

The same organization in 2013 defined social vulberability :

The vulnerability resulting from social relations, institutions and systems of cultural values is called social vulnerability. ([UNISDR, 2013])

It was expected through the actions taken by international organizations, especially by UN, that the reduction in physical vulnerability will be generated through a decrease in social vulnerability. However much resources are allocated to the immediate response to a disaster and less attention is paid on the assessment of risk and vulnerabilities. As discussed by UNISDR : *The Hyogo Framework for Action (HFA) offers a guidance framework for action, but its progress has been the weakest in the area of reducing social vulnerabilities ; though this domain lies under the primary concerns of this framework. The stronger focus has been on disaster response, such as search, rescue and providing humanitarian assistance in the aftermath of disasters, rather than on assessing and addressing the hazards, risks, and vulnerabilities ...... There is still a lot to be done before it can be said that the countries in the region are looking into the issues of social vulnerability in a systematic and comprehensive manner. Social vulnerability issues are excluded from many disaster management policies and plans in the region, and where they have been included, there is no clear understanding if there are mechanisms in place for their implementation. In most countries even the disaster response to the specific needs of groups such as women, children, the elderly and disabled, has been somewhat superficial.* ([UNISDR, 2013])

The discussion mentioned above provides a strong link of social vulnerability with that of physical vulnerability. The less a community is socially vulnerable, the less it will face physical vulnerability. Hence for DRR, it is a core strategy to reduce physical and social vulnerability simultaneously.

2.1.3.3 Economic vulnerability

Van Westen defines the economic vulnerability as : *"The potential impacts of hazards on economic assets and processes (i.e. business interruption, secondary effects such as increased poverty and job loss)."* Hence this is the vulnerability of different economic sectors ([Van Westen, 2009]).

The communities economically more vulnerable before a hazard suffer higher damages during the event. In consequence it becomes harder to lessen the impacts of hazards on such population even afterwards. However capacity building through reconstruction can target this factor of vulnerability too. The post-quake livelihood programs focusing on economic side of vulnerability can generate a better community than before ([Khan, 2009] ; [Fernando, 2010]).

2.1.3.4 Environmental vulnerability

Natural resource depletion and resource degradation are key aspects of environmental vulnerability ([ODPM]). The South Pacific Applied Geosciences Commission (SOPAC) identifies three aspects of environmental vulnerability ([GEO-3, 2002]) :

- Level of risks (or pressures) on the environment ;
- Resilience of the environment to pressures, or intrinsic vulnerability;
- Level of degradation of ecosystems, or extrinsic resilience

Environmental vulnerability can be defined as *"The potential impacts of events on the environment cause environmental vulnerability"* ([Van Westen, 2009]). With reference to post-quake reconstruction, environments must be protected by the authorities and communities. It is however observed that reconstruction programs pay less attention on environment vulnerability reduction ([UNHABITAT, 2012a]).

2.1.4 Coping capacity

In the field of social sciences, some major definitions of coping capacity are :

The ability of people, organizations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters. ([UNISDR, 2009])

The ability of a group or household to resist a hazard's harmful effects and to recover easily. ([Wisner, 2003])

The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. In general, this involves managing resources, both in normal times as well as during crises or adverse conditions. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards ([UNISDR, 2004]).

Coping capacity is considered as strength of a community to struggle against disasters. The formulae of risk mentioned in previous section only focus the terms of ”hazard”, ”vulnerability”, ”exposure” and ”coping capacity however the term ”resilience” is also frequently used in the field of risk.

2.1.5 Resilience

The social sciences provides some major definitions as :

Resilience is the flip side of vulnerability-a resilient system or population is not sensitive to climate variability and change and has the capacity to adapt. IPCC (2001) p. 89, when a social or ecological system loses resilience it becomes vulnerable to change that previously could be absorbed. ([Kasperson and Kasperson, 2001])

The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures ([UNISDR, 2004])

”The capacity of a system, community or society to resist or to change in order that it may obtain an acceptable level in functioning and structure. This is determined by the degree to which the social system is capable of organising itself, and the ability to increase

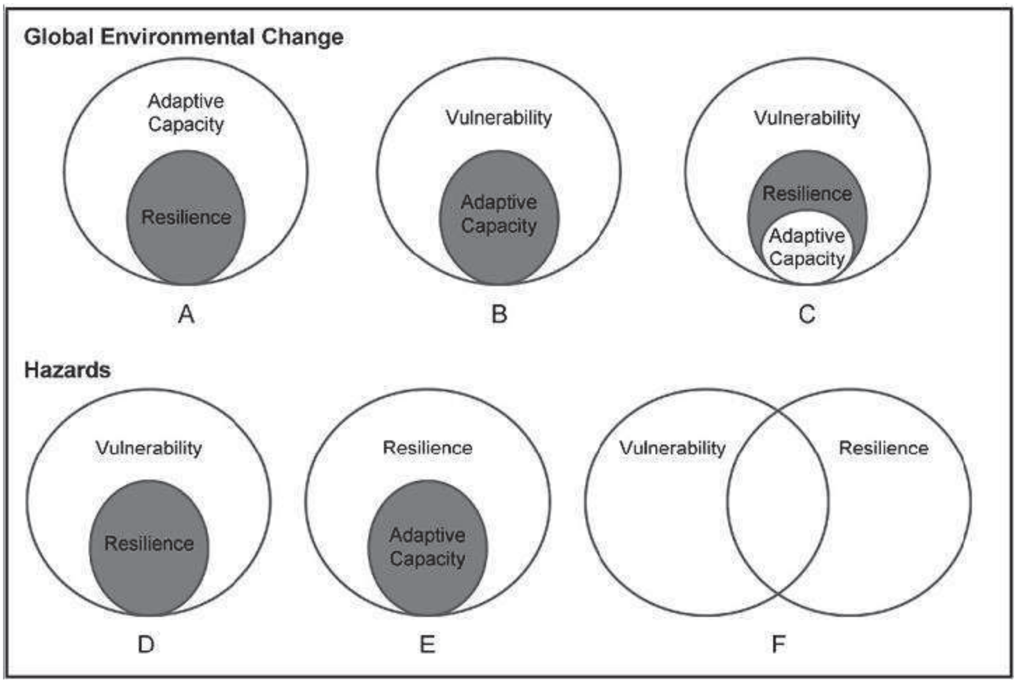


Figure 2.7 — A place-based model for understanding community resilience to natural disasters. Source : Cutter, et al, 2008,

its capacity for learning and adaptation, including the capacity to recover from a disaster." ([UNDP, 2004])

As discussed by Cutter ([Cutter *et al.*, 2008]) :

Vulnerability is the pre-event, inherent characteristics or qualities of social systems that create the potential for harm. Vulnerability is a function of the exposure (who or what is at risk) and sensitivity of system (the degree to which people and places can be harmed) ([Adger, 2006] ; [Cutter, 1996]). Resilience is the ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organize, change, and learn in response to a threat. Vulnerability and resilience are dynamic processes, but for measurement purposes are often viewed as static phenomena.

Resilience, coping capacity, adaptive capacity and vulnerability are treated differently and in numerous ways under the fields of hazards and environmental change (figure 2.7).

2.1.6 Terminology relationship

For centuries human beings have blamed the hazards to be the disaster generating events. It was not until recent studies that the hazard and disaster were separately focused upon. DRR research is more concentrated upon the reduction of vulnerability and increasing resilience and capacity to make sustainable societies.

The relationship between vulnerability, resilience, and adaptive capacity is still not well articulated ([Cutter *et al.*, 2008]). This is complex and multifaceted. In many studies vulnerability and capacity are inversely related. In some cases resilience is also understood as the opposite of vulnerability (stated by Birkmann, ([Birkmann, 2006]), by referring [Adger *et al.*, 2005]), while others view vulnerability as the opposite and lack of human security (stated by [Birkmann, 2006], by referring [Bogardi and Brauch, 2005]). The terms resilience and vulnerability are tricky ([Cannon, 2008]) and still lack a standard framework. Different frameworks are already discussed in previous sections which express multiple view points of experts on the terms and the relations of terms.

Summarizing the discussion it can be said that the ability to recover can include both internal strengths (of the individual or the group) and external opportunities provided by the society at large ([Jigyasu, 2010]). This approach may well be part of the normal development process of any society, but such development of capacity (or reduction in vulnerability) is difficult to assess under normal circumstances. It is only in the immediate aftermath of a seismic event that the effectiveness of capacity-building measures of a society may be assessed through the seismic performance of its building and human populations.

One good measure of the seismic performance of a building stock is the number of fatalities incurred which is essentially a function of building collapse. Indeed it is a valid indicator of the overall vulnerability of the population as well since it expresses societal preferences and attitude towards seismic risk, and also includes socio-economic and governance aspects of the society. Vulnerability may be reduced through increasing the capacity of the population at risk before, during and after the disaster and for this purpose ; reconstruction programs can provide a good opportunity.

As discussed earlier, the primary focus of post-hazard reconstruction is shifted from

”build back” to ”build back better”. Researchers stress that by availing the opportunity of reconstruction, sustainable development can be generated in a society.

2.2 Sustainable reconstruction

Chauvet discusses the purpose of reconstruction with reference to sustainability as :

Achieving sustainability, which, in a disaster-related context, means the ability to survive future natural disasters with minimum loss of life and property, is the overarching goal of planning for postdisaster reconstruction ([Chauvet, 2013])

Sustainable reconstruction is considered to be that reconstruction which holistically deals with all present and future needs of the community and provides room for sustainable development ([Monday, 2002]). To understand ”sustainable reconstruction” a brief introduction of ”sustainability” and ”sustainable development” is given here.

2.2.1 Sustainability

Sustainability is the term which became the centre of DRR discussions after the report of the World Commission on Environment and Development in 1987 (also named as Brundtland report). Like vulnerability, resilience and capacity, sustainability is also deficient of one universal definition rather multiple sources have used it differently. Here are few definitions of sustainability :

”Meeting the needs of the present without compromising the ability of future generations to meet their own needs” ([WCED, 1987])

”Sustainability is the ability of a locality to tolerate and overcome damage, diminished productivity, and reduced quality of life from an extreme event without significant outside assistance. ([Mileti *et al.*, 1999])

Referring Cecilia Wong, Katharina Thywissen says ([Thywissen, 2006]) :

In general, there is a consensus that sustainability should encompass social equity, economic growth and environmental protection. Some of the most widely quoted definitions include :

- *"Improving the quality of human life while living within the carrying capacity of supporting ecosystems"* (IUCN/UNEP/WWF, 1991)
- *"To equitably meet developmental and environmental needs of present and future generations"* (UNCED, 1992)

Sustainability is the primary objective of many reconstruction and development projects now.

2.2.2 Sustainable development

Often "sustainability" and "sustainable development" are interchangeably used and researchers do not provide a distinction between the two ([Chauvet, 2013]).

In Brundtland report it was suggested :

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts : the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given ; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs. ([WCED, 1987])

UNISDR provides the definition of sustainable development as :

Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction ([UNISDR, 2004]).

UNISDR has provided a framework for DRR in the context of sustainable development where it has considered four fields to be most influencing ; socio-cultural, economic, environmental and political (figure 2.8).

UNISDR considers the post disaster period an opportunity to reduce future disaster risk through adopting sustainable development planning :

The post-disaster reconstruction period provides the best time to introduce disaster reduction into sustainable development planning. When perceived as a distinct set of activities,

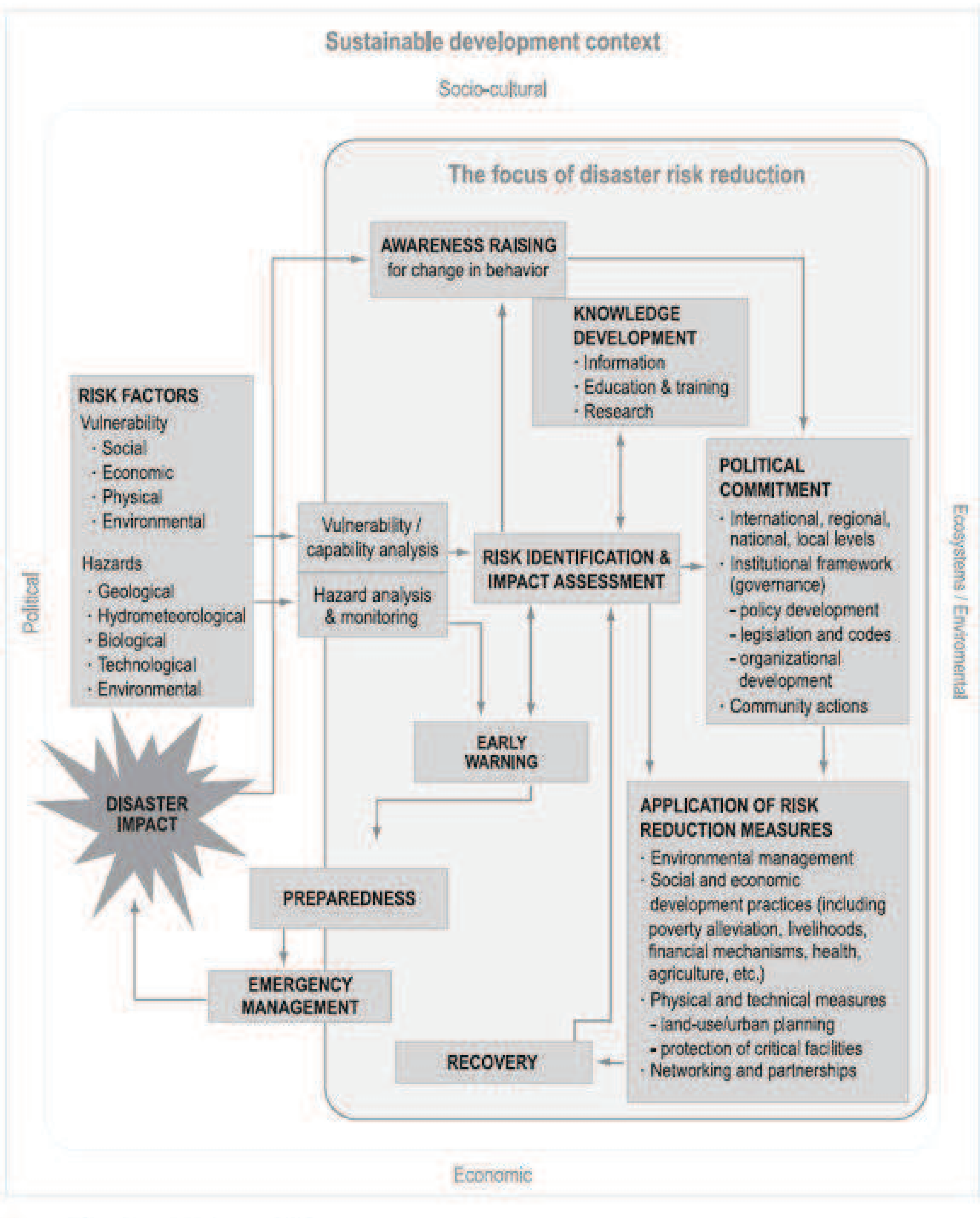


Figure 2.8 — Framework for disaster risk reduction. Source : [UNISDR, 2004]

Figure 2.9 — Opportunity can be found in disasters. Source : Rob Pudim via Monday, 2002

risk management initiatives are placed in competition with other environmental and developmental objectives, rather than being seen as integral parts of the same whole. Therefore, political commitment and social acceptance of the value of risk reduction are necessary to increase the sustainability of communities ([UNISDR, 2004]).

2.2.3 How to generate sustainability through reconstruction?

The World Commission on Environment and Development (WCED) has included social, environmental and economic strands as the core elements of sustainability ([WCED, 1987]). This ”three legged stool metaphor” has been widely adopted however few researchers argue that there are further set of interests that could be incorporated in the field of sustainability ([Campbell, 1996] ; [Moore] ; [Monday, 2002]). UNISDR considers the links between disaster and the sociocultural system as a pillar of sustainable development and rates them important components in disaster risk reduction ([UNISDR, 2004]). The Brundtland Report ([WCED, 1987]) identifies the cultural sustainability as a separate aspect from social sustainability, and Moore identifies aesthetics as another aspect ([Blanco-Lion *et al.*, 2011]). Moore argues that if sustainable developments are ”beautiful and also compelling ; they will be sustained by societies they claim to serve” ([Moore]). Blanco-Lion thinks that in order to achieve a sustainable development, a building must find the balance between the five measures ; social, cultural, environmental, economic and aesthetical ([Blanco-Lion *et al.*, 2011]). In the area of sustainable reconstruction, the current study finds two frameworks most relevant ; of Monday and Blanco-Lion.

2.2.3.1 The Monday’s framework

In 2002, Monday provided a framework to shift the adversity of disasters into an opportunity for sustainable future development. Figure 2.9 summarizes the theme of Monday’s work. His paper focuses on six dimensions of sustainability ; quality of life, economic vitality, social and intergenerational equity, environment quality and disaster resilience, all linked with participatory process (figure 2.10). All the six dimensions of sustainability are discussed by Monday through providing generic rules applicable to every society and a matrix of opportunities which should be taken into consideration during reconstruction (figure 2.11). It is still debatable that what actually is meant by these rules to generate sustainable development after a disaster. For example if we consider the first rule ”make housing available/affordable/better” under the dimension ”quality of life”, we need a lot to know what is meant by ”better”. Although he refers that quality of life expresses different meanings for different societies but research is needed to explore that ”which parameters are essential in defining quality of life for a particular society”. All the hazard prone areas must have a clear understanding of ”better” before they make and implement policies.

One example of area specific study regarding low income housing reconstruction in post disaster zone is found through the paper of Cristina Blanco-Lion ([Blanco-Lion *et al.*, 2011]).

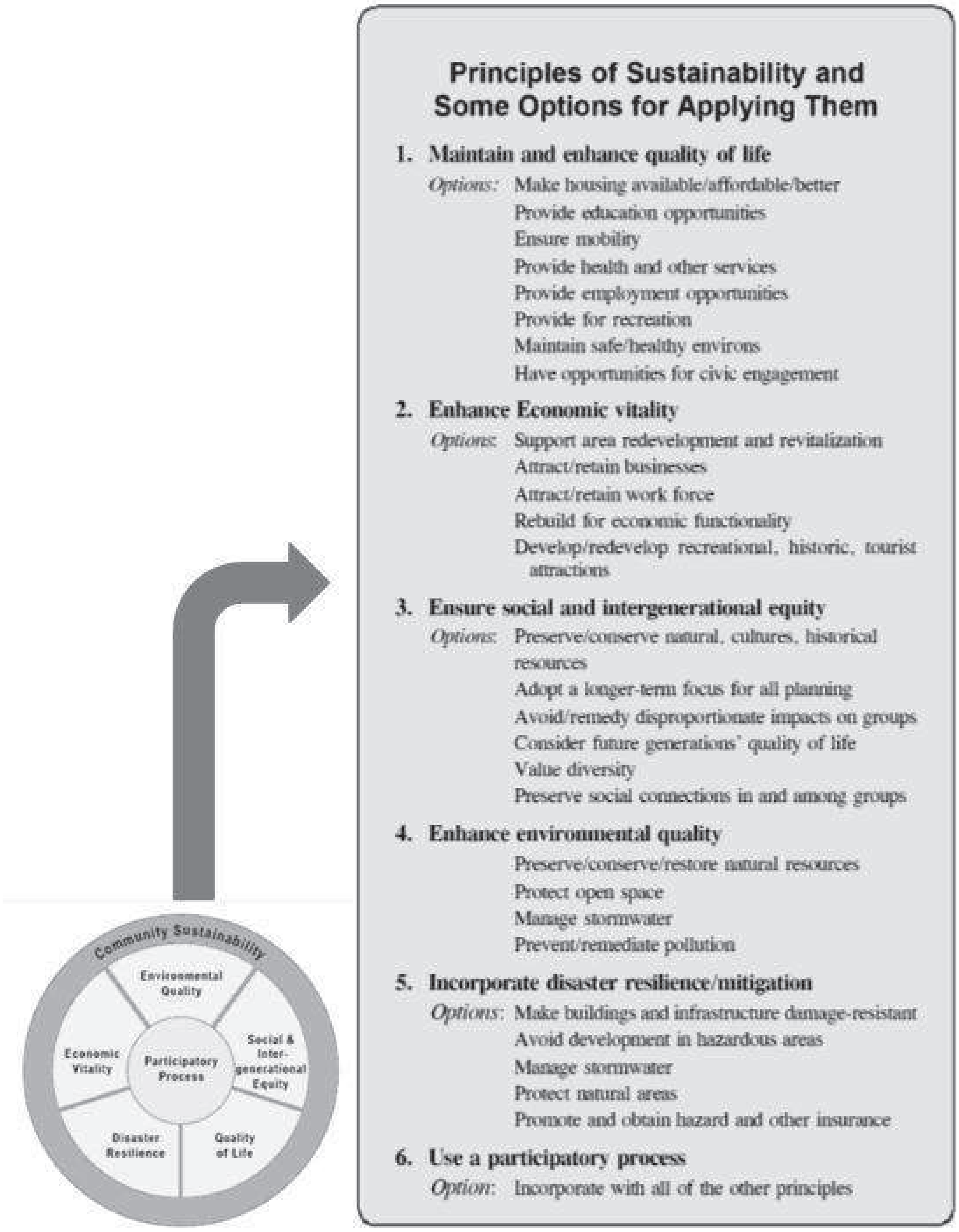


Figure 2.10 — Monday's framework for community sustainability

Matrix of Opportunities

(x = an opportunity to devise a recovery strategy that furthers sustainability)

Some Situations a Community Could Face during Disaster Recovery

The Principles of Sustainability & Some Options for Applying Them	DAMAGED TRANSPORT			DAMAGED PUBLIC FACILITIES						DAMAGED UTILITIES				DAMAGED HOUSING			ECONOMIC DISRUPTION					ENVIRONMENTAL DAMAGE				DISRUPTION TO HEALTH & SAFETY				OTHER		
	Roads, bridges, & railroad infrastructure	Subway, rapid transit	Other	Schools	Downtown, CBD, historic district	Public spaces	Harbor, port, airport	Stormwater system, power plant	Other	Power lines	Phone lines	Water treatment plant	Other	Houses to be repaired	Houses damaged beyond repair	Other	Commercial buildings damaged/destroyed	Businesses disrupted	Unemployment	Loss of work force	Other	Riverine, beach, & dune erosion	Toxic air, water, soil, wellheads	Tree loss, habitat loss	Other	Medical facilities damaged	Social & family services, daycare disrupted	Victims, population traumatized	Other			
1 Maintain & Enhance Quality of Life																																
Make housing available/affordable/better				x			x			x	x			x	x					x								x				
Provide education opportunities		x			x	x												x	x								x	x				
Ensure mobility	x	x		x	x	x	x								x		x		x	x						x						
Provide health & other services					x					x									x			x		x		x	x	x				
Provide employment opportunities			x														x	x	x	x						x	x					
Provide for recreation				x	x	x	x															x		x								
Maintain safe/healthy environs	x	x		x		x		x				x		x	x							x	x	x		x	x	x				
Have opportunities for civic engagement				x	x	x	x												x			x		x				x				
Others																																
2 Enhance Economic Vitality																																
Support area redevelopment & revitalization		x		x	x	x	x	x		x	x	x		x	x		x	x		x		x				x						
Attract/retain businesses	x	x			x		x								x		x	x	x	x												
Attract/retain work force		x		x		x								x	x		x	x				x		x		x	x	x				
Enhance economic functionality	x	x		x	x	x	x	x				x					x									x	x					
Develop/redevelop recreational, historic, tourist attractions					x	x	x										x			x		x		x								
Others																																
3 Ensure Social & Intergenerational Equity																																
Preserve/conserve natural, cultural, historical resources				x	x	x	x	x				x		x								x	x	x				x				
Adopt a longer-term focus for all planning	x	x		x	x	x	x	x		x	x	x		x	x		x									x	x					
Avoid/remedy disproportionate impacts on groups	x	x		x	x	x						x		x	x		x	x	x	x		x	x			x	x	x				
Consider future generations' quality of life	x	x		x		x				x	x	x		x	x		x					x	x	x				x				
Value diversity				x	x	x	x							x	x					x							x	x				
Preserve social connections in and among groups				x	x	x								x	x				x					x			x	x				
Others																																
4 Enhance Environmental Quality																																
Preserve/conserve/restore natural resources	x	x		x	x	x	x	x				x		x	x							x	x	x								
Protect open space						x	x					x			x		x					x	x	x								
Manage stormwater							x	x				x			x					x			x	x								
Prevent/remediate pollution	x			x	x	x	x	x		x	x	x		x	x								x					x				
Others																																
5 Incorporate Disaster Resilience/Mitigation																																
Make buildings & infrastructure damage-resistant	x	x		x	x	x	x	x		x	x	x		x	x		x						x			x	x					
Avoid development in hazardous areas	x	x		x	x	x	x			x	x	x			x		x					x		x		x						
Manage stormwater							x	x				x			x					x			x	x								
Protect natural areas	x				x	x	x								x		x					x		x								
Promote & obtain hazard & other insurance	x			x	x							x		x	x		x	x								x		x				
Others																																
6 Use a Participatory Process	Use a participatory process in conjunction with all the other principles of sustainability, and in every disaster recovery situation in which it is appropriate.																															

Figure 2.11 — Matrix of opportunities which should be taken into consideration during reconstruction. Source : [Monday, 2002]

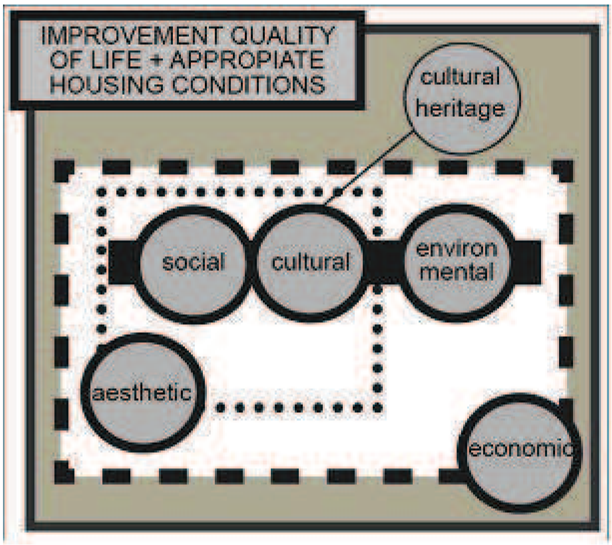


Figure 2.12 — Model of sustainable housing development for Low income societies. Source : [Blanco-Lion *et al.*, 2011]

2.2.3.2 The Blanco-Lion framework

She has incorporated the definitions of sustainability provided by different organizations and researchers (Kates and Pijawka ; Haas ; UNDRO; Quarantelli ; Chiu ; Sphere Project ; Coch and Cerra ; Architecture for Humanity ; UNHABITAT ; [Moore] ; WCED) in one model by preferring and linking different aspects. She considers economic interests as foremost important factor for low-income families hence enveloped all the other interests in them (figure 2.12). What she says about the model is :

In summary, in order to set up a design process for the reconstruction of housing in low income societies, the improvement of quality of life and appropriate housing conditions envelope the whole model. Social and Cultural interests share some characteristics and as a consequence are interlinked. Environmental interests work parallel with Social & Cultural interests throughout the process ; however tend to be relegated due to economic constraints. Economic interests provide constraints or opportunities that will set the boundaries of many decisions. Aesthetics are part of the Social and Cultural interests and must be achieved in order for the object to be accepted by the community and succeed. In the end, the design pattern does not have a defined linear sequence ; it is a non-defined mixture of intersected guidelines, in which the architect must find the right balance that suits the family he/she is

Requirements	The Dwelling...	Features
BOTTOM LINE REQUIREMENTS	Improves quality of life	Provision of external support
		Future enhancement of living conditions
		Protection against natural disasters
	Meets Housing Standards	External Surroundings
		Internal Spaces
ECONOMIC	Minimises building costs	
	Involves local labour	
	Manages cost impact on future generations	
SOCIAL	Respects Social Norms & Rules	Functionality of the House
		External Interaction
		Security
		Privacy
		Social Acceptability of Materials
CULTURAL	Respects Cultural Identity	Preserving traditional material
		Preserving Traditional/ Local Styles
AESTHETICS	Fits object to its surroundings	
	Meets expectation of people	
	Achieves attractive design	
ENVIRONMENT	Achieves Passive Design	Passive Design Qualities. **REFER TO TABLE 2**
		Passive Design Systems
		Building Behaviour
	Achieves energy efficient & reduces waste	Electricity
		Water
		Sewage
		Solid Waste
		Potential for Renewable Technologies
	Manages use of natural resources	Minimises embodied energy of materials
		Locally sourced materials
		Uses recycled materials
	Future proofs the building	Long lasting building characteristics (Climate change)
		Long lasting structure (material durability)
	Leaves Legacy	Materials recycle after demolition
		Structure reusable

Figure 2.13 — Assessment grid main table. Requirements. Source : [Blanco-Lion *et al.*, 2011]

serving. Though not referring to Monday, she has also included "quality of life" in her assessment grid (figures 2.13 and 2.14). She describes that the basic minimum requirements for a sustainable dwelling must fulfill bottom line requirements which can be attained through (1) improving quality of life and (2) meeting housing standards.

General Features	Passive Design Qualities		
The Location	Topography	Relation with Natural surroundings	
Shape	Compactness	Porosity	Stylised
	Settlement	Attachment to other volumes	Weight
	Quantity of external openings	Transparency	Insulation
	Texture	External Colour	Versatility: external elements
Internal Features	Volume	Shape	Proportion
	Internal division of spaces	Internal connection	Internal texture + colours

Figure 2.14 — Assessment grid sub-table, passive design qualities. Source : [Blanco-Lion *et al.*, 2011]

2.3 Socio-cultural characteristics and post-quake reconstruction

The importance of respecting socio-cultural characteristics for sustainable reconstruction is discussed by many researchers in recent studies ([Jigyasu, 2002a] ; [Jigyasu, 2002b] ; [Opricovic and Tzeng, 2002] ; [Cannon *et al.*, 2003] ; [Sharma *et al.*, 2003] ; [Shaw *et al.*, 2003] ; [Shaw and Sinha, 2003] ; [Wisner, 2003] ; [Jigyasu, 2004] ; [Limoncu and Celebioglu, 2006] ; [Rotimi *et al.*, 2006] ; [Baumwoll, 2008] ; [Jigyasu, 2010] ; [Hizbaron *et al.*, 2012]). The reconstruction programs which considered culture of a society as centre point are proven extremely popular among people and also a higher completion rate is observed there. Below is presented a brief introduction of the term ”socio-cultural characteristics”.

2.3.1 Socio-cultural characteristics

It means *”relating to both social and cultural issues”* (Collins Dictionary) or *of, relating to, or involving a combination of social and cultural factors* (Merriam Webster Dictionary). Where :

Social

of or relating to people or society in general (Merriam Webster Dictionary) or connected with society and the way it is organized (Oxford Dictionary).

Culture

the integrated pattern of human knowledge, belief, and behavior that depends upon the capacity for learning and transmitting knowledge to succeeding generations (Merriam Webster Dictionary) or

the total of the inherited ideas, beliefs, values, and knowledge, which constitute the shared bases of social action (Collins Dictionary)

Socio-cultural characteristics are numerous and complexly interlinked but this study initially focused upon two of them :

1. Indigenous construction practices
2. Self reliance

2.3.2 Post-quake rural AJK reconstruction

The rural reconstruction of AJK was aimed to ”build back better” ([ERRA, 2006]). The authority had started the reconstruction program after considering the aspects which are called ”sustainability generating”. ODR [1] and Local Knowledge were two of them which made the bases for this research. The ODR had shown outstanding results in the field of reconstruction ([Barenstein, 2006]) where owners are mainly responsible to rebuild the house while authorities assist them financially (and sometimes technically as well). This approach was introduced in reconstruction programs first after Gujarat earthquake. Similarly indigenous knowledge is the basis of community coping practices that have helped vibrant communities survive natural calamities over centuries ([EU, 2009]). It was however yet to be explored that how much adopting/rejecting these factors has influenced the sustainability of other societies. Moreover, if these features have generated sustainability in other countries, which issues can turn the ”sustainable” into ”non sustainable” in the reconstruction/development housing of AJK.

[1] If the reconstruction was held in any case study country before Gujarat event, this thesis considers participatory approach inspite of ODR as a sustainability generating paradigm.

To explore this field, the examples of Turkey, India and Iran were taken into consideration for the period of 1999 till the occurrence of Kashmir earthquake.

Table 2.1 — Significant earthquakes in India, Iran, Pakistan and Turkey since 1999 ; Sources : [goo] ; [Doğangün *et al.*, 2008] ; [Ghafory-Ashtiany and Hosseini, 2008] ; [Report] ; [Barenstein, 2006] ; [Duyne Barenstein, 2006] ; [NEWS] ; [Zare] ; [Mahdi, 2004] ; [ReliefWeb] ; [Nations]

Earthquake	Date	Magnitude	Deaths	Homeless	Buildings Damaged
Kocaëli, Turkey	1999	7.6	17,118	500,000	132,892
Duze, Turkey	1999	7.2	894	30,000	2,682
Bhuj, India	2001	7.6	20,085	1.7 Million	1,122,000
Avaj, Iran	2002	6.5	261	50,000	15,000
Bam, Iran	2003	6.6	31,000	65,000	61,761
Bingöl, Turkey	2003	6.4	177	15,000+	12,758
Indian Ocean Tsunami, India	2004	9.1	10,881	70,000	154,000
Zarand, Iran	2005	6.4	650	32,000	30 to 100 % (50 villages)

2.3.3 Reconstruction overview of Turkey, India and Iran

It could be a good option to evaluate post-event reconstruction program of Pakistan carried out before Kashmir. However Kashmir earthquake was the very first big scale earthquake in the history of the country. No previous reconstruction programs could provide substantial information to learn the lessons and to point out mistakes. Considering this obstruction it was decided to study post-quake reconstruction programs of other countries with respect to ODR and Indigenous Construction Systems. Among all the countries where reconstruction programs were started after disasters, Turkey, India and Iran were selected for case studies. The two primary reasons were 1) these three countries have some socio-cultural connections with Kashmir, and, 2) they had experienced tragic earthquakes not much before than Kashmir event. So the results can be applied on ERRA's RHRP.

2.3.3.1 The case of Turkey (1999 - 2005)

Considering life loss and building damage, Turkey experienced three significant earthquakes during the six-year period causing over 18,000 deaths and a building damage toll exceeding 148,000 buildings (table 2.1). All three events were followed by reconstruction programs. Over 90% of deaths and building damage, however, were caused by the August 1999 Kocaëli earthquake.

In a detailed and comprehensive study focusing on both of the 1999 earthquakes Gülhan and Güney ([Gulhan and Guney, 2000]), compare the performance of reinforced concrete and traditional structures namely timber based Himis and Baghdadi construction systems. In this comparative study across two provinces they show that seismic performance of traditional structures was far better than the reinforced concrete structures. In particular, instances of collapse and heavy damage were far less in traditional structures. Many pre-event and later studies ([Arioglu and Anadol, 1978] ; [Langenbach, 2003] ; [Langenbach, a] ; [Gülkan and Langenbach, 2004] ; [Langenbach, b]) also support similar conclusion.

However the Turkish government did not encourage the traditional building types for reconstruction ([Jigyasu, 2002b]). Indeed the reconstruction programs launched after 1999 earthquakes showed a strong rejection of traditional construction techniques. An excerpt after Orta earthquake 2000 describes this trend as : ”In a number of instances, government inspectors predictably recommended that the himis houses be replaced by new ones of concrete and hollow clay tile because of what they thought (falling of plaster) was irreparable structural damage” ([Gülkan and Langenbach, 2004]).

Multiple studies also indicate that the ’disrespect’ of traditional building structures in Turkey is institutional, and built into their training programs : textit ”All too often, cultural heritage takes an unnecessary hit in the post-earthquake inspection process, especially with vernacular cultural properties that are not officially recognized. Inspectors sent into areas after a disaster often have no training and even less sympathy for vernacular buildings and archaic construction simply because their training is remote from that which would be relevant to understanding of how such buildings can competently resist earthquakes” ([Langenbach, b]).

A small percentage of reconstruction has taken place where the population has been involved in decision making and reconstruction process. After the Duze earthquake in 1999, several local and international NGOs as well as World Bank projects and government did not adopt participatory approach for reconstruction. Arslan and Unlu ([Arslan and Unlu, 2006]) report a higher satisfaction level of people for participatory approach used in a small project by an NGO than housing provided by the World Bank. Despite such feedback the reconstruction approach of Turkish government did not change, and in the aftermath of 2003 Bingöl earthquake the government took up reconstruction of 98% of destroyed houses itself ([Bakir and Boduroglu, 2004]). Another negative characteristic of Turkish reconstruction drives is frequent relocation without any public participation in the decision making process ([Arslan and Unlu, 2006]).

On the whole, reconstruction policies in Turkey do not appear to promote owner driven reconstruction nor are they sympathetic to vernacular construction practices, the two parameters of reconstruction policies that had been identified as indicating sustainability generating in the population at risk.

2.3.3.2 The case of India (1999-2005)

During the past decade, India experienced two devastating earthquakes. The first and the larger of the two was the 2001 Gujarat (M 7.6) earthquake which caused over 20,000 deaths and damaged or destroyed 1,122,000 buildings ([goo]). The other disaster was caused by the Indian Ocean Tsunami, secondary effect of M 9.1 earthquake that took place near the west coast of Sumatra, Indonesia. The tsunami caused 10,881 deaths and destroyed or damaged 154,000 houses in India ([Duyne Barenstein, 2006]). Both of the events were followed by large scale reconstruction programs, but with contrasting approaches.

In the case of Gujarat earthquake, right from day one, Indian government adopted an owner driven reconstruction approach. Furthermore, based upon their reasonably good seismic performance, the government also accepted Bhungas, the vernacular building type in the affected area, as an acceptable option in the reconstruction program. Large scale efforts were made by NGOs to propose and promote several enhancements in this construction system which was endorsed by the government by publishing it as an official Guideline Document

([Jamal-Shaban, 2007]).

The construction process as well as the product earned widespread approval. In a detailed study of five different permanent housing programs following the 2001 Gujarat earthquake, Duyne Barenstein compared the quality of houses and levels of satisfaction as expressed by homeowners. The analysis clearly indicated that the participatory approaches scored much higher on homeowners satisfaction with i) the house location, ii) the size of the house, iii) quality of materials and iv) construction quality. She concluded that, within a context where people are used to constructing their own houses, and with the provision of adequate financial and technical support, a leading role of the homeowners in the construction process is more likely to lead to houses which are a good match with local needs and preferences as compared to houses provided by outside agencies ([Barenstein and Iyengar, 2010]).

On the whole, owner driven reconstruction and acceptance of vernacular building type had been a resounding success where structures were rebuilt by their owners with financial and technical assistance from the government ([Barenstein and Iyengar, 2010]) eventually leading to construction of almost 200,000 houses, some 87% of all destroyed.

The positive Gujarat experience encouraged the government to continue with the same approach, and reconstruction after the 2004 tsunami was planned to focus on community participation approach ([ADB and WB, 2005]). During policy making period researchers also raised their voices in favor of saving cultural heritage of the area ([Boen, 2005]). However a change in the administrative approach to the reconstruction led to a reversal of the overall strategy. The government invited NGOs and private enterprises to adopt villages and reconstruct with their own choice of architects and reconstruction approach ([Duyne Barenstein, 2006]).

Their adopted methodology of ”full reconstruction by means of construction companies” translated in the aim *”to replace all self-built traditional houses with ’modern’ settlements of flat-roofed reinforced concrete buildings”* which assumed, contrary to the reality, that the affected population was composed of nuclear families. This (and other similar decisions) resulted in a reconstruction that was severely insensitive to local culture and attracted strong disapproval by the local population. Eventually the reconstruction after tsunami was characterized by massive demolition of undamaged vernacular houses, provision of culturally and climatically inappropriate houses, poor quality of construction, depletion of habitat and trees and dramatic changes in way of life ([Barenstein and Iyengar, 2009]). Although learning from Gujarat did not happen in Tamil Nadu ([Barenstein and Iyengar, 2009]), India did own and practice the enlightened strategy of increasing the capacity of its population at risk through adoption of ODR and improved vernacular construction in its reconstruction drives.

2.3.3.3 The case of Iran (1999-2005)

For the period of 1999 to 2005, Iran experienced three earthquakes (Table 2.1) that were followed by significant reconstruction programs. The first one of these, the 2002 Avaj earthquake caused 261 deaths and damaged 15,000 structures. Most of the reconstruction related decisions and the process of reconstruction for this event was controlled by the Housing Foundation which is Iranian government's implementing arm for its construction activity including post-event reconstruction programs.

The Housing Foundation did not include people in the decision making or implementing phases of reconstruction. The reconstruction of residential units was based on model plans that were prepared by the Housing Foundation. These single or two storey structures embodied earthquake resistant design, however the affected population did not approve of them because they did not fulfill social and cultural needs. The reconstruction also involved relocation of several villages where the local population was not involved in the decision-making process and the reconstructed-relocated villages were not welcomed by the villagers ([Derakhshan, 2008]).

The second and worst of these events was the 2003 Bam earthquake which caused 31,000 deaths and damaged over 61,000 structures. The almost exclusive construction system in the affected region consisted of mud and dried brick load-bearing walls which exhibited low seismic performance and resulted in near total destruction of the building stock, more than 86% suffering Heavy Damage or higher ([Fallahi, 2007])

During the first year of reconstruction, the Housing Foundation attempted contractor built construction but the poor performance and slow delivery by the contractors and their numerous claims for cost increases led the HF to shift after the first year to ODR with technical assistance ([Jha, 2010]) The participatory approach to reconstruction was worked out in detail.

It involved comprehensive planning of the city, protection of natural environment, sensitivity to historical sites and structures, in-situ reconstruction, and an aim to protect social and cultural characteristics of the city. However vernacular construction system was not included in the program as most of the traditional adobe buildings were destroyed under this earthquake and the government as well as the local population had strong reservations about its seismic performance.

Several attempts were made to create awareness for traditional building styles ([UNESCO and ICOMOS, 2004]). However the efforts did not bring fruit and the adobe construction was prohibited. Despite this almost complete negation of the vernacular construction systems, the participatory approach in Bam was largely successful. One major tool used in the participatory process was the establishment of an exhibition complex in order to provide technical services, materials exhibition and housing samples with reference to resistance, cost-effectiveness, climatic & environmental compatibility and long life operation ([Joodi, 2010]).

The 2005 Zarand earthquake caused over 600 deaths and between 30 to 100% destruction in 50 villages (2.1). It has been reported that despite official claims, inclusion of people in the reconstruction, especially in the early phases had been limited. The same study also reveals that ”the new houses have modern architectural plans, which are not acceptable for villagers, and many have left the village” ([et al, 2010]). The 2006 Lorestan earthquake caused destruction in 330 villages ranging from 30 to 100%. In this case it was decided to execute reconstruction through an accelerated program. Thus the temporary settlement phase was eliminated altogether and public participation in the programming and designing phase was not carried out. The implementation of reconstruction, however, was based upon public participation ([Derakhshan, 2008]).

In terms of government as well as societal response, the Bam earthquake did prove to be a turning point. The government recognized and formally adopted public participation in reconstruction as a public policy. Similarly it also generated a lot of debate about traditional building practices which resulted in research focusing on mechanisms of damage and improvement in their seismic performance.

While Iran did abandon vernacular construction in the affected region of Bam earthquake due to almost total destruction of such building stock, it has shown sensitivity towards traditional building construction and ODR appears to be its primary strategy for reconstruction.

From Turkey to Pakistan, a big change in reconstruction approach is evident. There is a decided shift in the attitude of governments towards affected populations, who are increasingly being given a say and a role in the reconstruction process, and their traditional construction systems appear to gain respect. In particular ODR appears to have become a norm rather than exception, especially in the aftermath of large earthquakes.

Yet it is difficult to say that the reconstruction programs carried out from 1999 to 2005 have reduced the vulnerability of societies to any significant extent ([Jigyasu, 2010]). Turkey is still practicing government based reconstruction and there is no acceptance for traditional construction techniques ; India observed good results after Gujarat reconstruction program but does not apply them again and Iran decided to forego in totality the strong and distinctive vernacular construction of a large area. Considering the overall scenario, it is probably in order to conclude that the intrinsic relationship between vulnerability and sustainability remains to be fully exploited by these three countries under study.

2.4 Conclusion

This chapter primarily discussed the main terminologies used in disaster risk reduction debates and their relation (figure 2.15). Disaster risk can only be reduced if it is understood properly. For this purpose the components of risk ; hazard, exposure, vulnerability, coping capacity and resilience should be analyzed in depth. Although the relation of these areas is complex and multidimensional and studies are yet unable to agree upon one single framework, DRR approaches should explore them vastly.

The purpose of reconstruction should not only be the reduction of future disaster but a holistic approach for post-quake programs is needed. This may generate sustainable development in a society where previously less attention was paid in this respect. The link of sustainability with socio-cultural aspects is a key for future development. If reconstruction is done by keeping in focus the socio-cultural characteristics, it can open gateway to development of the community. The analysis of paradigm shifts in Turkey, India and Iran shows

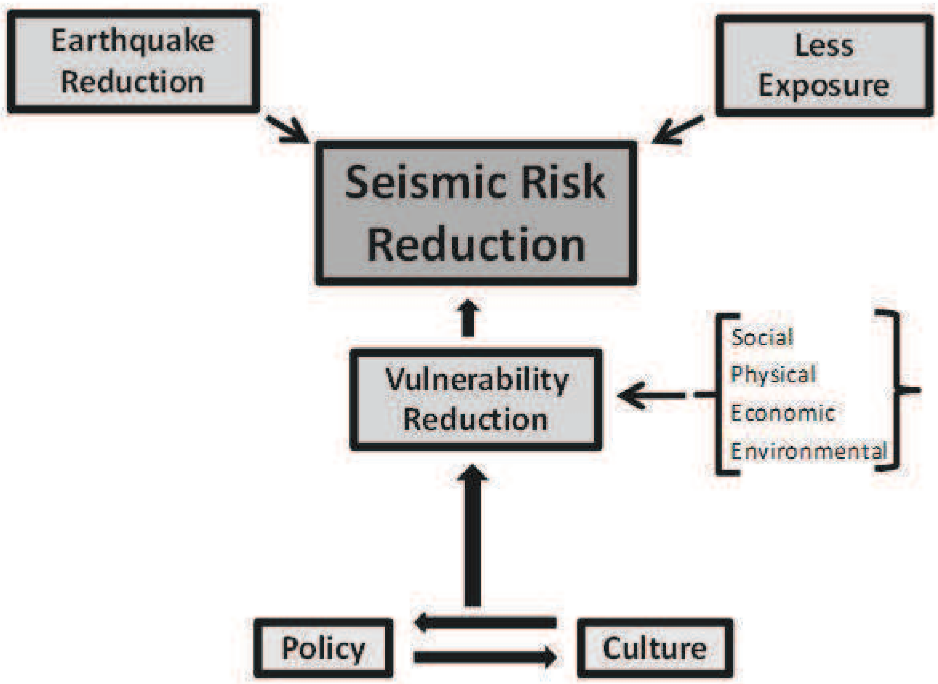


Figure 2.15 — Relationship of seismic risk with earthquake, exposure and vulnerability. reduction in all types of vulnerability, earthquake hazard and less exposure to the hazard can reduce seismic risk. the reduction in vulnerability depends upon policy and culture to great extent.

that the programs centered on the culture are more welcomed by the people.

Although Pakistan has shown a friendly approach as far as indigenous construction styles and self reliance of people is concerned yet the gaps should be explored to avoid future vulnerabilities. It should also be researched that which other socio-cultural characteristics have played a positive or negative part in the reconstruction. Moreover, the socio-cultural aspects which are affected by the reconstruction are to be explored through in depth studies. All these dimensions can point out that how future social, cultural, physical, economic and environmental vulnerabilities can be reduced to build a sustainable society.

CHAPTER 3 Research methodology

THE current research encompasses vulnerability and capacity approaches of policies on one hand and socio-cultural characteristics on the other ; both directing towards sustainable reconstruction of Kashmir. The breadth of the topic was handled by selecting few socio-cultural characteristics which (were) influenced (by) reconstruction. The corresponding policies were also studied simultaneously. The selection of these aspects was a continuing process spanning the field surveys period. Methodology to conduct this study is not limited to one tool only rather a combination of qualitative and quantitative assessments knit the structure of the thesis. It was tried to explore the reconstruction approach of different stakeholders. For this purpose the authority, implementers, masons, social mobilizers and house owners were approached. The research was constituted on five phases.

3.1 The first phase

This was a stretched phase which included three major methodologies as:

1. Literature review
2. ERRA conference 2010
3. Pilot surveys from UET, Lahore

3.1.1 Literature review

According to Anol Bhattacherjee ([Bhattacherjee, 2012]):

The purpose of a literature review is three-fold : (1) to survey the current state of knowledge in the area of inquiry, (2) to identify key authors, articles, theories, and findings in that area, and (3) to identify gaps in knowledge in that research area.

This research was started by collecting data on earthquake occurrences, areas prone to earthquakes and reasons of earthquake events. Without knowing the answers to *how, why* and *where*, it was difficult to proceed. Simultaneously different documents, reports and research articles were approached to clear the concept of risk and vulnerability.

Initially Kashmir vulnerability was to be assessed and quantified for future earthquakes however this was an altogether different field needing specialized pre existing data. Nevertheless the perception of vulnerability has the pivotal position in this study. The socio-cultural characteristics of a community are numerous however some have direct and others have indirect influence on the sustainability of reconstruction. The present research was not commenced by considering specific socio-cultural characteristics nor was any policy aspect predetermined. One objective of reviewing literature was to pick these aspects. For reviewing the seismic events and their resultant reconstruction programs, two major considerations for selection were :

1. Time connection

2. Socio-cultural connection

Hence those seismic events, which were recently occurred before Kashmir earthquake, were selected. However only those communities among them were taken into consideration, which were somehow culturally connected with Kashmir. The most relevant reconstruction programs with that of Kashmir were found

1. 2004 Indian Ocean tsunami
2. 2003 Bam earthquake, Iran
3. 2001 Gujarat earthquake, India
4. 1999 Kocaeli earthquake, Turkey

Policy issues which somehow affected reconstruction sustainability of these countries were analyzed. During the same exercise lessons learnt, repeatedly committed mistakes and the paradigm shifts were extracted (already discussed under section 2.4 in chapter 2). This helped in designing the standards which had to be followed in post quake Kashmir reconstruction.

ERRA online database and library helped in understanding the overall process of reconstruction program. As the current research is mainly focused upon rural areas of Kashmir, the in-depth study of RHRP facilitated to construct questionnaires. Annual Monitoring & Evaluation reports of ERRA covered all aspects of reconstruction program and provided gradual progress in the program. All these documents are listed in bibliography. This initial phase of literature review resulted into two socio-cultural characteristics which provided an inspiration for further exploration as shown in figure 3.1. These were

1. Building Practices (especially of indigenous knowledge)
2. Self Reliance (disasters hit the confidence of people and authorities try to enhance self reliance to promote sustainable reconstruction)

However it was yet to be confirmed that whether or not these aspects are equally important for Kashmir reconstruction case.

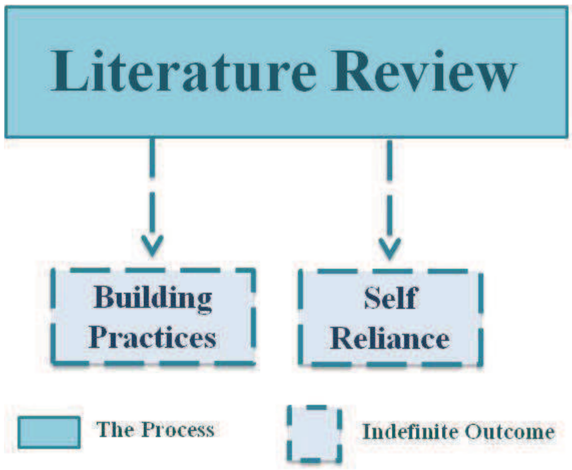


***Figure 3.1* —** The major socio-cultural characteristics selected after reviewing literature

3.1.2 ERRA conference 2010

ERRA International Conference *"Converting Adversity into Opportunity : Learning from Experiences in Reconstruction and Rehabilitation for Rebuilding Lives and Communities after Disasters"* was a milestone for this research. Held in April 2010 the conference provided an opportunity to get the authority approach towards sustainable reconstruction. The bases of policies were shared with the researchers and other groups. ERRA also provided a platform to exchange the reconstruction experiences of different countries.

Different stakeholders contributed in this conference explaining their practices. These included donors, NGOs/iNGOs, PPAF, SERRA, PERRA, and UNHABITAT along with media groups and civil society.

By that time more than 96% reconstruction of rural houses was completed and ERRA was in position to share the outcome (see [EIC, 2010]). RHRP was claimed to be among most successful reconstruction programs with respect to scale, transparency and sustainability. Beside this, details of other fields of reconstruction were shared including *Infrastructure Building, Role of the Media in Post-Disaster Situations, Livelihoods, Gender Equality, Environmental Safeguards, Water and Sanitation and DRR*. The most striking statements which had a link with current study interests were With respect to indigenous building practice

1. *The first course correction was done in December 2006 with the approval of dhajji*

construction techniques

2. *30% of all reconstructed houses are of dhajji*

3. *Wood consumption in this construction is lesser*

4. *Finished look is better.*

With respect to self reliance :

1. *The owner-driven reconstruction approach (ODR) had brought about a paradigm shift in the affected areas towards seismically resistant construction.*

2. *Owner-driven approach with assistance & inspection regime promotes efficiency*

The conference compelled this study to broaden its perspective and include

1. Reasons of delays in policies

2. Reasons of inconsistent policies

3. The effects of delays and inconsistence upon reconstruction

Finally two key aspects from the conference found a link with literature review (figure 3.2). These were *Dhajji* with *Building Practices* and *ODR* with *Self Reliance* As shown in figure 3.3, the socio-cultural aspects derived from reviewing literature could be linked with conference findings at this stage. It was however still ambiguous that which issues could lead people towards vulnerable future construction. For this purpose a detailed examination methodology was essential.

3.1.3 Pilot surveys from UET Lahore Pakistan

The Department of Architecture (a faculty of School of Architecture and Design, SOAAD), UET Lahore, Pakistan, has been a collaborating body (officially as well as unofficially) with this study since its commencement. The interests of both sides were analogous and seismic risk reduction was aimed through research. The university was interested in identifying

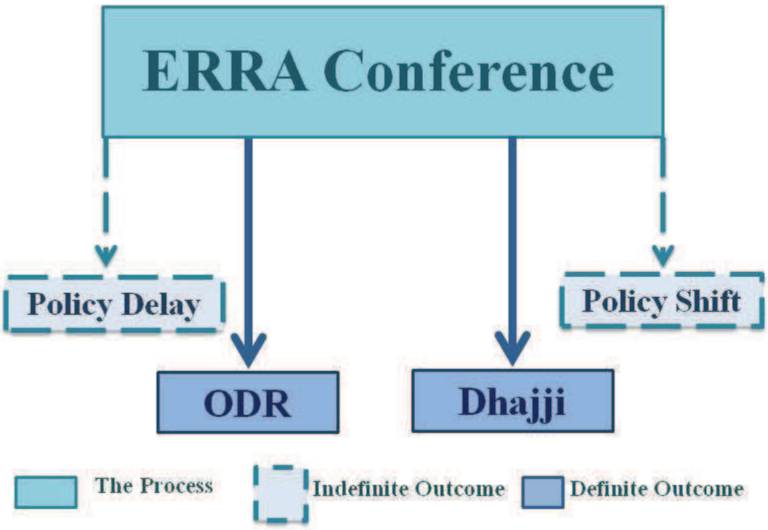


Figure 3.2 — Focused fields after ERRA conference

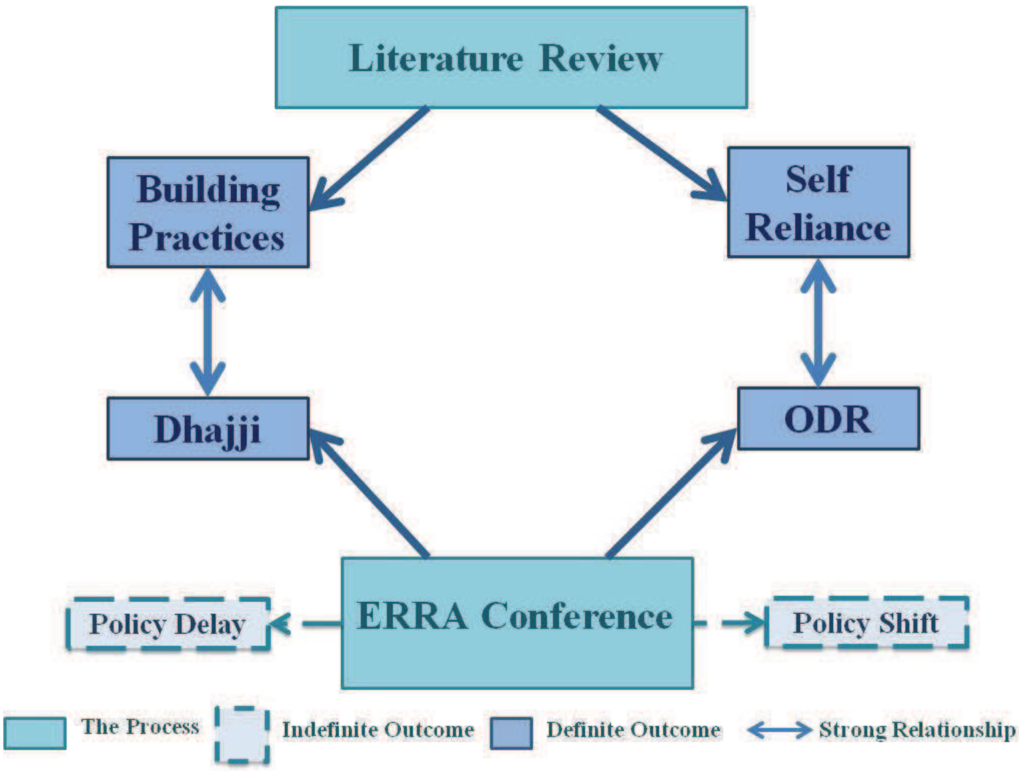


Figure 3.3 — A link was developed between socio-cultural aspects and conference results.

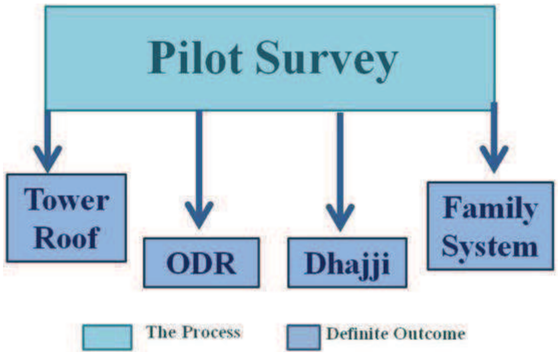


Figure 3.4 — The outcomes of UET pilot surveys

people's behavior towards sustainability after reconstruction period. Hence in July 2010 the Department of Architecture conducted pilot surveys of two districts of Azad Jammu & Kashmir named *Hattian* and *Bagh* under the umbrella of UET mega project. This project however could not be continued due to lack of university funds hence it was ended up without substantial outcome.

After this pilot surveys (see figure 3.4), the major hypotheses made by the department were

1. People have vastly adopted *dhajji-dewari* for reconstruction in rural high altitude areas of Kashmir which is a result of ERRA policy on strengthening local knowledge.
2. *Owner Driven Reconstruction* with financial and technical assistance has encouraged people to enhance socio-cultural, psychological and physical capacity.
3. During reconstruction, *Tower Roof* is deeply penetrated in rural Kashmir architecture.
4. *Family system* is shifted from extended to nuclear.

Consequently the present thesis made the basis of its field surveys on the pilot survey results of the Department of Architecture. These results were analyzed for

1. Indigenous construction practices
2. Owner Driven Reconstruction
3. Tower roof

4. Family system

To test the hypotheses, literature was continuously consulted and a systematic pattern of field activity was adopted.

3.1.4 The outcome of first phase

The first phase of research which was comprised of literature review, attending ERRA conference and analyzing pilot survey from UET, figure 3.5 graphically presents its upshots as :

1. Selection of socio-cultural characteristics which were strongly linked with reconstruction
2. Selection of policies which were strongly linked with aforementioned socio-cultural characteristics
3. Selection of changes in social/architectural fabric of society during/after reconstruction

The literature on tower roof, family system, policy delays & shifts was consulted throughout the study.

3.2 The second phase

This phase comprised of

1. Selection of study field
2. Selection of Muzaffarabad and Bagh districts
3. Meeting with implementers
4. Pilot survey
5. Life hi/stories

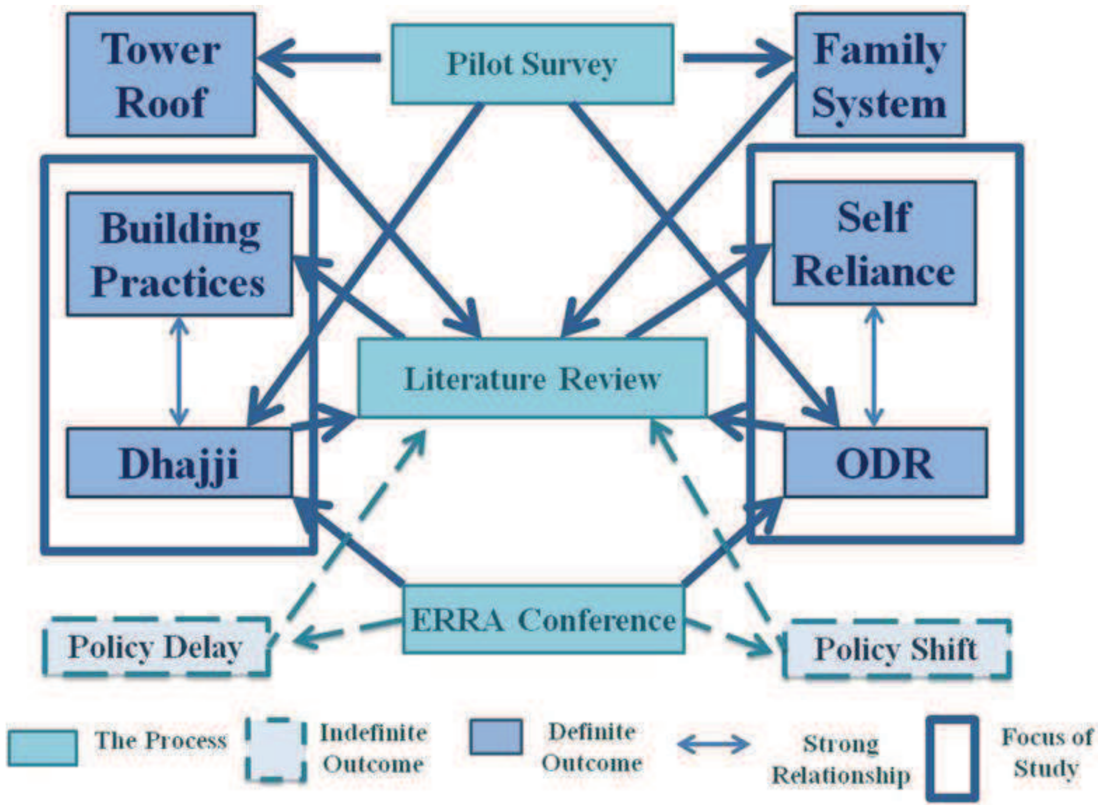


Figure 3.5 — Selecting two aspects of reconstruction in relation with two socio-cultural characteristics and way forward.

6. Semi structured interviews with households

This period played a major role in setting the direction of thesis. Started in March 2011, it ended up in September 2011.

3.2.1 Selection of study field

By this phase several aspects were considered to be explored however the fundamental drive for selecting the areas was indigenous construction practice-dhajji dewari. As hypotheses made by UET Lahore were also to be tested, the areas with tower roof construction were also preferred in this study.

3.2.2 Selection of Muzaffarabad and Bagh districts

The primary reason of selecting these two districts was the extent of destruction there. In Muzaffarabad, private housing sector suffered a huge loss as 89% housing structures were totally destroyed whereas 9% got partially damaged and only 2% remained in livable condition ([ERRA, 2007g]). In Bagh, private housing sector suffered a huge loss as 94.24% housing units were totally destroyed whereas 5.47% got damaged and only 0.29% remained in liveable condition ([ERRA, 2007c]).

It was of extreme interest to examine the reconstruction standard in the areas where several villages were razed from the surface of the earth. Although other districts also suffered from severe damage but it was impractical to expand the circle of research to many locations. In that case the study could be broadened but not deepened. Additionally, dhajji was adopted in Bagh and Muzaffarabad for reconstruction and tower roof spread was also evident.

3.2.3 Meeting with implementers and in-depth interviews

By attending ERRA conference the approach of decision makers was understood to a good extent. The next step was to have an idea of implementers approach towards reconstruction of rural Kashmir. The major implementing partners of ERRA for RHRP in AJK were UNHABITAT.

A meeting was conducted with the members of UNHABITAT during August 2011. During this discussion the hypotheses made by UET were discussed. Several documents on dhajji were provided by this organization. However the details on tower roof were not available. The officials shared their experiences on tower roof and shared an unpublished draft. Similarly no material was available on shift of family system but they confirmed this change. During this meeting UNHABITAT shared its contacts to facilitate the field visits of the area.

3.2.4 Pilot survey

Experts are convinced that to test the questionnaires before conducting large scale study is beneficial in many ways ([van Teijlingen and Hundley, 2001]). About Pilot testing Bhattacherjee says ([Bhattacherjee, 2012]):

Pilot testing is an often overlooked but extremely important part of the research process. It helps detect potential problems in your research design and/or instrumentation (e.g., whether the questions asked is intelligible to the targeted sample), and to ensure that the measurement instruments used in the study are reliable and valid measures of the constructs of interest. The pilot sample is usually a small subset of the target population.

Thabane et al discus the importance of pilot study as ([Thabane *et al.*, 2010]):

Pilot or vanguard studies provide a good opportunity to assess feasibility of large full-scale studies. Pilot studies are the best way to assess feasibility of a large expensive full-scale study, and in fact are an almost essential prerequisite. Conducting a pilot prior to the main study can enhance the likelihood of success of the main study and potentially help to avoid doomed main studies. Pilot studies should be well designed with clear feasibility objectives, clear analytic plans, and explicit criteria for determining success of feasibility. They should be used cautiously for determining treatment effects and variance estimates for power or sample size calculations.

A questionnaire was formulated keeping in focus the selected sociocultural characteristics and policy issues. This questionnaire was tested in the pilot survey conducted during the month of September 2011 in both Muzaffarabad and Bagh.

3.2.5 Life stories

During the same period of pilot surveys, life stories of people were also listened and recorded. As an excerpt from Kim Etherington, ([Etherington, 2009]) article explores:

Knowledge embedded in life stories is memorable, interesting and sometimes transforming. Life stories allow us to bring together many layers of understandings about a person, about their culture, and about how they have created change in their lives : we hear people struggle to make sense of the past and create meanings as they tell and/or 'show' us what *happened to them. The shape and form of a story helps the teller (and the listener) to organise information about the storyteller's personal and social lives ; how they have interpreted past events ; the values, beliefs and experiences that guide those interpretations ; and their hopes, intentions and plans for the future. As researchers try to analyse or re-tell those stories we find complex multi-layered patterns, descriptions of identity construction and reconstruction, and evidence of social discourses that impact on a person's knowledge creation from specific cultural standpoints ([Daiute and Lightfoot, 2004] ; [Etherington, 2007] ; [Harber and Pennebaker, 1992]). Knowledge gained in this way 'is situated, transient, partial and provisional ; characterized by multiple voices, perspectives, truths and meanings.' ([McCormack, 2004])*

According to Qualitative Methods in Social Research, British Library, the oral history is ([Bertaux and Thompson, 1993]) :

Adopted as a means of recording the aspects of social life that are often omitted from the conventional (written) historical record, oral history has its roots in anthropology, sociology and social history. In practical terms oral history collects the spoken accounts and personal reflections of particular events, places and times through recorded interviews. Oral historians, like those interested in narrative and narrative identity, often follow a life history or life story approach to collecting material and as such attempt to account for the relation between a person's biography and a given historical event or account. Oral historians tend to have a particular interest in oral sources for what they reveal about history and memory. Oral histories, therefore, are not regarded straightforwardly as representations of the past (with an emphasis on their veracity), but as a means of examining how individual narratives are socially and culturally constituted as part of an on-going explanatory and relational process. The importance of the oral tradition as a means of creating and maintaining shared memories, understandings and identities informs the approach of oral historians who aim to encourage natural narratives from their respondents.

The earthquake event was the most memorable and tragic incident in the lives of respondents. They shared the memories of pre earthquake scenario of the area. They recalled the family system they lived in and the bits of pleasure they had in every day life. This activity helped in including several aspects which could not be foreseen in first phase of research.

3.2.6 Semi structured interviews with households

Harrell and Bradley mention the objectives of semi structured interview as ([Harrell and Bradley, 2009]):

> *This kind of interview collects detailed information in a style that is somewhat conversational. Semi-structured interviews are often used when the researcher wants to delve deeply into a topic and to understand thoroughly the answers provided.*

Conducting semi structured interviews with households aided in formulating a link between the community and researcher. It was sort of a general discussion. During this activity the major focus were the issues faced by *the people during and after reconstruction, the positive sides of reconstruction, the future plans etc.*

3.2.7 The outcome of second phase

The methodology used and the outcomes of this phase are shown in figure 3.6. It was concluded through this phase that the hypotheses made by UET were true. During the same phase, few gaps were identified in the policy and community attitude towards reconstruction. These included:

1. Absence of guidelines on thermal insulation of houses
2. Absence of guidelines on basic spaces
3. Absence of guidelines on maintenance of the houses
4. Vulnerable families becoming more vulnerable due to reconstruction approach
5. Deviation from guidelines

Next surveys considered all the above mentioned aspects.

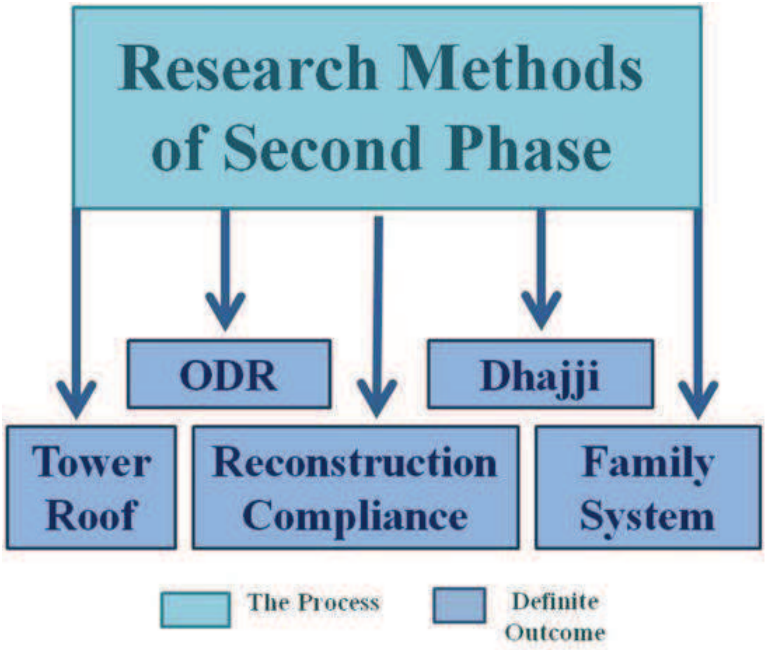


Figure 3.6 — Methods used in second phase directed the research towards concrete selection of different aspects to be explored.

3.3 The third phase

Spanning on two months, this phase consisted of

1. Village selection
2. In-depth interviews with social mobilizers
3. Selection of sample households
4. Field surveys
5. Direct observation

3.3.1 Village selection

Those Union Councils (UCs) were to be selected which suffered major destruction during earthquake and were reconstructed in Dhajji. Although both of Muzaffarabad and Bagh were heavily destructed due to earthquake and many of their villages were reconstructed in Dhajji, another stimulus was the presence of a contact person in the region. When field study was started, reconstruction program was already ended up and UNHABITAT had also left most of the areas. People who worked there were dispersed and could only be contacted through proper channel. For me, without having my origin there, it was difficult to reach door to door for surveys. Consequently those UCs/villages were selected where:

1. Heavy destruction was recorded
2. Reconstruction promoted dhajji-dewari
3. A contact person was available

After pilot survey in September 2011, union councils Kaimanja, Salmia and Sena Daman were selected in Muzaffarabad and UC Thub, Mallot and Jaglari in Bagh. The villages selected from Kaimanja were : Kaimanja, Haryala and Kharabiyan whereas the villages selected from Bagh were Thub, Mallot and Jaglari. The villages in link with UCs and districts are mentioned in table 3.1. Village selection of Salmia and Sena Daman was done later and will be discussed under section 5 of this chapter.

3.3.2 In-depth interviews with social mobilizers

To approach the region without having any contacts was not a workable plan. Hence the social mobilizers were contacted after having their information from UNHABITAT officials. On the basis of region awareness and experience, these social mobilizers were hired by UNHABITAT during post-earthquake reconstruction period but after the reconstruction was ended up, they were engaged in their own work.

In-depth interviews were conducted with them during the travelling interval from main cities to the villages as it took almost two to three hours in one stretch.

Berry discusses the usefulness of in-depth interviews as : *In-depth interview is well suited for describing both program processes and outcomes from the perspective of the target audience or key stakeholder (Pereira). This method is used to elicit information in order to achieve a holistic understanding of the interviewee's point of view or situation ; it can also be used to explore interesting areas for further investigation.* ([Berry, 1999]).

Table 3.1 — The villages in link with UCs and districts

District	Union Council	Village
Muzzafarabad	Kaimanja	Kaimanja
		Haryala
		*Kharabiyan
	Salmia	Salmia
		Jabar/Jandali
		Timberkot
		Gundiwala
		Lamibari
	Sena Daman	Bani Langryal
Bagh	Thub	Thub
	Mallot	Mallot
	Jaglari	Jaglari

* The name of this village could not be confirmed through the records ; authorities include it in Kaimanja.

Boyce and Neale talk about the positive aspects of in-depth interviews ([Boyce and Neale, 2006]):

> *In-depth interviews are useful when you want detailed information about a person's thoughts and behaviors or want to explore new issues in depth. Interviews are often used to provide context to other data (such as outcome data), offering a more complete picture of what happened in the program and why.*

Social mobilizers provided useful information about different aspects of reconstruction. They portrayed the pictures for both the community and the authority. As they behaved as a link between them, they could understand the requirements of people and the limitations of policy makers. Hence the issues and solutions were discussed with them in detail. The most interesting aspect of having interviews with these persons was that they not only knew whole region but they also knew every house and family members residing there.

In rural areas of Kashmir the houses are not numbered. When UNHABITAT officials were asked about this issue, they gave credit to the social mobilizers to aid authorities in this regard. This aspect specifically helped this research in recording the extended family data. Mostly the respondents were reluctant in admitting that they lived jointly in pre-quake situation and got split to obtain financial assistance. The counter check of their statement was made possible by asking social mobilizers. These persons also mentioned several areas where landsliding was occurred during earthquake. The shifting in routes and relocation of community were obvious outcomes of landsliding. Social mobilizers talked about the both.

Although people of Kashmir are welcoming, conducting surveys in Kashmir could be difficult without being introduced by social mobilizers.

3.3.3 Selection of sample households

A combination of Systematic Random Sampling and Cluster Sampling was used in this research keeping in view:

1. Avoiding bias in sample selection
2. Feasibility of access to houses

For example in one village if the reported reconstructed houses were 1000, they were considered them to be equally distributed along both sides of the metalled road. Hence the 500 houses on each side of the road were having the population for selecting the sample. Here the issue was that the houses in rural areas of Kashmir were not numbered. No organization could provide any GIS based data or maps of the villages. Second issue was that the houses were scattered on far elevated sloppy surfaces of mountains. This selection was the most difficult part of conducting field surveys as practically it was not possible to approach those houses. It was therefore assumed that half of these houses are inaccessible. Rest of the figure became 250 on each side of the road.

If 30 houses were to be surveyed from the whole village, 15 focused on either side of the road. Hence every 15th house was to be surveyed. Figure 3.7 provides and idea of existing and expected situation of the road.

But during pilot surveys it was observed that the road ends up before sample is completely accessed. And if half of the village is consider inaccessible, the length of the village must

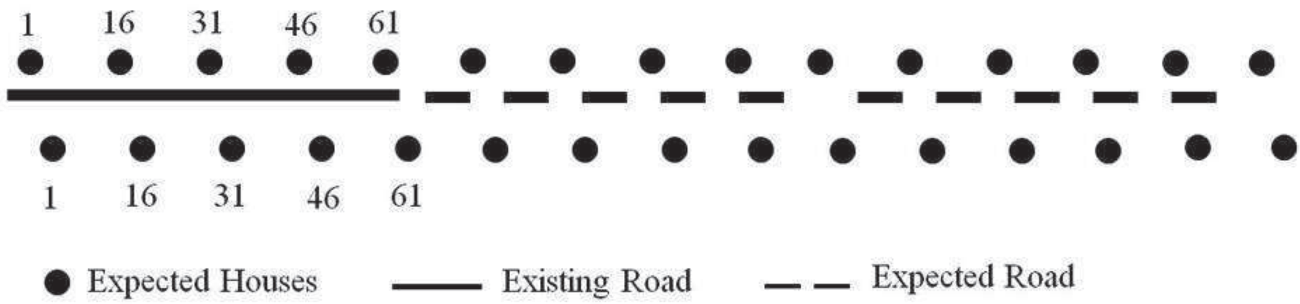


Figure 3.7 — The road generally ended up while sample was not finished.

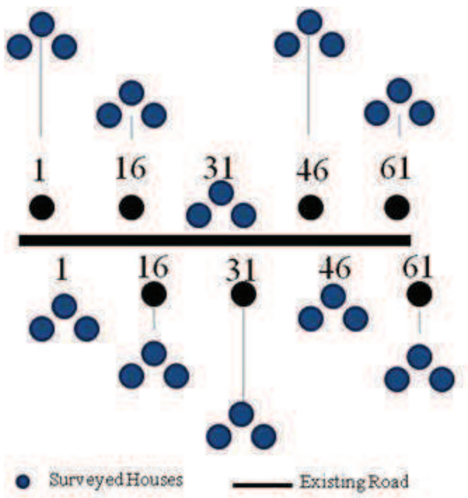


Figure 3.8 — Every 15^{th} house with a maximum hiking distance of 15 minutes from the road.

be more than it actually is. The technique of selecting the houses was then changed. The road length was considered to be the pivotal aspect of selecting the houses. If every 15th house was to be approached in surveys, after that the movement was made by ascending or descending the hill. Here CS was also taken as a sample selection approach during detailed surveys. For Cluster Sampling Anol Bhattacherjee states,

If you have a population dispersed over a wide geographic region, it may not be feasible to conduct a simple random sampling of the entire population. In such case, it may be reasonable to divide the population into "clusters" (usually along geographic boundaries), randomly sample a few clusters, and measure all units within that cluster. ([Bhattacherjee, 2012]).

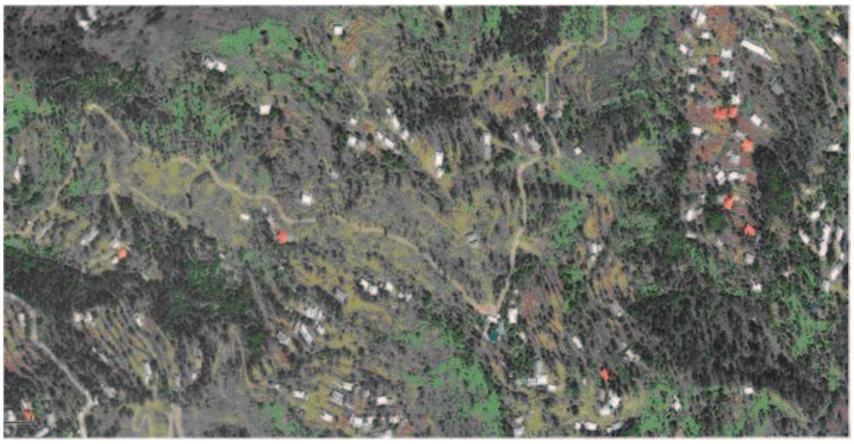


Figure 3.9 — Satellite image of Kaimanja (a surveyed village) shows the scattered houses and their distance from the route. Also it can be seen that houses are generally present in clusters. Source : Google Maps

Although Bhattacherjee recommended CS for large population, it was feasible to apply this on Kashmir rural areas as well. Thus it was planned to survey the houses in cluster of 2 to 3. So every 15th house with a maximum hiking distance of 15 minutes from the vehicle route was selected. Then two to three houses in its vicinity were also surveyed. After this, next cluster of three houses with a hiking distance of eight minutes was selected. Following that three houses which were just close to the road were approached for surveys. Sometimes no houses were present on the calculated distance. In that case going upside/downside the hill to find a cluster of houses was preferred. Figure 3.8 presents the actual selection of houses. In figure 3.9 satellite image of the surveyed area is presented.

The same methodology was adopted during the 2013 surveys.

3.3.4 Field surveys

For quantitative analysis field surveys were planned to be conducted with the selected households. During pilot surveys it was observed that people were not very comfortable with unstructured interviews. In that case they used to give a generic statement and what was needed to explore was not touched in many cases. For example when their opinion upon reconstructed houses was asked, majority had the theme ”If earthquake occurs, nothing can stand in front of it.” But when they were asked different questions focusing strength, weight, ease of construction and material availability etc, they gave concrete response. It was observed that they had a good idea of reconstruction details but they were not able to express it in tangible form. Semi structured questions were asked from 80 households which were approached during this period.

3.3.5 Direct observation

Direct observation was one of the key methodologies of this research. Though participation in the reconstruction work was not done through this research, direct observation on built environment, cultural in/stability, deviation from prescribed practices etc after reconstruction period could be made with a background of architecture studies. As stated by Trochim ([Trochim, 2006]) :

Direct observation is distinguished from participant observation in a number of ways. First, a direct observer doesn't typically try to become a participant in the context. However, the direct observer does strive to be as unobtrusive as possible so as not to bias the observations. Second, direct observation suggests a more detached perspective. The researcher is watching rather than taking part. Consequently, technology can be a useful part of direct observation. For instance, one can videotape the phenomenon or observe from behind one-way mirrors. Third, direct observation tends to be more focused than participant observation. The researcher is observing certain sampled situations or people rather than trying to become immersed in the entire context. Finally, direct observation tends not to take as long as participant observation. For instance, one might observe child-mother interactions under specific circumstances in a laboratory setting from behind a one-way mirror, looking especially for the nonverbal cues being used.

During field visits direct observation helped in detecting the issues which were not mentioned in literature or during interviews. The findings were noted down and a separate record was kept for reference.

3.3.6 The outcome of third phase

Detailed examining of the outcomes of second phase was done here. All the elements were analyzed keeping in view the role of different stakeholders of reconstruction. As explained through figure 3.10, the third phase came up with detailed investigation on hypotheses made by UET Lahore and on the pilot surveys particular to this thesis:

3.4 The fourth phase

1. Key informant interviews with ERRA officials
2. Key informant interviews with implementers
3. Key informant interview with the mason Abdul Qayoum
4. Internship at UNHABITAT

3.4.1 Key informant interviews with ERRA officials

According to Amy Carroll, ([Carroll, 2005])

Key informant interviews are qualitative in-depth interviews with people who know what is going on in the community. The purpose of key informant interviews is to collect information from a wide range of people-including community leaders, professionals, or residents-who have first hand knowledge about the community. These community experts, with their particular knowledge and understanding, can provide insight on the nature of problems and give recommendations for solutions.

These interviews were conducted during the months of March and April 2012.

3.4.1.1 Director housing (Rural housing/Complaints/Compensation)

This interview had the basic theme to obtain authority's opinion upon the acceptability for indigenous construction techniques in the community. Director Housing briefed about the gradual change in the construction culture prior to earthquake. The decline of traditional way

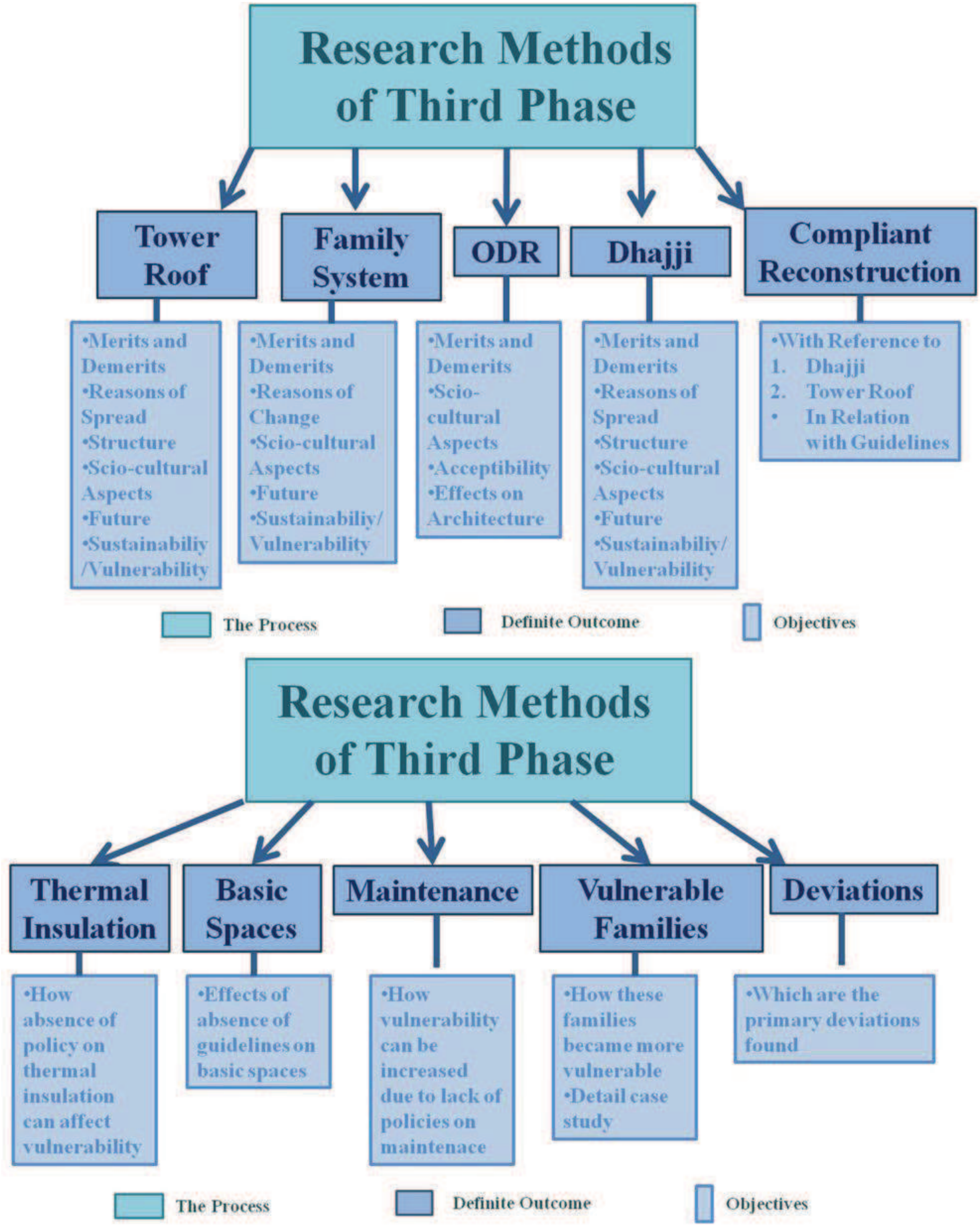


Figure 3.10 — The outcome of third phase.

of building houses was evident from the destruction details of rural houses. He confessed the adverse effects of initial rigidity in ERRA policies for indigenous construction techniques but he also explained the role of the authority in the revival of these building styles.

As he was also responsible for responding to complaints, he briefed about the grievance redressal system of ERRA. After more than six years of the disaster, people were visiting the capital of the country in the hope of being compensated. It was a complicated job to address their needs since many of them did not lie under the beneficiary categories. Fake cases were also reported and people already having several financial packages were still claiming to get more.

Another major issue discussed with him was of Balochistan reconstruction. Although this province was not the study area of my thesis but it was of extreme importance to know about its details. Where Kashmir experience was considered to be a good example among reconstruction programs, according to the experts, ERRA could not perform well for post-seismic Balochistan reconstruction. Director Housing discussed different aspects which became a hindrance for the authority in this area.

3.4.1.2 Director planning

Key informant interview was conducted with the Director Planning, ERRA, who was responsible for coordinating between ERRA and other organizations. He shared his experience of reconstruction in rural areas of Kashmir. The key socio-cultural characteristics which were selected during this study were also discussed during this interview. He informed about the bylaws enforcement in Kashmir and briefed about the role of technical partners of ERRA.

3.4.1.3 Director linkages

During this key informant interview, the official of ERRA, having his origin in Kashmir, provided details of pre-quake Kashmir construction. Recalling the trends and culture of the area he gave the description of family system. In the same interview he explained that how few people exploited the policy. He explained the reason of policy exploitation that for the last several generations we have been suffering from slavery which has its deep routes in our behaviors. The deprivation has compelled people to find out ways which are not legal. He also added the effects of change in family system of Kashmir rural areas.

The discussion moved to Neelum valley, a famous area of Kashmir, where pre-quake houses generally had three storeys. The detail sketch of such houses shall be provided in Chapter 6 of this report. Discussing these houses, he connected *tower roofs* with them.

3.4.2 Key informant interviews with implementers

The higher-ups of UNHABITAT were approached again after the detailed surveys. The interviews were conducted to take the opinion of implementers on outcomes of Phase 3 of this report.

3.4.2.1 Manager technical team

Different aspects of tower roof were included in this interview. The loopholes in the RHRP were focused and it was analyzed that how these have adversely affected the reconstruction. He informed about different initial plans which could not be executed in later stages of reconstruction.

The process of assistance and inspection was the major area of discussion during this interview. He mentioned the problems faced by implementers during this phase from both the community side and the authority side. Also the hardships they faced due to climate, topography and lack of pre-existing data were talked about. The consequences of these issues also affected the final stage of reconstruction.

The compliance standard of houses and the remedial measures were included in this interview.

3.4.2.2 Manager disaster risk management

A key informant interview was carried out with the manager DRM. The major area explored in this discussion was the sustainability of reconstruction. It was discussed that the seismically resistant reconstructed houses must be well resistant against other disasters as well.

He also quoted few examples of change in family structure of rural Kashmir and talked about the issues families are facing now.

3.4.3 Key informant unstructured interview with the mason Abdul Qayoum

A resident of Thub, Bagh, mason Qayoum is the key person of rural Kashmir reconstruction. He had served the nation as Master Carpenter, UNHABITAT, Pakistan. He has learnt the construction techniques from his father and is a professional mason for the last fifty years or so.

When earthquake occurred, dhajji dewari was on decline in rural areas of AJK. People were more interested in heavy stone masonry construction in his area. Observing the performance of indigenous construction techniques under seismic tremors, he started building his niece's house in dhajji. UNHABITAT was continuously in search of people who could positively participate in sustainable reconstruction. On viewing his construction, implementers of RHRP became interested in dhajji work. They discussed different aspects of dhajji with him and requested him to accompany to the headquarters of ERRA. On his accord, they arranged meeting of the mason with authorities. ERRA was not convinced at once but after extensive arguments and discussions, it did acknowledge the view point of Qayoum.

Having a meeting with this experienced person was proved to be a good source of information for this research. Although dhajji related literature was reviewed before the meeting, he explained several features practically. To provide data for this study, he arranged the visits to five different types of houses. The questions provoked during the initial stages of this research were answered by him. Through all these houses he mentioned the wrong perceptions of people about the indigenous construction practices. Different styles of framing in dhajji along with a variety of sizes were explained in detail. He also explicated the local terms used for different parts of the construction.

Not only the positive side of dhajji was shown by him but also negative aspects were discussed. His major concerns were the misunderstanding/less understanding of people while constructing in dhajji hence making it a fragile structure. As many people complained that dhajji was not warmer than stone masonry, he suggested the options to enhance its thermal insulation. Also the fatigue of maintenance of dhajji could be reduced through many ways. Mason Qayoum helped understanding the structure of tower roof too. By explaining the connections of elements he stressed that this roof is a good option for people to increase the space of the house.

Keeping in view the socio-cultural characteristics and the policies by authority, mason Qayoum was asked his opinion about ODR, split family system and social vulnerability of families. He provided useful information on these areas of study.

3.4.4 Internship at UNHABITAT

An internship was conducted at UNHABITAT from May to July and September 2012. The purpose of this apprenticeship was mainly to access and then assess the data about AJK reconstruction. Although simultaneous work for the organization was also done, the primary focus remained on the current research.

The maps prepared by UNHABITAT were proved to be a good source of information on the progress of RHRP. The implementation phase of RHRP was comprehended by consulting UNHABITAT progress reports on rural housing reconstruction. These quarterly reports not only gave a detailed presentation of implementation, the loopholes and flaws were also mentioned there.

During the same period, UNHABITAT started a project proposal on Resilient Cities. This mega project had already completed the initial phase of assessing local bodies and organizations. Through LGSAT (Local Government Self Assessment Tool) forms, the country wide condition of disaster preparedness was recorded. This exercise helped find out the current situation of this research study area after seven years of disaster.

Meanwhile the proceedings of a joint conference on disasters were reviewed. This was held in early 2012 in Islamabad, Pakistan. The visual recording and research papers of disaster experts provided the past mistakes, present strategies and future plans of different national and international organizations. The task of designing the earthquake resistant buildings in seismic risk zones aided in understanding the procedure of policy, design and implemen-

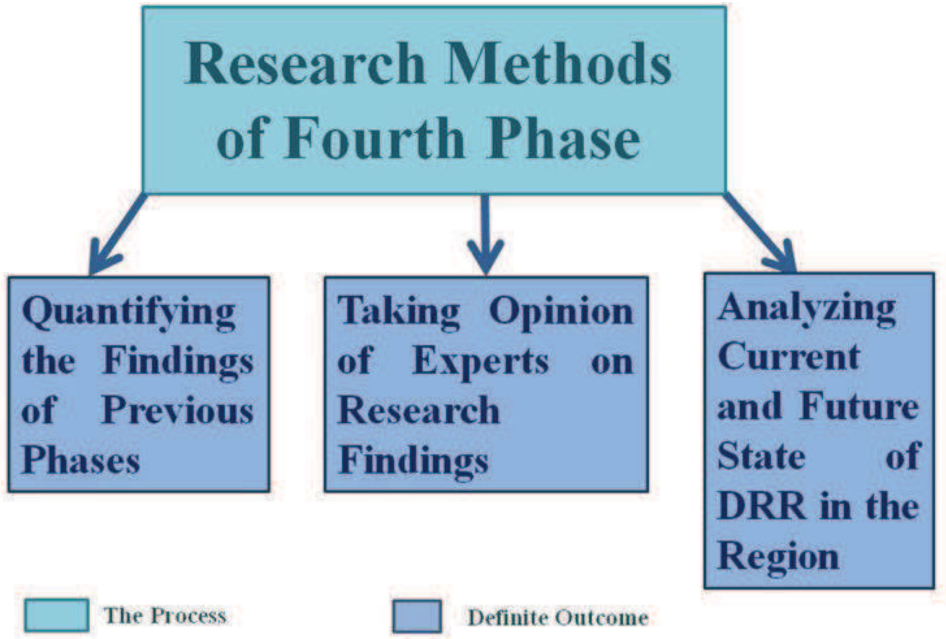


Figure 3.11 — The outcome of fourth phase.

tation in a comprehensive way. It was interested to know the balance between needs (of society) and delivery (by authority). The design work helped comprehend the hurdles of implementation as well.

3.4.5 The outcomes of fourth phase

The experts were re-approached and their opinion was taken on research findings during this phase. Simultaneously the findings were quantified. This process is shown in figure 3.11

3.5 The fifth phase

1. Surveys for quantitative analysis

2. Data analysis

3.5.1 Surveys for quantitative analysis

Salmia and Sena Daman were not personally visited in this phase rather a quantitative survey during the last phase of the thesis was conducted through a graduate student. This survey had the intention of exploring the long term impacts of reconstruction.

The reason for selecting this area was the map provided by UNHABITAT according to which dhajji construction was almost 100% in the whole UC Salmia (map is presented in chapter 4). This research was also aimed to find out the reasons and the related aspects of adopting dhajji on such a large scale. Through discussions with few Kashmiris it was identified that tower roof was present in Nato (a village in Sena Daman) before earthquake hence the views of native people in this regard were decided to be explored.

The surveys in the five villages of Salmia and one of Sena Daman were although not carried out personally, contact with the respondents through mobile phone of the surveyor was executed (Mobile phones are preferred in rural AJK than land line). The photographs of the houses helped find out different dimensions and conditions of reconstruction. A total of 148 houses were surveyed in this phase.

3.5.2 Data analysis and results formulation

The research reveals that every data-collecting tool has its own advantages as well as disadvantages ([Olsen, 2004] ; [Fernando, 2010]). To extract the maximum quality of results and to avoid bias, more than one data-collecting tool is used in my research. This mixing of methods is popularly known as the ”triangulation of methods“ ([Arksey and Knight, 1999] ; [Adams and Cox, 2008]) or triangulated qual-quant methods ([Olsen, 2004]). What Alan Bryman states about triangulation is ([Bryman, 2004]) :

Triangulation refers to the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings. Since much social research is founded on the use of a single research method and as such may suffer from limitations associated with that method or from the specific application of it, triangulation offers the prospect of enhanced confidence. Triangulation is one of the several rationales for

MULTIMETHOD RESEARCH. The term derives from surveying, where it refers to the use of a series of triangles to map out an area.

Talking about the types he further adds :

Denzin ([Denzin, 1970]) extended the idea of triangulation beyond its conventional association with research methods and designs. He distinguished four forms of triangulation:

1. *Data triangulation, which entails gathering data through several sampling strategies, so that slices of data at different times and social situations, as well as on a variety of people, are gathered*

2. *Investigator triangulation, which refers to the use of more than one researcher in the field to gather and interpret data.*

3. *Theoretical triangulation, which refers to the use of more than one theoretical position in interpreting data.*

4. *Methodological triangulation, which refers to the use of more than one method for gathering data*

The fourth of these, as the preceding discussion implies, is the most common of the meanings of the term

Above mentioned 1, 2 and 4 types of triangulation are utilized in this research as :

1. By conducting the research in different study areas, at different time and people of different strata.

2. By the collaborative research in the start of the thesis helped avail the view point of other researchers

3. By using different methods (already mentioned in detail) to explore the study field

For analyzing the data, SPSS 18 is taken help from. Codebooks of both surveys (2011 and 2013) were prepared and data was entered. A frame of analysis, including variables to be analysed with relevant statistical procedures, was constructed. The analysis is presented in the form of tables and graphs in the related sections of the report. The outcome of fifth phase is expressed in figure 3.12.

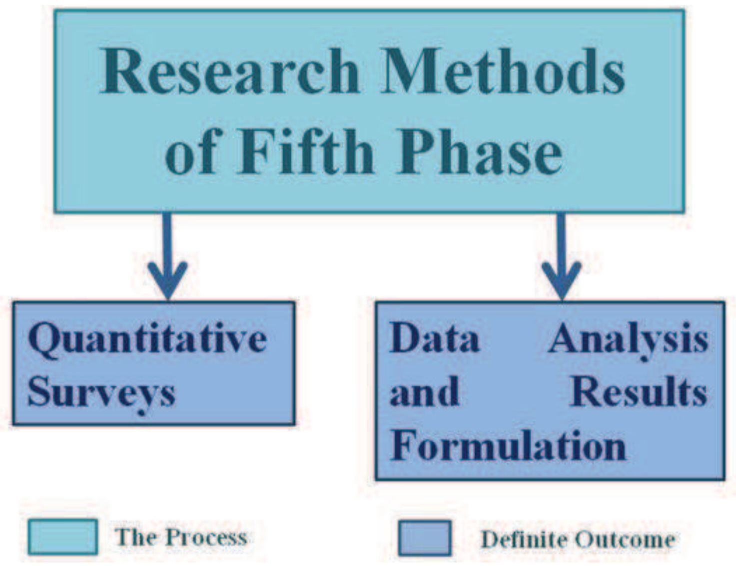


Figure 3.12 — The outcome of fifth phase.

3.6 Issues faced during field work

3.6.1 Change in field location

Initially it was expected that this research will be conducted in two regions ; Kashmir and KPK (Khayber Pakhtunkhwa ; an earthquake hit province of Pakistan). But the law and order situation of KPK in early 2010 made it difficult to approach. Consequently the focus was shifted just on Kashmir.

3.6.2 Sensitivity of research subject

People considered this research to be a livelihood survey and expected future financial aid as a result. The negation of their expectation made them a bit unconcerned or irritated.

When people were asked questions about the reasons of shift in family structure, they were not willing to answer or they denied the existence of extended families in pre quake situation. With the promise of not mentioning their names, the house owners were agreed to respond about family shift. This scenario had to be tested with the help of social mobilizers. These people knew every family of the region in pre and post quake condition hence corrected the information. A Change in Data Analysis & Demonstration Tool Initially it was planned that all the results of field surveys would be demonstrated and analyzed through GIS. However few constraints changed this method and only SPSS was utilized.

3.6.3 Absence of data

It was foreseen in the start of the study that the vulnerability of Kashmir will be quantified. But the last census was conducted in 1998 in the region and this field could diverge my focus from actual theme of research. Hence this plan was quit. To conduct surveys of the field, it was found difficult that houses were not numbered. To carry out the initial livelihood and damage surveys, the authorities had to take help from social mobilizers or electricity bills. No substantial data was available for surveys. Similarly for me, though the destruction detail on district level was available, it was absent on village level and sometimes on UC level too. One organization referred to another organization to obtain data but hardly anyone could help. The record was present in bits and had to be compiled it in an organized manner which obviously was not accurate.

3.6.4 Weather of Kashmir

The region of Kashmir can not be approached from mid December (or sometimes from mid November) to end March due to extreme winter and snowfall. Generally the roads get blocked during this time period.

Kashmir experiences Monsoon during July and August. Heavy rains restrict the approach to most of the areas of Kashmir. Even if the metalled roads are open, hiking towards the houses which are not linked with routes, becomes impossible during these months.

Hence almost for half of the year research can not be conducted in the selected areas.

3.6.5 Difficult terrain

Muzaffarabad and Bagh districts are hilly areas. The surveyed households were located on high altitude. To reach those regions was extremely difficult task. Special vehicles were arranged which could mount this terrain. In many places metalled roads are not yet completed and one has to travel on rugged surface as it took 3 hours to ascend a 10 Km long route while going to Bagh.

Accessing houses from metallic road was also not easy. Sometimes it took 15 minutes to hike from one house to another.

3.6.6 Gender issue

It was advised by many people that being a woman one must not go alone to this region and any family member should accompany her. Hence each time the area was surveyed, the family members had to come along.

Although no security threats were experienced in the region, precautionary measures had to be taken in all cases.

CHAPTER

4 Introduction to reconstruction program and surveyed areas

THIS chapter presents the background of the Kashmir event by discussing the earthquake history of the region. Also it focuses upon the consequences of these earthquakes. The event of Kashmir is then discussed by providing the destruction details. The consequent seismic reconstruction program for rural areas under the umbrella of ERRA is also introduced.

4.1 Azad Jammu and Kashmir

AJK Official Website briefs about the area as : *Azad Jammu and Kashmir lies between longitude of 730 - 750 and latitude of 33 - 36 and comprises an area of 13,297 Square Kilometres.*

The topography of the area is mainly hilly and mountainous with valleys and stretches of plains. Azad Kashmir is full of natural beauty with thick forests, fast flowing rivers and winding streams. The main rivers are Jehlum, Neelum and Poonch. The climate is sub-tropical highland type with an average yearly rainfall of 1300 mm. The elevation from sea level ranges from 360 meters in the south to 6325 meters in the north. The snow line in winter is around 1200 meters above sea level while in summer, it rises to 3300 meters.

According to the 1998 population census the state of Azad Jammu & Kashmir had a population of 2.973 million, which is estimated to be grown to 3.5 million in 2006. Almost 100% population is comprised of Muslims. The Rural : urban population ratio is 88:12. The population density is 270 persons per Sq. Km. The literacy rate which was 55% in 1998 census has now risen above 60%. Approximately the infant mortality rate is 56 per 1000 live births, whereas the immunization rate for the children under 5 years of age is more than 95%.

The majority of the rural population depends on forestry, livestock and agriculture to eke-out its subsistence. Average per capita income has been estimated to be 847 US$. Unemployment rate ranges from 6.0 to 6.5% per annum. In line with the national trends, indicators of social sector improvement, particularly health and population welfare have not shown much proficiency. Efforts have been made during the recent past to make up this deficiency, which will bring the fruits of development to the common man.

AJK's literacy rate is well above 60% which is significantly higher than the national average of Pakistan. At present the gross enrolment rate at primary level is 95% for boys and 88% for girls (between the age of 5-9 years).

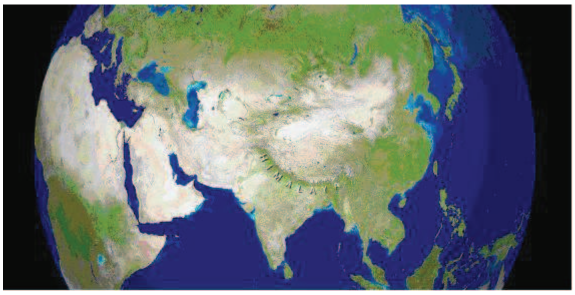


Figure 4.1 — The location of Himalayan region in the world. ([of Cambridge])

Figure 4.2 — The location of Kashmir in Himalayan region ([of Cambridge])

4.2 History of earthquakes in Kashmir and its neighboring region

The Himalayan Region, where Kashmir is located (figure 4.1 & figure 4.2, has experienced frequent earthquakes throughout the history. This region consists of the lofty mountain ranges spreading over Afghanistan in the west and Bangladesh in the east across Pakistan, India, Nepal and Bhutan. The Himalayan Mountains are the highest and the youngest on the earth ([Joshi and Khan, 2009]).

Sorkhabi states about the earthquakes of Himalaya as :

Although earthquakes have struck the Himalaya for millions of years, historical documents of these earthquakes go back to only the 13th century and were compiled in the 19th century. A British scholar, R. Baird-Smith, prepared 'Memoir on Indian Earthquakes' and *published it in three parts (1843, 1844, and 1845) in the Journal of Asiatic Society of Bengal. In 1883, Thomas Oldham, the first director of the Geological Survey of India in Kolkata, published 'A Catalogue of Indian Earthquakes from the Earliest Times to 1869 in the Memoirs of the Geological Survey of India. A more recent catalogue of historical earthquakes in the Himalaya has been published in the Indian journal Current Science ('Seismology in India', 25 January 1992).* ([Sorkhabi, 2011])

Bilal in 2011 expresses :

Kashmir has a distinction of having historical record of 5,000 years in its archival resources, where fragmentary accounts on past earthquakes exist. In all we collated the details of as many as sixteen earthquakes from these historical records that have been felt in the Kashmir Valley ; notable among them are the earthquakes of 844, 1123, 1501, 1555, 1735, 1778, 1828, 1863 and 1885 A.D. However, the available information about most of these earthquakes is very scanty ; it is only for the 1885 event that there is some detailed first hand information available about the areas and magnitude of damage, courtesy two British missionary doctors, Dr. Arthur Neve and Dr. Ernest Neve, who happened to be in Kashmir when the earthquake struck the Valley. As per their description, the earthquake seems to have affected much of the area in the north western part of the Kashmir Valley, particularly in and around Baramulla town. ([Bilal, 2011])

The details of all major earthquakes are summarized in table 4.1.

Bilham explains the figure 4.3 as :

Plate boundary velocities are indicated in mm/yr. Shading indicates flexure of India : a 4 km deep trough near the Himalaya and an inferred minor (40 m) trough in south central India are separated by a bulge that rises approximately 450 m. Tibet is not a tectonic plate : it extends east west and converges north-south at approximately 12 mm/yr. At the crest of the flexural bulge the surface of the Indian plate is in tension and its base is in compression. Locations and dates of important earthquakes mentioned in the text are shown, with numbers of fatalities in parenthesis where known. With the exception of the Car Nicobar 1881, Assam 1897 and Bhuj 2001 events, none of the rupture zones of major earthquakes are known with any certainty. The estimated rupture zones of pre-1800 great earthquakes are shown as unfilled outlines, whereas more recent events are filled white. ([Bilham, 2004])

Table 4.1 — Organized by S. Abidi. Courtesy : [Jain *et al.*, 1999] ; [shr] ; [Sorkhabi, 2011] ; [Bilal, 2011]

Earthquake	Date	Magnitude	Deaths	Injuries	Buildings Destruction
Nepal	26.08.1883	7.7	414	172	4040
Kashmir	30.05.1885	6.3	*3500		400
Assam	12.06.1897	8.3	1500		
Kangra	04.04.1905	7.8	20000		
Bihar, Nepal	15.01.1934	8.1	10700		
Assam	15.08.1950	8.7	1526		
Uttarkashi	20.10.1991	6.6	2000	1800	49000
Chamoli	29.03.1999	6.8	103	394	21100
Kashmir	08.10.2005	7.6	87350	134570	632400

* In addition, 67.33% of total human population died in Baramulla district alone.

4.2.1 The reason behind Himalayan earthquakes

Scientists believe that 200 million years back India was distantly placed from it today's location as shown in figure 4.4 & 4.5. In the living planet earth the movement of lands is evident through historical records. India also travelled from far away Antarctic area (present) to the Asia.

Now Indian tectonic plate is moving towards and converging with the Eurasian plate at a rate of five-six centimetres each year. This has resulted into the formation and uplift of Himalaya Mountains as shown in figure 4.6([Paudyal, 2012] ; [Hamblin and Christiansen] ; [Mountains]). Significant earthquakes are also an obvious outcome of this process which is going on for the past millions of years. During this period, continental lithosphere longer than 2000 km has been shortened into the massive mountain ranges and elevated plateaus of central Asia ([Molnar and Tapponnier, 1975] ; [Jade *et al.*, 2007])

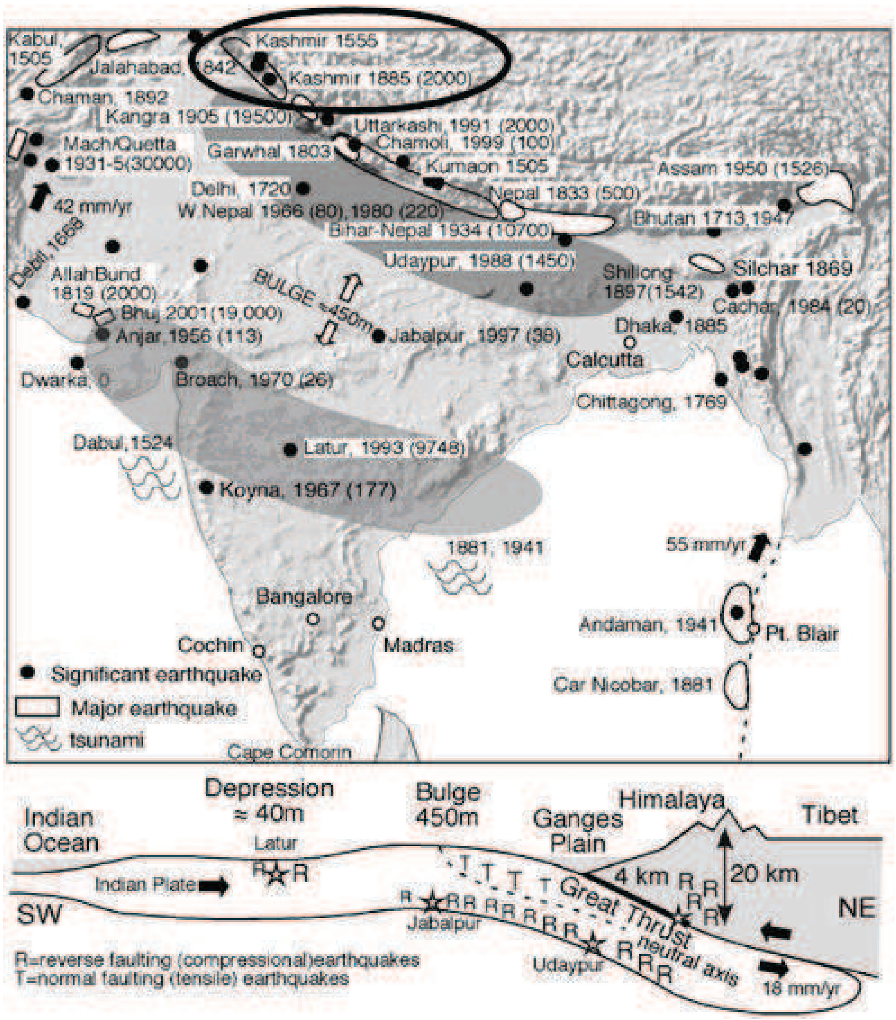


Figure 4.3 — Schematic views of Indian tectonics. Source : ([Bilham, 2004])

4.2.2 Earthquakes in Pakistan

Pakistan is situated in South Asian region between longitudes 61^o & 76^o E and latitudes 24^o & 37^o N covering a total land area of 796,095 sq. km. Himalayas are in the North, Hindukush and Suleiman ranges in the Northwest. In the South, along the coast of Arabian Sea, there is a narrow marine zone belt. In rest of the country there is a belt of sub-mountain Potohar plateau and Salt range in Punjab, western bordering highlands the Balochistan plateau and southern Indus plain.

The country shares its borders with Iran to the West, India in the Southeast, Afghanistan in the Northwest, and China in the North. Figure 4.7 shows, the Geographical location of

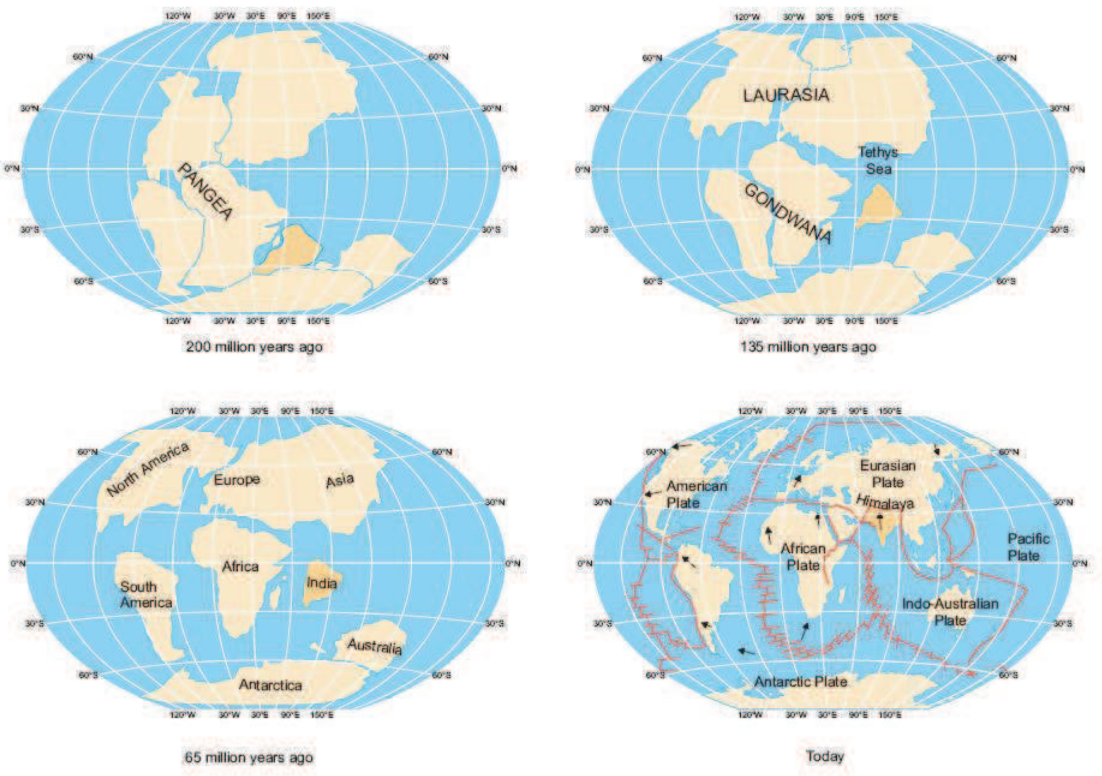


Figure 4.4 — The location of Kashmir in Himalayan region ([of Cambridge])

Pakistan in South Asia ([Gill, 2004] ; [Magsi, 2007])

The Pakistan region comprises diverse nature of geological features as it lies at the junction of Indian, Eurasian and Arabian plate boundaries. Figure 4.8 shows Pakistan's location behind tectonic plates whereas figure 4.9 explains the movement of tectonic plate.

Pakistan region has experienced numerous significant earthquakes throughout the history. The map below reveals the frequency of earthquakes since last century to date. It is obvious that Pakistan region has experienced numerous earthquakes during past 113 years (as shown in figure 4.10).

Figure 4.11 shows the high seismicity of Pakistan and other parts of the world whereas figure 4.12 provides the detail of seismic zones of Pakistan. The seismic zones of the country reveal that the regions of Karachi ([Bilham *et al.*, 2007]), Kashmir, Chitral, Quetta and some other areas on coastal belt in the south lie in Zone 4 ; with the highest seismicity. Many active faults exist in Northern and Southern areas of Pakistan and more than half of the total

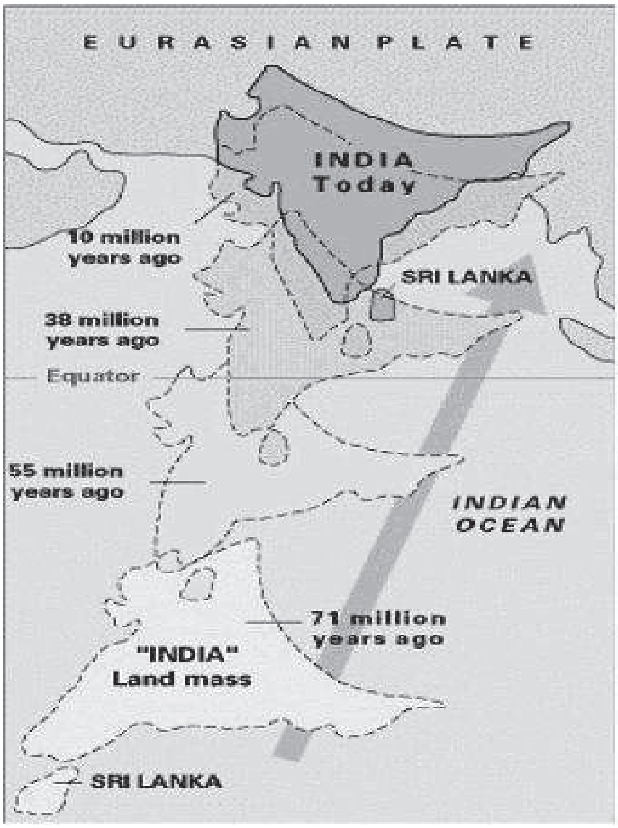


Figure 4.5 — Movement of Indian land mass. Source : [usg, 1999]

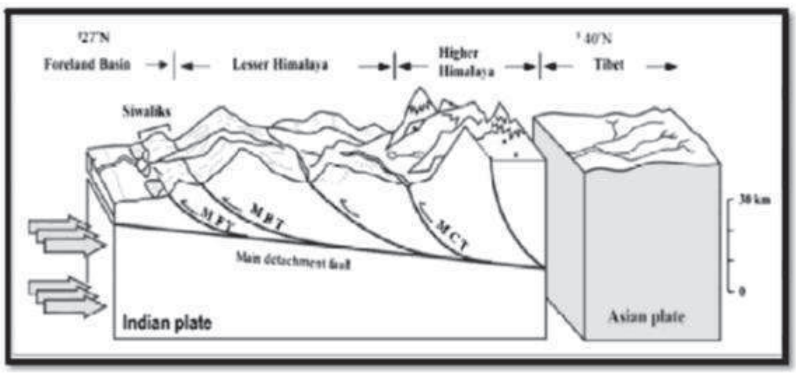


Figure 4.6 — The important fault system (MCT : Main Central Thrust, MBT : Main Boundary Thrust, MFT : Main Frontal Thrust) Beneath the Himalaya Is Depicted ([Mondal, 2013])

Figure 4.7 — Map of Pakistan

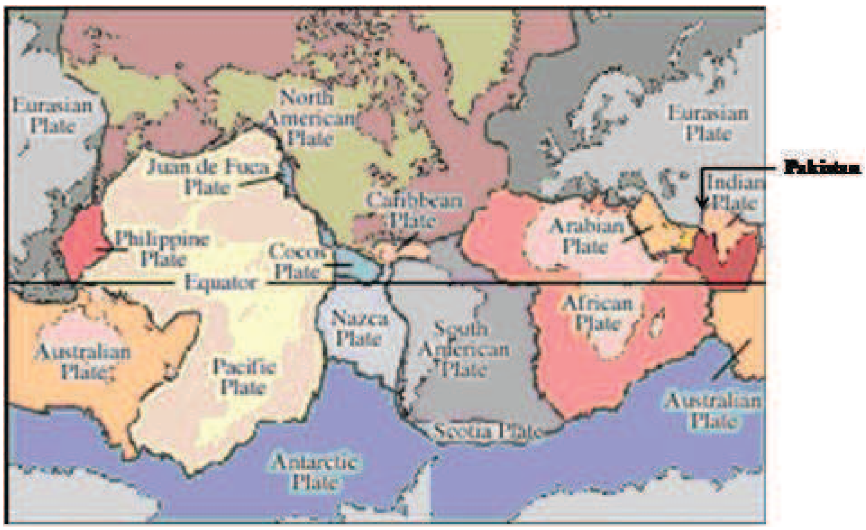


Figure 4.8 — : Location of Pakistan with reference to tectonic plates. Courtesy : Geographical Association UK

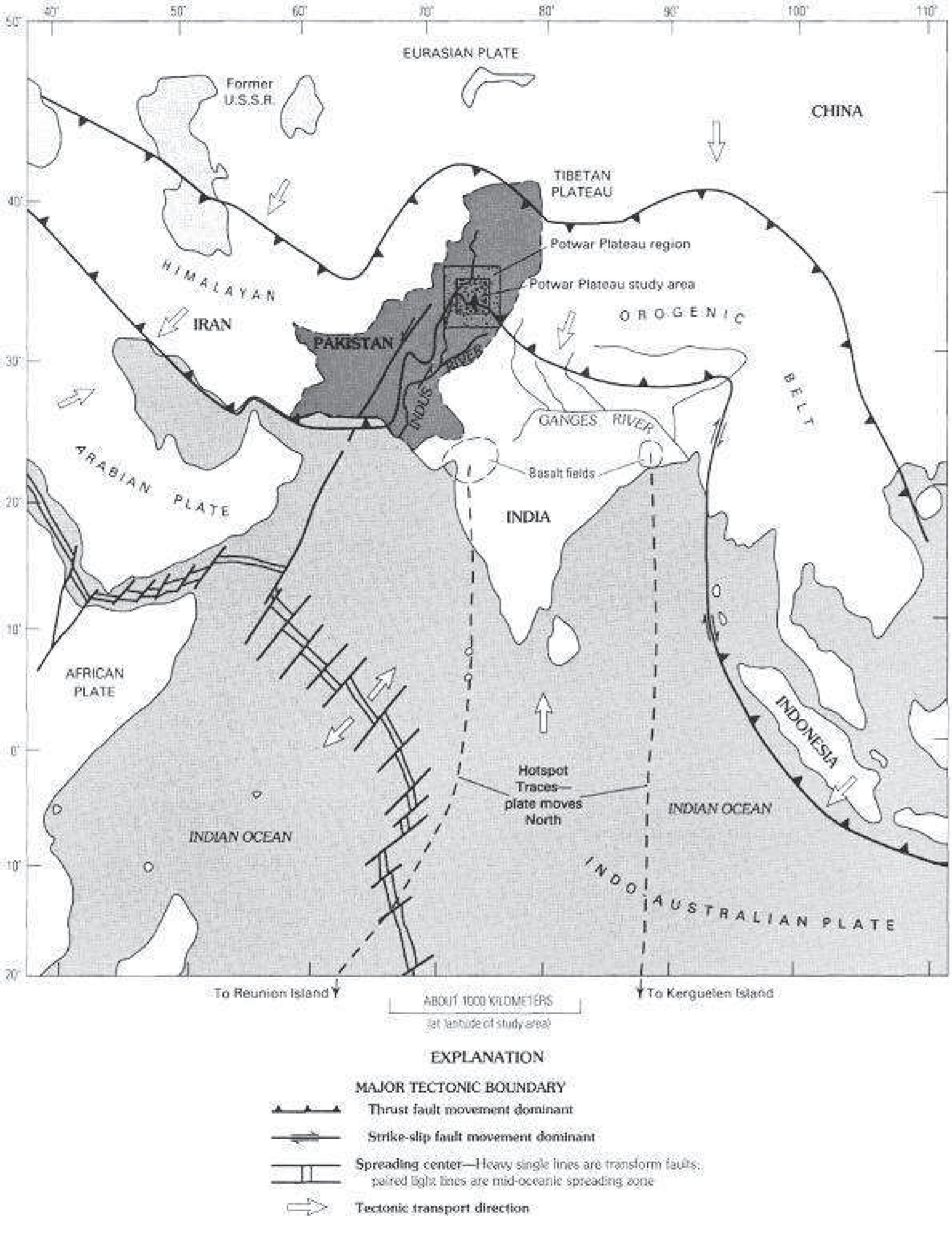


Figure 4.9 — : The map above was created to show the USGS project area however it is a good explanation of the movements of tectonic plates. Source : [Drewes, 1995]

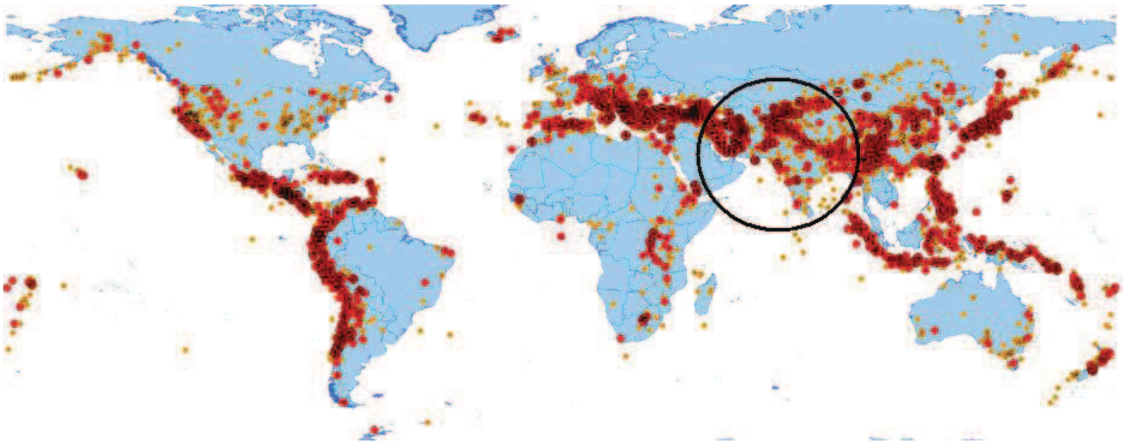


Figure 4.10 — : Locations of orange, red and dark-red earthquakes registered in CATDAT over the last 113 Years. Source : [CATDAT, 2013]

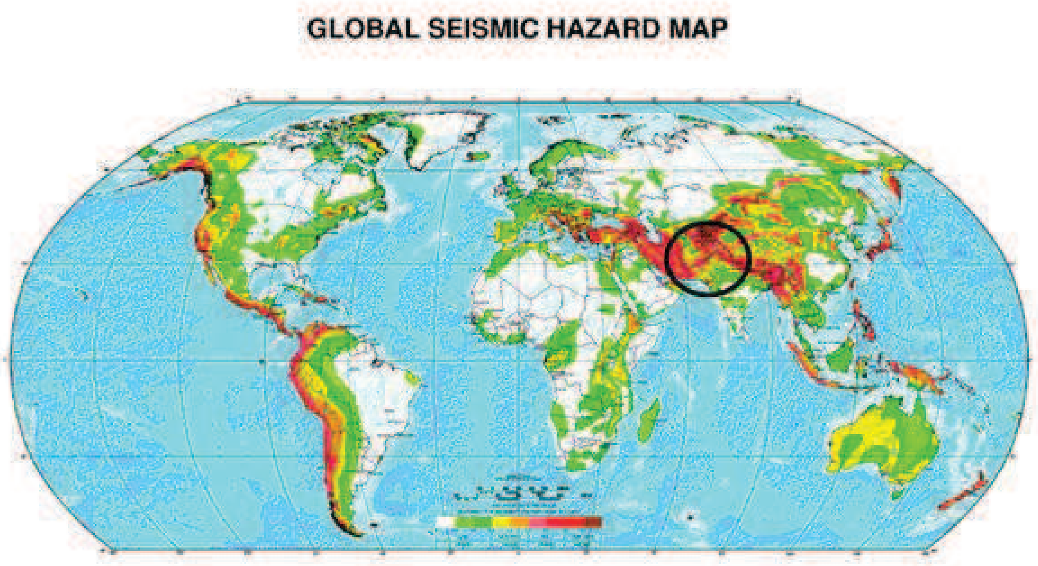


Figure 4.11 — : Global seismic hazard map showing the region of Pakistan with high seismicity

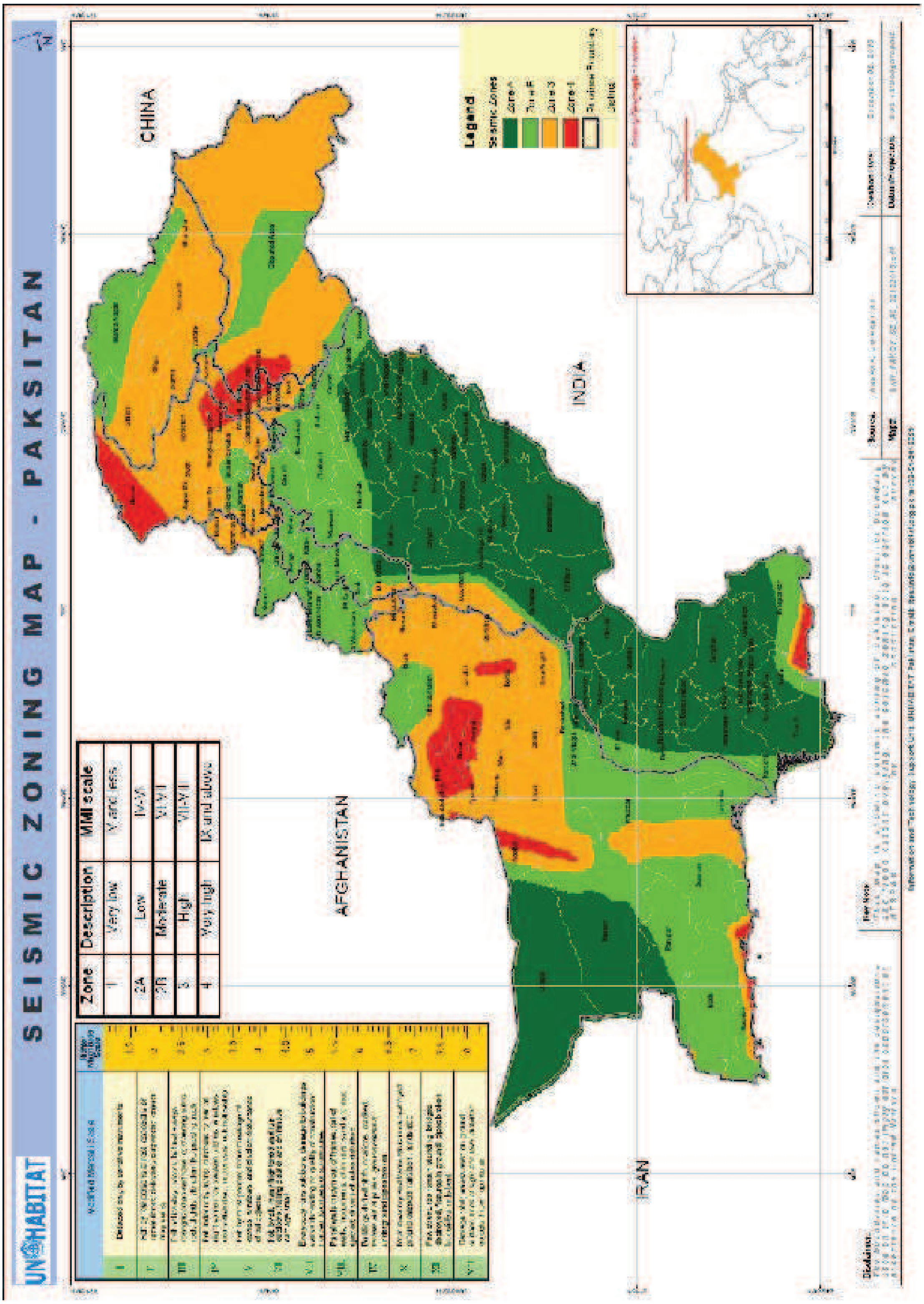


Figure 4.12 — : Different seismic zones of Pakistan, Source : [UNHABITAT, 2010b]

population are living with earthquakes and will have to continue doing that. ([Department and NORSAR, 2007])

Although the region where Pakistan is located has a long history of earthquakes, only few significant earthquakes are occurred since the existence of Pakistan in 1947 (table 4.2). Before 2005 earthquake, Pakistan has experienced 1974 Pattan earthquake which generated substantial damage to human lives and property.

Table 4.2 — Significant earthquakes of Pakistan. Courtesy : [goo] ; ERRA Official Website ; [UNHABITAT, 2010a] ; [Baloch and Musaddaq] ; Source : S. Abidi

Earthquake	Date	Magnitude	Deaths	Injuries	Buildings Destruction
Pattan	28.12.1974	6.2	5300	17000	Thousands
Kashmir	08.10.2005	7.6	86000	138000	600000
Quetta	28.10.2008	6.4	166	370	9881
Dalbandin	18.01.2011	7.2	3	-	200

4.3 The event of Kashmir earthquake 2005

The deadliest earthquake in the history of Pakistan struck its northern parts on the morning of October 8, 2005 (figure 4.13). With a magnitude 7.6, it caused widespread destruction by perishing more than 86,000 people, severely injuring another 138,000 and leaving an estimated 3.5 million people homeless (EERI, 2006). Significant damage was also inflicted in the Indian administered parts of Kashmir where at least 1,350 people were killed and 6,266 people were injured ([goo]).

The quake was centered about 12 miles northeast of Muzaffarabad, the capital of Pakistan-administered Kashmir. (Since 1947, India and Pakistan have fought a series of wars for control of Kashmir. A line of control separates Kashmir into two parts, each administered by these two countries).

The event of Kashmir earthquake affected nine districts (figure 4.14)and 2.8 million population (figure 4.15) in Azad Jammu & Kashmir (AJK) and Khyber Pakhtunkhwa (KPK)

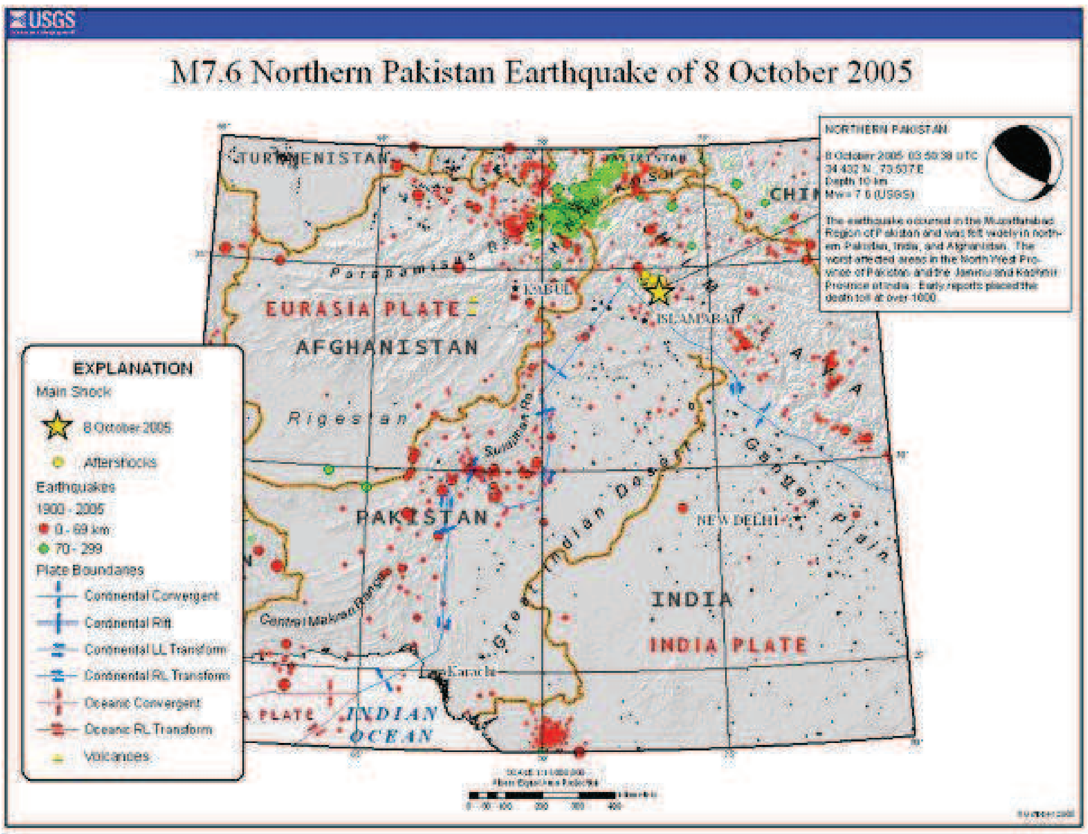


Figure 4.13 — : The 8^{th} October 2005 Kashmir earthquake. Source : [goo]

province, covering an area of approximately 30,000 square kilometres (figure 4.16). More than 600,000 houses were either completely destroyed or partially damaged among those 463,243 were completely destroyed rural houses (ERRA official website) ; 3,14,474 housing units were damaged only in Azad Kashmir (SERRA official website). Few examples of the destruction can be seen in figures 4.17 and 4.18. At least 32,335 buildings collapsed in Anantnag, Baramula, Jammu and Srinagar, Kashmir ([goo]).

The earthquake also destroyed or damaged health facilities, education centers and government sector buildings. Infrastructure destruction caused severe interruption in the supply of aid to needy communities. Damages to telecom and power created chaos in the hour of emergency ([ERRA, 2011]). The details can be seen in table 4.3.

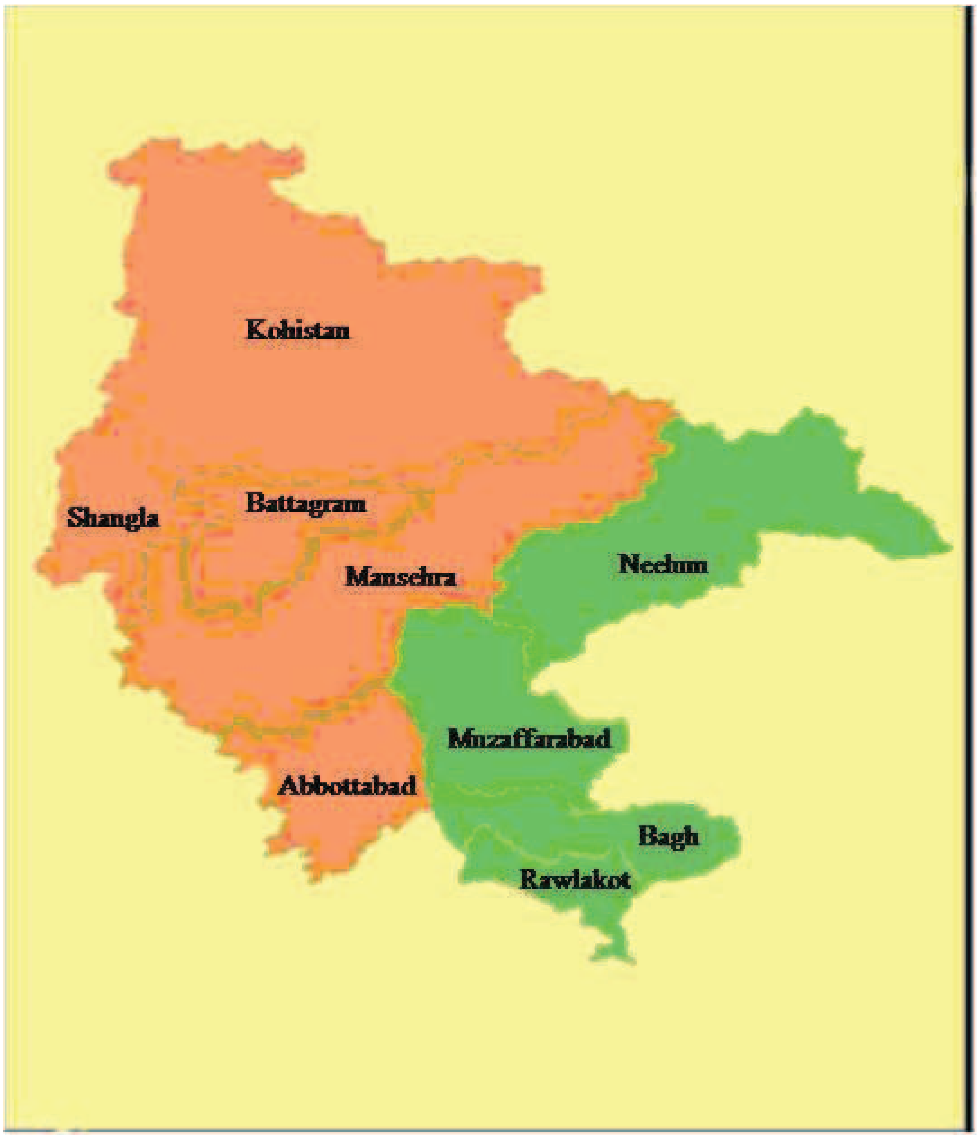


Figure 4.14 — : Nine districts which were severely affected by the earthquake. Source : ERRA Project Completion Report (2007-2011), ([Reconstruction and Authority, 2007])

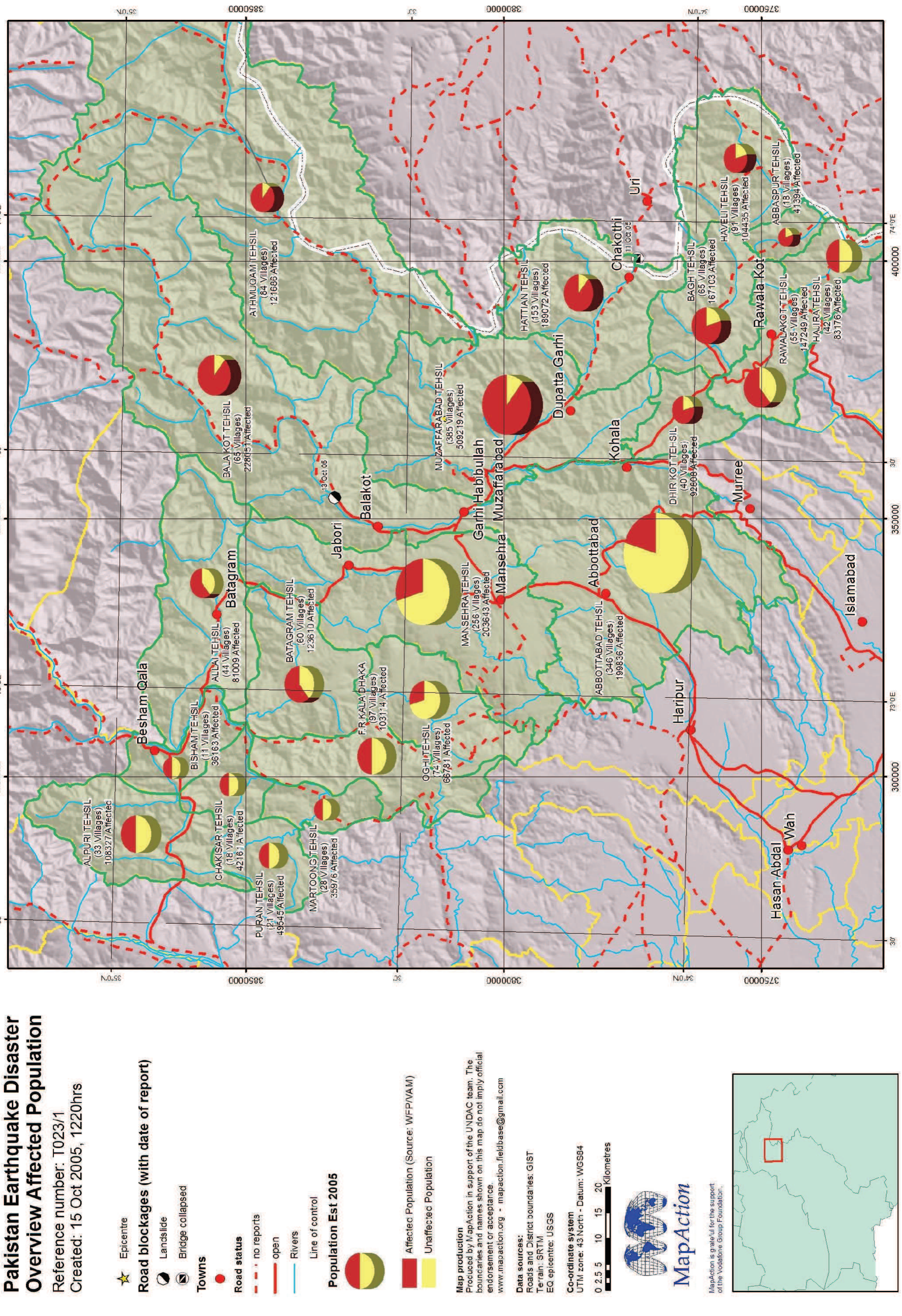


Figure 4.15 — : Affected population estimated during mid-october, 2005. Source : [MapAction]

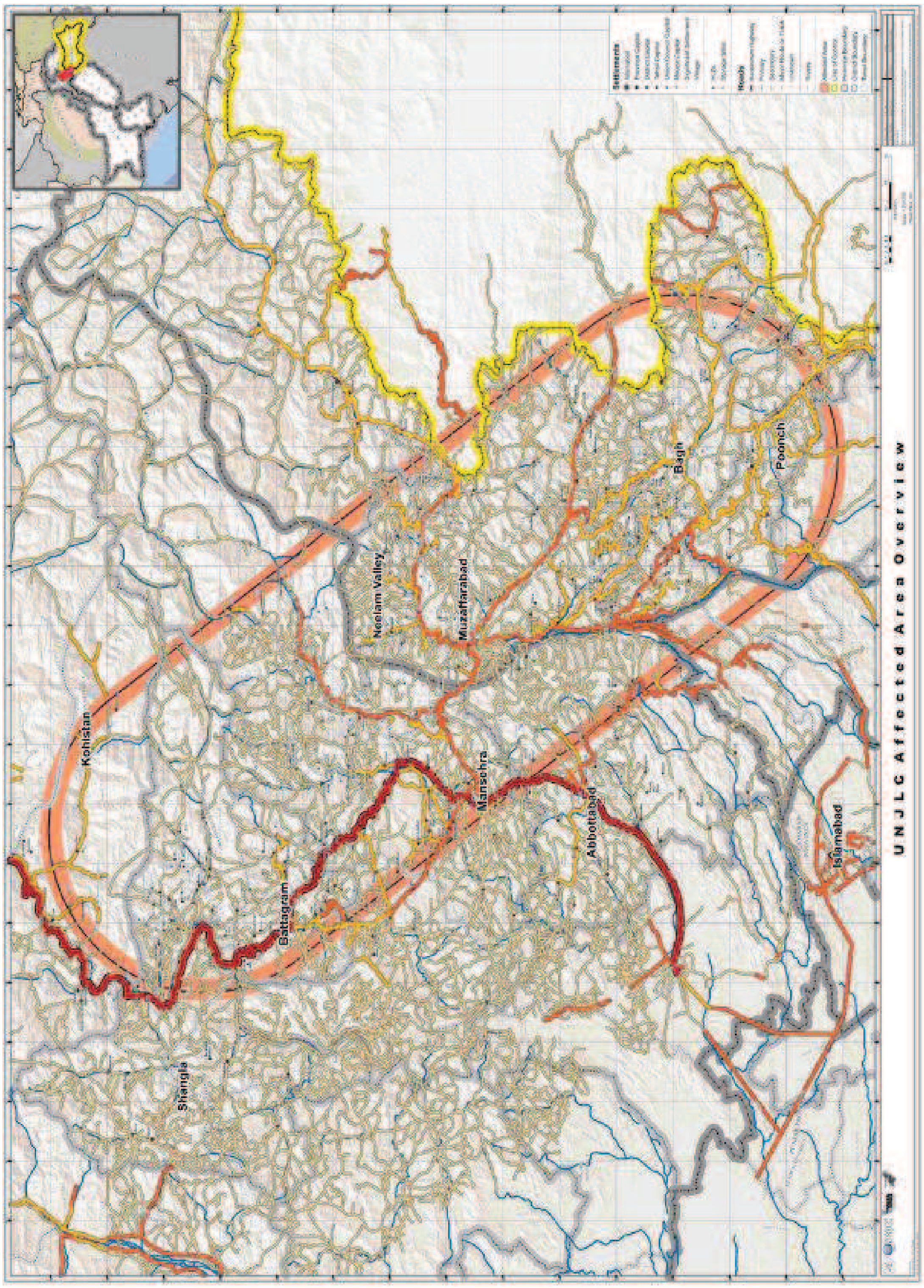


Figure 4.16 — : Earthquake affected areas of AJK and KPK. Source : [Authority, 2006]

Figure 4.17 — : The Earthquake razed several structures from the surface of the earth. Source : The Pakistan Quake.com

Figure 4.18 — : Poor quality RCC played a brutal role in the 2005 event of Kashmir. Source : SERRA official website

Table 4.3 **—** Detail of destruction in KPK and AJK due to 2005 earthquake ; Courtesy : ERRA official website ; [goo] ; [EERI, 2006] Source : S. Abidi

Deaths	86,000
Injuries	138,000
Homeless	3.5 million
Houses Destroyed	600,000
Affected Families	500,000
Affected Districts	9
Affected Tehsils	25
Affected Villages	4,000
Affected Area	30,000 sq km
Children Died	19,000
Educational Institutions Destroyed	6,298
Health Units Destroyed	796
Farm Animals Died	250,000
Roads Damaged	6,440 km
Services Destroyed/Damaged (Telecom, Power, WATSAN)	50-70%
Hazards Generated by the Erathquake	Massive Landslides, Rock Falls

4.3.1 Reasons of damage and destruction

4.3.1.1 The location and intensity

To a great degree the location of the communities fix the extent of damage due to earthquakes. The areas near the epicentre suffer from greater damage. The 2005 earthquake occurred twelve miles north from the major city, Muzaffarabad. This factor added in the death toll as many big towns are situated near Muzaffarabad including Mansehra, Balakot and Bagh. Being situated on fault line, housing units in Balakot and its surrounding area were fully destroyed.

Similarly the M 7.6 is considered to be high magnitude especially for the areas where earthquakes were not taken as serious threats before.

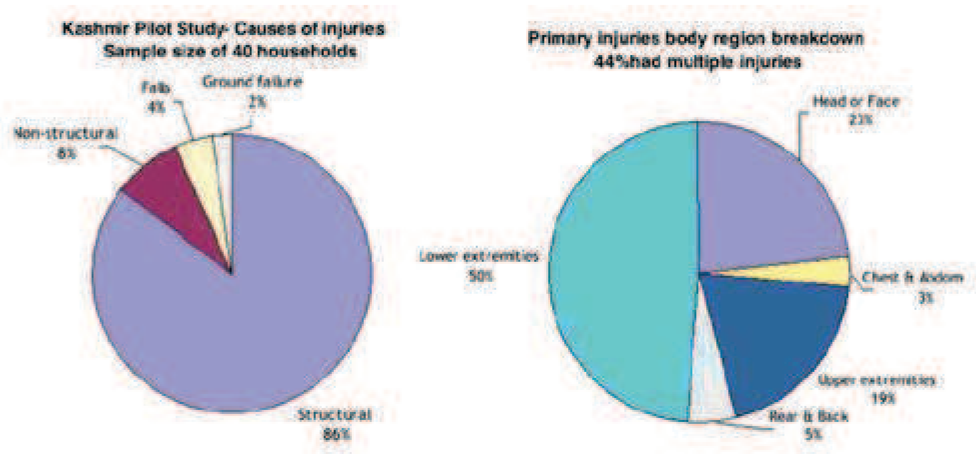


Figure 4.19 — : Data on causes and types of injuries from pilot study of survivors of Kashmir earthquake (Source : [Spence, 2007])

4.3.1.2 Lack of seismic resistance in houses

Virtually none of the housing in affected areas featured seismic considerations in their design. Compounding this was the generally poor quality of construction and maintenance ([Arshad and Athar, 2013]). In many areas over 80% buildings were destroyed ([UNHABITAT, 2012a]). Table 4.4 provides the district wise data of house destruction. The high-death toll was undoubtedly primarily due to the widespread collapse of buildings in the area, most of them of masonry. Figure 4.19 shows that the primary cause of injuries during this earthquake was the structural failure of buildings. Because of the harsh climate, buildings have traditionally been made from thick stone masonry, often using rounded riverbed stones in poor quality mud mortar, with thick mud roofs. In the past such walls were often tied together with timber lacings and the roof independently supported. However, timber is less and less used because of its scarcity and high value, and the severe ground shaking would have been more than enough to cause roof collapse. In many places more modern building types using concrete blocks and reinforced concrete frames also collapsed ([Spence, 2007]).

Table 4.4 — District-wise detail of house destruction and damage. Courtesy : [ERRA, 2007b] ; [ERRA, 2007d] ; [ERRA, 2007e] ; [ERRA, 2007f] ; [ERRA, 2007h] ; [ERRA, 2007i] ; [ERRA, 2007c] ; [ERRA, 2007g] Source : S. Abidi

Province/ State	District	Total Houses	Destroyed		Partially Damaged		Negligibly Damaged	
			No.	%	No.	%	No.	%
KPK	Abbottabad	61,427	21,053	34	19,386	32	20,988	34
	Battagram	61,498	51,105	83	8,537	14	1,856	3
	Kohistan	73,622	11,936	62	4,865	25	2,450	13
	*Mansehra	152,957	1,08,283	71	34,001	22	10,673	7
	Shangla	26,531	14,104	53	9,623	36	2,804	11
AJK	Muzaffarabad	130,241	121,715	93	7,194	6	1,332	1
	Neelum	20,366	7,222	35	8,772	43	4,372	22
	Rawlakot	47,481	39,190	83	7,209	15	1,082	2
	Bagh	94,752	89,295	94.24	5,184	5.47	273	0.29

*In district Mansehra, Balakot was the city which suffered from 100 % destruction. ([ERRA, 2007f])

4.3.1.3 Poor building performance of schools

Many government-built and private schools, both in urban and rural areas collapsed under earthquake (table 4.5). In most of the areas of KPK 60+% schools were destroyed or damaged. In AJK this ratio was much higher as 95% of all the education institutes were completely or partially destroyed. Overall the poor quality building standards in the existing education buildings are evident in the whole country.

4.3.1.4 Timing of earthquake

The earthquake took place shortly after 8:50 a.m. local time on Saturday. (Saturday is a working day in Pakistan as most of the education institutes allow one day off in a week which is Sunday). 19,000 children were died in the event of 8th October 2005 just because they were present in the poorly constructed buildings at the time of earthquake.

Table 4.5 — District-wise detail of house destruction and damage. Coutesy : [ERRA, 2007b] ; [ERRA, 2007d] ; [ERRA, 2007e] ; [ERRA, 2007f] ; [ERRA, 2007h] ; [ERRA, 2007i] ; [ERRA, 2007c] ; [ERRA, 2007g] Source : S. Abidi

<table>
<tr><th>Province/State</th><th>District</th><th>Destroyed</th><th>Partially Damaged</th><th>Total</th><th>% of Total</th></tr>
<tr><td rowspan="5">K
P
K</td><td>Abbottabad</td><td>295</td><td>736</td><td>1,031</td><td>64</td></tr>
<tr><td>Battagram</td><td>410</td><td>115</td><td>525</td><td>60</td></tr>
<tr><td>Kohistan</td><td>56</td><td>154</td><td>210</td><td>25</td></tr>
<tr><td>Mansehra</td><td>935</td><td>624</td><td>1,559</td><td>-</td></tr>
<tr><td>Shangla</td><td>225</td><td>330</td><td>555</td><td>81</td></tr>
<tr><td rowspan="4">A
J
K</td><td>Muzaffarabad</td><td rowspan="2">1,519</td><td rowspan="2">187</td><td rowspan="2">1,706</td><td rowspan="2">95</td></tr>
<tr><td>Neelum</td></tr>
<tr><td>Rawlakot</td><td>655</td><td>268</td><td>923</td><td>100</td></tr>
<tr><td>Bagh</td><td colspan="3">755</td><td>89</td></tr>
</table>

4.3.1.5 Inaccessibility to health facilities

A dimension which added the death toll was the inaccessibility of much of the affected area to the health facilities.The numerous landslides triggered by the earthquake blocked the routes for aid. The rescue work was thus very slow and many of the survivors had to walk long distances in difficult terrain . This also complicated injuries bringing on infections and resulting in more drastic medical measures. Many more with head and chest injuries from falling masonry did not survive until medical help arrived. And search and rescue capability in the crucial early stages was concentrated in Islamabad, where few buildings failed, rather than being sent to the epicentral area. The deaths and injuries are summarized with reference to districts in table 4.6.

4.3.2 Rescue and relief

In the aftermath of earthquake, rescue and relief activities were started immediately. Earthquake affected areas received aid and support on national as well as international level. The appeal of the government to international community resulted in the inflow of humanitarian

Table 4.6 — District-wise detail of deaths and injuries. Courtesy : [ERRA, 2007b] ; [ERRA, 2007d] ; [ERRA, 2007e] ; [ERRA, 2007f] ; [ERRA, 2007h] ; [ERRA, 2007i] ; [ERRA, 2007c] ; [ERRA, 2007g] Source : S. Abidi

Province/State	**District**	**Deaths**	**Injuries**
KPK	Abbottabad	Hundreds	Hundreds
	Battagram	3,564	3,799
	Kohistan	596	1,160
	Mansehra	15,997	9,903
	Shangla	444	1,925
AJK	Muzaffarabad	35,803	23,138
	Neelum	470	624
	Rawlakot	1,120	1,883
	Bagh	9,366	7,440

aid of food, medicine, personnel and equipment from all around the world. People from across the country reached out to the affected areas in KPK and AJK with food supplies, water, medical assistance, clothing, blankets and other necessities. Significant support came from bilateral and multilateral donors, non-governmental organizations and the private sector organizations. ([Authority, 2006]) However the rescue and relief activities confronted three major issues

1. Incoherence
2. Duplication
3. Slower Rate

The causes behind these issues included:

1. Absence of any sole authority to deal with such disasters
2. First case of such event since the existence of the country
3. Absence of data mentioning the presence of houses especially on high altitude areas

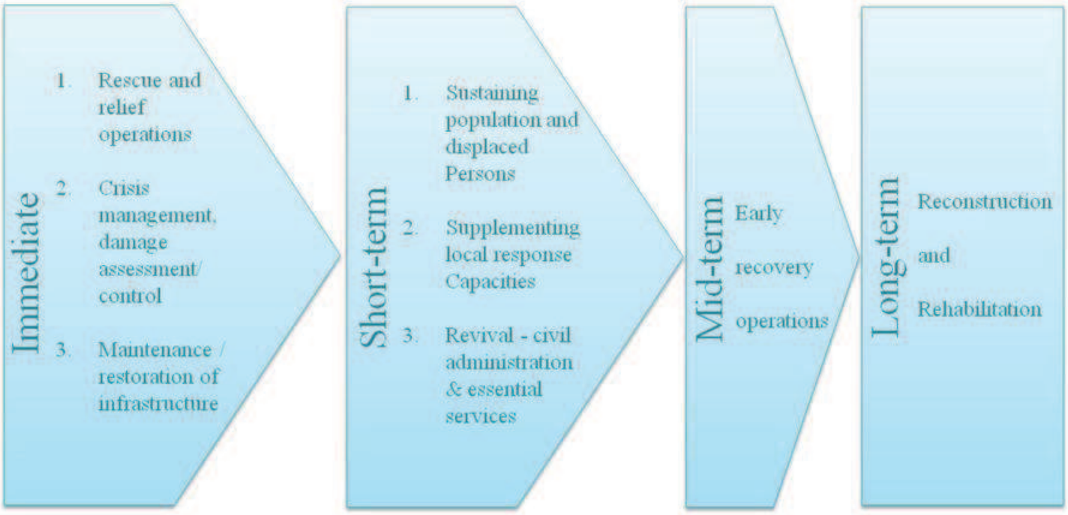


Figure 4.20 — : Response phases planned by the government to the 8th October 2005 earthquake. Courtesy : [Authority, 2006] ; Source : S. Abidi

4. Lack of coordination among different organizations
5. Shortage of trained manpower
6. Shortage of debris removing equipment
7. Blockage of routes due to land slides
8. Large scale destruction
9. Vast affected area with a difficult terrain
10. Inaccuracy of initial damage assessment
11. Absence of civil administration due to damage to government buildings

The government was unable to address these gaps immediately however continuous dedicated efforts made the rescue and relief phase successful. The primary objectives of the government from immediate response to the long term programs are shown in figure 4.20.

4.4 Earthquake Reconstruction & Rehabilitation Authority (ERRA)

In response to the earthquake, The Earthquake Reconstruction & Rehabilitation Authority (ERRA) was formulated on 24th October 2005 (ERRA Official Website). The nucleus staff of ERRA comprised a hybrid of civil servants, armed forces personnel and international consultants. ERRA's prime task was to strategize and approve projects together with the provision of funds to State Earthquake Reconstruction & Rehabilitation Authority (SERRA) and Province Earthquake Reconstruction & Rehabilitation Authority (PERRA) to undertake the reconstruction and rehabilitation works in their respective areas. The idea behind the creation of ERRA was to bring all efforts and activities, pertaining to post disaster damage assessment, reconstruction and rehabilitation in the affected areas under one umbrella, with a view to providing a fast track and seismically safe reconstruction regimes and solutions. Main role of ERRA was macro planning, developing sectoral strategies, financing, project approval and monitoring and evaluation. Additionally, it ensured the required coordination and provided facilitation to implementing partners, whereas physical implementation of the projects was the responsibility of respective governments.

Policy Role of Provincial and State Governments as Stated by ERRA :

Besides policy formulation, ERRA has restricted its role to developing sectoral strategies, project approval, financing, coordinating, monitoring and evaluating the reconstruction activities in the affected areas. The implementation of the approved strategies is governed through a devolved mechanism with maximum powers resting with the Provincial/State and District governments. At the Province and State level, both the governments have created Provincial Earthquake Reconstruction and Rehabilitation Agency (PERRA) and State Earthquake Reconstruction and Rehabilitation Agency (SERRA), respectively. They act as Secretariats for the Provincial/State Steering Committees. These committees are headed by the respective Chief Secretaries with representation of secretaries of all the relevant line departments and a representative of the Planning Wing of ERRA. These forums have the mandate to approve the Annual Work Plans of their respective governments received by them from each of the affected districts. They have the financial powers to approve any reconstruction project costing up to Rs.250 million. The basic mandate of implementation of all reconstruction projects rests with these forums.

Role of District Governments as Stated by ERRA :

The Provincial and State Governments have created District Reconstruction Units (DRUs) in each of the affected districts. These DRUs act as Secretariat to the District Reconstruction Advisory Committee (DRAC), which is headed by the District Nazim in each district of Khyber Pakhtunkhwa and Deputy Commissioner in AJ&K with representation of all the relevant line departments of the district and elected representatives. Each DRAC has the powers to approve projects up to Rs.100 million and prioritize the reconstruction activities as per their needs and requirements. They develop the Annual Work Plan and submit the same to PERRA/SERRA, as the case may be.

A comprehensive consultative process was followed, while formulating the policies. All the major donor organisations, whose funds were involved in the reconstruction programmes, were consulted before conceiving a policy. The draft policies were discussed with the representatives of both the governments i.e. Government of AJ&K and Khyber Pakhtunkhwa and subsequently placed before the ERRA Board and/or ERRA Council for the final decision.

ERRA had intervened in 12 different sectors, 3 cross-cutting programmes, and was required to reconstruct over 13,000 projects, (at a cost of over US$ 5 billion) of nine districts of AJ&K and Khyber Pakhtunkhwa. The 12 sectors are:

1. Housing
2. Health
3. Education
4. Government Sector Buildings
5. Transportation
6. Telecommunication
7. Livelihood

8. Power
9. Environment
10. Water & Sanitation
11. Social Protection
12. Tourism

Cross-cutting programmes are:

1. Disaster Risk Reduction
2. Environmental Safeguard
3. Gender Equality

4.5 Stakeholders and roles under the umbrella of ERRA

The major stakeholders involved in the housing reconstruction (figure 4.21) and their roles under the umbrella of ERRA are discussed by SDC ([SDC, 2008]) as :

4.5.1 Pakistan Army

The army of Pakistan remained involved in the post quake efforts from rescue & relief phase to the reconstruction phase. Assistance & Inspection (AI) teams were formulated to get field data from the destroyed areas. Focusing just on the housing sector, here the main activities conducted by the Pakistan Army are mentioned:

1. Initial identification and classification of houses
2. Damage assessment after receiving training from the HRC
3. AI teams signed the MOU with the beneficiary who was eligible for the cash grant.

4. Certifying compliance with seismic-resistant standards at each stage for release of the next installment.

5. Establishing and maintaining database about reconstruction progress.

The AI teams carried out house to house surveys to assess the progress on the site. They kept a record of all the houses including the compliant, non compliant and those which needed rectification. They accomplished this job with the help of the guidelines provided by ERRA. These teams were on front line for the interaction with earthquake victims hence they had a complete idea of on ground situation.

4.5.2 Implementing Partners (IPs)

UN-HABITAT and SDC-HA were the key IPs of ERRA. UN-HABITAT, with the highest budget, had played a pivotal role in the implementation of policies especially in AJK. They also intervened in developing the strategies and advising ERRA in its role. The construction standards, manuals and guidelines were developed jointly by UNHABITAT and SDC-HA teams, while NSET provided some of its expertise in an early stage.

4.5.3 District Reconstruction Units (DRUs)

The Provincial and State Governments had created District Reconstruction Units (DRUs) in each of the affected districts. The DRU is the leading office specially established on District level for the coordination of all reconstruction activities and the implementation of the housing reconstruction programme in particular: Reconstruction needs identifications Developing the Annual Work Plan and submitting the same to PERRA/SERRA, as the case may be. Financial management Coordinating among relevant District level departments on all matters related to reconstruction of housing, and especially on the implementation of earthquake resistant construction standards Supervising the work of the Partner Organizations (Pos) mandated by ERRA Providing ongoing advice and advocacy on all housing related issues and on the implementation of the ERRA housing policy to the District Coordination

Officers and Deputy Commissioners Providing regular reports on progress regarding housing reconstruction and related training activities Maintaining District data base on housing reconstruction Monitoring the implementation of the ERRA housing policy, including the disbursement of compensation payments To chair the District level coordination meetings among all stakeholders on housing reconstruction

4.5.4 District-based Housing Reconstruction Centres (HRCs)

14 Housing Reconstruction Centres (HRC) were provided in all earthquake affected districts ; one in each and two in larger districts. Where the IPs participated in the development of construction standards at institutional level, they operated the HRCs at district level. The HRCs provided assistance in several domains as : Capacity building of local authorities Coordination of POs activities in the assigned area Providing technical and social training to POs Master Trainers, local authorities and AI teams Quality control of training delivered by master trainers Information Dissemination at District Level Creating awareness Acting as point of technical support and reference for beneficiaries Data collection and forwarding to ERRA

4.5.5 Partner Organizations (POs)

At UC level Partner Organizations, mainly INGO/NGOs provided technical assistance. ERRA assigned them the task of social mobilization activities in the affected villages. They supported the implementation of the owner driven housing reconstruction program by building up and operating field offices and training capacity for a door-to-door approach. The Pakistan Poverty Alleviation Fund (PPAF) had actively been working in the earthquake-affected areas, long before this disaster occurred. Their established networks with community based organizations (CBOs) have been embraced in the reconstruction programme ; PPAF has become an important PO of ERRA. Within 'their' areas, the PPAF has delegated the roles of the VRCs to the (already existing) CBOs with whom PPAF had worked before the earthquake (Leersum, 2009). In this way, ERRA rural housing programme has been able to build upon existing institutional structures. Their main tasks included : Providing guidance to affected communities in implementing the owner driven housing reconstruction program To supervise reconstruction/restoration activities to assure quality and EQ resistant construction Capacity-building of local authorities and village communities Assisting and accompanying AI teams in assessment, training and inspection To train artisans, self builders and community members at UC level To certify trainees To monitor training adequacy To provide technical assistance during construction and provide feedback Training Monitoring Information System (TMIS) data collection and transmission to the HRC

4.5.6 Village Reconstruction Committees (VRCs)

POs were responsible to form the Village Reconstruction Committees. Their major roles were to: Guide and monitor the overall housing reconstruction programme by ensuring that local traditions and social needs are taken into consideration Support compliance efforts Regularly report on progress to the wider community Ensure that vulnerable groups such as women-headed households, the elderly and widows are able to access reconstruction benefits

4.6 RHRP-Rural Housing Reconstruction Programme

The key intent enveloping the whole RHRP was to ”Build Back Better”. ([ERRA, 2011]). To achieve this goal Owner Driven Reconstruction (ODR) approach with assisted and inspected regime was adopted. ERRA also believed in mobilization of the community to ensure higher reconstruction rate and compliance.

4.6.1 What is RHRP?

While majority of destruction caused by the 2005 earthquake was centred on the rural areas of AJK and KPK, ERRA planned to launch a program specifically focusing on rural communities of these two regions. The Rural Housing Reconstruction Programme was aimed to financially and technically assist the people. To augment the safer reconstruction a simultaneous inspection system was further appended.

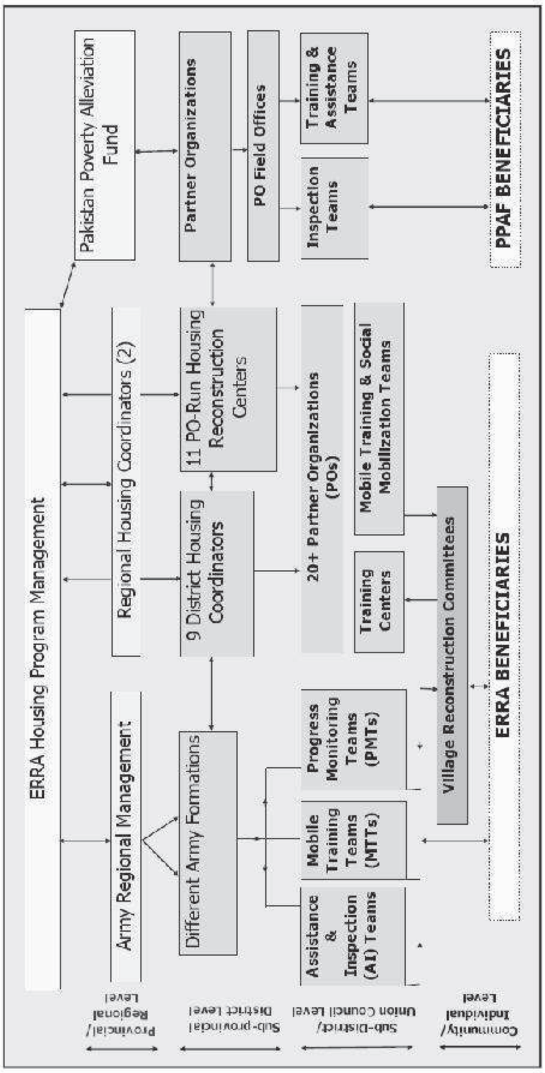


Figure 4.21 — : Interaction between different organizations. Source : [Reconstruction and Authority, 2007]

4.6.2 Main objectives

To make the RHRP successful, two main objectives were set:

1. To promote earthquake resistant construction techniques in the damaged/destroyed houses reconstruction through cash grants to eligible households.

2. To rebuild houses as per seismic resistant standards for rehabilitation of peoples lives, enhancement of their skills and capacity, and strengthened social capital.

And if consider the time frame, the immediate and long-term objectives were ([GFDRR, 2012]) :

Immediate : Reconstructing or rehabilitating damaged houses to seismic resistant standards - ”building back better” Long-term : Reaping the longer term benefits of owner driven reconstruction - ”inducing behavioural change and a culture of voluntary seismic compliance in housing construction”

4.6.3 Strategic approach

Successful implementation of RHRP depended on the strategic approach of ERRA. As figure 4.22 depicts, RHRP included primary sections as : housing grants, technical assistance and capacity building. Other main objectives discussed by SDC were ([SDC, 2008]):

1. Ensuring owner-driven housing reconstruction where home-owners are in charge of rebuilding their homes
2. Assisted and inspected reconstruction and retrofitting
3. Ensuring seismic resistant construction
4. Ensuring uniform assistance packages across all programmes and funding sources, maximising outreach through optimised designs and implementation mechanisms
5. Ensuring judicious use of grants, reducing and managing conflicts and grievances, minimising socio-economic distortions, inequities and disparities

Both the pace and quality of implementation under the RHRP is considered remarkably impressive ; especially when compared with similar homeowner driven housing reconstruction programs elsewhere in the region and internationally, which in most cases have met with only partial and belated success ([Bank, 2008]).

Not only the financial assistance is provided by the authority, trainings on seismically safe construction are delivered in all the nine affected districts. Table 4.8 and figure 4.23 provide the number of beneficiaries and % disbursement progress in the affected areas whereas figure 4.24 shows the number and ratio of trainees.

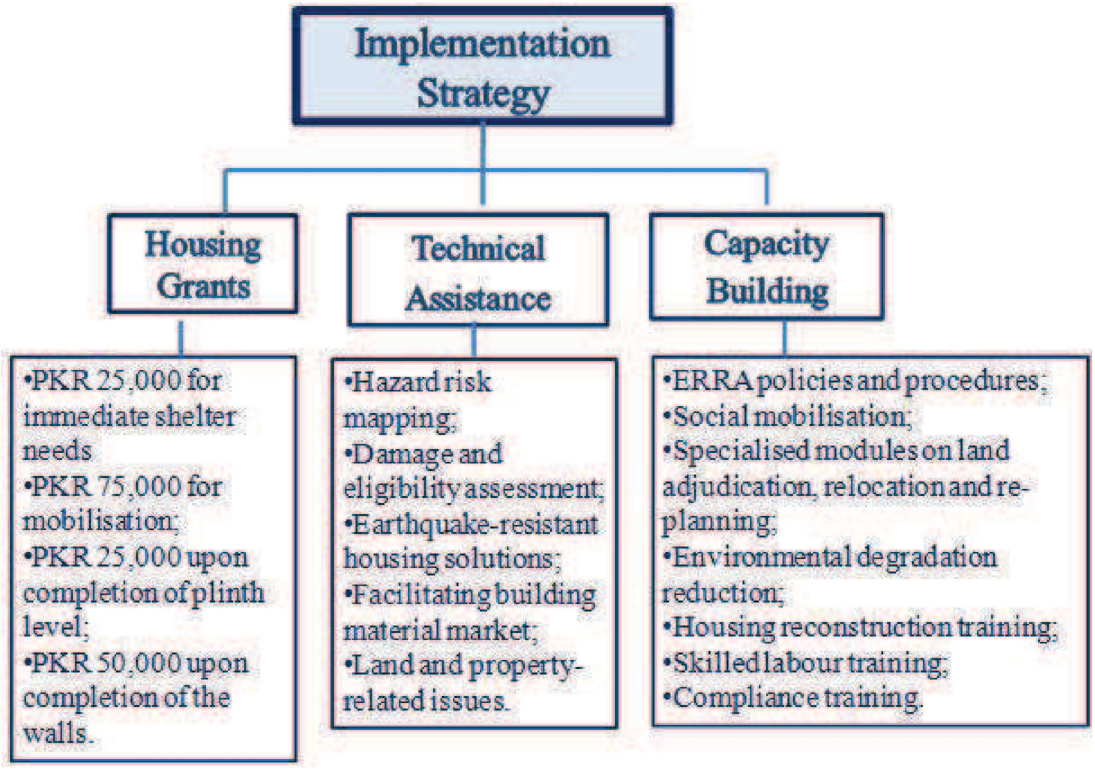


Figure 4.22 — : Implementation strategy devised by ERRA for RHRP ; Courtesy : ERRA ; Source : S. Abidi.

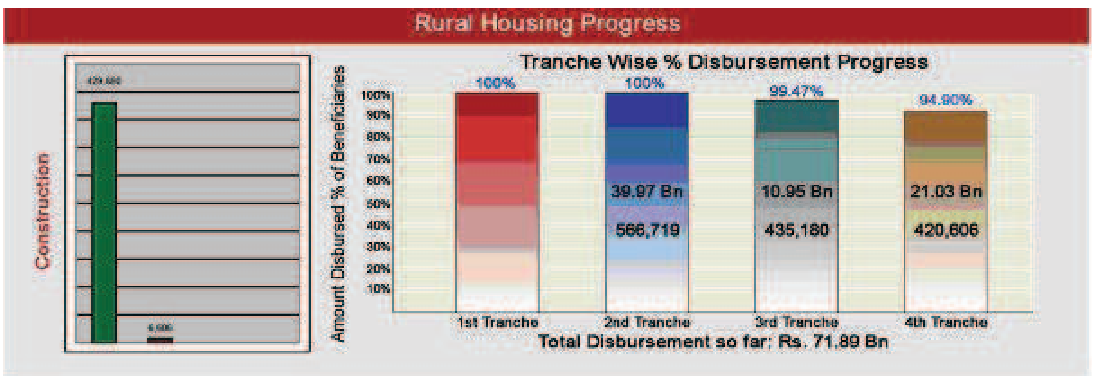


Figure 4.23 — : Tranche wise % disbursement progress, Source : [ERRA, 2013]

Table 4.7 — No. of beneficiaries who availed the financial assistance through RHRP, Source : [ERRA, 2011]

Tranche	Rs. In Billion (ERRA□PPAF)	Beneficiaries (ERRA□PPAF)			
	Present	Present	ERRA	PPAF	ERRA□ PPAF
2nd Tranche of Rs. 75,000 for initiation of work	39.97	566,719	100.00	100.00	100.00
3rd Tranche of Rs. 25,000 On Completion of Plinth	10.95	437,845	99.32	99.93	99.63
4th Tranche of Rs. 50,000 On Completion of Lintel	20.98	419,509	96.19	93.58	94.89
Total	**71.89**				

The procedure of damage assessment and beneficiary eligibility verification is discussed in figure 4.25 and an example of damage assessment form is shown in figure 4.26. RHRP grant payment mechanism is elaborated in figure 4.27 and the memorandum of understanding between authority and beneficiary is mentioned in figure 4.28 and 4.29.

4.7 Introduction to the case study areas

The reasons for selecting Muzaffarabad and Bagh are already mentioned in chapter 3. Here a brief introduction to these areas will be provided. All the selected villages (see figures 4.31 and 4.32) were reported by different sources to be reconstructed in dhajji, though the UCs where they lie do not show 100% dhajji reconstruction in the map (figure 4.30). The death toll and damage to houses in the selected villages can be found in the tables 4.8 and 4.9.

4.7.1 District Muzaffarabad

Muzaffarabad is the capital of AJK and the epicentre of 2005 earthquake was just 10 to 12 Km northwards of this city. Among the mountains are valleys and terraces used for

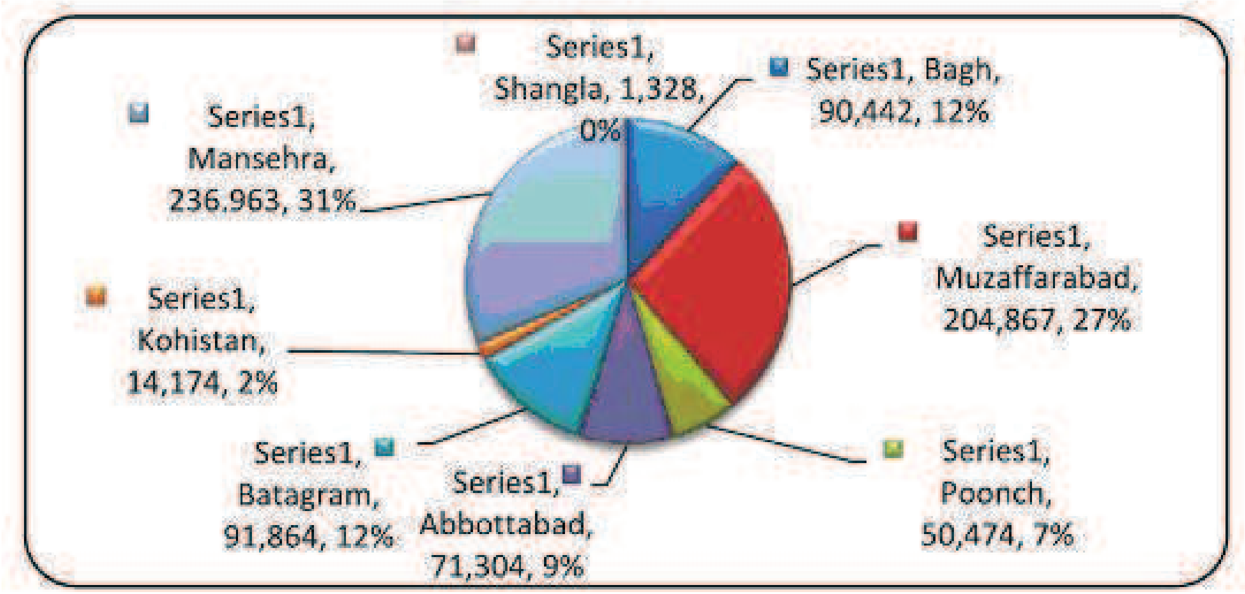


Figure 4.24 — : Number and ratio of people who attended training in each district. Source : [ERRA, 2011]

cultivation. According to 1998 census (the census last carried out), Muzaffarabad district had a population of 0.746 million and an average annual growth rate of 2.80%. The average household size was 7.1 persons both in the rural and urban areas. After the administrative change in district boundaries (when Muzaffarabad and Neelum were merged), the combined population of Muzaffarabad and Neelum stands at 0.929 million whereas there is no change in the growth rate and average household size. Some 86.35% population lives in rural areas. There are 101940 housing units in district Muzaffarabad ; 88,388 (86.71%) in rural areas and 13,552 (13.29) in urban areas. One room housing units constituted 12.46 in rural and 17.02% in urban areas ([ERRA, 2007g])

As mentioned in chapter 3, In Muzaffarabad, private housing sector suffered a huge loss as 89% housing structures were totally destroyed whereas 9% got partially damaged and only 2% remained in liveable condition.

4.7.2 District Bagh

This is another important area of AJK. Topographically, the entire Bagh district is mountainous area, generally sloping from northeast to south-west. The area falls in lesser Himalayas

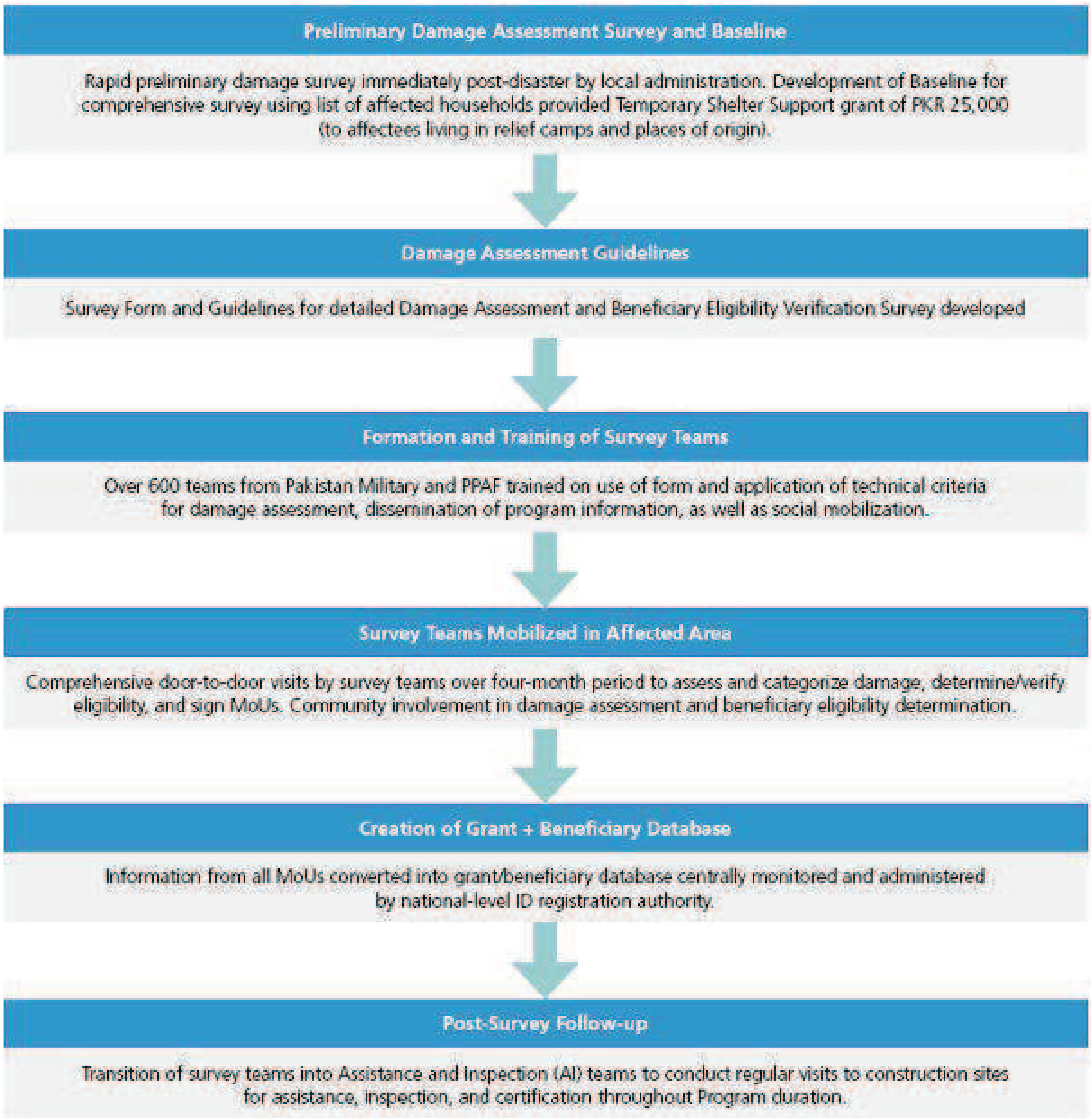
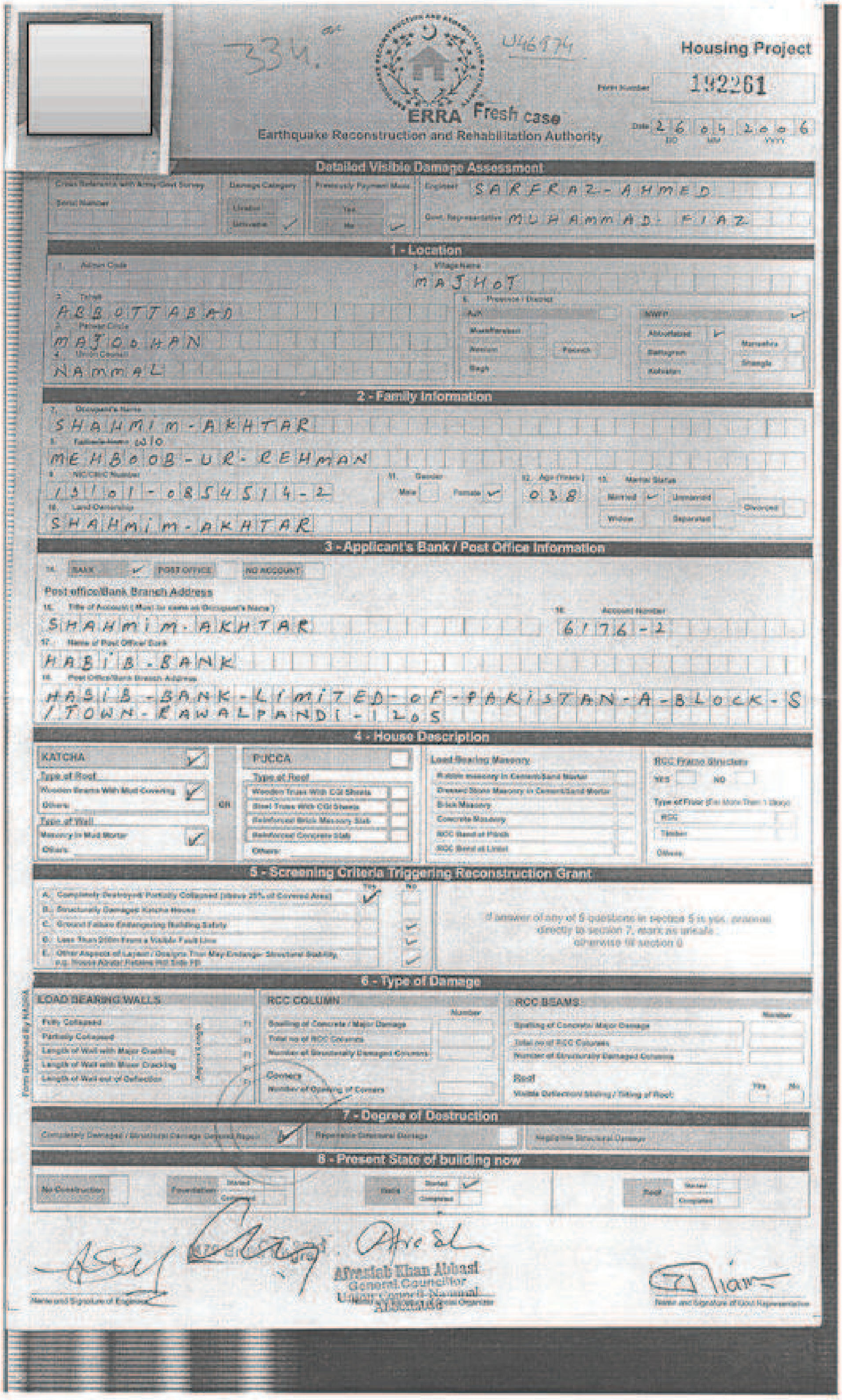


Figure 4.25 — : Damage assessment and beneficiary eligibility verification survey process ; Source : [Arshad and Athar, 2013]



334.

U46974

Housing Project

Form Number 192261

ERRA Fresh case

Earthquake Reconstruction and Rehabilitation Authority

Date 26 04 2006

DD MM YYYY

Detailed Visible Damage Assessment

Engineer SARFRAZ-AHMED

Govt. Representative MUHAMMAD-FIAZ

1 - Location

Village Name MAJHOT

Tehsil ABBOTTABAD

Patwar Circle MAJOOHAN

Union Council NAMMAL

2 - Family Information

Occupant's Name SHAHMIM-AKHTAR

Father/Husband Name w/o MEHBOOB-UR-REHMAN

NIC/CNIC Number 13101-0854514-2

Gender Female

Age (Years) 038

Marital Status Married

Land Ownership SHAHMIM-AKAHTAR

3 - Applicant's Bank / Post Office Information

BANK

Post office/Bank Branch Address

Title of Account SHAHMIM-AKHTAR

Account Number 6176-2

Name of Post Office/ Bank HABIB-BANK

Post Office/Bank Branch Address HABIB-BANK-LIMITED-OF-PAKISTAN-A-BLOCK-S/TOWN-RAWALPANDI-1205

4 - House Description

KATCHA

PUCCA

Load Bearing Masonry

RCC Frame Structure

5 - Screening Criteria Triggering Reconstruction Grant

6 - Type of Damage

LOAD BEARING WALLS

RCC COLUMN

RCC BEAMS

7 - Degree of Destruction

8 - Present State of building now

Afrasiab Khan Abbasi

General Councillor

Union Council Nammal

Abbottabad

Figure 4.26 — : : Damage assessment form received as a sample from ERRA Headquarters, Islamabad.

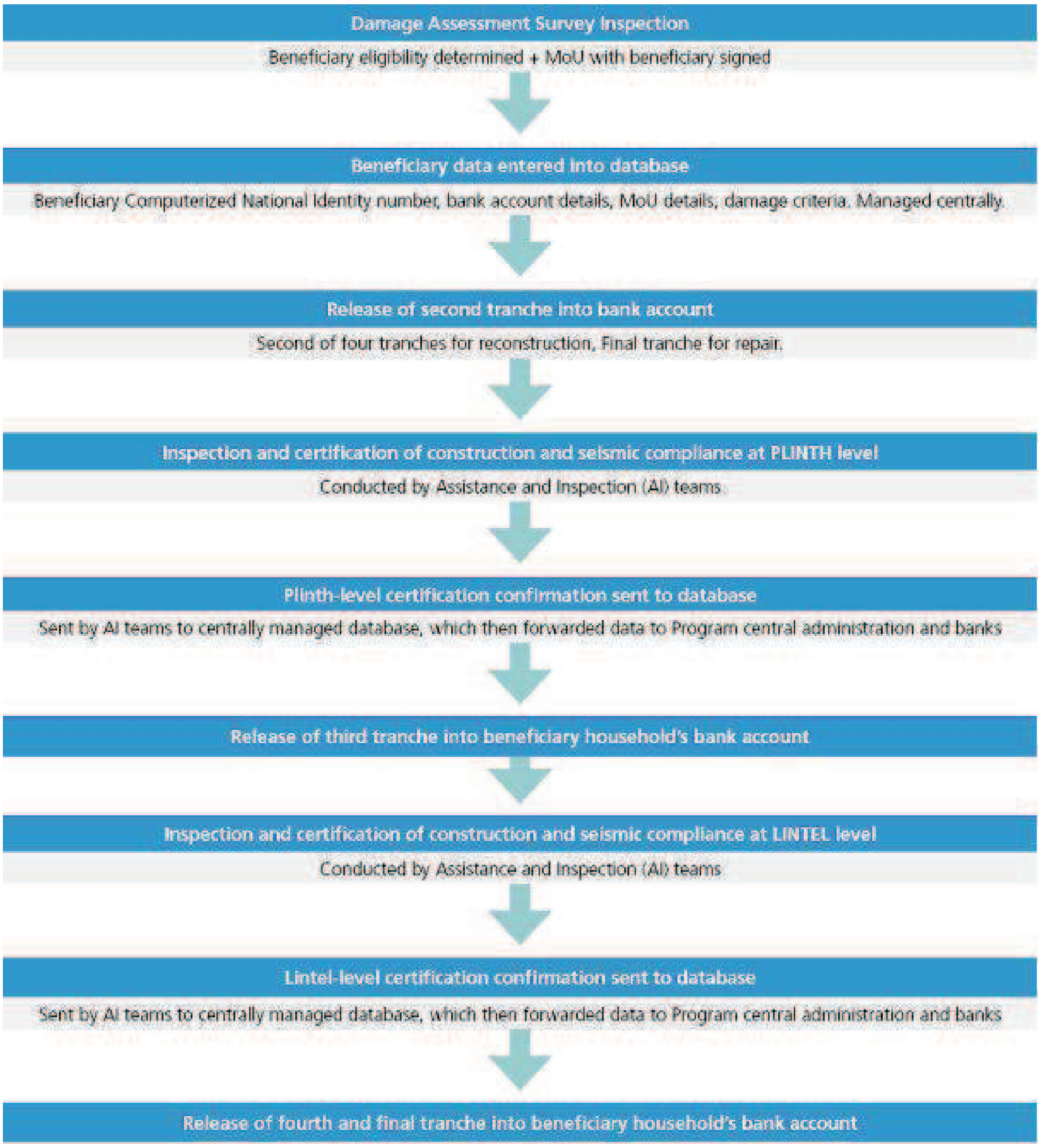


Figure 4.27 — : RHRP grant payment mechanism ; Source : [Arshad and Athar, 2013]

ERRA

فارم نمبر ________________

مفاہمت کی یادداشت

مفاہمت کی یہ یادداشت مکان کی تعمیر نو میں معاونت کے حکومتی نمائندہ اور معائنہ ٹیم نمبر ------------ برائے یونین کونسل -------------- کے مابین بحیثیت فریق اول ''یعنی ایرا (E R R A) '' اور تعمیراتی امداد سے استفادہ کنندہ ------------ حامل شناختی کارڈ رکمپیوٹر شناختی کارڈ نمبر -------------------- ساکن ---------- جو بعدازاں فریق ثانی کہلائے گا، آج بتاریخ ----------- برموقع --------- مقام -------------- موثر بہ شرائط وضوابط ذیل طے پاتی ہے۔

1:۔ یہ کہ فریق اول نے 8 اکتوبر 2005ء کے زلزلے سے فریق ثانی کے مکان کو پہنچنے والے نقصان کا تعین کرلیا ہے اور یہ تعین بھی کر لیا ہے کہ مذکورہ مکان درجہ --------- میں آتا ہے (فارم تخمینہ نقصان فریقین سے باقاعدہ دستخط شدہ لف ہے) اور فریق اول کی جانب سے بسلسلہ -------- برائے کل رقم --------- روپے صرف تعمیراتی امداد کی ادائیگی کا مستحق ہے جو کہ فریق اول کی جانب سے ڈھانچا کے معائنہ اور صفحہ کی پشت پر درج ادائیگیوں کے نظام الاوقات کے مطابق اس طرح کی جائے گی:

2:۔ یہ کہ فریق ثانی مکان کی تعمیر نو یا ڈھانچے کی بحالی، جیسا کہ شق الف میں صورت حال بیان کی گئی ہے۔ کے سلسلے میں فریق اول کی جانب سے مجوزہ ڈیزائیوں اور تعمیراتی رہنما ہدایات پر کاربند رہنے پر متفق ہے۔ مزید یہ کہ فریق ثانی، فریق اول کی جانب سے فراہم کردہ ان دستاویزات کی وصولی اور ان کی عملی معلومات سے آگاہی کا اقرار کرتا ہے۔ مزید یہ کہ ایرا (ERRA) کی جانب سے جاری کردہ زلزلہ برداشتی معیارات اور رہنما ہدایات کی بنیاد پر فریق ثانی مکان کی تعمیر نو کے لیے اور ایرا کی شراکت دار تنظیم کی جانب سے دی جانے والی تربیت باقاعدہ حاصل کرنے پر متفق ہے۔

3:۔ یہ کہ فریق ثانی امداد کا استعمال صرف اور صرف صورت حال کے مطابق مکان کی تعمیر نو یا ڈھانچے کی بحالی کے لیے نہایت سوچ سمجھ کر کرنے پر متفق ہے۔

4:۔ یہ کہ فریق ثانی کسی بھی قسم کے مابعد نتائج کی پوری ذمہ داری قبول کرتا ہے اور کسی بھی نشان دہی، ملکیت اثاثہ، کرایہ داری یا فریق ثانی کی جانب سے پیش کردہ امداد کے استحقاق کے دوسرے معیار کے ضمن میں توثیقی ثبوت اور دعوؤں کی غلط بیانی سے پیدا ہونے والی تعزیری ذمہ داریوں پر رضامند ہے۔

5:۔ یہ کہ فریق ثانی تصدیق کرتا ہے کہ اس نے مکان کی تعمیر نو کے لیے حکومت اور دیگر امداد دہندہ پروگراموں میں سے کسی سے ابھی تک کوئی امدادی رقم وصول نہیں کی۔ (ماسوائے 25000 روپے کے)

6:۔ اگر اصل مالک وفات پا چکا ہے تو فریق ثانی تصدیق کرتا ہے کہ وہ مرحوم کے مکان، جس پر تعمیر نو رپہلے جیسا ڈھانچا کھڑا کرنے کے لیے فریق اول سے امداد لی جانی ہے، کا جائز وارث ہے۔ (اگر دستیاب ہو تو جانشینی سرٹیفیکیٹ منسلک کریں)۔

7:۔ یہ کہ فریق ثانی تصدیق کرتا ہے کہ اس چھت رعمارتی احاطے کے اندر کوئی دوسرا کنبہ رہائش پذیر نہیں ہے جس کے لیے کہ فریق ثانی حکومت یا دیگر کسی امداد دہندہ پروگرام سے پہلے ہی کوئی امدادی رقم وصول کر چکا ہے۔

8:۔ یہ کہ فریق اول کے لیے بعدازاں فریق ثانی کے امدادی رقم سے تعمیر شدہ مکان میں کسی بھی وجہ (ایک اور زلزلے سمیت) کے باعث ہونے والی کسی تعمیراتی ٹوٹ پھوٹ کے ضمن میں کوئی ذمہ داری قابل قبول نہیں حتیٰ کہ اگر تعمیراتی کام کے معیار کی فریق اول کی معاون اور معائنہ ٹیمیں بھی تعمیر کے مختلف مراحل پر تصدیق کر چکی ہوں۔

9:۔ زمین کے مالک مسمی ------------ ولد ------------ کیطرف سے کرایہ دار مسمی ------------ ولد ---------------- کو اس زمین پر گھر تعمیر رمرمت کرنے کی اجازت کے بارے میں (NOC) اس MOU کے ساتھ منسلک ہے۔

فریق اول کی جانب سے

____

____

مجاز دستخط کنندہ

تاریخ

فریق ثانی کی جانب سے

____

استفادہ کنندہ

مقام

Figure 4.28 — : Memorandum of understanding (MoU) received as a sample from ERRA Headquarters, Islamabad.

ادائیگیوں کا طریق کار

نقصان زدہ مکمل/تباہ شدہ	نقد امداد	ادائیگی کی شروعات	کاروائی کا طریق کار
پہلی قسط (ادا کی جا چکی ہے)	25,000/- روپے	تعمیراتی نقصان کا ابتدائی تعین	تعمیراتی نقصان کا ابتدائی تعین
دوسری قسط	75,000/- روپے	تعمیراتی نقصان کی درجہ بندی استفادہ کنندہ کے استحقاق کی تصدیق	تخمینہ اور استحقاق کی تصدیق بذریعہ معاونتی و معائنہ ٹیم، جس نے اس مفاہمت کی یادداشت پر دستخط کیے
تیسری قسط	25,000/- روپے	بنیادوں کی تکمیل	بنیادوں کا معائنہ
چوتھی قسط	50,000/- روپے	دیوار اور اوپر کی تعمیر	آر سی سی فریم، کھڑکی کا فریم
جزوی نقصان زدہ مکانات			
پہلی قسط	25,000/- روپے	تعمیراتی نقصان کا ابتدائی تعین	تعمیراتی نقصان کا ابتدائی تعین
دوسری قسط	50,000/- روپے	تعمیراتی نقصان کی درجہ بندی اور استفادہ کنندہ کے استحقاق کی تصدیق	تخمینہ اور استحقاق کی تصدیق بذریعہ معاونتی و معائنہ ٹیم، جس نے اس مفاہمت کی یادداشت پر دستخط کیے۔

Figure 4.29 — : Method of payment (backside of MoU)

zone.

According to the 1998 Census, Bagh District has a population of 0.395 million (projected 0.50m) at an average annual growth rate of 2.6%. The average household size is 7.4 persons per family. About 94% population lives in rural areas and 6% lives in urban areas. The housing units that stood at 53,275 in 1998 seemed to have grown two fold during the last decade. The Housing Damage Assessment identified more than 90,000 housing units destroyed and damaged private housing sector suffered a huge loss as 94.24% housing units were totally destroyed whereas 5.47% got damaged and only 0.29% remained in liveable condition ([ERRA, 2007c]).

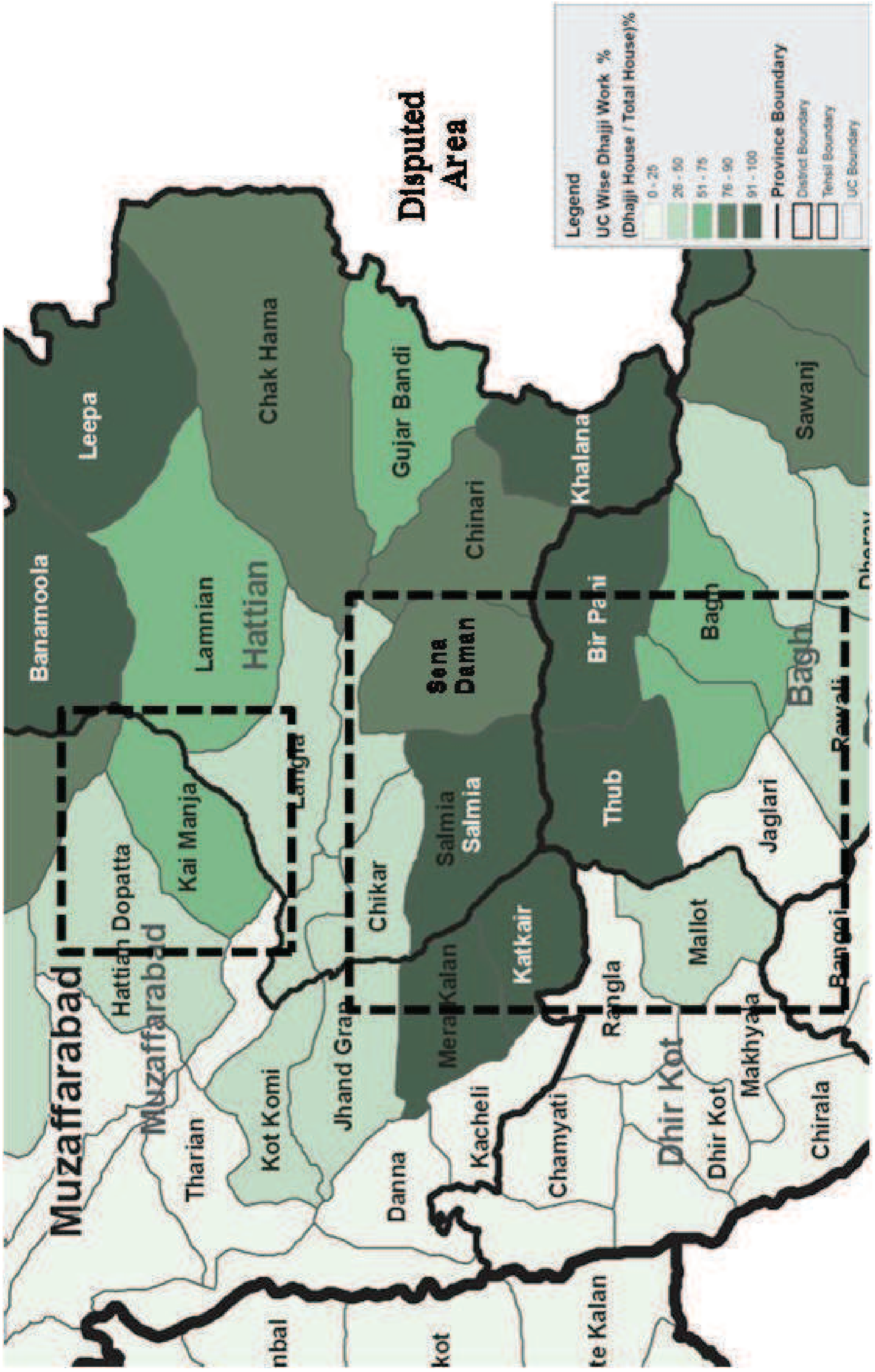


Figure 4.30 — : The above map shows the reconstruction percentage of Dhajji in UCs (and not in villages). Dotted squares mention the area of study. Source : UNHABITAT

***Table 4.8* —** Detail of villages visited in 2011. Data Source : UET, Lahore

Village	Total Population	Death during Earthquake	Total Houses	Destroyed Houses during Earthquake	No. of Houses
Kaimanja	2151*	144*	303*	297	20
Haryala	1675*	112*	236*	232	10
Kharabiyan	2108*	142*	297*	292	10
Thub	999*	27	135	127	21
Mallot	3196*	87	432	404	8
Jaglari	2123*	57	287	268	11

*The data was not available in the form as presented. It is calculated by the author while using UET unpublished documents.

***Figure 4.31* —** : Villages of Muzaffarabad surveyed during 2011. Kaimanja, Kharabiyan, Haryala.

Table 4.9 — : Detail of villages visited in 2013 Data Source : UET, Lahore

Village	Total Population	Death during Earthquake	Total Houses	Destroyed Houses during Earthquake	No. of Houses
Salmia	2399*	93	338*	332	27
Jabar Jandali	3329*	65	469*	460	31
Timberkot	681*	8	96*	95	22
Gundiwala	2513*	120*	354*	347	26
Lamibari	1505*	72*	212*	208	20
Bani Langryal	1952*	59	275*	270	22

*The data was not available in the form as presented. It is calculated by the author while using UET unpublished documents.

Figure 4.32 — : Villages of Bagh surveyed during 2011. Thub, Mallot, Jaglari.

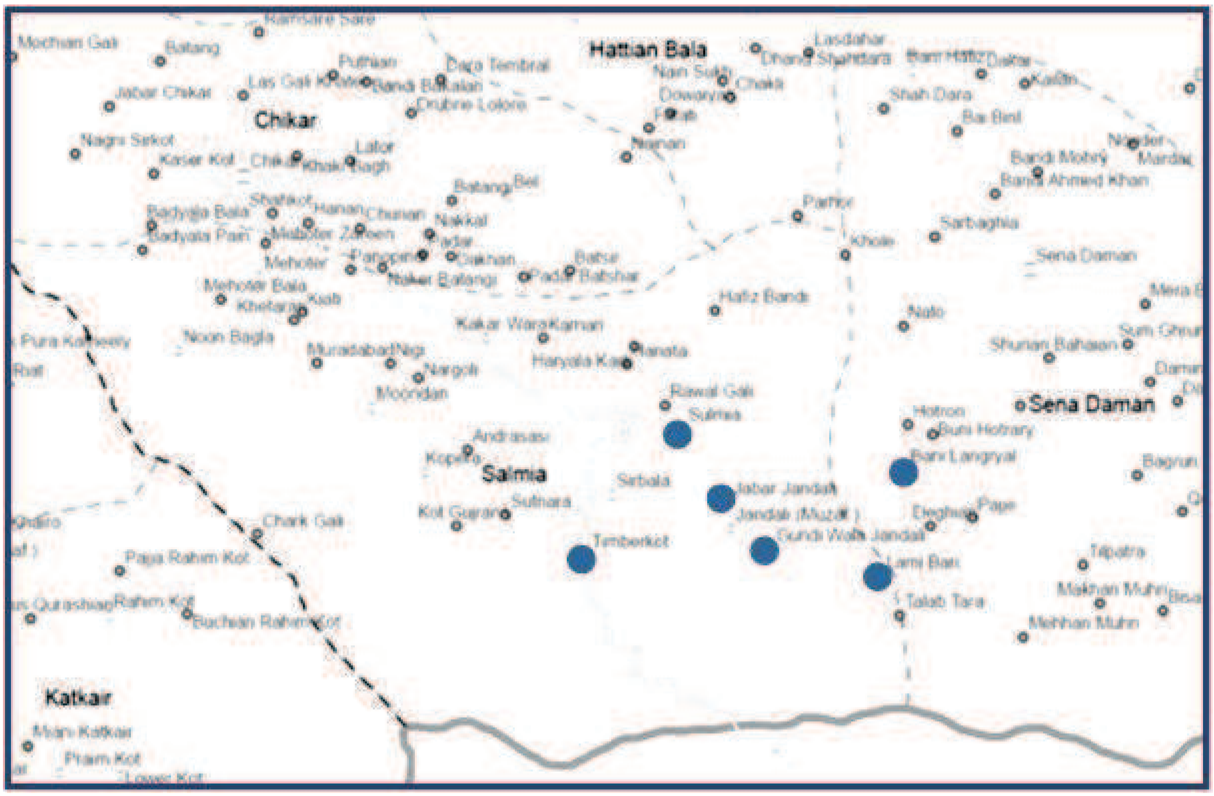


Figure 4.33 — : Villages of Muzaffarabad surveyed during 2013. Salmia, Jabar/Jandali, Gundi Wala, Timberkot, Lami Bari and Bani Langryal

4.8 Conclusion

This chapter provided the background of the most devastating earthquake in the history of Pakistan ; the Kashmir earthquake. The successive reconstruction program and the agencies which played different roles in this program are also mentioned. A brief introduction to the surveyed districts is presented followed by the details of surveyed village location maps. In the forthcoming three chapters the relation of socio-cultural characteristics and the policies with reconstruction will be discussed in detail. These chapters mainly comprise of the current study results while assistance is also taken from existing examples. In chapter 5 it will be highlighted that according to the literature which aspects can generate a sustainable reconstruction. Then these aspects will be explained. After that it will be explored that how much the community is satisfied with "sustainability producing aspects". It will then be discussed that if the community is not satisfied with a particular aspect, it will reject or change that. Chapter 6 is about those outcomes of the reconstruction which are not discussed in the literature with reference to Azad Kashmir. This study tries to find out the effects of these outcomes on the sustainability and vulnerability of the community. Chapter 7 will focus only on the aspects of policy and socio-cultural characteristics which are considered to be ”vulnerability producing aspects” in the literature. Self observation is the key methodology used in this section as none (whether the authority or the community, whoever is responsible) focused on certain shortcomings.

CHAPTER 5 Sustainability through reconstruction

SEVERAL steps are taken by authorities to ensure sustainability of reconstruction, leading to sustainable development, after 2005 earthquake of Kashmir. This chapter however centers two of them. Not only the literature categorizes both of these aspects as sustainability producers but also the same is found through discussions with experts during current study. One of these steps is strengthening indigenous construction techniques and second is adopting Owner Driven Reconstruction (ODR), with financial & technical assistance, as reconstruction approach. The journey of including traditional building practices in ERRA policies is stretched from the earthquake occurrence till April 2008. This chapter provides details of how dhajji dewari (one of the traditional building practices) was approved by the authorities to be a seismically resistant technique. Also through field surveys the results of satisfaction level of the community for dhajji are presented.

The upshots of ODR in Kashmir reconstruction are analyzed after discussion on dhajji.

5.1 Indigenous construction practices in Kashmir

Long back it was acknowledged by the researchers that seismic resistant reconstruction should centre the culture and local materials of that area. As stated by Arioglu and Anadol ([Arioglu and Anadol, 1978]) :

The design of earthquake resistant low-cost rural dwellings is not only a technical problem as it is for modern engineering structures, but it is a very complex subject with large socioeconomic dimensions. The socioeconomic difficulty of the problem forces the rural dwellings to be built with the same regional materials and geometric dimensions but by using earthquake-resistant design criteria and technical aid.

However we observe an on ground situation to be inversed of that. Authorities appear to be reluctant in adopting local techniques for reconstruction programs and try to induce alien styles ([Jigyasu] ; [Mercer *et al.*, 2007]).

Not all the indigenous construction found in Kashmir was earthquake resistant. The government of Pakistan estimated that more than 80% of the total destroyed buildings were located in rural regions of AJK and KPK ([EERI, 2006]). These rural houses were mainly categorized as Katcha (temporary) houses where 15-18 inches thick unreinforced stone masonry walls were supporting heavy mud roofs (These roofs shall be discussed in forthcoming chapter in detail). The walls were loosely connected to each other. The stone used in making the walls were also not suitable for seismic resistance. As reported in an unpublished document by UET, Lahore (UET Unpublished Report, 2005) :

"The most common form of construction in the surveyed area (Balakot, Garhi Habibullah, Muzaffarabad, Bagh) is stone masonry employing riverbed gravel stone. These stones are universally available and their cost is limited to their haulage to the site, rendering them attractive as construction material. However, these are also patently unsuitable for construction due to their high density, toughness, weight, rounded contours, and smooth polished surface. The high density tough material does not permit any shaping of these stones, while the rounded contours do not permit any bedding, leveling or interlocking necessary for reasonable masonry work. Furthermore, their polished surface does not provide much hold to any mortar, resulting in highly unstable walls."

Katcha houses were generally lacking any sort of foundation. People used to make a base bed of stones to elevate the walls upon it. No mortar was placed to bind these stones. Beside this several other construction issues added the destruction.

According to UNHABITAT document ([UNHABITAT, 2012a]) :

"While examples of seismically resistant local technologies existed in small numbers and isolated locations, there was extensive use of traditional unreinforced masonry with heavy timber and mud roofs. This construction technique is highly vulnerable to earthquakes as it is very heavy, masonry wythes and walls are not well connected to each other, the roof is also heavy and not connected to the walls. These buildings generally performed badly in the earthquake and caused high levels of destruction and fatalities. The simple categorization of all buildings using similar materials as 'katcha' (temporary) led to a simple perception of traditional or local materials as inherently weak and vulnerable rather than discriminating between different construction traditions and techniques using the same materials but with different structural principles and seismic performance. ERRA, technical experts and all implementing partners needed to identify and confirm the performance of better traditional techniques rigorously and try to clarify the difference between vulnerable and safer traditional techniques to ensure people could better understand their option to build more safely even with the same materials or salvage. ERRA had to communicate the risk of previous traditional unreinforced masonry. The message was therefore not as simplistic as old= weak, new= strong."

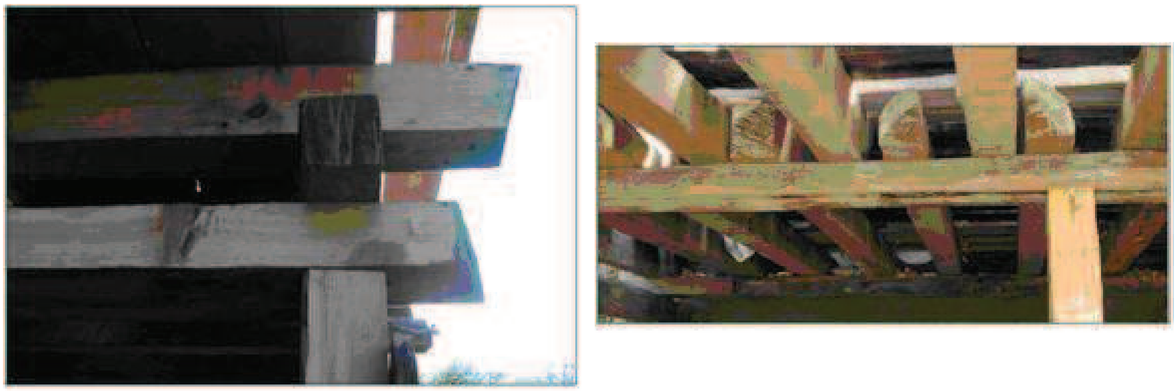
Azad Jammu & Kashmir has two major construction techniques which are seismically resistant ; Leepa and Dhajji dewari. Pre-earthquake Kashmir was neglecting these practices and was more inclined towards latest construction techniques (Key informant interviews with H. Mumtaz, Israr Ayyub, and Mason Qayoum). Here is a brief description of these indigenous styles.

5.1.1 Leepa

Leepa is the timber post and beam construction (figures 5.1 a, b). The configuration of leepa can be seen from the figures 5.2 and 5.3. Leepa and Neelum valleys with extreme winters, close to the line of control (beside Indian Administered Kashmir) represent the greatest concentration of traditional 'Kashmiri' timber construction, with small numbers of similar practice in other remote areas of Kashmir. Knowledge of this technology was only local and not well documented prior to the 2005 earthquake (UNHABITAT Toolkit, 2012).

(a) (b)

Figure 5.1 **—** Leepa elevations (a) Leepa valley. Source : [ERRA, 2008a] ; (b) near Kaimanja. Source : S. Abidi



(a) (b)

Figure 5.2 **—** The configuration of Leepa. Source : [ERRA, 2008a]

Leepa construction practice is not discussed in detail as this research has focused on only one type of indigenous construction i.e., dhajji dewari.

Figure 5.3 — Leepa construction. Source : [ERRA, 2008a]

5.1.2 Dhajji dewari

It is estimated that after the October 2005 Kashmir earthquake some 30% of total reconstructed houses (Stephenson, M., in [EIC, 2010]) or over 100,000 homes were reconstructed using the indigenous construction method of dhajji dewari ([Hicyilmaz, 2012]). Dhajji dewari is timber frame construction with stone and mud infill (figure 5.4). This is the light weight construction where main wooden frames are divided into sub frames. The wooden members are connected with nails. Sometimes joinery is also used to fix them. Small pieces of stones are mixed with mud mortar to fill the gaps between sub frames ([Schacher, 2006]). Generally the walls are plastered with a mixture of clay, straw, and other ingredients ([Langenbach, 1990]).

Pre-quake dhajji houses survived the earthquake and became an attraction for community to practice this technique in future.

(a) (b)

Figure 5.4 — Typical dhajji dewari houses found near Muzaffarabad. Source : S.Abidi

Dhajji in local terms means patch while dewari is the word used for wall hence dhajji dewari means a wall having patches. Another root of this word is claimed to be that 'Dhajj' means 'patchwork quilt' (figure 5.5) hence the patchwork of stone and timber is called dhajji dewari (Schacher, 2006).

In the dhajji dewari system, timber frames for confining masonry in small parcels are used. The timber frames, not only have vertical elements, but also have cross members,

Figure 5.5 — Dhajj, a patchwork quilt

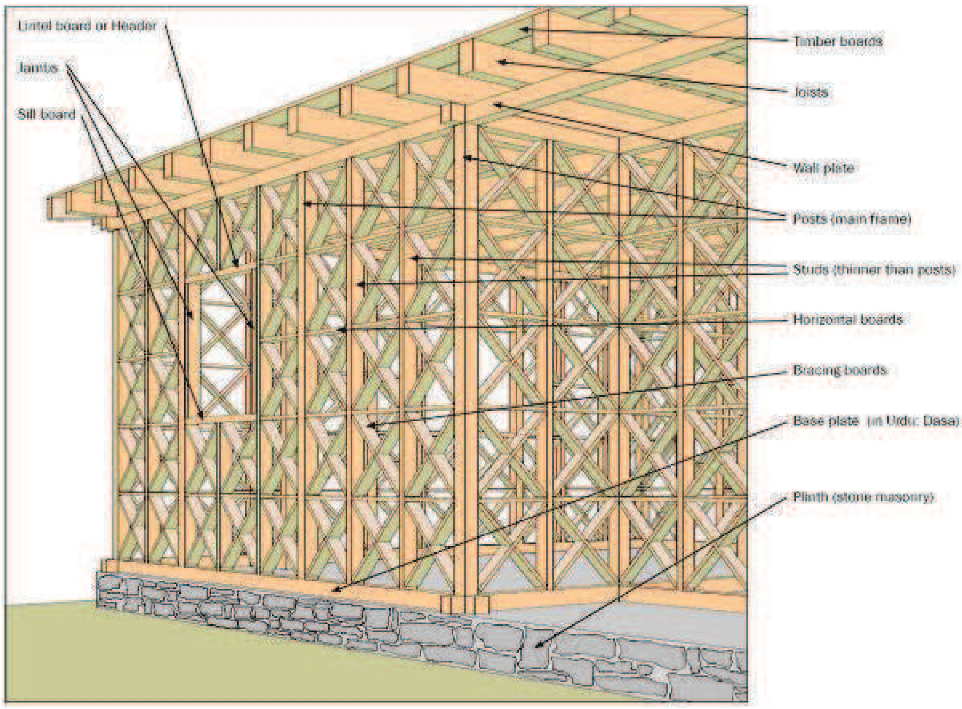


Figure 5.6 — Basic elements found in a dhajji house. Source : [Ali and Schacher, 2010]

which divides the masonry infill into various small panels (figures 5.6 and 5.7). The most important characteristic of this type of construction is the use of mud mortar. A common practice in the region was to use the dhajji dewari system in the upper story walls, especially for the gable portion of the wall (Shaw et al, 2008). But during reconstruction majority of people have built ground floor walls in dhajji dewari where the house was having two to three rooms (figure 5.8). Many types of frame designs are in practice in Kashmir. Few can be seen from the figure 5.9

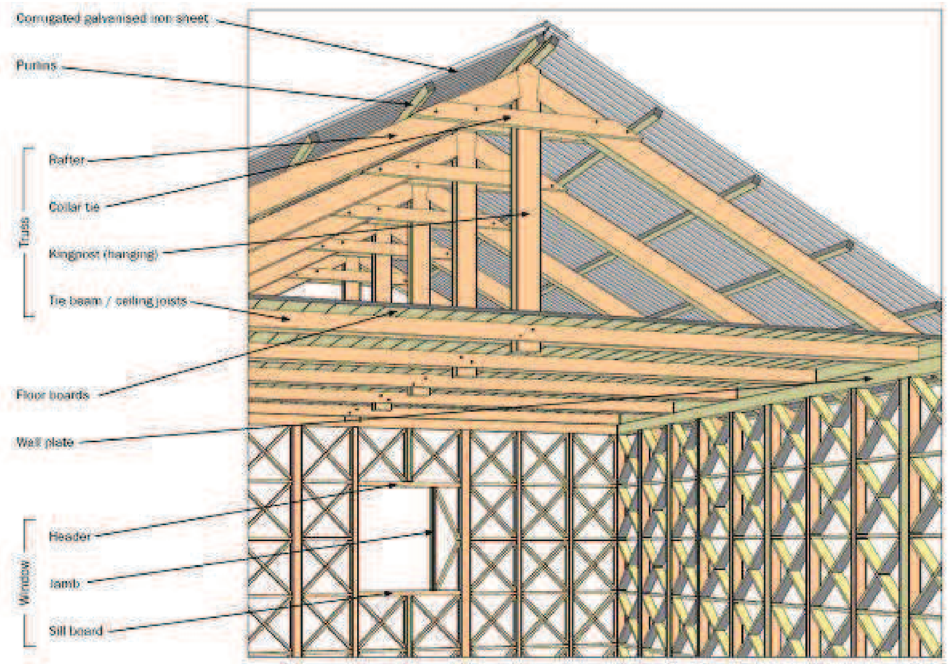


Figure 5.7 — Basic elements found in a dhajji house. Source : [Ali and Schacher, 2010]

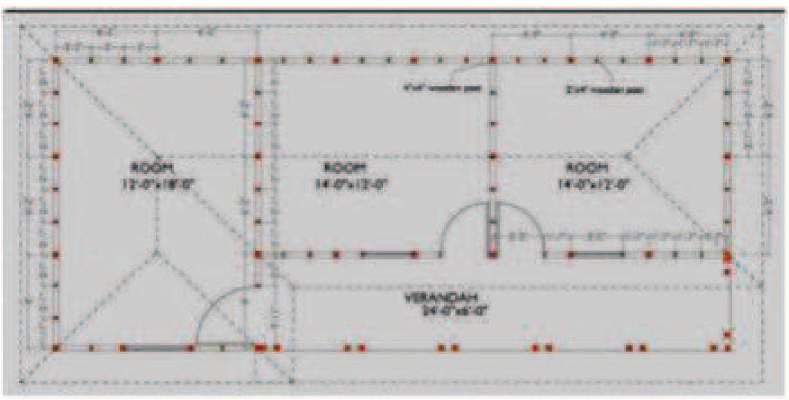


Figure 5.8 — Basic house design of a dhajji house. Source : [Hicyilmaz, 2012]

(a) (b) (c) (d) (e) (f)

Figure 5.9 — Different styles of dhajji wall framing found in surveyed areas. Source : S. Abidi

5.1.2.1 Dhajji in the world

Dhajji dewari is present in other parts of the world as well but is named differently. In medieval times, many European houses were constructed in the same style. The structural timbers were exposed in some parts of the world whereas these were covered in some other areas. During the 1800s, imitating the medieval building techniques became a trend. Timbers were applied to exterior wall surfaces just as decoration ; and not formulating the structure. This became a popular type of ornamentation in many nineteenth and twentieth century house styles ([Craven]).

Much older dhajji buildings are present in Turkey, Europe and other parts of the world however it is not yet determined that from which part of the world this construction technique entered the region of Kashmir. In Turkey the timber frame construction is called Himis and was used to build upper storey of houses. Talking about the Ottoman Construction Style of Turkey, Randolph Langenbach says :

"The upper story is almost always constructed with the infill-frame type of construction, with the frame infilled with a single-withe of fired brick or stone masonry. This type of construction is referred to in Turkish as "himis" (pronounced "humush"). This construction utilizes a weak mortar of mud or lime holding a single wythe of masonry into a timber framework of studs rarely more than two feet (60cm) apart. The studs are themselves tied at mid-story height by other timbers. Because the masonry is only one withe in thickness, the walls are light enough to be supported on the cantilevered timbers." The upper storey in himis can be seen from the figures 5.10 and 5.11 (a) whereas figure 5.11 (b) shows a pattern of himis.

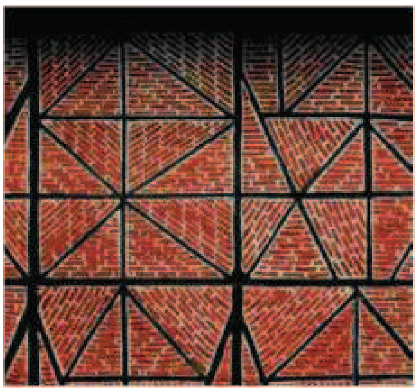
It was observed during post-quake researches that himis construction resisted earthquakes very well ([Celebioglu and Limoncu, 2006] ; Güçhan, 2007). Talking about himis, M. Hasan Bodurolu says ([Tobriner, 2000]) :

The traditional construction techniques used in timber frame buildings have been very successful. In contrast to stone masonry buildings, they may adequately resist earthquake forces.

The same construction technique is called Half-timbered in England (figure 5.12). There

Figure 5.10 — The upper story is almost always constructed with himis. ([Langenbach, 2003])

(a)



(b)

Figure 5.11 — The Turkish building technique Of himis has its details as that of dhajji. (a) : [Isik, 2009] ; and, (b) Source : [Gülkan and Langenbach, 2004]

Figure 5.12 — English farmhouse (1630), timber frame filled with wattle and daub, Worcestershire, England (Britainexpress.com)

it was popular in regions that lacked stone as a building material. It was used in England in the southern counties and the West Midlands, especially, from about 1450 to 1650 ([Britannica]). As mentioned by Dutu et al ([Dutu, 2012]) :

"The style that developed under the Tudor monarchs (1485-1603) derived from changing social and cultural trends in England. An increasingly wealthy merchant class combined with the land redistribution from Henry VIII's dissolution of the monasteries to provide the opportunity for both nobility and merchants to construct grand homes and estates. As England became more politically stable, there was less need for the nobility to occupy fortified castles. A major design element for newly-constructed private residences was half-timbering, which was common in the forested districts of England."

This construction style is named *Fachwerk* in Germany (figure 5.13). Fachwerk buildings exist both in southern and northern Germany. They are prevalent in the country as about 2 million houses were built with wooden frames filled with masonry, adobe or plaster. They were built until 1970. There are documents that testify to the occurrence of this type of construction in 1320, but most of them date from the end of the 18th century ([Dutu, 2012]).

Colombage is the name given in France to the dhajji type houses (figure 5.14). Several

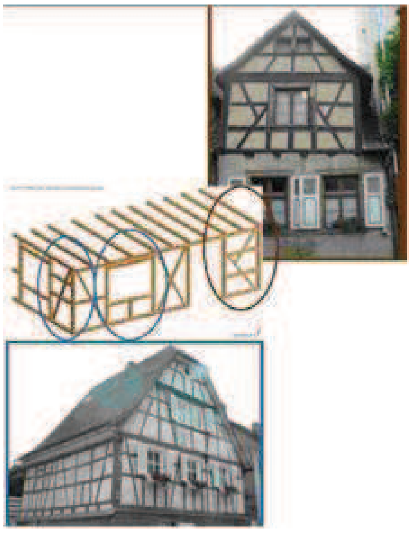


Figure 5.13 — The figures drawn out of posts, braces and ties give hints about the time the *"Fachwerk"* building was constructed. Source : [Bostenaru, 2004]

Figure 5.14 — Colombage houses present in Strasbourg, France. Source : S. Abidi

examples of such houses exist in different regions of France however these are mainly found in Normandy and eastern Alsace. The architecture of these houses differs slightly where exposed wood is sculpted differently ([Dutu, 2012]).

For timber frame construction, Spain calls it *"telar de medianería"*, Italy as *"casa barac-*

cata", Americas as *"taquezal or bahareque"* and Portugal as "pombalinos". Both the Pombalino and Baraccata systems are significant because they were deliberately developed and selected as earthquake-resistant construction (Langenbach, 2006). Examples of same construction are also present in Scandinavian countries, Greece, Romania and Americas.

5.1.2.2 The seismic behaviour of timber frame houses

Timber frame houses have shown remarkable performance under earthquakes in different parts of the world. However, the first intentional effort on government level to cope seismic hazard was observed after 1755 Lisbon earthquake (figure 5.15 shows seismic performance of pombalino gaiola). Discussing this event, Randolph Langenbach says ([Langenbach, 2007]) :

One of the largest earthquakes ever to hit Europe struck Lisbon in 1755, which also unleashed a destructive tsunami and fire. In planning for the rebuilding of the central area, Chief Minister Sabastiao Jose de Carvalho e Melo (who later became the Marquis of Pombal), gathered a group of military engineers led by Manuel da Maia to determine the best manner of earthquake resistant construction to use for the rebuilding. For this, they developed the gaiola ("cage"), which has become known as Pombalino construction. The gaiola essentially is a well-braced form of half-timber construction. After testing a prototype, they made its incorporation into the reconstructed buildings a requirement ([Thywissen, 2006]). Many of the new buildings with the gaiola were five and six stories in height and most of these remain standing today."

In Kashmir, many pre-quake dhajji houses withstood the earthquake of 2005. This not only motivated the community to practice it but also the seismic experts conducted lab tests to judge its behaviour under earthquakes. More recently (in 2010), the manual about dhajji prepared jointly by NDMA and UN ([Ali and Schacher, 2010]) was a result of extensive lab tests. As stated by Schacher :

".... given the typical low consideration in which traditional architecture stands in many parts of the world, no technical documentation was available to engineers and architects, both in the field and in key offices, nor to artisans. And since the technical detailing of Dhajji

Figure 5.15 — Left : 18th Century building in central Lisbon showing "Pombalino gaiola" construction, 2003. Centre : Gaiola wall sections from a late 18th or early 19th C. building after having been tested. Right : Hysteresis diagram from one of the wall tests of the walls in both left figures ([Langenbach, 2007])

construction, as observed in the field, frequently did not come up to the standards of good practise, the need for a proper guideline became imperative.

The present manual intends to fill that gap. It is not only based on the results of extensive lab research at UET Peshawar, including shake table tests on reduced scale models, quasi-static tests on full scale walls and rigorous nonlinear inelastic numerical modelling, but also on a tradition of good practice in timber construction as well as, and most importantly, on the priceless experience of the innumerable field trainers who have worked in the Kashmir mountains since the earthquake."

During other researches conducted to test the seismic behaviour of dhajji, it was proven that this construction style can withstand the earthquake by dissipating energy. Its ductility and strengths are also analyzed under several experiments. ([Basu, 2006] ; [DOĞAN, 2010] ; [Gonçalves *et al.*, 2012] ; [Gubana *et al.*, 2012] ; [Ahmad *et al.*, 2012])

5.1.2.3 Pre-quake dhajji in Kashmir : Case study of Qadri market

Dhajji construction existed in the region prior to earthquake. Although there was a declined trend to adopt dhajji dewari in new house construction, examples of dhajji were present in

Figure 5.16 — Minor damage was observed in this building after the earthquake. Photo Source : [Langenbach, 2009]

different areas.

The most significant example of pre-quake dhajji dewari observed is a market in Bagh district named Qadri Market (figures 5.16, 5.17, 5.18). It is located near Thub (a village) and has survived the shocks and after shocks of 2005 earthquake. The ground floor of this market is allocated to the shops however a primary school is present on the first floor (figure 5.19). The figure 5.17 shows the old shutters on the ground floor and the timber beams on both floors. The actual year of its construction could not be verified however people consider it to be a century old. CGI roof present on the top of this building was replaced few years before earthquake. People say that initially it had a flat timber-beam roof covered by mud.

Is this a safe building?

The discussion of sustainability does not encompass only single aspect rather it is about holistic approach. If one building is proven seismically resistant, the same time it should also fulfil other requirements of safety. Qadri market was examined for other safety measures with respect to its function.

Figure 5.17 — Front elevation of Qadri market. Source : S. Abidi

Figure 5.18 — Front and side elevation of Qadri market. Source : S. Abidi

Figure 5.19 — Rear side of the market is having entrance door for school on first floor. Mud plaster is hiding the dhajji wall details however wooden posts (columns) are visible wherever the plaster is fallen. Source : S. Abidi

Difficult access

The access to the school was found extremely dangerous (figure 5.20). Ascending from the road to the first floor was only possible through hiking on the hill. This passage was full of thorny bushes. In the end of the passage, stones were loosely placed on each other to make a riser. The children studying in the school were of the ages 3 to 12. When asked about access issues, the school officials were not bothered about it. Rather they responded, *"We get used to climb up such hills from the day we start walking."*

Large openings : Accident inviter

The market is a good example of dhajji and has proven its structural stability in 2005. But issues of safety still raise questions on its resilience. It was observed that either parapet walls were entirely missing (left side view in figure 5.17) or a tin board was loosely connected with wooden columns to behave as parapet (right side view in figure 5.17). This is a threat for the children who can easily fall down from 12 feet high roof. Fabric piece was also spread on front side of first floor (figure 5.21); the reason mentioned was privacy for women teachers.

(a) (b)

Figure 5.20 — Access issues. (a) A riser made of stones ; and, (b) thorny passage Source : S. Abidi

Large openings : Cold inviter

In Kashmir, the primary issue related to climate is not hot summers rather this is cold winter which is community's major concern. The large openings in the school were not having windows. It was as if children were sitting under the open sky. It was observed that even if windows were placed in the openings, the large inner space and high roof will keep the school cold (figure 5.22).

5.1.3 Socio-cultural characteristics affecting reconstruction policies

Reconstruction ensures sustainability if disaster resilient policies reinforce the cultural strengths of communities. Post 2005 Kashmir earthquake reconstruction program is a distinctive case where authorities had to carry out a major shift in their policies by recognizing the seismic resilient local construction techniques to be good solution than alien techniques.

5.1.3.1 ERRA policies on indigenous construction

For post-quake reconstruction ERRA was reluctant in accepting timber based construction techniques as earthquake resistant building practices. Initially it considered only reinforced

(a)

(b)

(c)

Figure 5.21 — Large openings in walls on first floor are not recommendable for a primary school. Source : S. Abidi

(a) (b)

Figure 5.22 — Outside and inside views of the roof. it is not only open to the outside ; also it decreases the inner temperature because of its height. Source : S. Abidi

masonry construction (RMC) suitable to cope with future disasters.

As Kashmir is a mountainous region with housing units scattered on high altitudes and with difficult terrains, it was almost impossible to take the building materials of reinforced masonry construction to far away lands. It was estimated that the construction cost could increase many folds and progress could be extremely slow if only RMC was adopted by the community. According to Mason Qayoum, *"if a dhajji house of 400 sq ft is built in PKR 200,000, an RMC house of same area could have the cost around PKR 0.10 to 0.12 million if built on high elevated areas."* Traditional practices were an ideal solution in these conditions.

The weather during November to February remains extremely cold in the region. Monsoon period of June, July and August hinders the construction too. In such harsh climatic conditions only few months are left for construction. As the timeline in figure 5.23 shows the policy announcing period ranging from May 2006 to April 2008, people had to wait for several months to start reconstruction. In other cases, they started reconstructing the houses

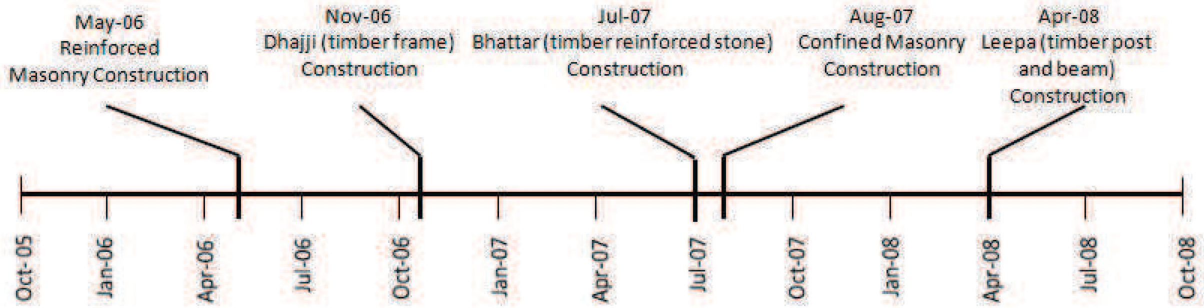


Figure 5.23 — Timeline of approved construction styles by ERRA ; based on progress reports of UN HABITAT ([Leersum, 2009])

without guidelines (Stephenson, M., in ERRA International Conference, [EIC, 2010]). This factor produced chaos, confusion and deviation from given guidelines ([Mumtaz *et al.*, 2008]). Adopting just RMC could raise the prices many folds as majority of the people had to construct within a specific time period. More demands and less supply could not only affect the prices, a slow rate and poor quality reconstruction could be resulted.

5.1.3.2 How people influenced the policies

As described earlier, people were ignoring dhajji construction before the 2005 earthquake. It was however its survival during severe seismic shocks which attracted them towards timber-frame construction.

Mason Qayoum explained this scenario as :

"No one wanted to build his house in dhajji before earthquake. This construction technique was being considered as obsolete. When earthquake turned the stone masonry houses into rubbles, people were astonished why dhajji survived. I and my fellows explained how dhajji works under seismic tremors.

Many of us did not wait for ERRA guidelines and aid. We had enough timber and other necessary material to construct dhajji houses. The masons guided people how to build an earthquake resistant dhajji house. We were then invited by UNHABITAT officials to give details of dhajji and help them convince the authorities. Several meetings were conducted to understand the related issues and solutions.

> Adoption of Dhajji construction:
> A villager of Chanaat shared that about 15 houses within their village were construction of Dhajji, before the earthquake. While the impact of the earthquake was severe, also in terms of damaged and collapsed houses, the Dhajji houses withstood the earthquake. Since they had the skills, experience, tools and materials to construct such houses, villagers decided they wanted to rebuild with Dhajji construction – even before reconstruction efforts had started.
>
> (U.C. Malot, rev. village Chanaat, AJK Pakistan, Aug. '08)

Figure 5.24 — Field results about dhajji, Source : [Leersum, 2009])

It was November 2006 that ERRA launched a policy on dhajji which was purely as a result of community inclination. This revolutionary step motivated those people as well who did not start reconstruction by then. As dhajji was a cheaper construction as compared to RCC construction, financial aid by ERRA was proved sufficient for reconstruction.

Reconstruction rate was increased many times due to short time required and ease in dhajji construction. People could construct their houses without any external help. Guidelines provided by UNHABITAT and trainings conducted by different organizations facilitated the community in understanding different aspects of dhajji construction" The same dimension was also mentioned in Leersum's thesis of 2009 (figure 5.24).

5.1.3.3 Efforts of ERRA, and partners to strengthen the traditional architecture

Although initially ERRA was reluctant in accepting the indigenous architectural techniques to be earthquake resistant, later it played an enormous role in strengthening the fading construction culture of Kashmir.

After launching its policy on dhajji in November 2006, ERRA with the help of other organizations took steps as :

1. Arranging technical trainings for the community

2. Skilled labor training
3. Dissemination of flyers and posters
4. Demonstration through Model Houses
5. Social mobilization
6. Preparing documents e.g., [ERRA, 2008a], Guidelines for one/two storey Dhajji Houses etc.

UNHABITAT was the implementing partner of ERRA for RHRP. During reconstruction period this organization guided villagers for construction. They also provided remedial measures wherever people had started reconstruction prior to ERRA policy launch.

5.1.4 Is dhajji construction sustainable? Community responses

The sustainability does not only depend on the in-built features of a construction type rather it is also the way community carries it out. We can not say that dhajji is a sustainable construction technique under every type of agents. The misuse or the changes added by the non experts can reverse the characteristics of any sustainable thing. It was mentioned in the current study surveys that dhajji was on decline in Kashmir before the 2005 earthquake. It is hence obvious that either people had issues to adopt it or they were simply unaware of its existence. Considering the first assumption (as second was not detected in the surveys) it should be investigated whether dhajji related issues were resolved for community through the guidelines provided by authorities. It should also be explored whether people now consider dhajji a sustainable construction technique and want to continue it in future. Centring this theme, the surveys took the opinion of people about merits and demerits of dhajji dewari through :

1. semi structured interviews with 80 households (in 2011)
2. surveys conducted of 134 houses (in 2013)

5.1.4.1 Dhajji and earthquake resistance

Experts are convinced that dhajji dewari is a good seismic resistant construction technique. ([Langenbach, 2003] ; [Langenbach, 2007] ; [Langenbach, 2009] ; [Basu, 2006] ; [DOĞAN, 2010] ; [Gonçalves *et al.*, 2012] ; [Gubana *et al.*, 2012] ; [Ahmad *et al.*, 2012]) The community however had different opinions on the relation of dhajji and earthquakes. The questions were asked about this relation in initial surveys. To test the findings, 2013's questionnaire had the question that *"How much you are confident about dhajji's resistance against earthquakes?"* The responses were to be given following likert scale as strong confidence, confidence, neutral, weak confidence and no confidence at all.

Results of 2011 survey

As the table 5.1 and corresponding bar graph mention, only 10% (8) people out of 80 said with strong confidence that dhajji is a seismically resistant technique. These were those people who somehow had a close link with social mobilizers or had attended technical trainings several times. Few of them were very confident because they constructed dhajji houses very early and had experienced its strength against earthquake during after shocks. They said that although few panels had lost the stone mud infill but the overall structure remained intact. Around 50% (39) people agreed that dhajji is safe under earthquakes but they considered other construction styles to be better than dhajji. 90% (35) among those debated in favour of block construction (no matter reinforced or confined). 10% (4) considered brick to be a good construction material for earthquake resistance. 18% (15) people said that although we consider dhajji to be a safer technique but we can say it confidently only if another earthquake of same intensity as that of 2005 earthquake occurs. 12% (10) of them said that nothing is safe under a strong earthquake. 10% (8) people said that only other construction techniques are safe and dhajji can not survive earthquake shocks for longer span.

Results of 2013 survey

The results of latest surveys (table 5.2 and corresponding bar graph) do not match with the previous results. One of the major reasons is that the community present in Salmia and Sena Daman had observed several examples of dhajji before earthquake. They had a strong belief that dhajji can survive earthquakes. Similarly those who lie under extreme confidence

Table 5.1 — : Survey results of 2011 for assessing dhajji's resistance against earthquake

		eq_resistant					
		Strong confidence	confidence	Neutral	Weak Confidence	No Confidence	Total
village	Kaimanja	0	7	4	8	1	20
	Haryala	0	1	3	2	4	10
	Kharabiyan	2	3	2	0	3	10
	Thub	4	13	4	0	0	21
	Mallot	2	5	1	0	0	8
	Jaglari	0	10	1	0	0	11
Total		8	39	15	10	8	80

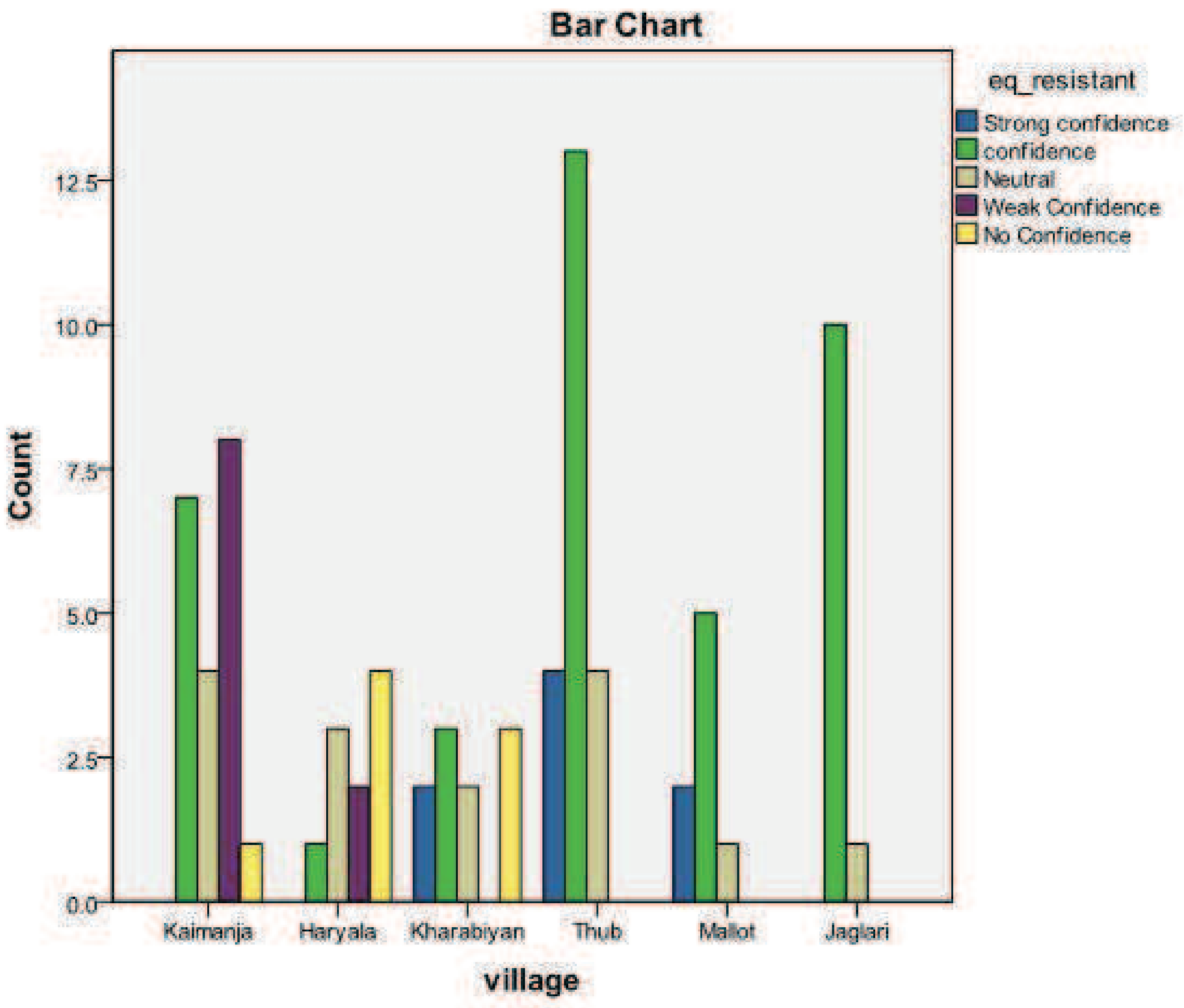
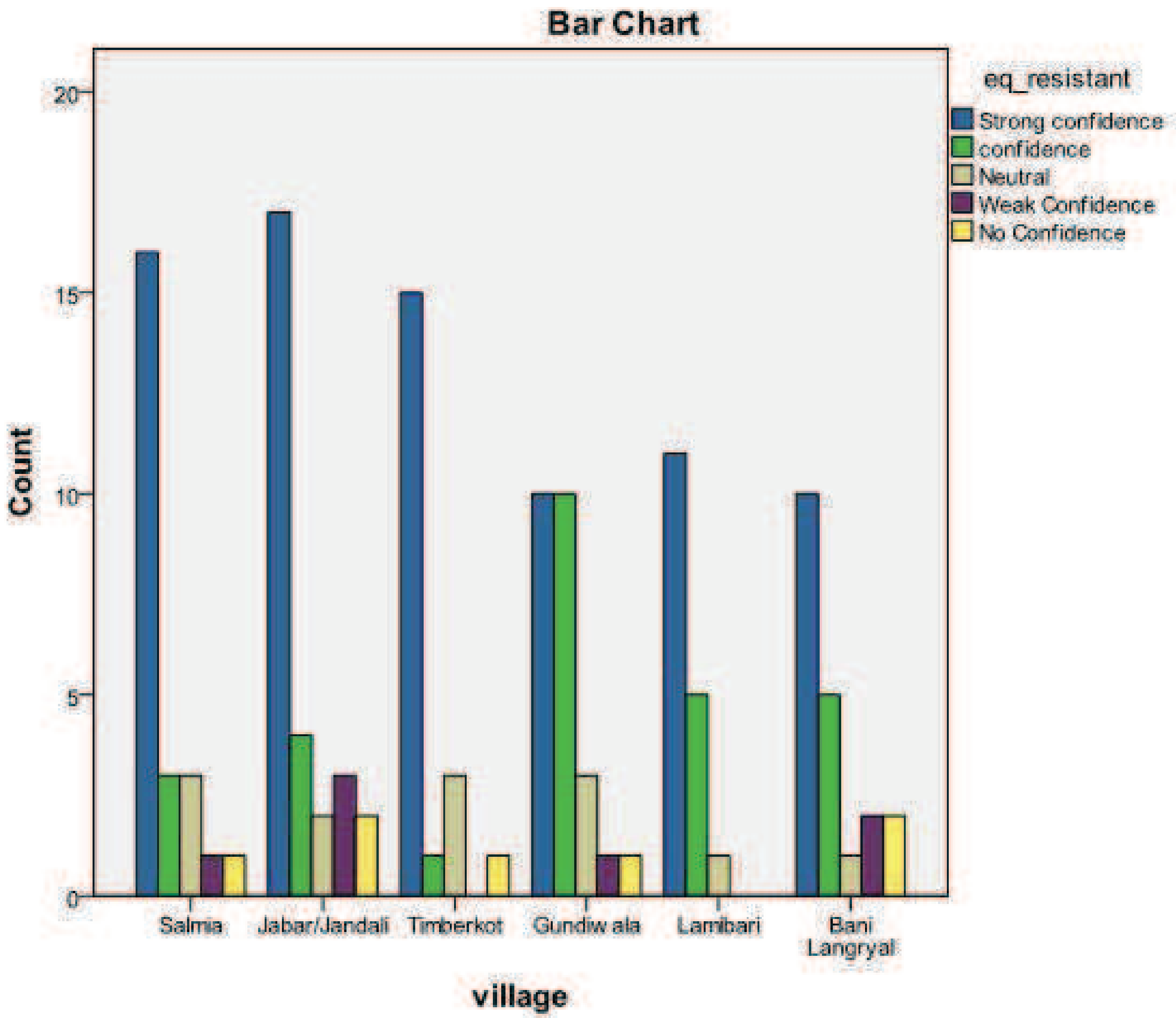


Table 5.2 — : Survey results of 2013 for assessing dhajji's resistance against earthquake

		eq_resistant					
		Strong confidence	confidence	Neutral	Weak Confidence	No Confidence	Total
village	Salmia	16	3	3	1	1	24
	Jabar/Jandali	17	4	2	3	2	28
	Timberkot	15	1	3	0	1	20
	Gundiwala	10	10	3	1	1	25
	Lamibari	11	5	1	0	0	17
	Bani Langryal	10	5	1	2	2	20
Total		79	28	13	7	7	134



during 2011 surveys were those who resided in Thub (the place where dhajji is said to be reconstructed even without authority's guidelines) or those who rebuilt in dhajji earlier and observed its performance during later earthquake aftershocks.

5.1.4.2 Dhajji and strength

As described earlier, thin timber frames are used to fabricate the house. The flexibility in the structure ensures survival of dhajji houses during seismic tremors. But the same time people have reservations on the strength of these houses. The graph below shows the percentage of community responses.

Results of 2011 survey

The table 5.3 and the corresponding bar graph show the results of 2011 surveys as : 10% (8) people said that dhajji houses are very strong. 20% (16) said that these are strong. 50% (40) responded that although these are strong but show weakness under certain pressures. 4 house owners among them have cattle shed connected to the main house. Respondents mentioned that their cattle adjacent to the house exert pressure on the walls. Big animals like cows and buffalos become a threat for the wall as they can apply force more than small animals. As they are kept inside during night, sometimes residents wake up through awful shaking of the walls. 14% (11) said that they consider dhajji houses to be weak. 6% (5) regard them as very weak.

Results of 2013 survey

The table 5.4 and graph show a similar trend in the results of 2013 surveys. Although people of Sulmia and Sena Daman adopted dhajji dewari for its better seismic performance, they do not find it strong enough.

5.1.4.3 Dhajji and cost

Three major elements drive the cost of a house ; the land, material and labour. Kashmiris generally have their own land and no case of living on rent is found in surveyed areas. Hence cost of land was not a concern for the community for reconstruction (except those who lost the houses in landslides. For their detail see ERRA Landless Program, RLP).

Table 5.3 — : Survey results of 2011 for assessing dhajji's strength

		strength					Total
		extremely strong	very strong	strong	weak	very weak	
village	Kaimanja	0	0	11	5	4	20
	Haryala	0	0	5	4	1	10
	Kharabiyan	0	2	6	2	0	10
	Thub	5	6	10	0	0	21
	Mallot	3	2	3	0	0	8
	Jaglari	0	6	5	0	0	11
Total		8	16	40	11	5	80

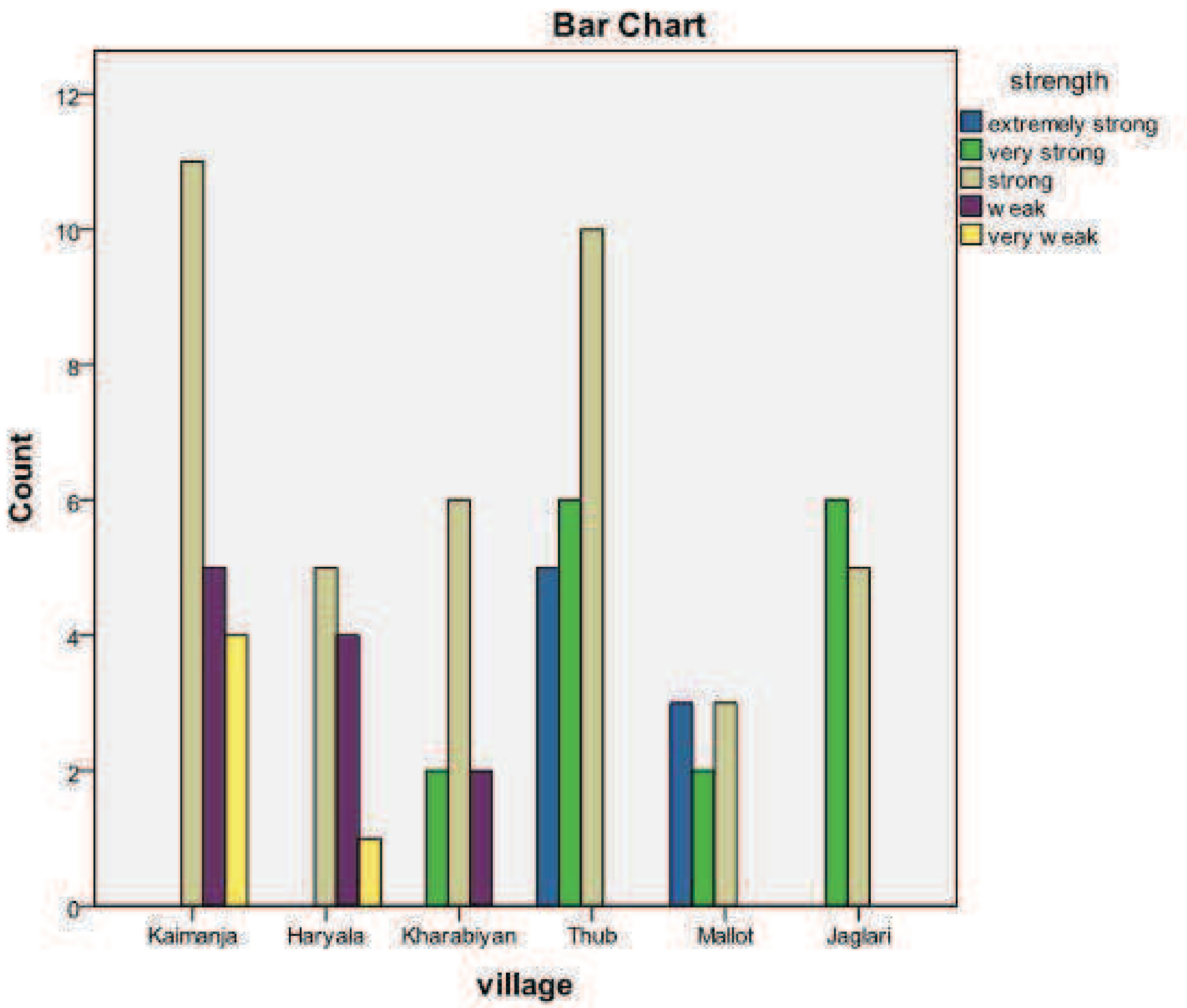
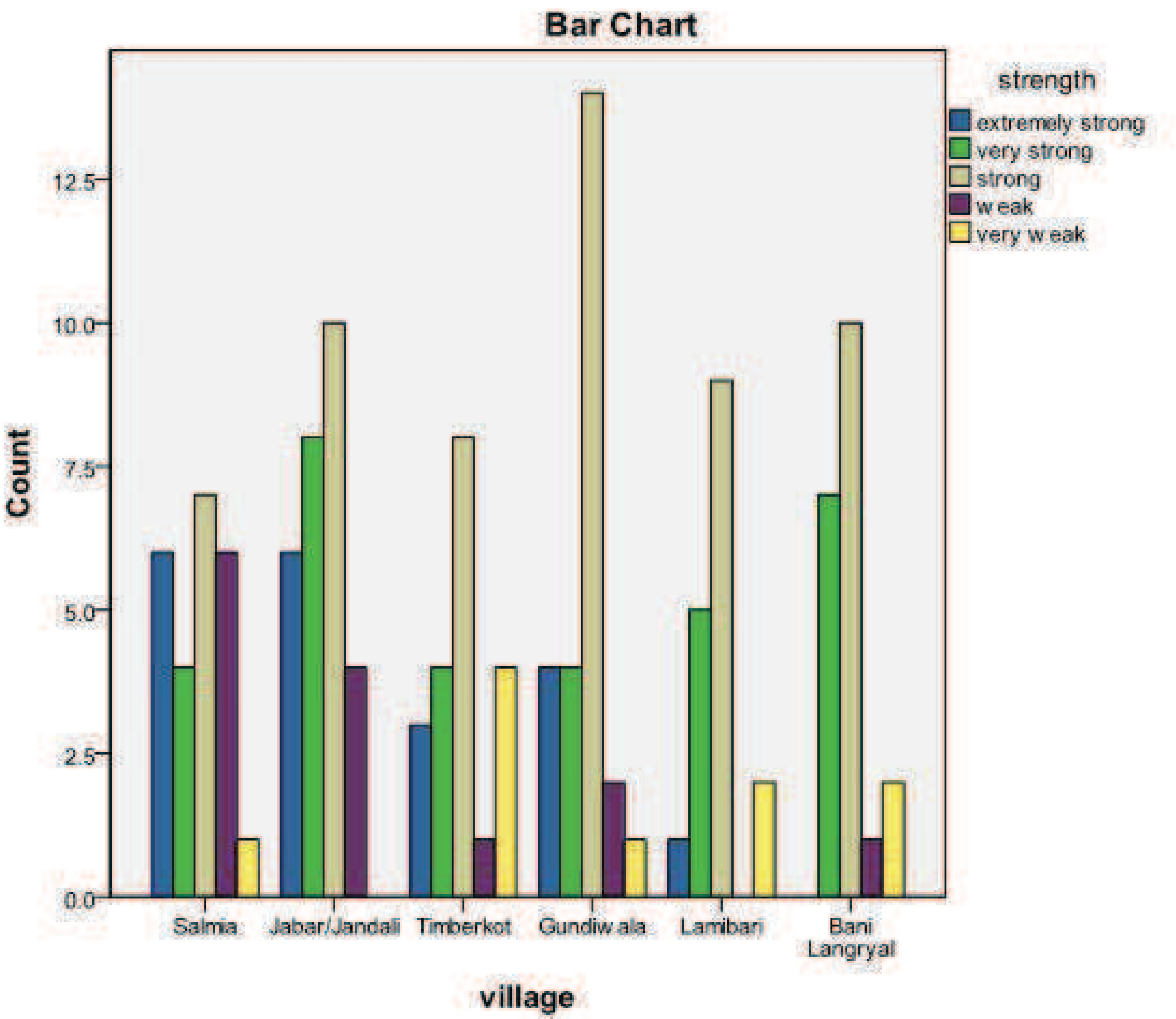


Table 5.4 — : Survey results of 2013 for assessing dhajji's strength

		strength					Total
		extremely strong	very strong	strong	weak	very weak	
village	Salmia	6	4	7	6	1	24
	Jabar/Jandali	6	8	10	4	0	28
	Timberkot	3	4	8	1	4	20
	Gundiwala	4	4	14	2	1	25
	Lamibari	1	5	9	0	2	17
	Bani Langryal	0	7	10	1	2	20
Total		20	32	58	14	10	134



Dhajji is considered to be a cost effective construction type. Main reason is that people have reused material from their pre-quake houses. In this case the aid provided by ERRA proved to be sufficient for reconstructing the house. Secondly it is easy to install dhajji house. After attending technical trainings provided by ERRA, many people had constructed their houses without external help. Neighbours also helped each other in construction. This saved the cost of labour.

As the tables 5.5 and 5.6 and their corresponding graphs depict, majority of the respondents in both surveys responded that the financial aid provided by ERRA was sufficient for the core house construction i.e. the house of 250-400 sq ft (as prescribed by ERRA). According to few respondents, the cost of other techniques was 2 to 5 times more than dhajji house. **Results of 2011 survey**

5.1.4.4 Dhajji and thermal insulation

This issue will be discussed in detail in chapter 7. However a brief introduction is presented here.

Results of 2011 survey

The question related to thermal insulation received sharp responses. When people were asked "Do you feel dhajji houses provide more thermal insulation than your previous houses during extreme weather conditions?" all of 80 respondents said, "No". Moreover people complained that the expenditure on fuel is elevated drastically. Many houses have left open spaces above doors and even in upper part of walls (figure 5.25). This allows cold wind to get enter the space and make it even colder.

Results of 2013 survey

The results were same as of 2011.

5.1.4.5 Dhajji and environment

Experts are convinced that the wooden structures are better for the environment as compared to other construction style but the same time they do not find excessive wood cutting a sustainable solution for construction ([Langenbach, 2009] ; [EIC, 2010]). During surveys it

Table 5.5 — : Survey results of 2011 for satisfaction on financial aid for core house

		aid_sufficient		
		yes	no	Total
village	Kaimanja	14	6	20
	Haryala	9	1	10
	Kharabiyan	10	0	10
	Thub	17	4	21
	Mallot	6	2	8
	Jaglari	11	0	11
Total		67	13	80

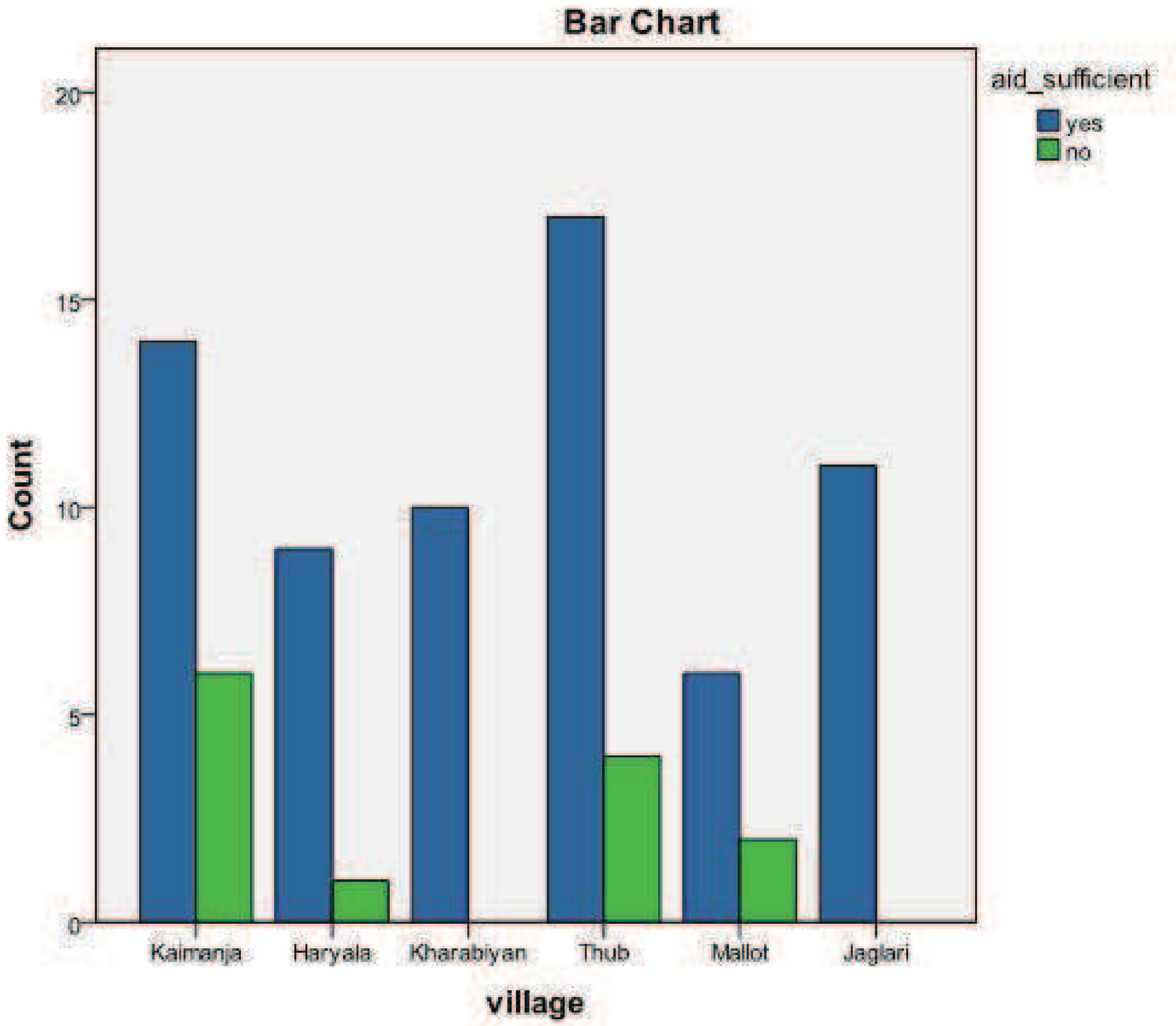
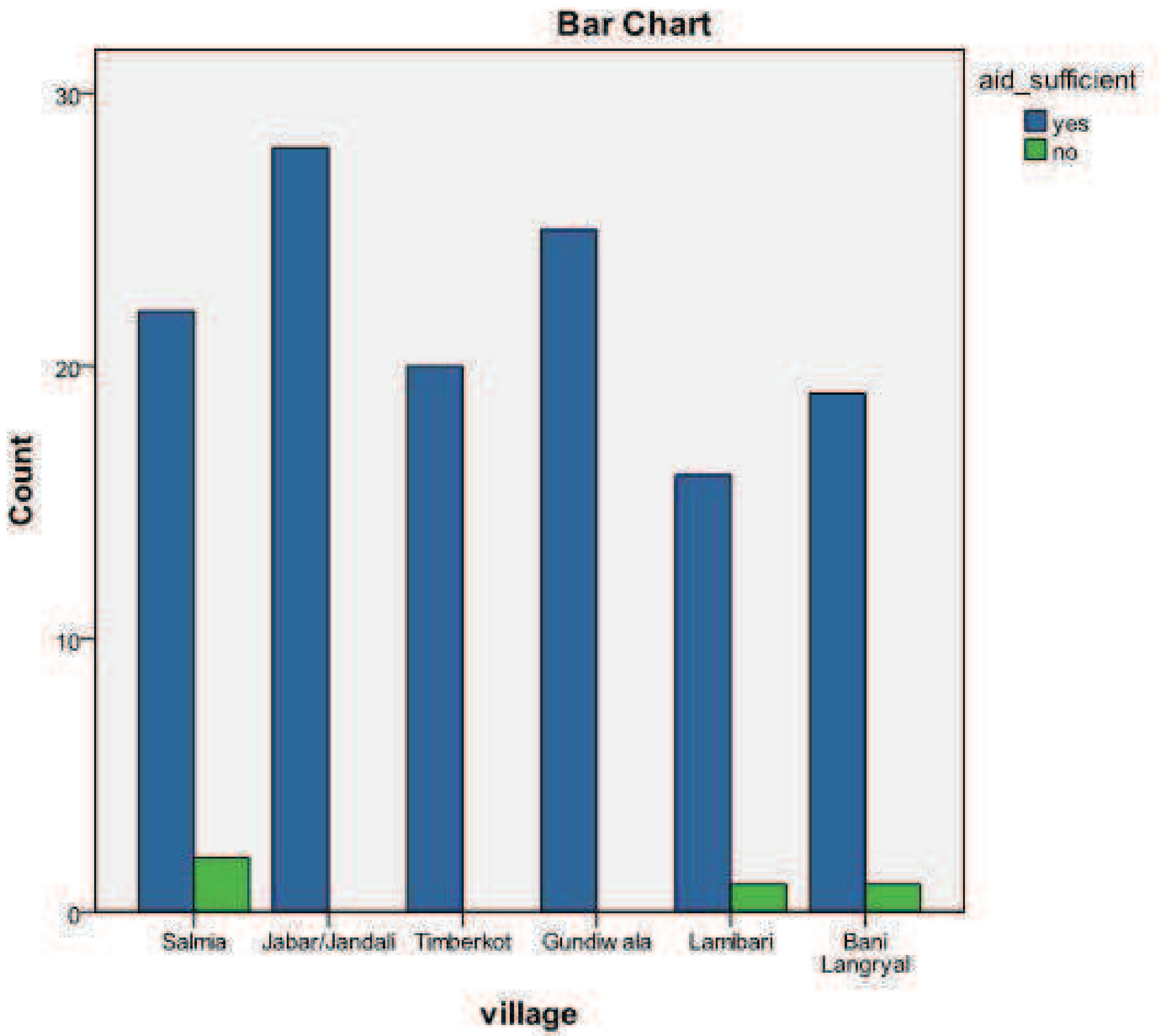


Table 5.6 — : Survey results of 2013 for satisfaction on financial aid for core house

		aid_sufficient		Total
		yes	no	
village	Salmia	22	2	24
	Jabar/Jandali	28	0	28
	Timberkot	20	0	20
	Gundiwala	25	0	25
	Lamibari	16	1	17
	Bani Langryal	19	1	20
Total		130	4	134



(a)

(b)

Figure 5.25 — : Opening above the doors. Source : S. Abidi.

was found that no one had considered dhajji to be a threat for the environment. According to them as they utilized most of the wood from pre quake house, no new timber was used. Those who bought new wood were also satisfied as they did not consider wood cutting of this scale is an alarm for the environment. Here it was observed that cutting of wood is a culture of the area, people are not bothered about sustainable surroundings. The results were same after 2013 surveys.

5.1.4.6 Dhajji and maintenance

Dhajji dewari needs extreme care to avoid structure deterioration. Focusing the maintenance of dhajji, two issues are mentioned here (effects of absence of guidelines on maintenance will be discussed in chapter 7). First is that dhajji structure needs to be protected from rains. During heavy monsoon rains in July and August and occasional winter rains during December to February cause the mud infill to fell off. Water is also a threat for the wood frame. People have opted diverse solutions to avoid the infill fall and protect the frame.

Second expected issue is of insect/termite attack. People mentioned such cases but those were present in the areas which were not under this study. According to the respondents, the houses which were attacked by termite were located on the hill sides which do not face the sun whole year. However no such case was found in the surveys. All the respondents were confident in mentioning that the wood they used was seasoned and there they do not expect

(a)

(b)

Figure 5.26 — Exposed dhajji walls. Source : S. Abidi.

any termite/insect attack.

Results of 2011 survey

In the surveys of 2011 it was observed that people consider the maintenance of dhajji as just to maintain the infill of walls. When they were asked about the solutions which they apply to maintain dhajji houses, they mainly related it to the wall. Table 5.8 and corresponding graph show different ways of protecting the walls.

Among 74 households of low income strata, 25% (18) houses were completely exposed and dhajji pattern could be seen (figure 5.26). People residing there frequently fill the divisions of frame with mud mixed stones.

A combination of dhajji cover was also observed in the region. 10% (7) houses had few walls exposed and rest covered with CGI sheets, mud plaster or wooden planks (figure 5.27).

47% (35) of 74 houses were plastered with mud. These houses belonged to lower income families and none had a coloured mud plaster (figure 5.28).

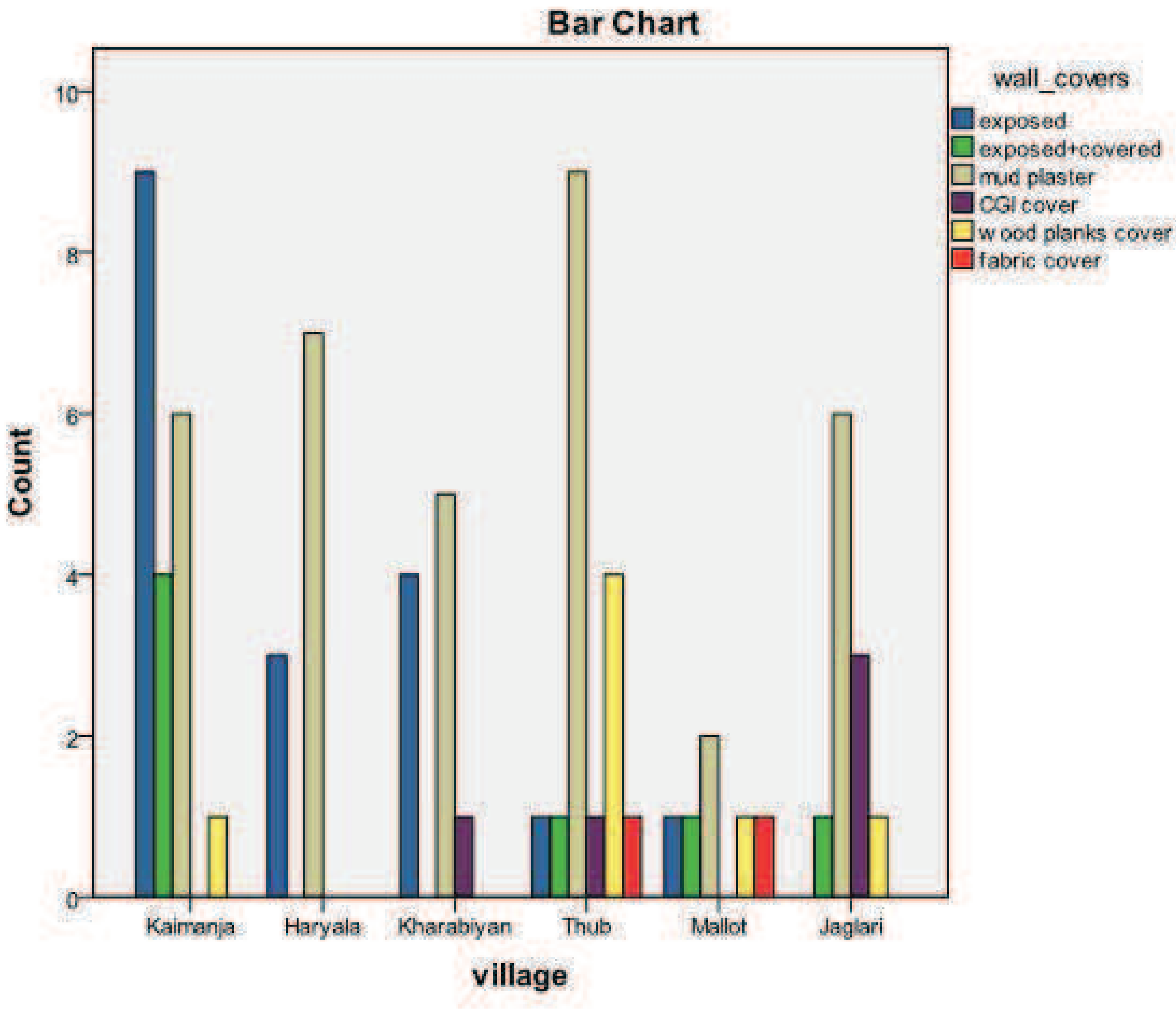
7% (5) houses among 74 were those which were covered with CGI sheets (figure 5.29). These sheets were provided to construct shelters in the immediate aftermath of earthquake. People used them both for covering walls and to build tower roofs.

9% (7) houses had wooden planks to cover the walls from rain water and wind pressure (figure 5.30).

Table 5.7 — : Survey results of 2011 for maintenance issues

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
village * wall_covers	74	92.5%	6	7.5%	80	100.0%

		wall_covers						Total
		exposed	exposed +covered	mud plaster	CGI cover	wood planks cover	fabric cover	
village	Kaimanja	9	4	6	0	1	0	20
	Haryala	3	0	7	0	0	0	10
	Kharabiyan	4	0	5	1	0	0	10
	Thub	1	1	9	1	4	1	17
	Mallot	1	1	2	0	1	1	6
	Jaglari	0	1	6	3	1	0	11
Total		18	7	35	5	7	2	74



(a) (b)

Figure 5.27 — Exposed walls Source : S. Abidi (a) exposed walls, but one wall is covered with planks ; and, (b) exposed walls, but upper part is covered with wooden planks

(a) (b)

Figure 5.28 — Mud plaster is frequently applied on the walls. This not only avoids rain water seepage but also provides thermal insulation to some extent. Source : S. Abidi.

(a) (b)

Figure 5.29 — The CGI sheets used in shelters are reused to protect walls. Source : S. Abidi.

(a) (b)

Figure 5.30 — Wooden planks are nailed on dhajji walls. source : S. Abidi

2% (2) houses had displayed fabric on walls to control water seepage (figure 5.31). People utilized the fabric which was provided to them for shelter building.

Among 6 houses belonging to high income families, a combination trend to cover the walls was observed. 1 of them was covered with wooden planks (figure 5.32). This wood was not cheap as that of previously discussed houses rather it was well finished

3 houses had their walls covered with mud plaster. The walls had plaster of different colored patterns (figure 5.33).

1 of these houses had CGI sheets to clad the walls. These sheets were left in their original color but few parts were painted, as shown in figure 5.34.

(a) (b)

Figure 5.31 — Fabric reused, Source : S. Abidi. (a) fabric is reused from shelters ; and, (b) front elevation is protected from rain through veranda while side exposed wall is covered with fabric.

(a) (b)

Figure 5.32 — The quality and finishing of planks exhibit the stratum using them. Source : S. Abidi.

(a)

(b)

Figure 5.33 **—** Colored bands on mud plaster ; right : ground floor walls show the aesthetic taste of the owner. Source : S. Abidi.

Figure 5.34 **—** CGI sheets of different colors. Source : S. Abidi.

Figure 5.35 — Concrete blocks are not part of the structure. Source : S. Abidi.

1 house was observed in such construction that the lower half of the wall was protected with concrete blocks (figure 5.35).

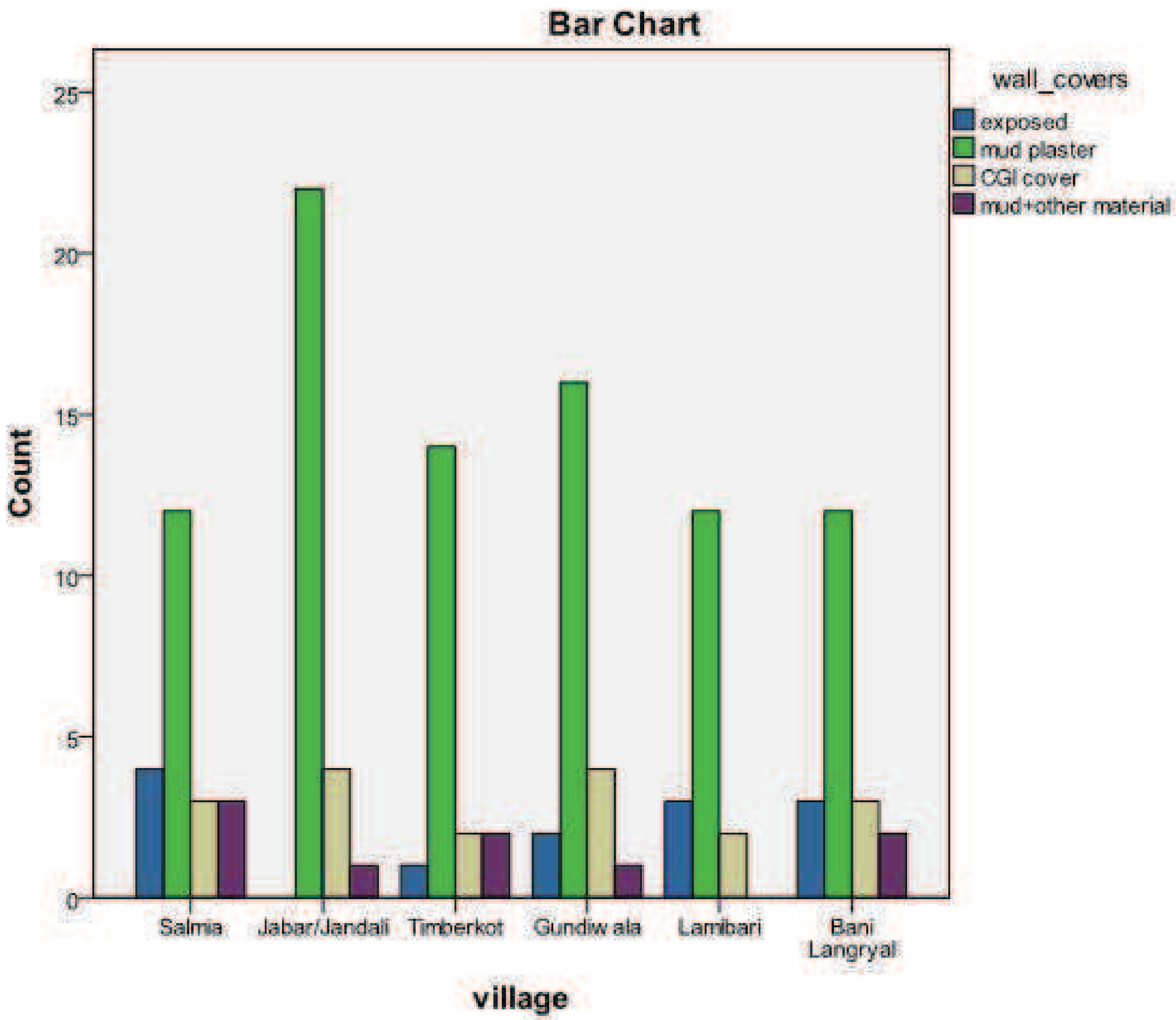
Results of 2013 survey

As all the survey forms were received with the photographs, the practiced wall covers in the surveyed areas could be observed. (This section does not include 14 under construction houses) The people who earned below PKR 30,000 were 128. 6 earned more than this. First category has the wall protection solutions presented in the table 5.8. If the categorization of 2011 results is referred here, the summary will be :

1. 10% (13) exposed (figure 5.36)
2. 0% (0) exposed+ other material to cover
3. 7% (9) mud plaster in combination with CGI sheets/wooden planks (figure 5.37)
4. 69% (88) mud plastered (figure 5.38)
5. 14% (18) CGI covered (figure 5.39)
6. 0% (0) with wooden planks

Table 5.8 — : Survey results of 2013 for maintenance issues

		wall_covers				
		exposed	mud plaster	CGI cover	mud+other material	Total
village	Salmia	4	12	3	3	22
	Jabar/Jandali	0	22	4	1	27
	Timberkot	1	14	2	2	19
	Gundiwala	2	16	4	1	23
	Lamibari	3	12	2	0	17
	Bani Langryal	3	12	3	2	20
Total		13	88	18	9	128



(a) (b)

Figure 5.36 — The fabric in the right photo is hanging to cover open space for left window. Source : S. Abidi.

7. 0% (0) with fabric cover

The 6 houses belonging to high income families had 3 houses with mud plater covered walls (figure 5.40) and 3 had used CGI sheets for cladding (figure 5.41).

5.1.4.7 Dhajji and aesthetics & modernity

The experts are convinced on the aesthetically pleasing dimension of vernacular construction ([Langenbach, 1990] ; [Sarkar, 2011]). But is dhajji aesthetically appealing in view of community? This question was posed to have the opinion of community about aesthetics of dhajji as this also is a major aspect of any sustainability ([Moore]).

Results of 2011 survey

These results are presented through the table 5.9 and corresponding bar graph. Interestingly all the 6 high income community members considered dhajji to be a modern style. They were satisfied with this construction technique in relation to aesthetics as well. 38% (28) among 74 of low income group explained that dhajji was present in this area before earthquake but people preferred other construction approaches to build their new houses. It was not till ERRA revived dhajji that people started considering it modern. They think that after its revival dhajji has become aesthetically appealing. Two houses were also found in

(a) (b)

(c)

(d)

Figure 5.37 — Mud plaster with CGI sheets or wood planks. Source : S. Abidi

(a) (b)

(c) (d)

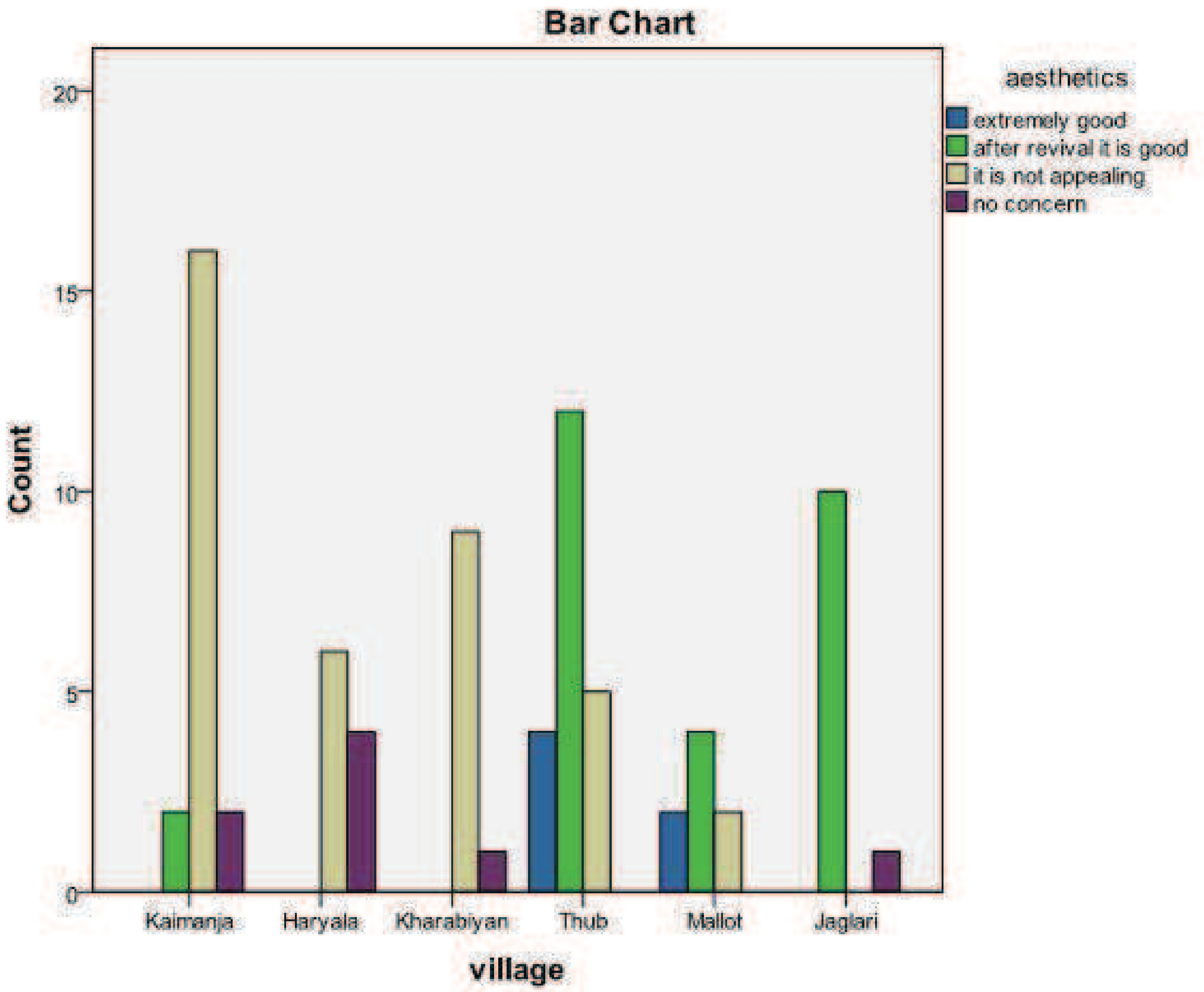
Figure 5.38 — Walls covered with CGI sheets. Source : S. Abidi

(a) (b)

Figure 5.39 — CGI covered houses. Source : S. Abidi

Table 5.9 — : Survey results of 2011 for aesthetics & modernity

		aesthetics				Total
		extremely good	after revival it is good	it is not appealing	no concern	
village	Kaimanja	0	2	16	2	20
	Haryala	0	0	6	4	10
	Kharabiyan	0	0	9	1	10
	Thub	4	12	5	0	21
	Mallot	2	4	2	0	8
	Jaglari	0	10	0	1	11
Total		6	28	38	8	80



(a) (b)

Figure 5.40 — Mud plastered walls. Source : S. Abidi

(a) (b)

Figure 5.41 — Walls covered with CGI sheets. Source : S. Abidi

the area which could not be reconstructed even after years of earthquake occurrence ; both owners do not want to build in dhajji and consider block construction better. At the moment they reside with their parents (figure 5.42).

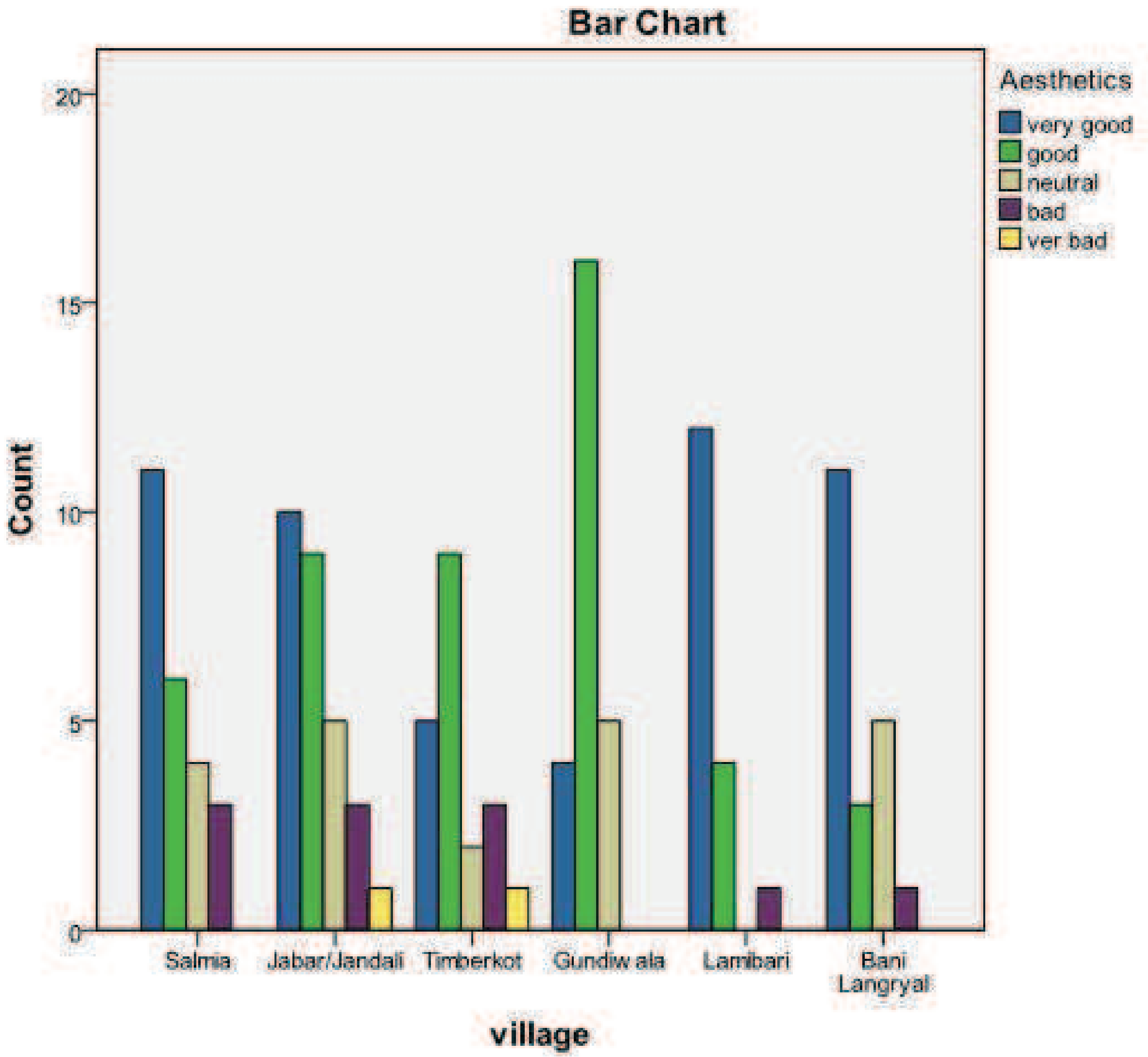
52% (38) out of 74 were not agreed that dhajji is a modern or attractive trend of building. According to them they adopted it because they were poor. If they were rich, they would have gone for block construction ; which appears to be more modern and beautiful to them.

10% (8) said that they had nothing to do with modern or old styles. Their major concern was that they got a house without financial burden.

Results of 2013 survey

Table 5.10 — : Survey results of 2013 for aesthetics & modernity

		Aesthetics					Total
		very good	good	neutral	bad	ver bad	
village	Salmia	11	6	4	3	0	24
	Jabar/Jandali	10	9	5	3	1	28
	Timberkot	5	9	2	3	1	20
	Gundiwala	4	16	5	0	0	25
	Lamibari	12	4	0	1	0	17
	Bani Langryal	11	3	5	1	0	20
Total		53	47	21	11	2	134



(a) (b)

Figure 5.42 — The houses are not constructed above plinth. Source : S. Abidi

The results of 2013 show a relatively high percentage of people who consider dhajji aesthetically good (table 5.10 and corresponding bar graph).

5.1.4.8 Future of dhajji

Results of 2011 survey

Results of 2011 surveys are tabulated in the table 5.11 and corresponding bar graph. 8% (6) considered that dhajji future is very good. 42% (34) were selected the good category for dhajji. 34% (27) said that if their next generation could earn more, it will go for other construction type. 16% (13) said that their kids will also reside in the same house hence they can not tell the future of dhajji.

Results of 2013 survey

2013 results give a high percentage of people who want to adopt it in future (table 5.12 and corresponding bar graph).

5.1.4.9 Primary reason to select dhajji

Results of 2011 survey

Table 5.11 — : Survey results of 2011 for future of dhajji

		future_value				
		very good	good	possibilty to adopt another construction	house for future generation	Total
village	Kaimanja	0	0	15	5	20
	Haryala	0	0	7	3	10
	Kharabiyan	0	3	3	4	10
	Thub	4	15	1	1	21
	Mallot	2	6	0	0	8
	Jaglari	0	10	1	0	11
Total		6	34	27	13	80

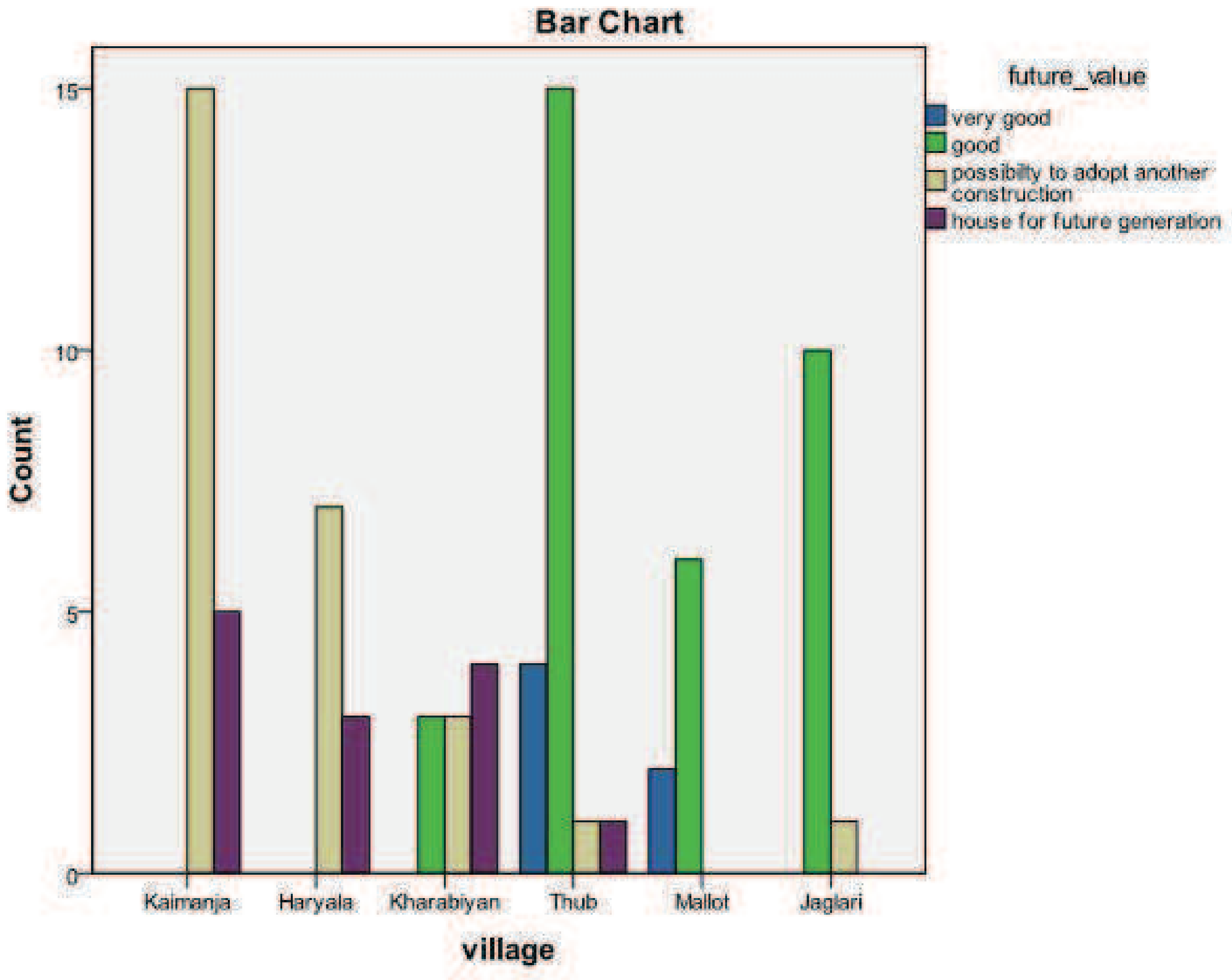
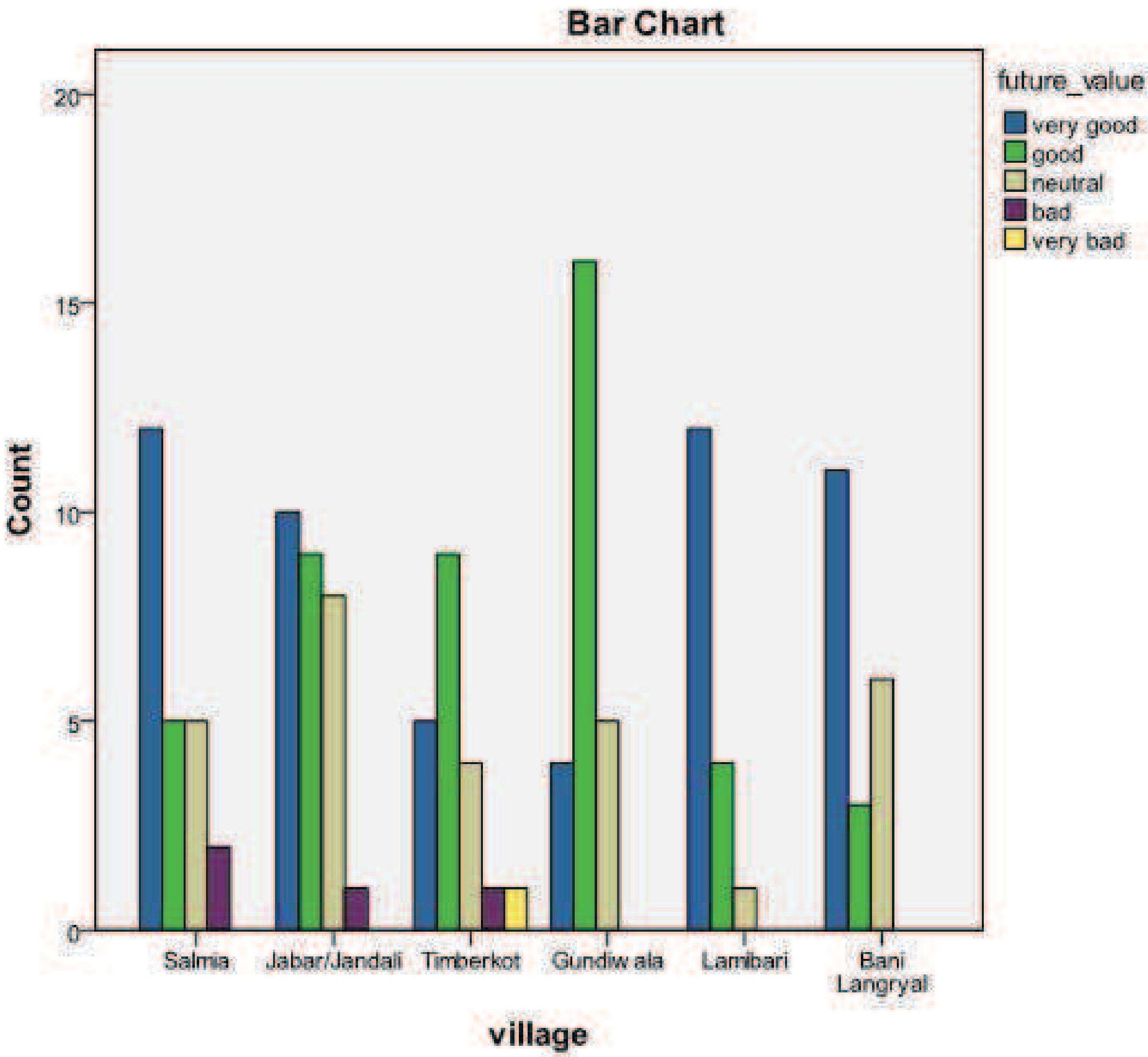


Table 5.12 — : Survey results of 2013 for future of dhajji

		future_value					
		very good	good	neutral	bad	very bad	Total
village	Salmia	12	5	5	2	0	24
	Jabar/Jandali	10	9	8	1	0	28
	Timberkot	5	9	4	1	1	20
	Gundiwala	4	16	5	0	0	25
	Lamibari	12	4	1	0	0	17
	Bani Langryal	11	3	6	0	0	20
Total		54	46	29	4	1	134



Reconstruction approach	Degree of household control	Form of assistance		Role of actors			Location	
		Financial	Technical	Community	Agency	Contractor	*In-situ*	New site
Cash Approach	Very high	Cash only	None	None	None	Household may hire	Yes	No
Owner-Driven Reconstruction	High	Conditional cash transfer to household	TA/Training of household	None	Project oversight and training	Household may hire	Yes	No
Community-Driven Reconstruction	Medium to high	Transfer to household or community	TA/Training of community and household	Project organization and oversight	Project oversight and training	Community may hire	Yes	No
Agency-Driven Reconstruction *in-Situ*	Low to medium	Funds handled by agency	Limited or none	Limited	Management of project	Agency hires	Yes	No
Agency-Driven Reconstruction in Relocated Site	Low	Funds handled by agency	Limited or none	Limited	Management of project	Agency hires	No	Yes

Figure 5.43 — Comparison of reconstruction approaches. Source : [Jha, 2010]

Most of the people mentioned that they adopted dhajji to get ERRA aid (table 5.13 and corresponding bar graph). Seismic resistance was less considered aspect.

Results of 2013 survey

Here again people mentioned the primary reason to adopt dhajji as to get ERRA aid (table 5.14 and corresponding bar graph). However lesser cost and material availability are also major driving factors.

5.2 Owner Driven Reconstruction (ODR)

The Owner Driven Reconstruction is an approach for post hazard reconstruction in which owner is encouraged to rebuild his house according to his own priorities and limitations. He can carry out reconstruction by himself, with the help of masons, laborers, relatives/friends, or with a combination of these. The authorities generally provide financial/material assistance to some extent but not necessarily offer technical assistance.

This approach has been in practice since 1970s albeit in the development sphere ([IRIN, 2010]). For earthquake reconstruction, this approach was first employed in 2001 after Gujarat India earthquake and showed exceptional results when united with financial and technical assistance.

Table 5.13 — : Survey results of 2011 for primary reason to select dhajji

		Primeselection_reason					
		to get aid	material availability	lesser cost	earthquake resistance	less time required to build	Total
village	Kaimanja	12	5	2	1	0	20
	Haryala	7	1	2	0	0	10
	Kharabiyan	4	5	1	0	0	10
	Thub	4	9	4	3	1	21
	Mallot	3	3	1	1	0	8
	Jaglari	6	1	2	1	1	11
Total		36	24	12	6	2	80

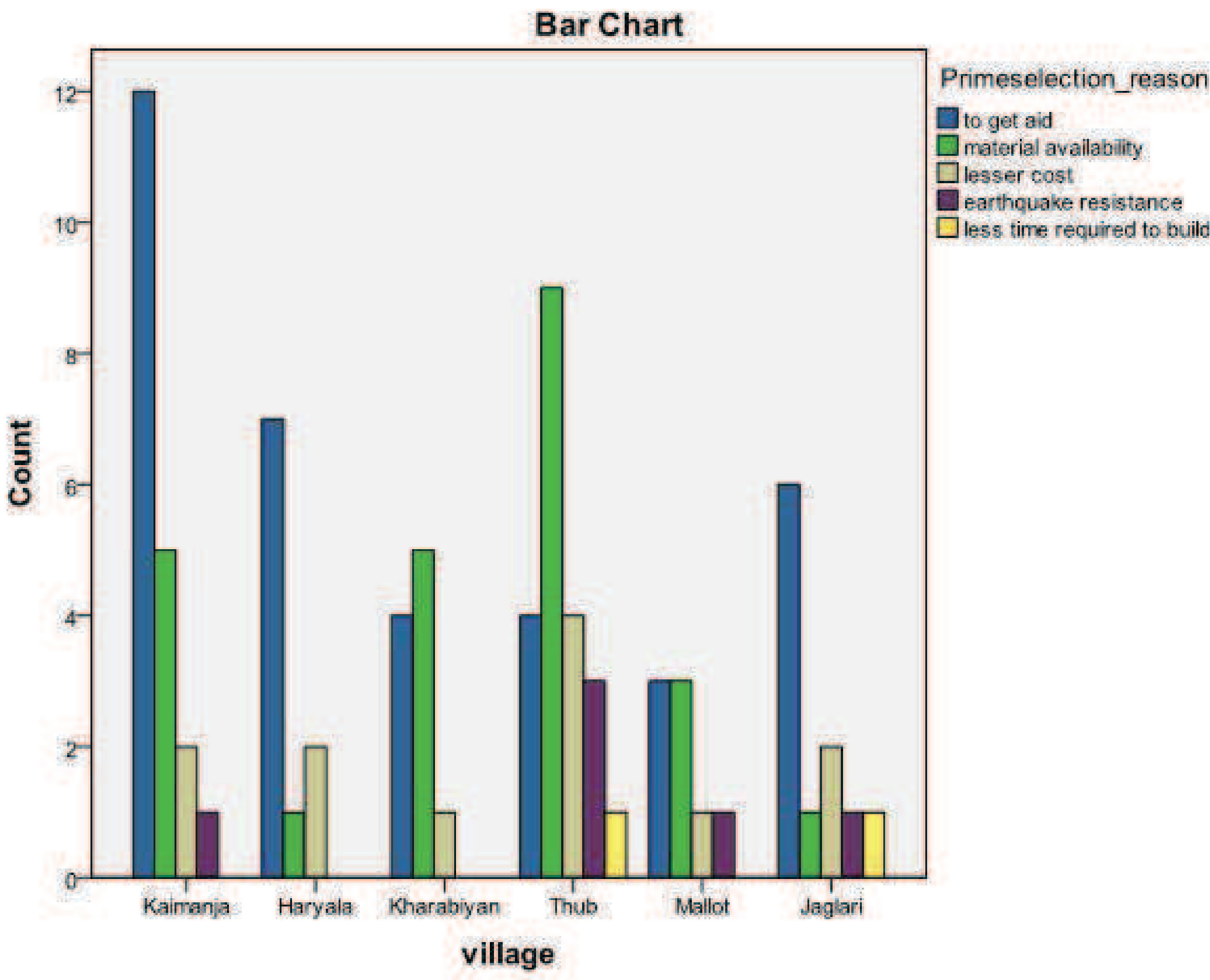
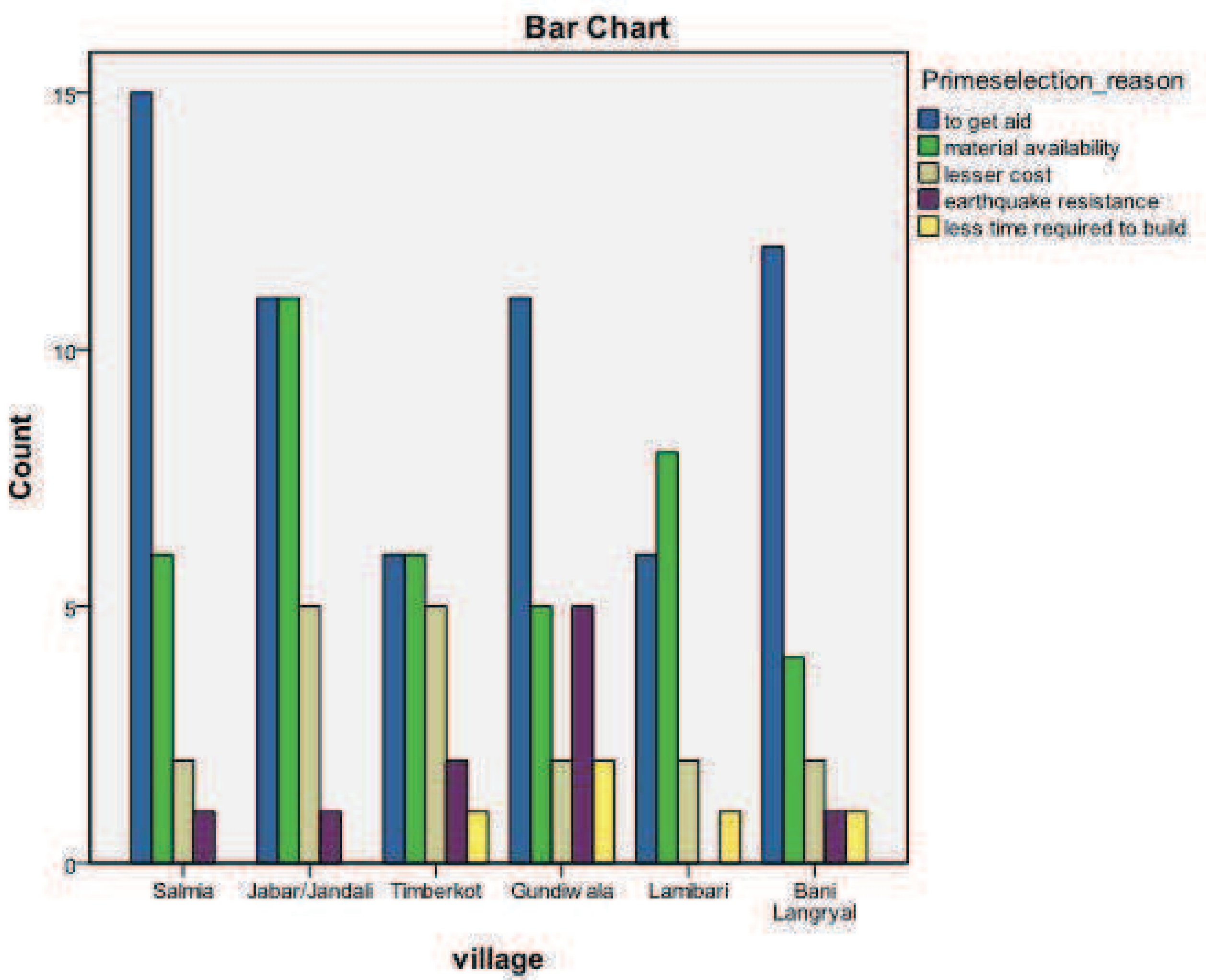


Table 5.14 — : Survey results of 2013 for primary reason to select dhajji

		Primeselection_reason					
		to get aid	material availability	lesser cost	earthquake resistance	less time required to build	Total
village	Salmia	15	6	2	1	0	24
	Jabar/Jandali	11	11	5	1	0	28
	Timberkot	6	6	5	2	1	20
	Gundiwala	11	5	2	5	2	25
	Lamibari	6	8	2	0	1	17
	Bani Langryal	12	4	2	1	1	20
Total		61	40	18	10	5	134



The government of Gujarat used ODR within the framework of the Gujarat Emergency Earthquake Reconstruction Project (GEERP). Under the GEERP, almost 200,000 houses - some 87% of destroyed homes - were rebuilt by their owners, with financial and technical assistance from the government. ([Barenstein, 2006])

Through ODR approach the house owner reconstructs his house according to his own priorities. It is considered to be a better way when compared with other reconstruction approaches (figure 5.43). During past few reconstruction drives, ODR confirmed several advantages ([Barenstein and Iyengar, 2010]) that include (i) Lower administrative burden, (ii) Higher social adaptability and acceptability, (iii) Speed and quality in reconstruction, and (iv) 'Penetration' of improved construction techniques into the local culture of construction.

Post-earthquake housing reconstruction after the October 2005 disaster in Pakistan is being acclaimed globally by donor agencies and the Government of Pakistan as one of the most successful examples of owner-driven reconstruction ([UNOCHA, 2007]).

One of the biggest challenges after 2005 earthquake was to make people confident for reconstruction. Under this discussion the cultural characteristic strengthened through reconstruction is *self reliance* and it is discussed that how ODR has strengthened the confidence of people.

5.2.1 Cultural characteristic : Self reliance

Kashmiris have faced an era of unrest for centuries. These people not only strived for liberty, they also faced hard climatic conditions and access issues in daily life. In these circumstances they have learnt to overcome the depressing past and hopeless present. These people are self reliant and know to cope with every sort of issues. This characteristic was extremely evident when people of Kashmir started reconstruction without waiting for policies and financial support by external agencies ([Mumtaz *et al.*, 2008]). However people needed to know the safer construction techniques to avoid future disaster threats. They were in the state of trauma after disaster and needed to recover from this condition to start a normal life. Authorities were responsible to rebuild their confidence through launching user friendly policies.

5.2.2 ERRA policy

ERRA announced several policies which were focusing upon cultural requirements of the community. Before the event of 2005, ODR was already tested in Gujarat and post-tsunami reconstruction (both through adopting and rejecting) that this approach is a key to generate sustainability through reconstruction ([Barenstein, 2006] ; [Duyne Barenstein, 2006] ; [Barenstein and Pittet, 2007] ; [Barenstein and Iyengar, 2009] ; [Barenstein and Iyengar, 2010]).

From day one ERRA announced the reconstruction approach to be owner driven with financial and technical assistance. This was the first ever case when this approach was applied for the reconstruction of such huge area. As ODR shows exceptional results when united with financial and technical assistance ([Jha, 2010]), Kashmir reconstruction confirmed excellent results in housing sector ([IRIN, 2010]).

5.2.2.1 Detail of assistance

The Rural Housing Reconstruction Program was targeted to provide financial and technical assistance to earthquake affected home-owners in both Khayber Pakhtunkhwa and AJK in reconstructing and retrofitting their damaged houses, using a home-owner driven, assisted and inspected construction regime ([ERRA, 2011]). To the extent possible the authority discouraged relocation of houses ; hence in situ reconstruction was promoted. Sub-components of this principle covered the operational measures necessary to ensure appropriate pace of construction while ensuring seismic safety ([ERRA, 2011]). These included :

Housing grants :

Financial assistance was aimed to facilitate the owners of both katcha (temporary) and pucca (permanent) houses, by disbursing money, directly into the accounts of eligible beneficiaries, with the condition that the houses are constructed in compliance with ERRA standards, with a ”core house” between 250 to 400 square feet. Below is a breakdown showing how the financial assistance was disbursed.

For destroyed houses or houses with structural damage beyond economic repair, an initial payment of PKR 25,000 was provided to cover immediate shelter needs. The balance of

PKR 150,000 was provided for permanent house construction. These payments were made in three installments :

- PKR 75,000 for mobilization ;
- PKR 25,000 upon completion of plinth level ;
- PKR 50,000 upon completion of the walls.

For structurally damaged houses within economic repair, an initial payment of PKR 25,000 was made to cover immediate shelter needs, while only one installment of PKR 50,000 was paid for restoration and/or retrofitting.

Technical assistance :

Technical assistance was targeted at local authorities and partner organizations in the implementation of rural housing strategy, covering :

- Hazard risk mapping ;
- Damage and eligibility assessment ;
- Earthquake-resistant housing solutions ;
- Facilitating building material market ;
- Land and property-related issues.

Offering this sort of technical aid, ERRA generated an organized system for reconstruction. It shows that reconstruction was not just aimed to rebuild a house ; it was to strengthen the society. If technical assistance was not provided with financial aid, it was difficult for people to reach such an extent of excellence.

Capacity building :

Capacity building was ensured through formal and informal trainings, as well as information dissemination campaigns in the following areas :

- ERRA policies and procedures ;

- Social mobilization ;
- Specialized modules on land adjudication, relocation and re-planning ;
- Environmental degradation reduction ;
- Housing reconstruction training ;
- Skilled labor training ;
- Compliance training

The above mentioned sub policies under RHRP had positive results as ([EIC, 2010])

- People reconstructed on the pre-earthquake locations by which they did not feel de-thatched from their roots.
- Tranche system accelerated the pace of reconstruction. People kept on rebuilding to get another tranche (The moment tranches were all transferred, people stopped consulting ERRA officials for further progress).
- People selected the type of construction according to their own requirements and priorities. This resulted into a better acceptability by people for reconstructed houses. This case is opposite to Contractor/NGO Driven Reconstruction where people do not like to live in reconstructed houses.
- Many people constructed their houses themselves. This strategy helped people come out of the feeling of loss and trauma.
- Women were equally involved in the reconstruction process (figure 5.44). Kashmiris have a culture to work outside their region to avail more opportunities. This way women and children are left behind. The authority promoted training of males as well as female members of the community. Through this way women could supervise the construction of their homes even in the absence of male members.
- More than 700,000 human resource was trained for seismically resistant construction (ERRA Official Website). ERRA policies created awareness among every group of society. Masons, labors and house owners, all got trainings to rebuild better.

(a) (b)

Figure 5.44 — Women also participated in reconstruction activities. (a) Source : ([Gallery, 2007]) ; (b) Source : ([UNHABITAT, 2007]) .

5.2.3 Has ODR generated sustainability? Community responses

Although the literature and experts are agreed upon the positive role of ODR in generating sustainability, some issues can be found related to this approach ([Jha, 2010]). To explore these issues different aspects were discussed with the community. Results of both 2011 and 2013 are elaborated below. The community is not disintegrated on the basis of its economic strata rather the overall perception of people about their abilities to reconstruct the houses is analyzed. The focused points were

1. Liberty to choose a construction style
2. Satisfaction on their selection
3. Primary reason(s) of non compliance
4. Difficulties in constructing the house
5. Agencies consulted during reconstruction
6. Agencies which are consulted after reconstruction period.

5.2.3.1 Liberty to choose a construction style

The past experiences of reconstruction programs reveal that if people are not provided liberty to choose their house types, they do not like to reside in reconstructed houses. Keeping this trend in focus, people were asked about the selecting agent for their houses. As ERRA had adopted ODR throughout the reconstruction period, the responses of community were simply expected as ”I selected the house with my own will”. However this was not the case.

Results of 2011 survey

These results are mentioned in the table 5.15 and corresponding bar graph. 87% (69) respondents said that they selected dhajji houses with their own will. But the way many of them replied raised questions that why they still were not happy. The satisfaction status for their selection was asked and they were found not satisfied due to many reasons. (as already detailed in dhajji section). 4% (3) said that a friend or relative provided them a suggestion. 7% (6) were guided by a mason or carpenter. 1% (1) said that ERRA asked them. 1% (1) said that other agents guided them to select a particular type of house.

Results of 2013 survey Table 5.16 and corresponding bar graph show the results of 2013 surveys. 89 % people said they selected the house with their own will. Other agents who affected the selection of house were found same as that of 2011 results.

5.2.3.2 Satisfaction level

Results of 2011 survey

20% people were not found satisfied during these surveys (as shown in table 5.17 and corresponding bar chart).

Results of 2013 survey

Around 20% people were not found satisfied during these surveys too (table 5.18 and corresponding bar chart).

5.2.3.3 Primary reason for non compliant reconstruction

Results of 2011 survey

Table 5.15 — : Survey results of 2011 for liberty to choose a construction style

		Selecting_Agent					Total
		I	friend/relative	mason/carpenter	ERRA	other	
village	Kaimanja	12	3	5	0	0	20
	Haryala	9	0	1	0	0	10
	Kharabiyan	9	0	0	1	0	10
	Thub	21	0	0	0	0	21
	Mallot	8	0	0	0	0	8
	Jaglari	10	0	0	0	1	11
Total		69	3	6	1	1	80

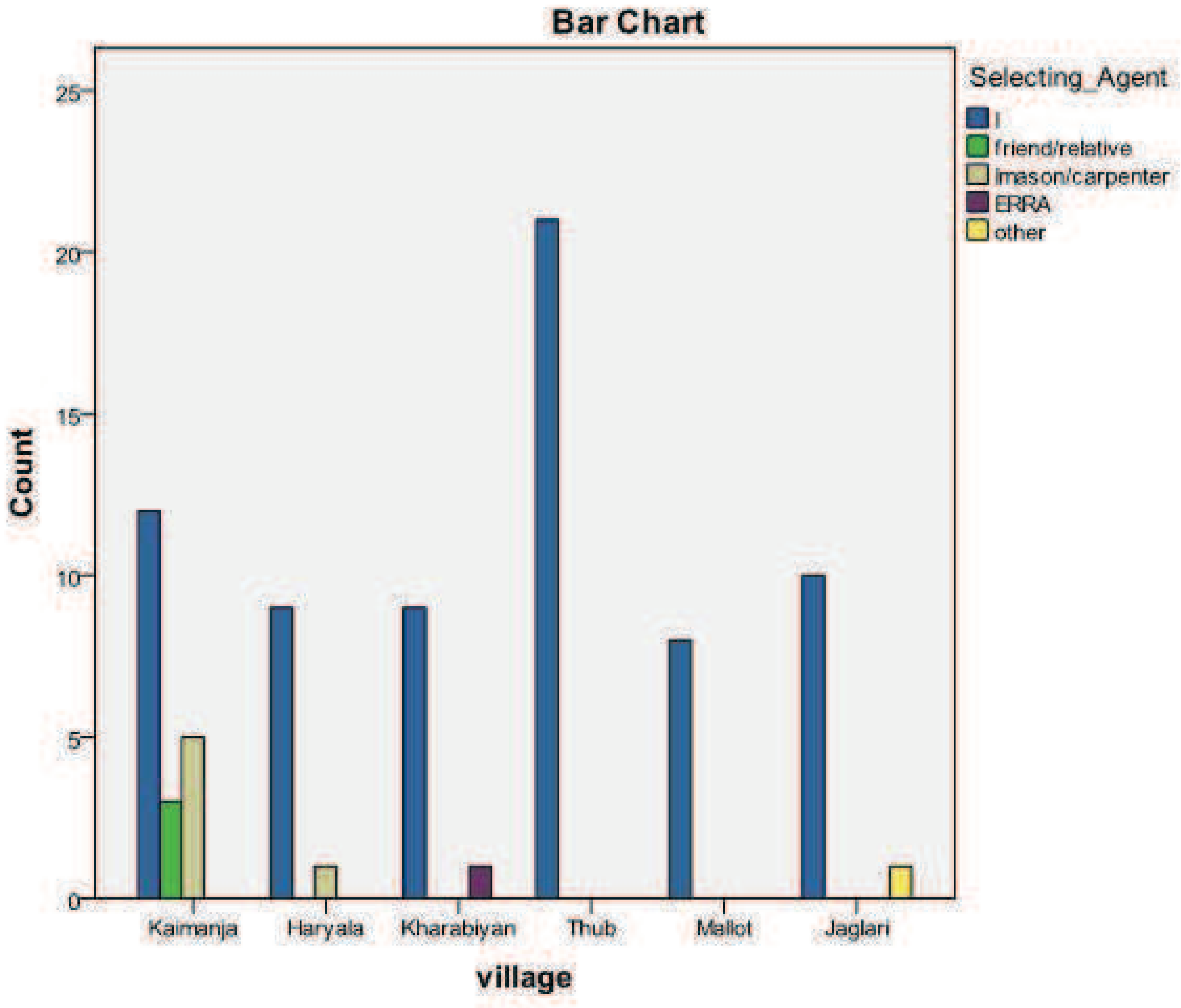


Table 5.16 — : Survey results of 2013 for liberty to choose a construction style

		Selecting_Agent					
		I	friend/relative	Imason/carpenter	ERRA	other	Total
village	Salmia	20	0	2	1	1	24
	Jabar/Jandali	27	0	0	1	0	28
	Timberkot	18	0	0	2	0	20
	Gundiwala	23	0	0	2	0	25
	Lamibari	17	0	0	0	0	17
	Bani Langryal	14	1	2	2	1	20
Total		119	1	4	8	2	134

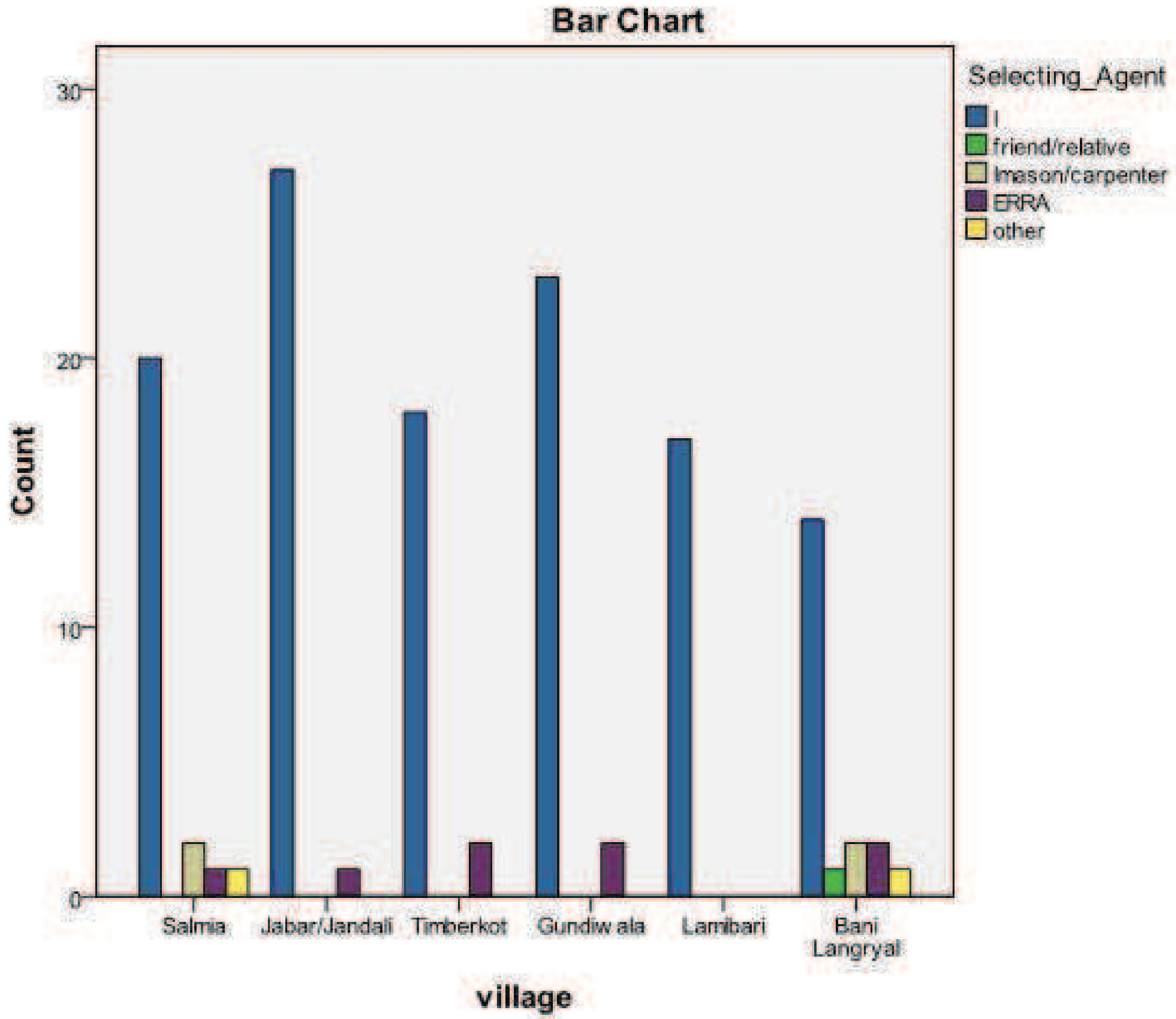


Table 5.17 — : Survey results of 2011 for satisfaction level

I		satisfaction					Total
		extremely satisfied	satisfied	neutral	a bit unsatisfied	not at all satisfied	
village	Kaimanja	0	5	7	5	3	20
	Haryala	0	2	3	4	1	10
	Kharabiyan	2	4	1	2	1	10
	Thub	9	12	0	0	0	21
	Mallot	2	6	0	0	0	8
	Jaglari	0	8	3	0	0	11
Total		13	37	14	11	5	80

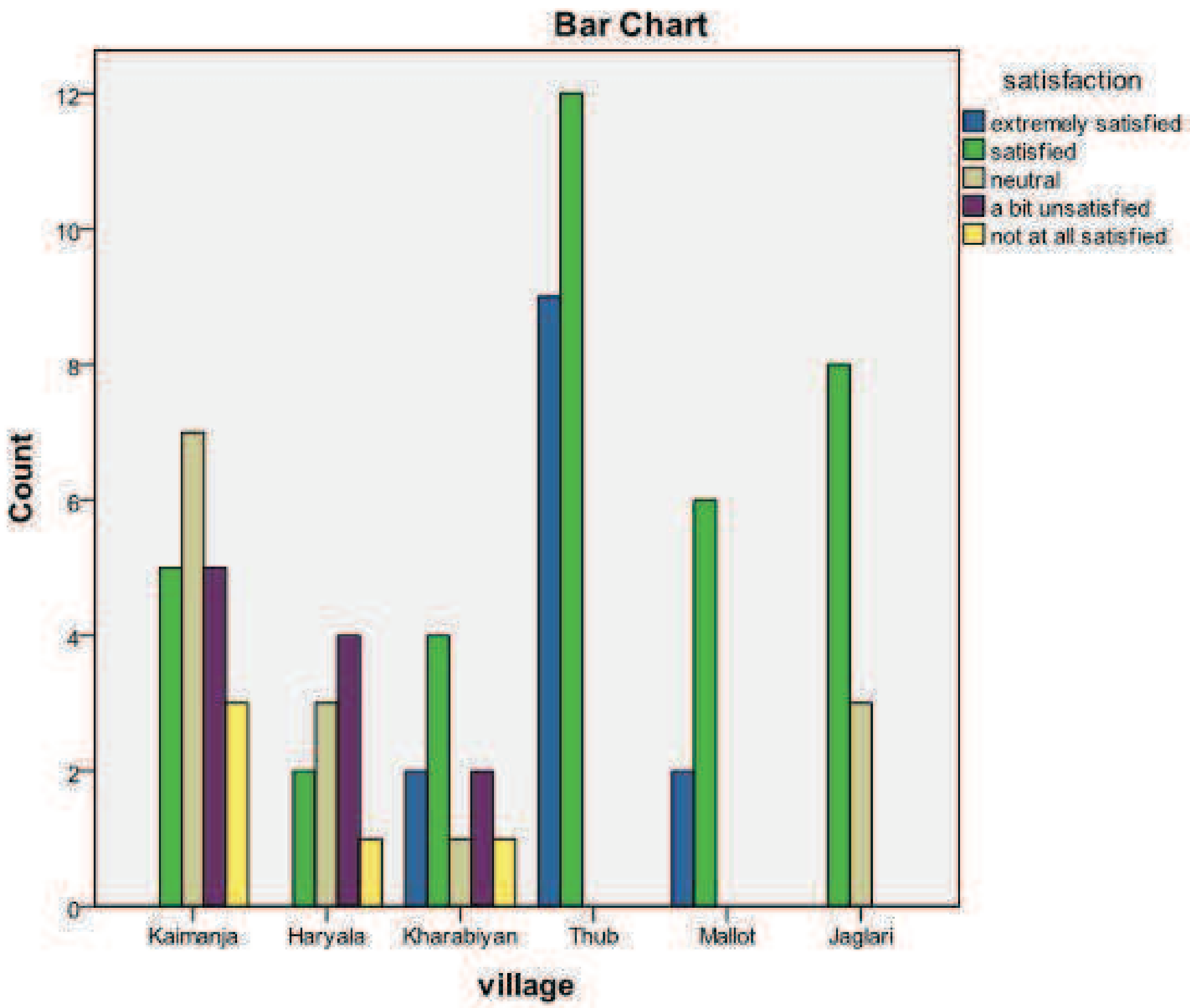


Table 5.18 — : Survey results of 2013 for satisfaction level

I		satisfaction					Total
		extremely satisfied	satisfied	neutral	a bit unsatisfied	not at all satisfied	
village	Salmia	13	6	4	1	0	24
	Jabar/Jandali	13	11	1	1	2	28
	Timberkot	4	2	3	6	5	20
	Gundiwala	3	7	10	4	1	25
	Lamibari	1	12	1	1	2	17
	Bani Langryal	3	14	0	2	1	20
Total		37	52	19	15	11	134

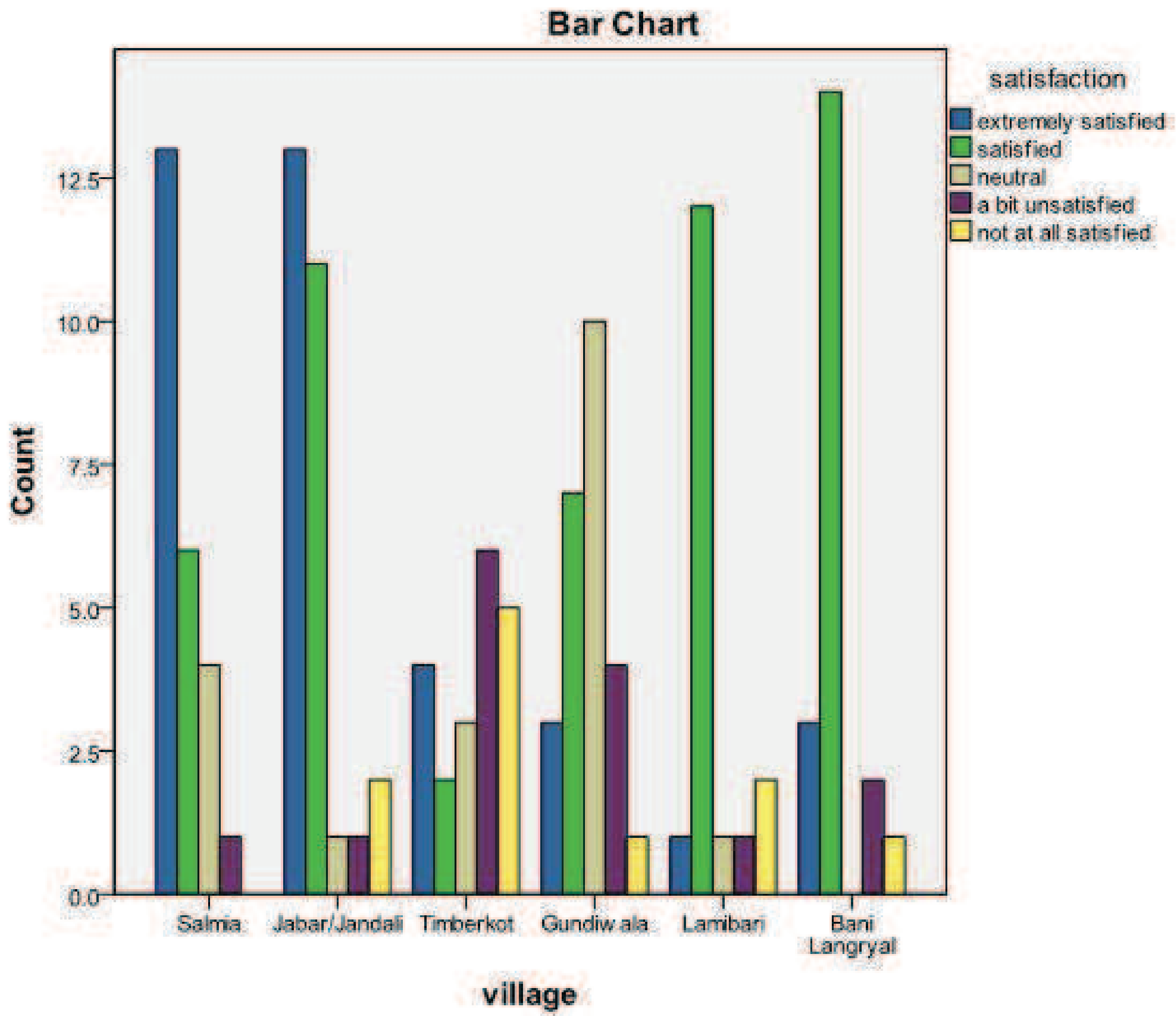
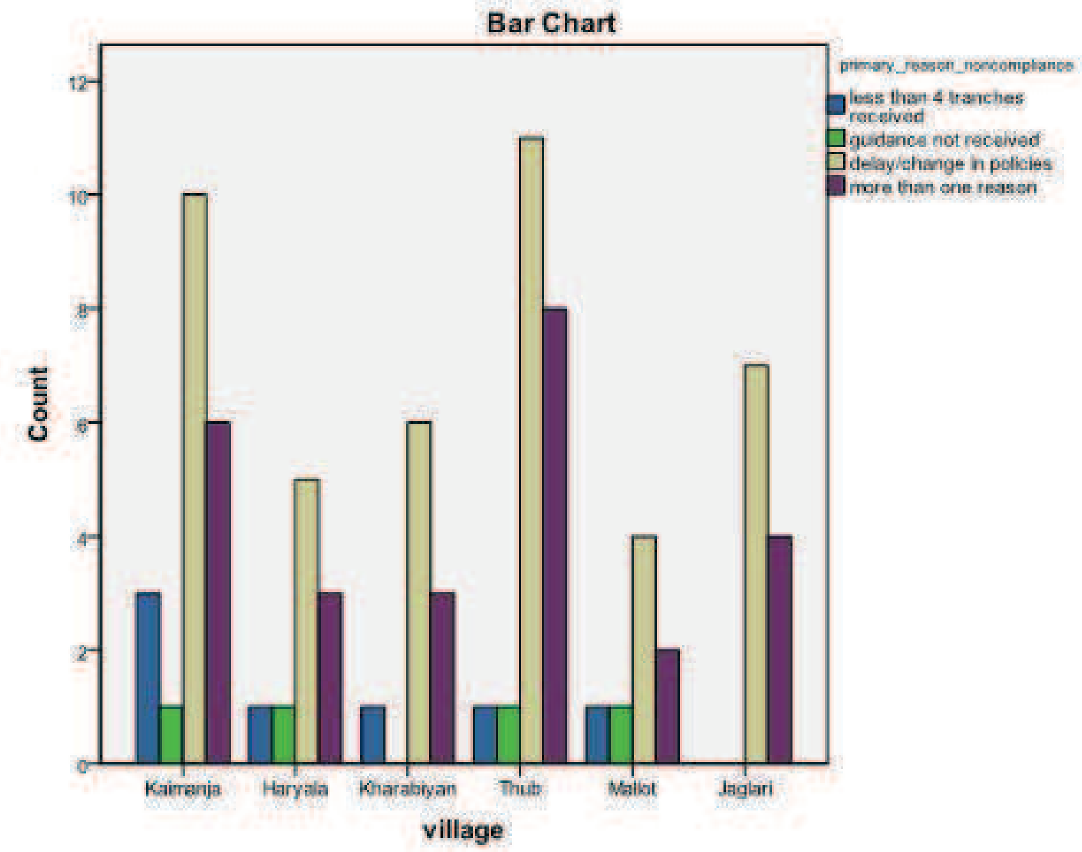


Table 5.19 — : Survey results of 2011 for primary reason for non compliant reconstruction

		primary_reason_noncompliance				
		less than 4 tranches received	guidance not received	delay/change in policies	more than one reason	Total
village	Kaimanja	3	1	10	6	20
	Haryala	1	1	5	3	10
	Kharabiyan	1	0	6	3	10
	Thub	1	1	11	8	21
	Mallot	1	1	4	2	8
	Jaglari	0	0	7	4	11
Total		7	4	43	26	80

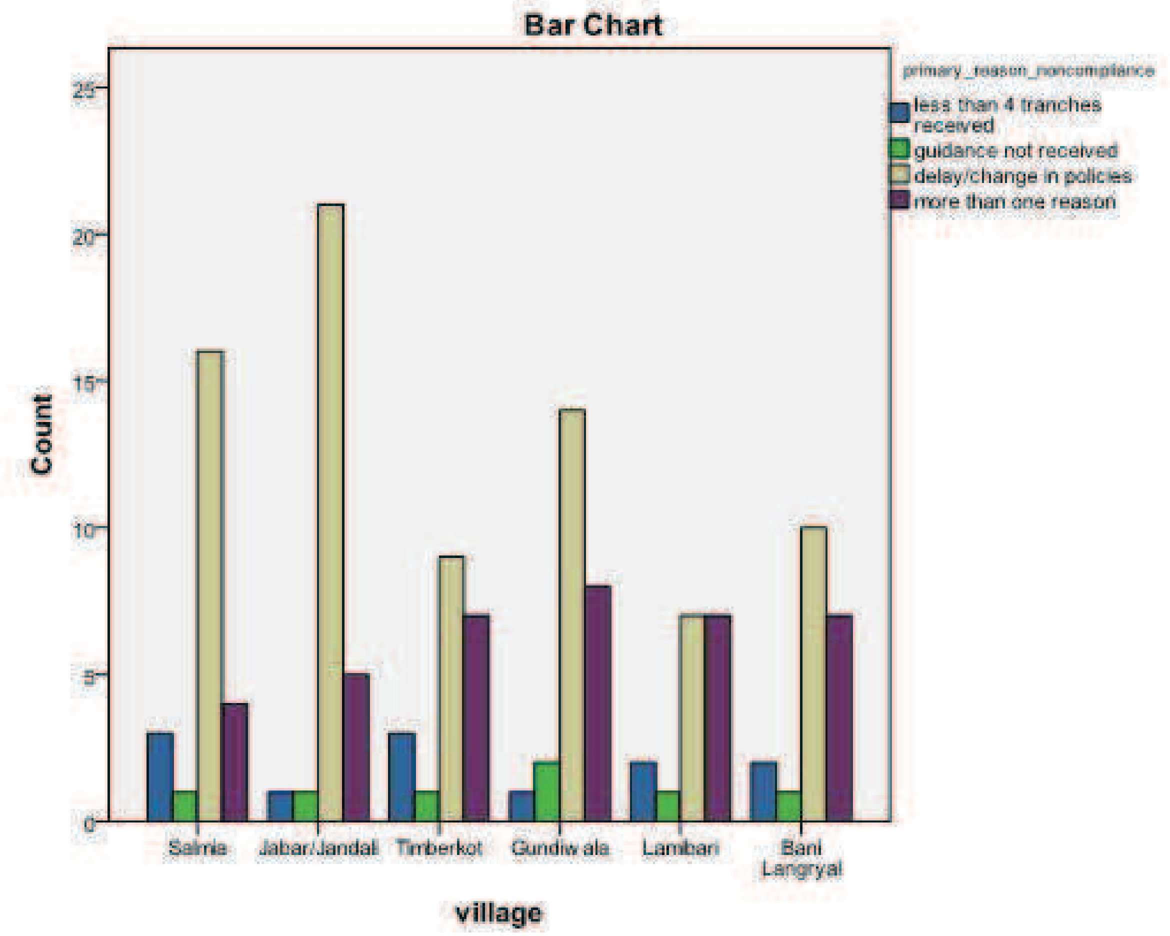


When people were asked about the primary reason for non compliant reconstruction with reference to different agents, they rated the policy issues most related (table 5.19 and corresponding bar chart).

Results of 2013 survey

Table 5.20 — : Survey results of 2013 for primary reason for non compliant reconstruction

		primary_reason_noncompliance				
		less than 4 tranches received	guidance not received	delay/change in policies	more than one reason	Total
village	Salmia	3	1	16	4	24
	Jabar/Jandali	1	1	21	5	28
	Timberkot	3	1	9	7	20
	Gundiwala	1	2	14	8	25
	Lamibari	2	1	7	7	17
	Bani Langryal	2	1	10	7	20
Total		12	7	77	38	134



The results are similar to 2011 results (table 5.20 and corresponding bar chart).

5.2.3.4 Faced any difficulty in constructing the house

Results of 2011 survey

Most of the people mentioned that the delays in policy had affected their house construction in bad manner (table 5.21 and corresponding bar chart). Moreover they were not were happy due to the changes in policies and alteration in inspection dates. Many of them had to wait for next step after completing the previous to show AI teams and get guidance.

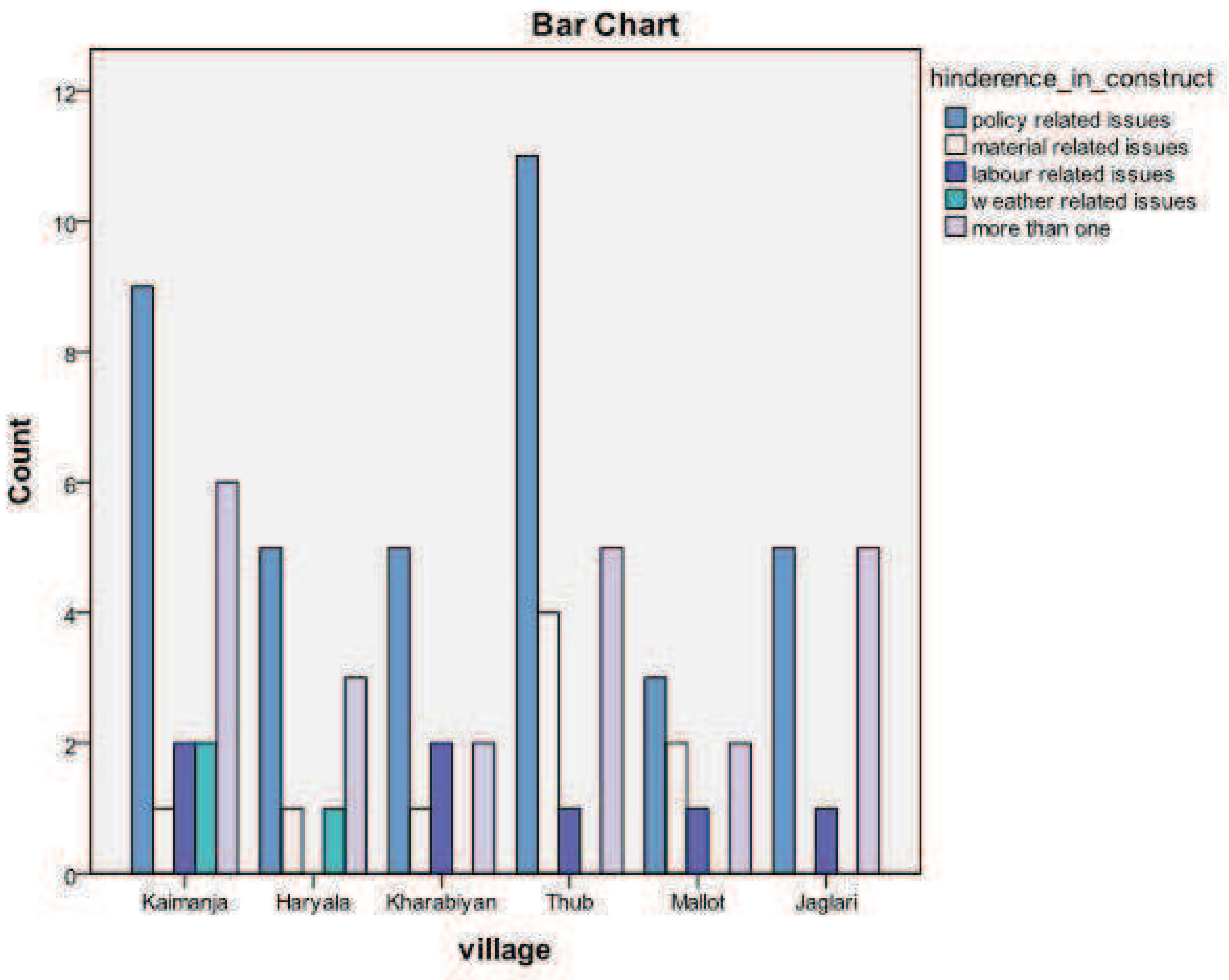
6 houses out of 80 were consisted on more than two rooms (figure 5.45). In other words we can call them big houses. The owner of these houses told that ERRA financial assistance was not sufficient for construction (as the material and labour cost were raised due to scale of house). But the same time they considered dhajji as cost efficient technique due to material reuse, material availability and lesser labour cost (as less time required to construct). Rest 74 respondents had mixed responses for this question. 60% (48) of them had reused whole material hence did not face money shortage. Rather they had additional timber which they stored afterwards. Among this category, 7 were those who built two storey houses (figure 5.46). 9% (7) reused the material but this was just enough for construction. This group was found in Kaimanja and their financial condition was worst. Their average income was PKR 1,500 per month and they had the minimum required houses (with an average area 400 sq ft). 15% (12) had to buy timber additionally. 9% (7) had to buy timber for whole house as there previous houses did not have enough wood or the material was lost in earthquake. One house was studied where the structure was left incomlete due to lack of funds but will be discussed in detail in chapter 7 (figure 5.47).

Results of 2013 survey

Here 46 % people said that primary difficulty they faced during reconstruction was related to policy matters (table 5.22 and corresponding bar chart). Those who earn more, consider the cost of dhajji to be relatively less and call it cost efficient (figure 5.48). The average income of people is PKR 11,000 and 10,000 in Sena Daman and Salmia respectively which is far more than Kaimanja.

Table 5.21 — : Survey results of 2011 for faced any difficulty in constructing the house

		hinderence_in_construct					
		Policy Related Issues	Material Related Issues	Labour Related Issues	Weather Related Issues	More than one	Total
village	Kaimanja	9	1	2	2	6	20
	Haryala	5	1	0	1	3	10
	Kharabiyan	5	1	2	0	2	10
	Thub	11	4	1	0	5	21
	Mallot	3	2	1	0	2	8
	Jaglari	5	0	1	0	5	11
Total		38	9	7	3	23	80



(a) (b)

Figure 5.45 — Houses with more than two rooms. Source : S. Abidi.

(a) (b)

Figure 5.46 — 2 room double storey houses belonging to low income families. Source : S. Abidi.

Figure 5.47 — An example of incomplete block masonry house in Kaimanja. Source : S. Abidi

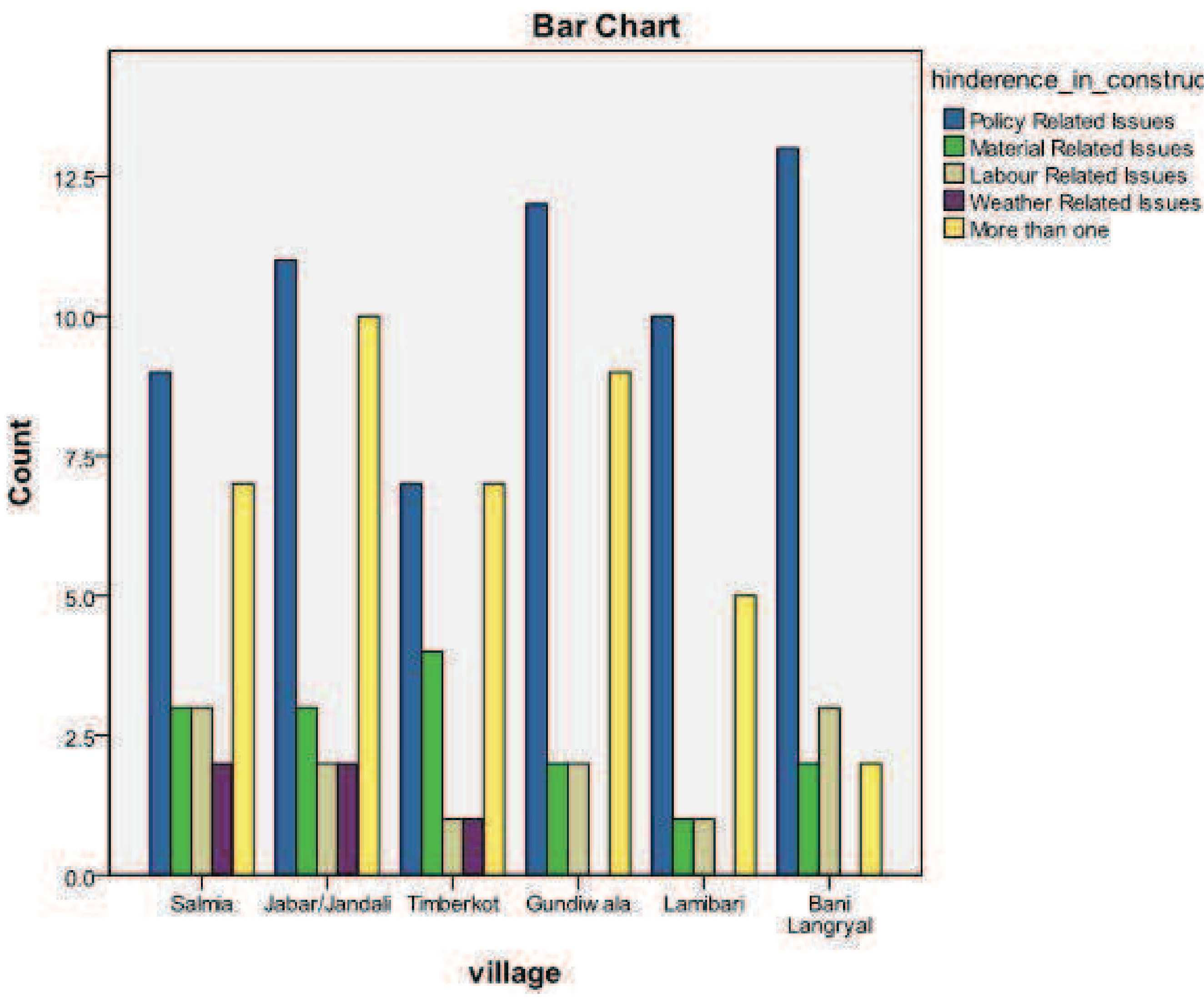
(a)

(b)

Figure 5.48 — Few examples of high-income houses found in 2013 surveys. Source : S. Abidi

Table 5.22 — : Survey results of 2013 for faced any difficulty in constructing the house

		hinderence_in_construct					
		Policy Related Issues	Material Related Issues	Labor Related Issues	Weather Related Issues	More than one	Total
village	Salmia	9	3	3	2	7	24
	Jabar/Jandali	11	3	2	2	10	28
	Timberkot	7	4	1	1	7	20
	Gundiwala	12	2	2	0	9	25
	Lamibari	10	1	1	0	5	17
	Bani Langryal	13	2	3	0	2	20
Total		62	15	12	5	40	134



5.2.3.5 Whom you consulted for queries

Results of 2011 survey

Majority depended upon the masons to consult for reconstruction (table 5.23 and corresponding bar chart). They said that as authorities trained the masons, we were confident to consult them.

Results of 2013 survey

Here too, masons are rated higher for reconstruction (table 5.24 and corresponding bar chart).

5.2.3.6 Whom do you consult now in case of queries?

Results of 2011 survey

Masons/carpenters are consulted more than any other agency (table 5.25 and corresponding bar chart).

Results of 2013 survey

Results are same as that of 2011 (table 5.26 and corresponding bar chart).

It is obvious through both the graphs that people are much reliant on the masons and carpenters after the reconstruction period. Training provided by ERRA and other organizations to the masons are found of extreme importance in this scenario where there are no authorities present in the area. In this way the trained man power can continue seismic resistant techniques in the future. It is claimed by ERRA that more than 700,000 people were trained during RHRP however the issues related to ongoing construction by these trained people are discussed in chapter 8.

5.2.4 Lessons learnt and nOT applied-The event of Balochistan

A magnitude 6.4 earthquake hit Balochistan (the south western province of Pakistan) almost exactly three years after Kashmir event. This earthquake of 29th October 2008 caused 170

Table 5.23 — : Survey results of 2011 for queries consultation

		pre_agency_consulted					
		mason/carpenter	VRC/AI team/UNHABITAT	HRC	Posters/flyers etc	others	Total
village	Kaimanja	8	8	1	2	1	20
	Haryala	5	4	1	0	0	10
	Kharabiyan	5	4	1	0	0	10
	Thub	13	5	3	0	0	21
	Mallot	6	2	0	0	0	8
	Jaglari	7	4	0	0	0	11
Total		44	27	6	2	1	80

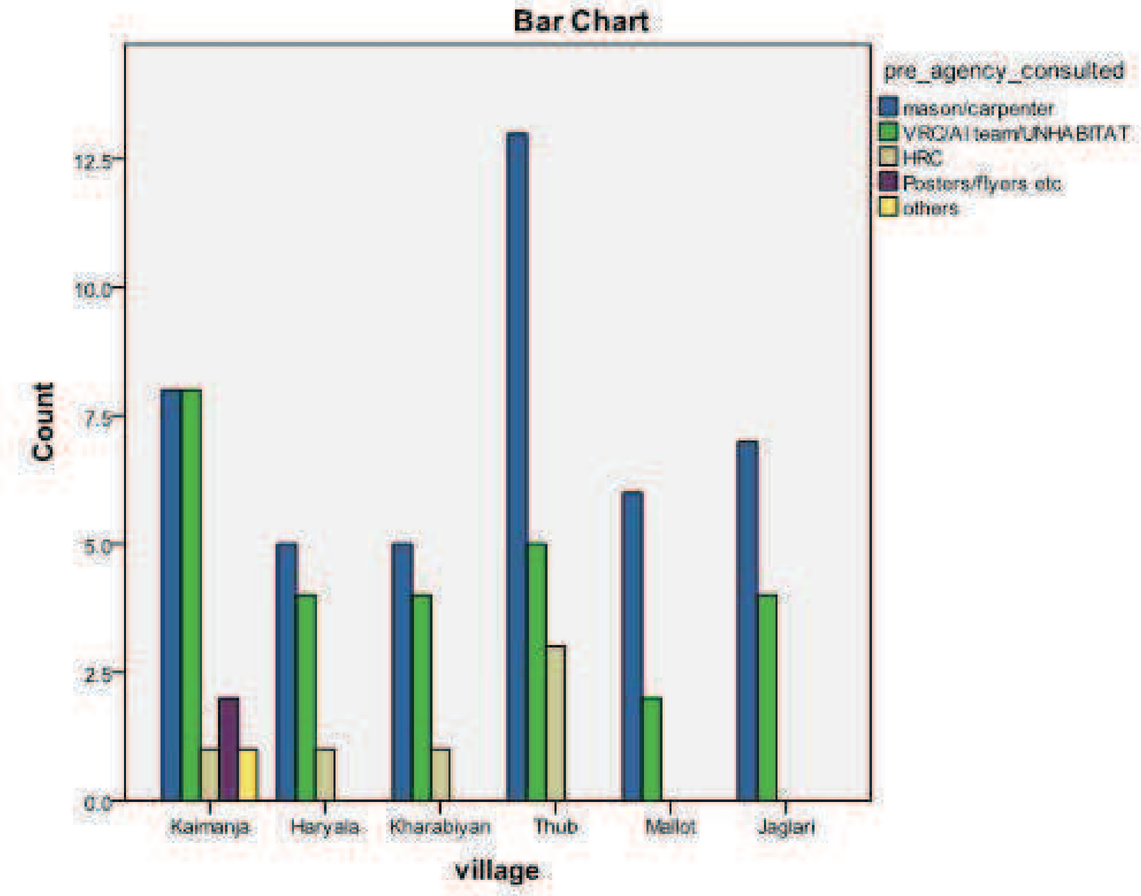


***Table 5.24* —** : Survey results of 2013 for queries consultation

		pre_agency_consulted					
		mason/carpenter	VRC/AI team/UNHABITAT	HRC	Posters/flyers etc	others	Total
village	Salmia	10	10	2	0	2	24
	Jabar/Jandali	12	13	1	2	0	28
	Timberkot	8	9	3	0	0	20
	Gundiwala	16	8	0	1	0	25
	Lamibari	11	3	3	0	0	17
	Bani Langryal	15	2	3	0	0	20
Total		72	45	12	3	2	134

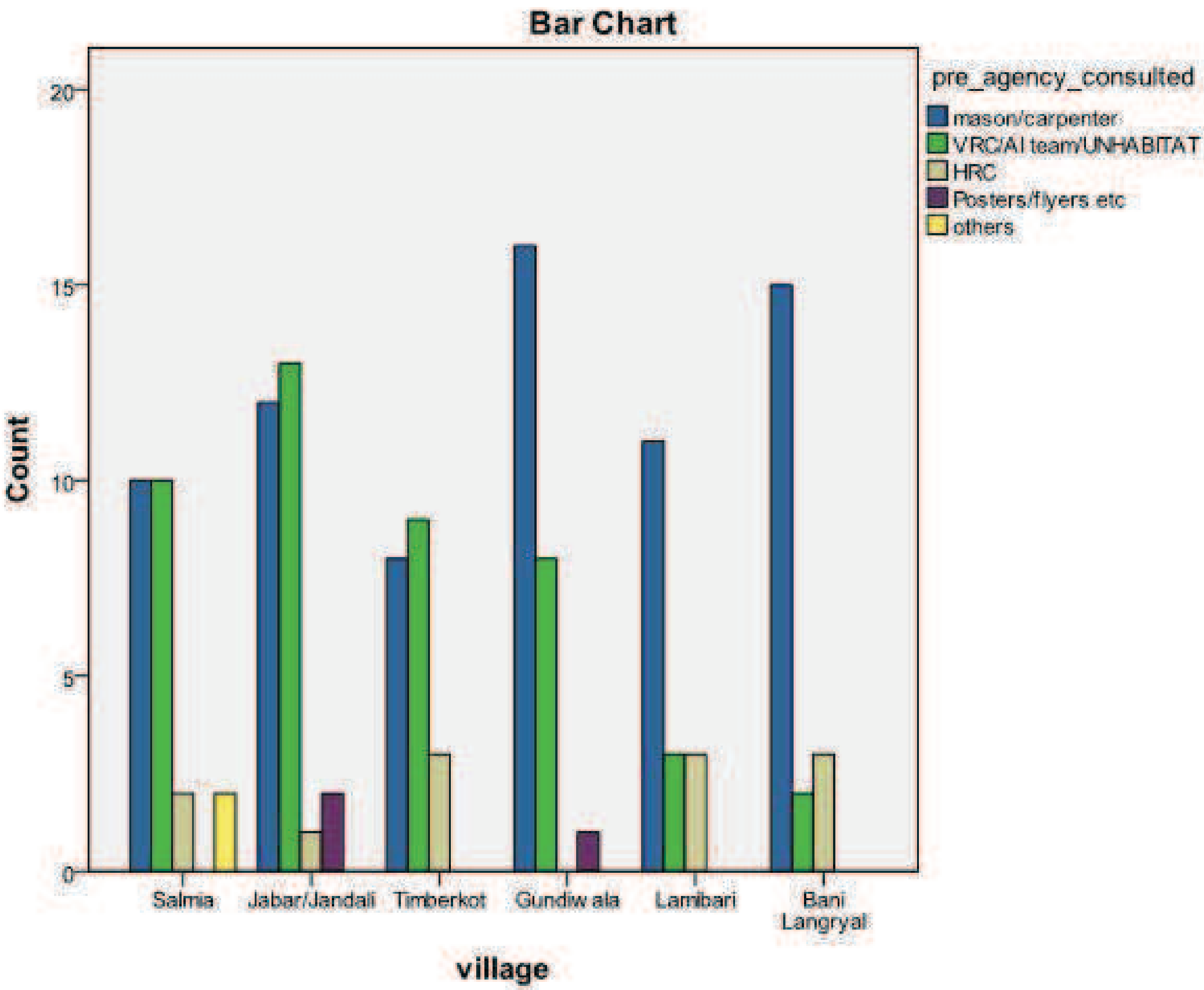


Table 5.25 — : Survey results of 2011 for queries consultation now

		post_agency_consulted			
		I myself know construction	masons/carpenters	other	Total
village	Kaimanja	0	19	1	20
	Haryala	1	9	0	10
	Kharabiyan	1	9	0	10
	Thub	4	16	1	21
	Mallot	1	7	0	8
	Jaglari	1	9	1	11
Total		8	69	3	80

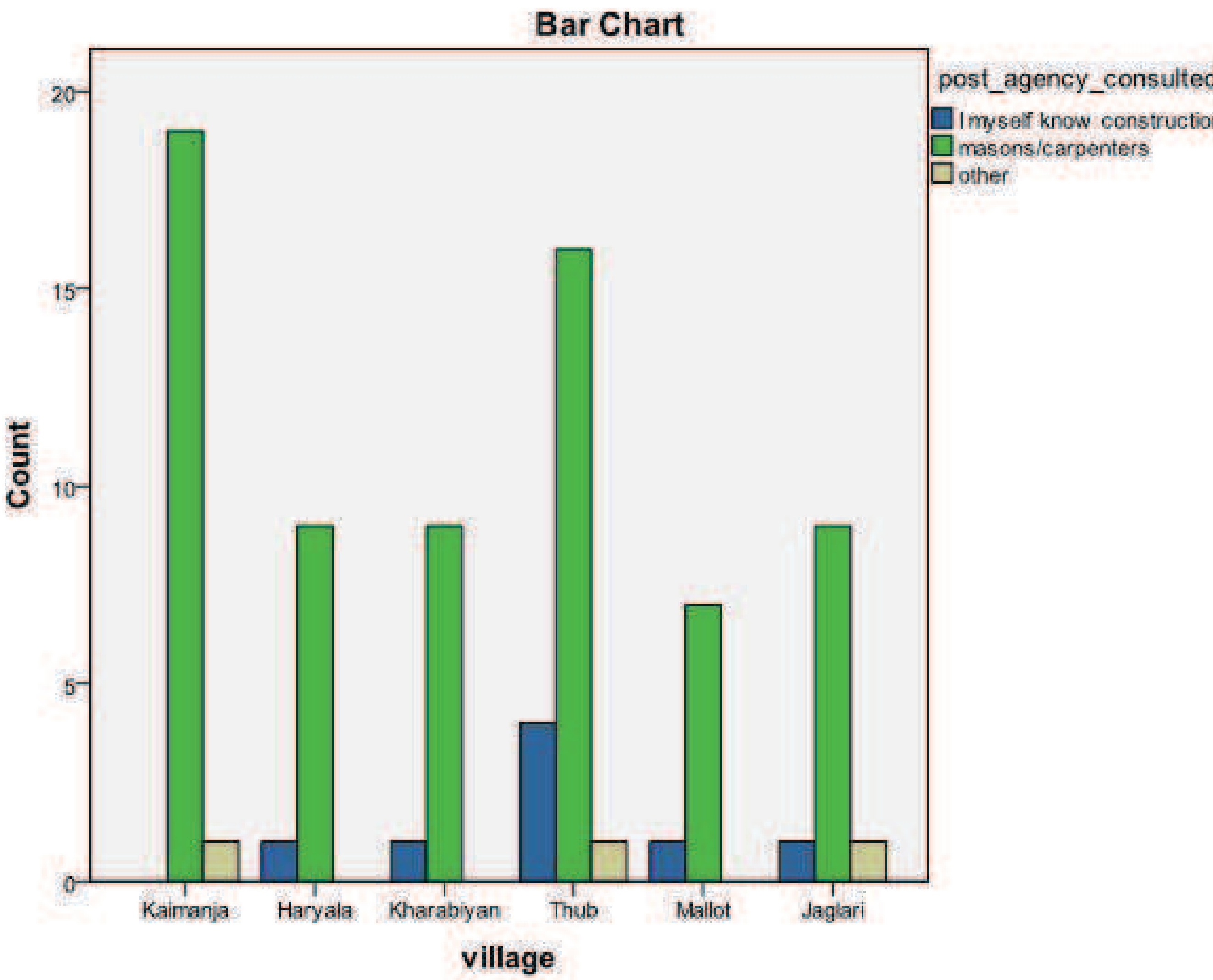
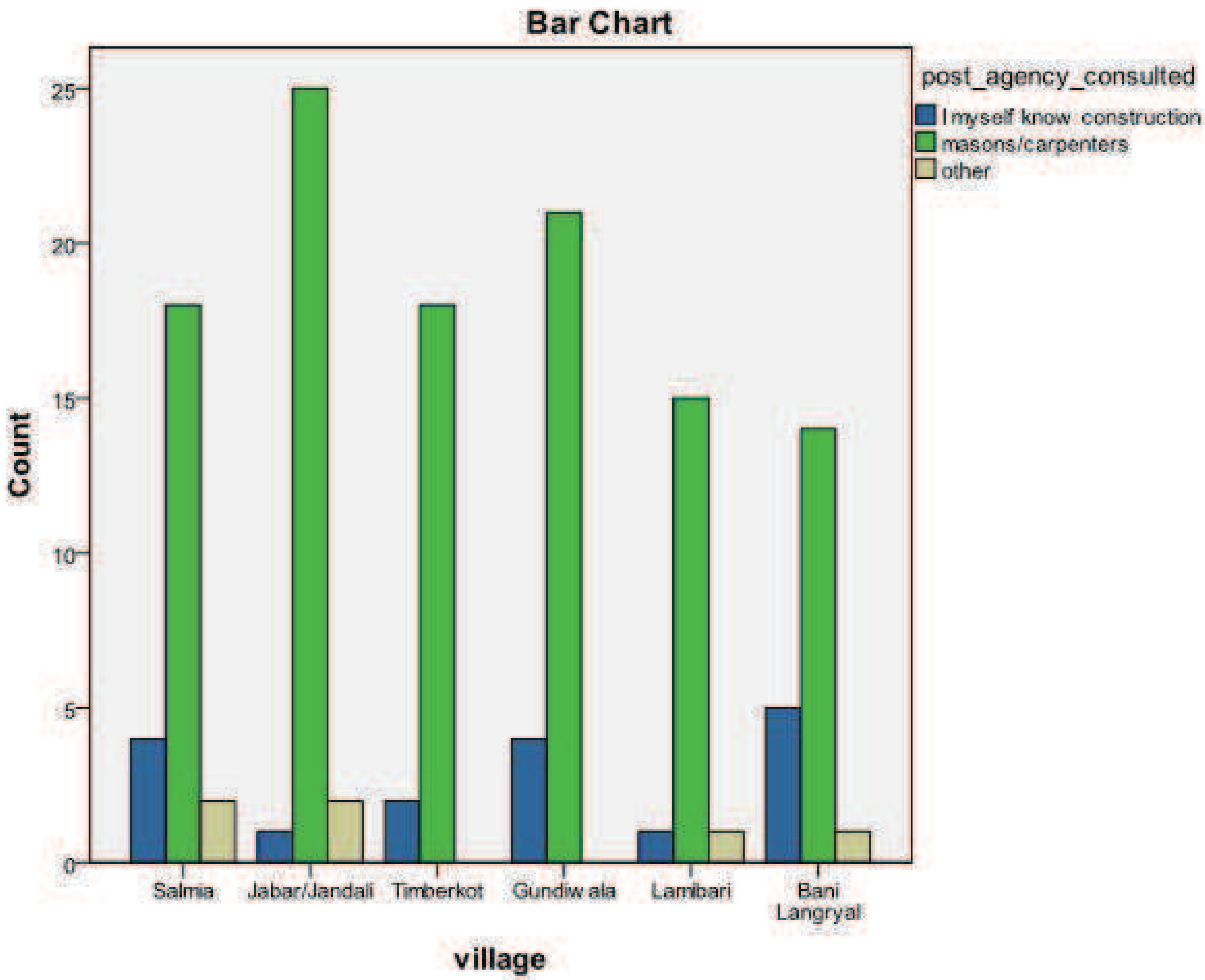


Table 5.26 — : Survey results of 2013 for queries consultation now

		post_agency_consulted			
		I myself know construction	masons/carpenters	other	Total
village	Salmia	4	18	2	24
	Jabar/Jandali	1	25	2	28
	Timberkot	2	18	0	20
	Gundiwala	4	21	0	25
	Lamibari	1	15	1	17
	Bani Langryal	5	14	1	20
Total		17	111	6	134



deaths, 173 injuries whereas the destruction of 9,881 building damage resulted into 117,500 homeless ([goo] ; [UNHABITAT, 2010a]).

This was a test case for Pakistan to demonstrate the reconstruction height in any upcoming event after the 2005 earthquake. Greater quality in housing reconstruction as well as better infrastructure were obvious expected outcomes of post quake program in Balochistan especially after gaining good experience few years back and having ERRA as reconstruction organization.

In order to take up this reconstruction ODR with financial assistance was adopted but without any technical assistance. As it turned out, this much smaller reconstruction (less than 10,000 residential units) remained plagued by an extremely slow rate, construction of vulnerable building types, and misuse of financial aid. As stated by UNHABITAT field assessment report of 2010 :

"Although the Government of Pakistan provided financial assistance of PKR 350,000 for each completely destroyed house, the reconstruction rate is lower than 2 %. Most of the people are still living in shelters and tents while using their old houses as storage sites. Schools and Basic Health Units (BHU) have been re-built along the main roads but a lot needs to be done in the remote areas. People are adopting new construction types by building light weight roofs and walls. Approximately 40% of the boundary walls have been reconstructed or repaired without any improvements.

Construction materials are available locally but there is an acute shortage of water for construction. Drinking water is also scarce because affected people have not been provided with water and sanitation facilities. Traditional labor is available locally but their wages have increased by 66%. There is also a serious shortage of skilled labor and the new construction types are not satisfactory. Orchards were the main source of livelihood for locals, which have been affected badly by the earthquake and drought. People are trying to fix their destroyed water channels to restart their orchard business.

The people of Ziarat and Pishin realize that the poor construction was the main cause of destruction and they are willing to rebuild safer houses but they don't have access to safety guidelines and information to improve the construction. Consequently, they are again constructing long narrow buildings and the shape of these buildings is not earthquake resistant.

There are little or no improvements in foundation. They are also trying non-engineered innovation to make their houses safe which in most cases make the building even more vulnerable and dangerous compared with previous construction style.

The local skilled artisans are not aware of the use of reinforcement and anchorage specifications for vertical and horizontal reinforcement ; adequate location of openings and wall heights are not known. Usually people are constructing the walls using timber or steel girders in the wall which are half mud and half masonry. The shift from traditional to the non-engineered light weight construction poses a threat on the durability of buildings and their thermal performance. Old construction had good thermal resistance whereas the new thin walls and light sheet construction with a light pitched roof will require continuous heating in winters, which will increase fuel needs. This factor will impact on consumption of local trees, the juniper tree that is on the verge of extinction."

Balochistan case proved that ODR with financial support but without technical assistance is fatal for reconstruction rate, compliance and sustainability. When talked about this particular case, ERRA officials mentioned the cause of this affliction to be the political instability of the region. According to them ERRA could not perform with same standard elevation in Balochistan as it did in Kashmir owing to region oriented issues.

5.3 Conclusion

The study justifies both the hypothesis made by U.E.T, Lahore, Pakistan :

1. People have vastly adopted dhajji-dewari for reconstruction in rural high altitude areas of Kashmir which is a result of ERRA policy on strengthening local knowledge.

2. Owner Driven Reconstruction with financial and technical assistance has encouraged people to enhance socio-cultural, psychological and physical capacity.

Besides justifying these hypotheses the study has pointed out related issues too. This chapter highlighted two major socio-cultural aspects ; indigenous construction practice and self reliance, affecting the sustainability of reconstruction. It was discussed in detail that how certain socio-cultural characteristics can influence the reconstruction approach and policy. To produce resilience in the society, satisfaction of people is also essential.

Under the dhajji section few reservations of people related to its seismic behaviour, strength, cost, thermal insulation, aesthetics etc were discussed. It is concluded that although dhajji is earthquake resistant technique, people are not well aware of it. Subsequently they need time or another hazard or detail awareness campaigns to gain confidence on dhajji's seismic behaviour. Strength of dhajji is also a great concern. People, who lived in stone masonry houses, consider this structure light weight which is dissatisfactory for them. Many respondents were willing to choose another construction technique but this does not seem possible in near future due to their economic condition. There are indications that dhajji will remain in construction culture of Kashmir in future too (fourteen under construction houses found in dhajji is a sign of dhajji acceptability for future requirements. See chapter 8 for under-construction houses details). Although people find issues in this vernacular construction, they find it most suitable to continue. It was also observed in 2011 surveys (when long discussions were conducted with house owners) that although people were given choices of different constructions, they were not involved in decision making since the very beginning of reconstruction program. People are still nostalgic about their old construction technique ; though it engulfed their lives. Awareness campaigns are of extreme importance to guide people about positive aspects of dhajji.

Concerning ODR, ERRA targeted three sections ; housing grants, technical assistance and capacity building. All these sections somewhat showed gaps. As far as housing grants are concerned, many people complained either to be less paid or paid with delay. Some issues related to data updates in ERRA system were also identified by the respondents. For technical assistance, they complained of high wages of masons/laborers during reconstruction. Delays in policy also affected the pace and quality of reconstruction. For capacity building, many issues were found and will be discussed in chapter 7 and 8 of this report. In short, it was felt that more control and discipline during reconstruction was needed from the authorities.

The gaps identified by the community in this study can be filled by the authorities for any upcoming post-hazard reconstruction program.

CHAPTER

6 Vague/vogue outcomes of reconstruction

IN the last chapter it was discussed that the policy makers together with other organizations tried to generate sustainable reconstruction in AJK. Although issues were observed in the surveyed houses but it was found that in rural AJK the construction technique (dhajji) and approach (ODR) have played a fundamental role in sustainable reconstruction. This chapter however focuses upon two outcomes of reconstruction which were not presumed by the authorities at the time of policy making and implementation or these were simply overlooked. Focusing Kashmir, neither the literature provides much information on these issues nor have experts discussed them in depth. These are "'Tower roof'' and "'Changes is family system"'. In this chapter, after providing the details of tower roof construction, ERRA policies which provided a room for tower roof shall be discussed. The other side of the picture ; the socio-cultural characteristics, which had their impacts on this construction, will also be presented. The merits and demerits of tower roof in view of the community are analyzed in combination with direct observation. The family system found in Kashmir before 2005 earthquake will be talked about in the second section of the chapter. The reasons behind the shift in the family system will also be provided. The community's opinion about the positive and negative aspects of nuclear family system is presented in detail. It is then discussed that how earthquake reconstruction has affected the social set up and whether it will reinforce the vulnerability of any group or not.

Figure 6.1 — A type of tower roof. Source : S. Abidi

6.1 The tower roof

In Kashmir rural areas, tower roof (figures 6.1 and 6.2) is the name given by the community to the attic. This is sometimes a raised or articulated roof space framed out from single storey houses (and in some cases from double storey houses too). The term tower roof is not familiar in other parts of the world the way it is in use in Kashmir. Every respondent, all implementers and ERRA officials were unaware of who gave the name to this structure as tower roof. Many officials were unaware of even the term itself. According to H. Mumtaz, (Manager Technical Team UNHABITAT) :

”In local language it is also called topi daar chat or topi wala chat”.

In Urdu (national language of Pakistan) and also in some other local languages the term topi is used for ””cap/hat/bonnet”, daar for ””along with” and Chat for the ”roof”. Hence Topi daar Chat means a roof having a bonnet or hat on its top or a hooded roof. This roof space is not considered to be a real storey rather people regard it as a quasi floor, though its height is sometimes equal to the ground floor.

Figure 6.2 — Tower roof is under construction. Source : S. Abidi

Tower roofs are usually framed out with perpendicular timber elements ; they are not trussed or braced roofs. This maximizes the usable roof space and access. (UNHABITAT, unpublished draft, 2012).

During this study few people mentioned that tower roof was practiced in Kashmir before the earthquake but its utility was different and construction was unlike the post quake style. It is observed during the surveys that this style is penetrated deep in the construction culture of rural areas of AJK.

In surveyed villages reconstructed housing unit generally consists of two to three rooms connected with a veranda (figure 6.3) and having ceiling height around 9 feet. Mostly verandas do not have a separate roof rather one roof, covering the rooms, extends over the verandas. In this construction style, the house attains a minimum height of approximately 15 feet.

To understand the tower roof system it is essential to have an idea of pre-quake roofs and the spaces created through them.

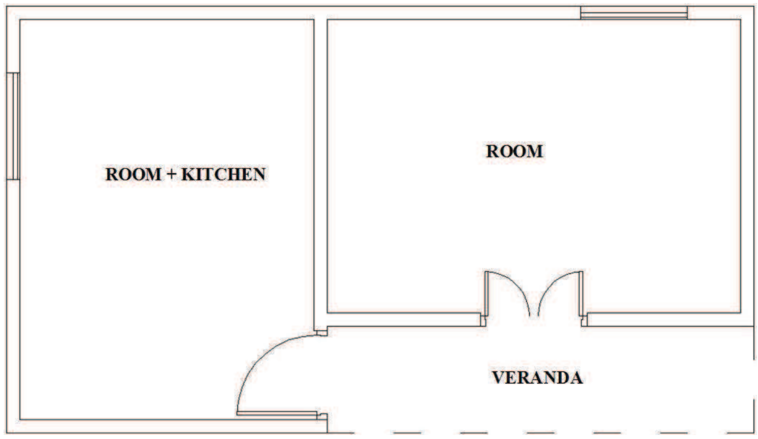


Figure 6.3 — Generic house plan of two rooms found in surveyed areas. Sketch by S. Abidi

6.1.1 Pre-quake roofs

The earthquake of October 2005 caused huge destruction due to the roof types practiced in rural Kashmir (UET Unpublished Report, 2005 ; [UNHABITAT, 2012b]). The types of roofs described in this section do not cover the overall forms of roofs in Kashmir which were present before the earthquake. Rather the pre-quake roof types of 214 surveyed houses are focused (as among 228, 14 surveyed houses were under construction at the time of surveys and do not lie in the category of ”reconstructed houses”). These were :

1. Flat Timber-Mud Roofs on Stone Masonry Construction
2. Roofs on Terraced Houses
3. Pitched Roofs on Stone Masonry Houses

6.1.1.1 Flat timber-mud roofs

167 (71+96) out of 214 houses had this type of roofs before the 2005 event. In this construction wooden beams were run across the width of rooms. Thatch mixed mud mortar was used to coat the roofs (figure 6.4). This mortar was to be applied frequently to avoid rain induced water seepage. Women found it a hectic activity as they had to plaster the roofs sometimes on weekly basis. Flat timber-mud roofs were vulnerable during winter as weight of snow could

Figure 6.4 — Traditional flat mud roof on timber under structure with stone masonry walls.
Source : [UNDP and UNESCO, 2007]

damage the structure of houses. These roofs were proven extremely fatal during earthquake too.

This type of roof is not found in reconstructed houses of Kashmir. However few examples are observed as cattle-sheds or store rooms (figures 6.5(a) and 6.6), still others are the remains of drastic earthquake (figure fig:6.5.2).

6.1.1.2 Terraced roofs

39 (8+31) out of 214 houses had terraced roofs before the earthquake. Mountainous region of Kashmir had a little plain space for construction which compelled people to go for this type of construction (UNHABITAT Toolkit, 2012). Here the roof of lower house becomes terrace, or sometimes covered living space, for upper storey residence (figure 6.8). Such construction resulted in multi storey houses (figure 6.7).

During 2005 earthquake these houses were also proven extremely hazardous as the retaining walls were generally not constructed at all. Ground tremors wiped out such houses in a moment (figure 6.9). It was hence restricted by authorities to construct such houses in future.

(a) (b)

Figure 6.5 — Flat roofs with thatch mixed mud mortar to cover the wooden frames (a) : Existing cattle shed) ; (b) Earthquake remains. Source : S. Abidi.

Figure 6.6 — A small room made in dhajji but with flat roof, used for storage now. Source : S. Abidi

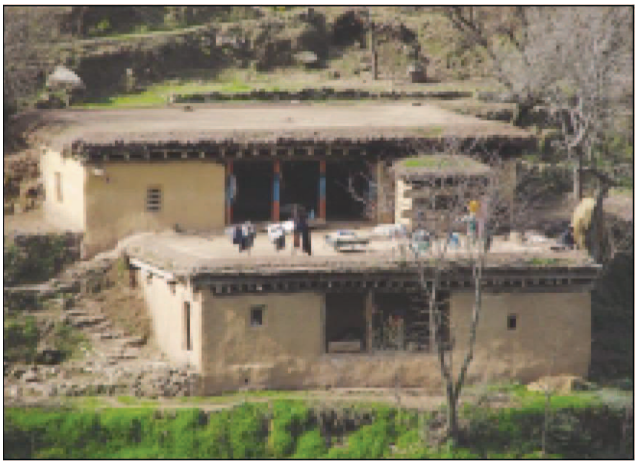


Figure 6.7 — Terraced house present before earthquake. Source : [UNDP and UNESCO, 2007]

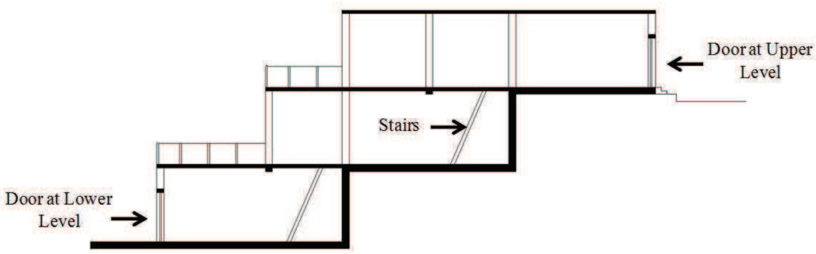


Figure 6.8 — Typical section of terraced-roof houses. A sketch by S. Abidi according to survey results

Figure 6.9 — Destroyed terraced house. Source : [UNHABITAT, 2012a]

Figure 6.10 — Few examples of houses with pitched roofs were present in AJK before earthquake 2005. Source : SERRA official website

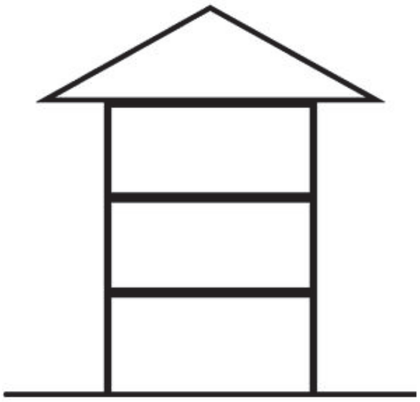


Figure 6.11 — A sketch of pitched roof by S. Abidi according to responses during study

6.1.1.3 Pitched roofs

8 (1+7) out of 214 houses had this roof type in pre earthquake construction. Such houses also suffered from major destruction during earthquake (figure 6.10). The attic was used as storage. Roof was covered with corrugated galvanized iron (CGI) sheets, supported on wooden trusses. These houses, however, had two or more than two storeys and had an attic above. A sketch can be seen from the figure 6.11.

6.1.2 Tower roof : A change in architecture of rural AJK

The architectural mood of the area is altered from the pre-quake situation where wooden mud roofs were prominent. As expressed through the figures 6.12, 6.14 and 6.11, shiny CGI sheets now dominate every vista of rural Kashmir.

6.1.3 Types of tower roof

As mentioned earlier, tower roof is the space and not the roof type. Initial discussions with the experts brought forward that :

The tower roof is the projected structure from the main hipped roof. (figure 6.15)

This explanation linked tower roof strongly with Säteritak (a roof practiced in Sweden ; will be discusses later in this chapter).

But the surveys carried out during this research explored people's view on this space which is :

Every type of space beneath the pitched roof which is separated from the ground floor through a ceiling is called tower roof.

It was then realized that people consider the attic as tower roof. Moreover, if they build room/rooms on the roof with the help of CGI sheets, they also call it tower roof, but the condition is that it must have *pitched roof.*

Hence, keeping in view the community responses, tower roof is categorized into three main types :

1. A space formed without any break in the roof of main structure
2. A space formed through the break in the roof of main structure
3. A space formed on the roof and is independent of the ground floor plan (while it has slanting roof on its top)

To place the surveyed houses in the above mentioned three categories, a brief introduction is provided to the different types of roofs used in the world. This will link the different forms of tower roof with the existing global examples of attic forms.

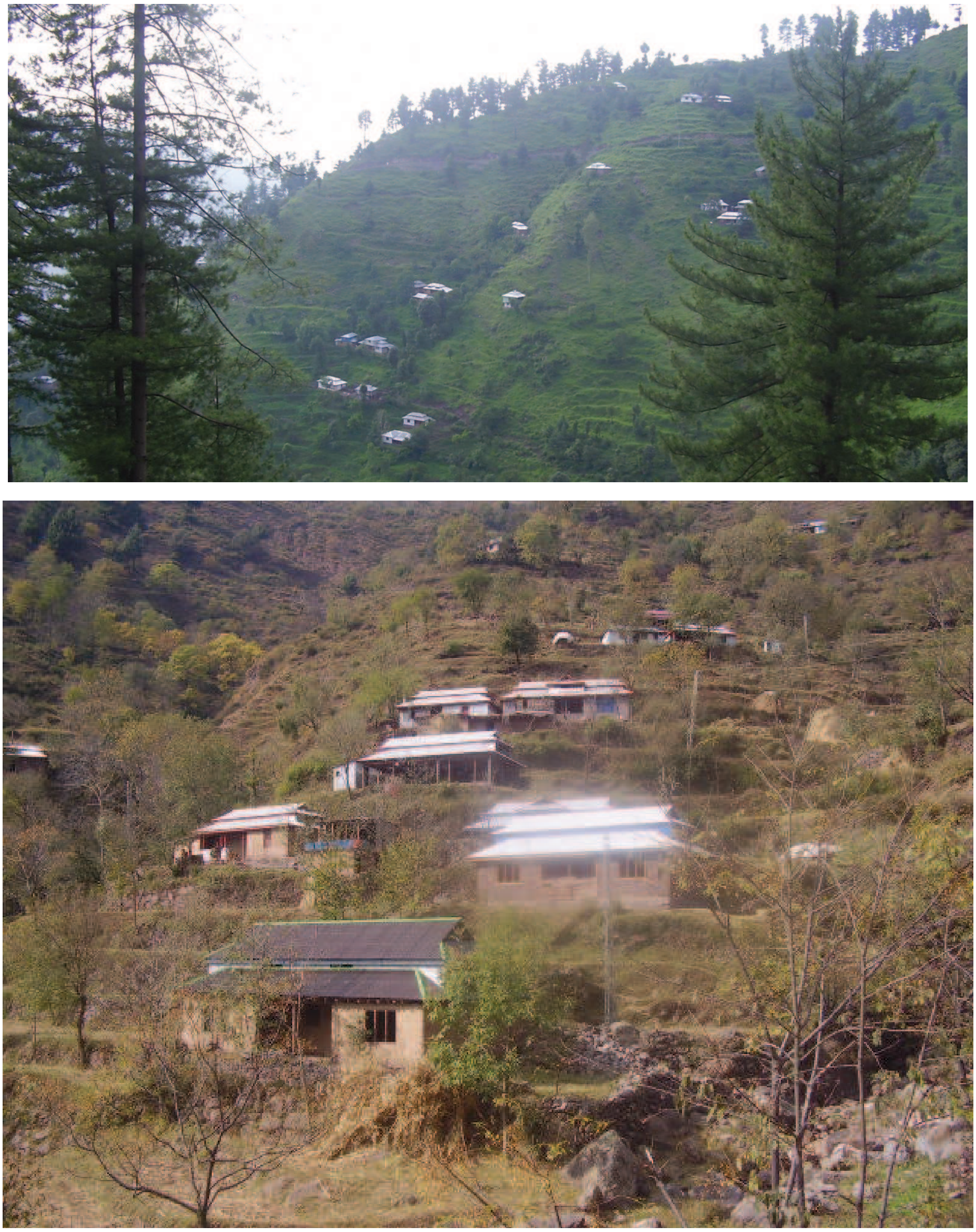


Figure 6.12 — Architectural mood of Kashmir is changed after 2005 earthquake. Photos above show multiple shapes and colours of tower roof. Source : S. Abidi

Figure 6.13 — The houses are scattered on the mountains. Source : S. Abidi

Figure 6.14 — Multiple forms of tower roof. Source : S. Abidi

(a) (b)

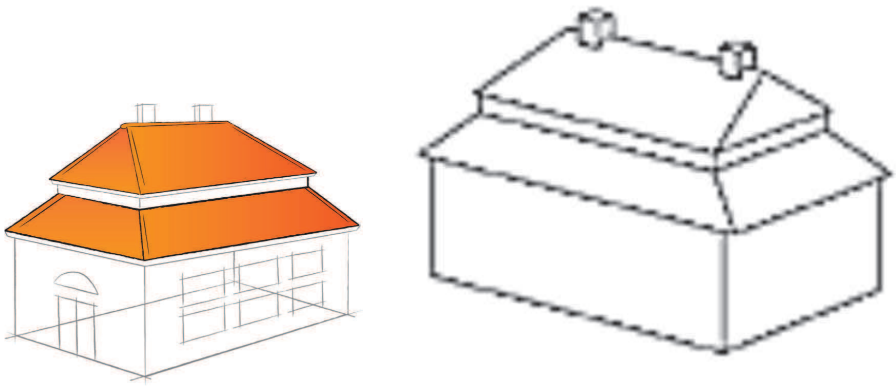
Figure 6.15 — (a) Double level hipped roof (säteritak) ; typical tower roof configuration ; (b) Tower roof under construction. Source : UNHABITAT Unpublished Draft.

6.1.3.1 Different types of roofs

Hipped roof

A hip roof, also called hipped roof, is a roof that slopes upward from all sides of a structure, having no vertical ends (figure 6.16). The hip is the external angle at which adjacent sloping sides of a roof meet. The degree of such an angle is referred to as the hip bevel. The triangular sloping surface formed by hips that meet at a roof's ridge is called a hip end (Encyclopedia Britannica).

Figure 6.16 — Hipped roof. Source : [ERRA, 2007a]



(a) (b)

Figure 6.17 — A sketch of säteritak. (a) Source : [mynewsdesk.com] ; (b) Source : [stockholmslansmuseum]

Säteritak

A Säteritak is a type of hip roof and consists of two portions pitch roof with an intermediate floor (figures 6.17 and (figure 6.18). This type was very common in the seventeenth century to construct the mansions, castles and manors (mynewsdesk.com). Often an additional line of windows was provided in the wall. It would later spread to rural buildings of more modest social status ([Snickare, 2007]).

Gable roof

A roof with two slopes that form an "A" or triangle is called a gable, or pitched, roof (figure 6.19). This type of roof was used as early as the temples of ancient Greece and has been a staple of domestic architecture in northern Europe and the Americas for many

Figure 6.18 — Vahlsta Manor (c. 1700) in Odensvi parish, Västmanland. Source : Wikipedia

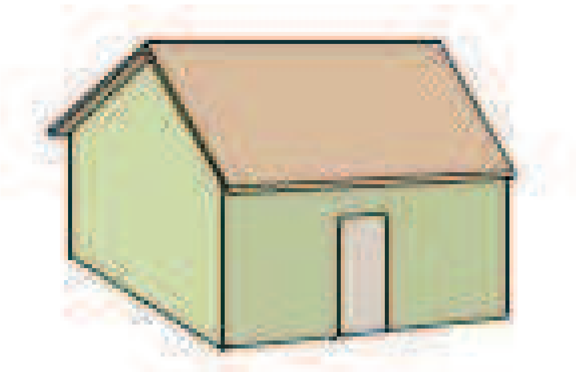


Figure 6.19 — Gable roof. Source : ([Britannica]).

centuries. It is still a very common form of roof (Encyclopedia Britannica).

Dutch Gable roof

A Dutch gable roof combines a hip roof, with four sloping sides, and tops it with a gable roof, also called a gablet (figure 6.20). Hip roofs have relatively small attic space but strong construction ; gable roofs have more attic space but more difficulty with attaching gutters, require more bracing from wind and create a larger shadow ; Dutch gable roofs have the advantages of both styles in one roof. ([houzz.com])

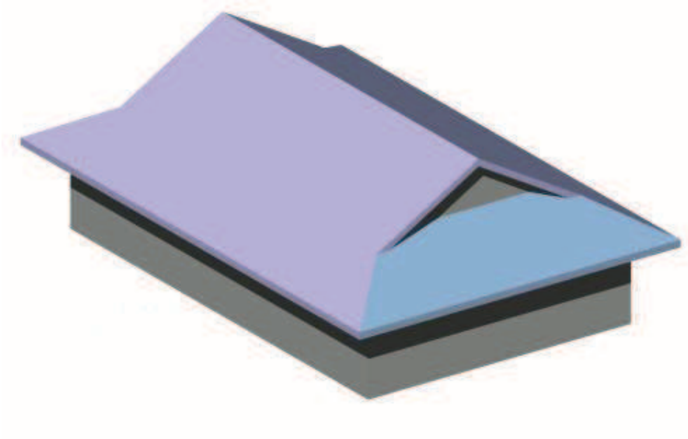


Figure 6.20 — Dutch gable roof. Source : [houzz.com]

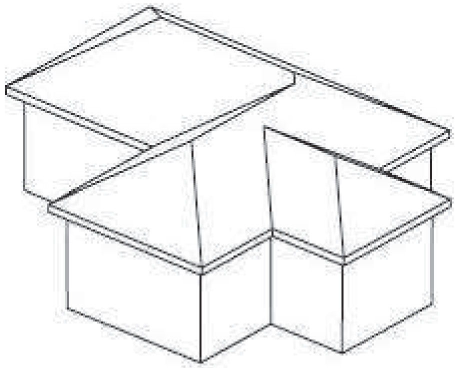


Figure 6.21 — : Hip & valley roof. Source : [toolstable.com]

Hip and valley roof

A hip & valley roof is simply a modified or extended hip roof (figure 6.21). The shape and pitch of the surfaces are basically the same ; however the base shape changes from a simple rectangle to a ’T’ or ’L’ shape, on plan. The hip & valley roof has an additional ridge, which joins the main roof ridge at the same height, which creates a single valley for an ’L’ shaped roof. It may also join the roof surface at the same height or at a lower level on a side or end, without connection to a hip, creating two valleys for a ’T’ shaped roof. It contains no gables ([NSW, 2008]).

Dormer roof

A roof having dormers is called dormer roof (figure 6.22). A dormer is a window that is

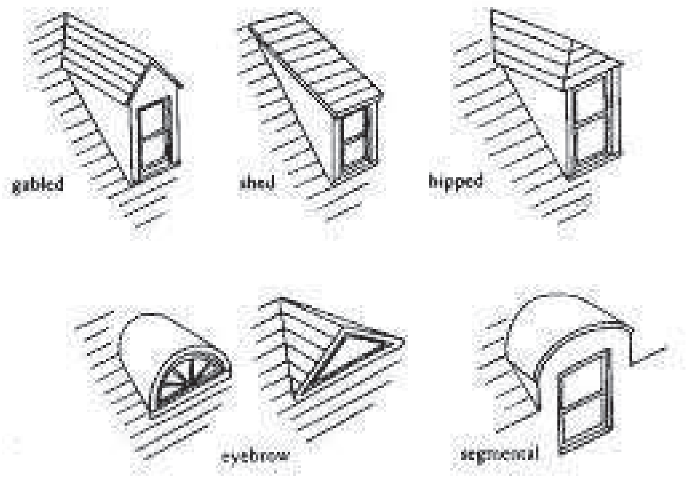


Figure 6.22 — Different types of roof dormers. Source : [ecohistorical.wordpress.com]

set vertically on a sloping roof. The dormer has its own roof, which may be flat, arched, or pointed ([NYC]).

Shangri-la roof

This type of roof is an inspiration from Chinese temple roofs and was placed on a tourist resort. In an attempt to fuel tourism to Pakistan, the Skardu Valley (a region in Pakistan) was promoted. Here in 1983, the Shangri-La Resort was opened at the Lower Kachura Lake, which was then given the moniker Shangri-La Lake. The resort comprises of two buildings of mock-Chinese architecture (figure 6.23), as well as an airplane. ([Atimian])

Centering the survey results shown in figure 6.24 and 6.25, now different spaces (tower roofs) resulted from the roofs mentioned above will be elaborated. This section includes the roofs of 13 under-construction houses as well (1 house was at the stage of lintel ; roof was not laid at the time of survey. 10 roofs of single storey houses are also not discussed).

6.1.3.2 A space formed without any break in the roof of main structure

This type of tower roofs are extensively used for storage purposes as they do not provide much vertical space for residence.

Under this category the detail of houses is as :

Figure 6.23 — Shangri-La resort in Skardu, Pakistan. Source : skyscrapercity.com

Hipped roof without break

3 houses belonged to this type in 2011 surveys, 4 were found in 2013 surveys (figure 6.26).

Dutch gable roof without break

21 houses in 2011 ; 18 in 2013 surveys fall in this category (figure 6.27).

Hip and valley roof without break

2 such examples were observed in 2013 surveys (figure 6.28).

Gable roof without break

One tower roof with gable roof is found during 2013 surveys (figure 6.29).

6.1.3.3 A space formed through the break in the roof of main structure

Two types of these structures are present in the surveyed houses.

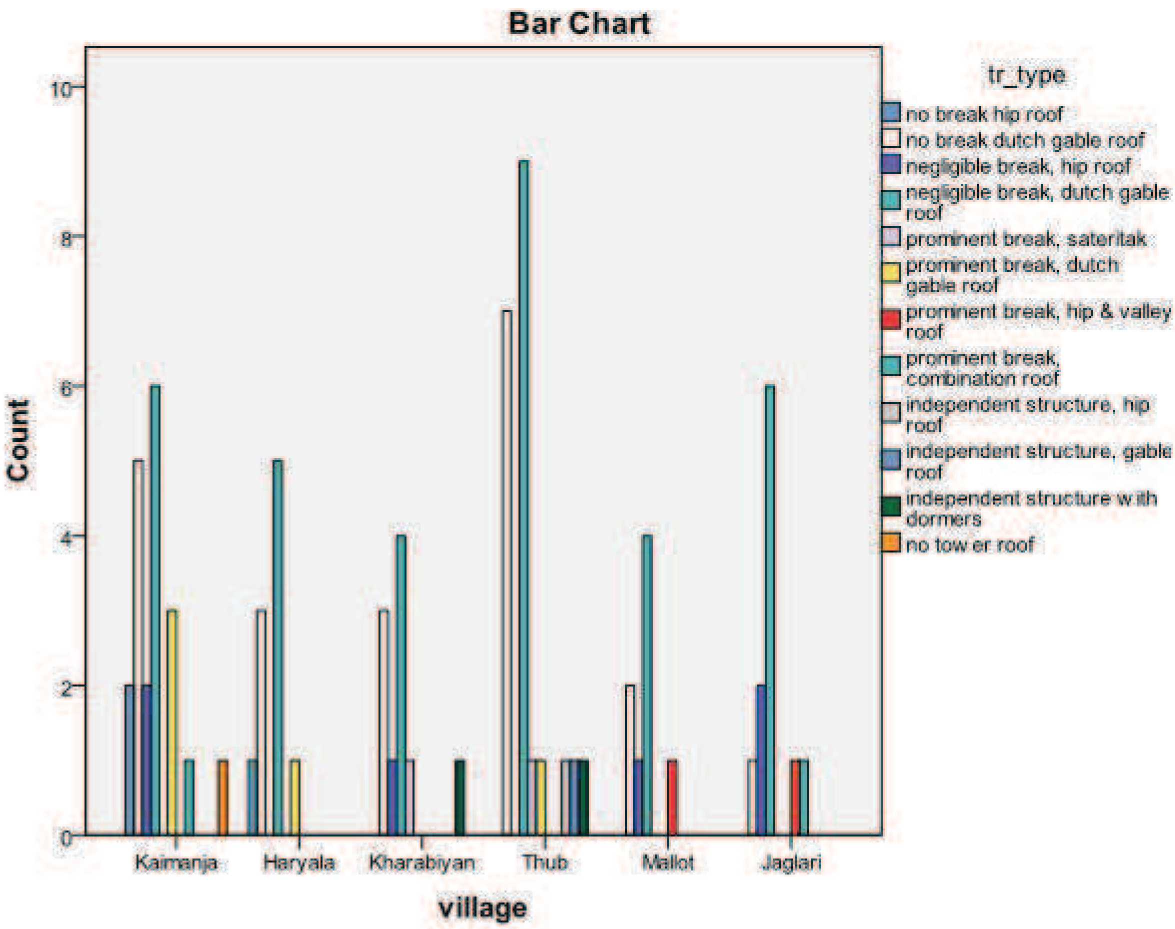


Figure 6.24 — 2011 survey results on types of roofs

1. Having negligible breaks

2. Having prominent breaks

Here for the category 1, it is almost as if there is no break in the roof. The wooden framework protruding out of the ceiling of the ground floor makes the walls of tower roof for second case.

Hipped roof with negligible break

6 in 2011, 8 in 2013 surveys detected these roofs (figure 6.30).

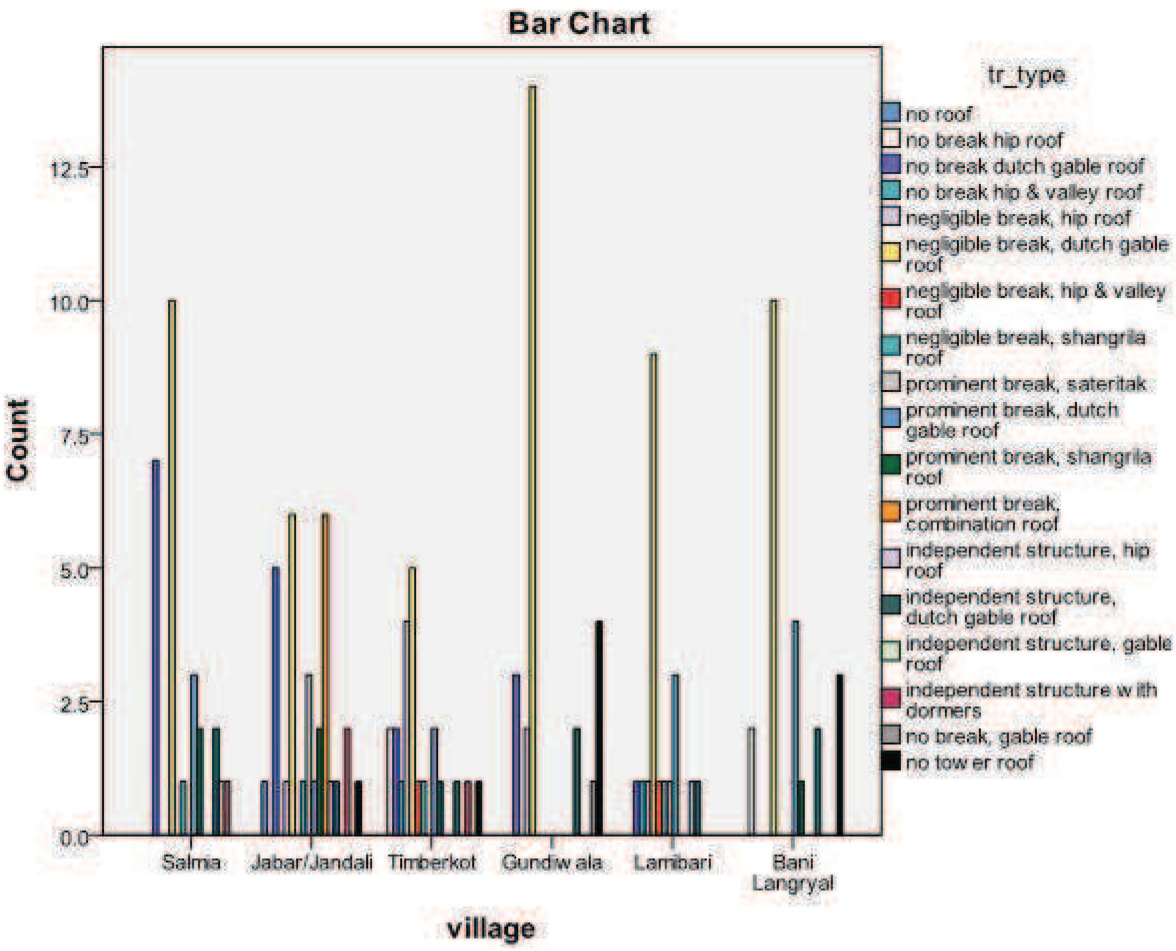


Figure 6.25 — 2013 survey results on types of roofs

Figure 6.26 — Tower roof with hip roof without break. Source : S. Abidi

Figure 6.27 — Dutch Gable roof without break. Source : S. Abidi

Figure 6.28 — A hip and valley roof without any break. Source : S. Abidi

Figure 6.29 — An example of attic having gable roof. Source : S. Abidi

Figure 6.30 — Negligible break hip roof. Source : S. Abidi

Dutch gable roof with negligible break

This was the most prevalent type of tower roof identified in the surveys (figure 6.31). 34 in 2011 and 54 in 2013 surveys mentioned Dutch gable roof with negligible break in the main roof structure.

Hip and valley roof with negligible break

None such type was observed in 2011 surveys. During 2013 surveys only 2 houses had this type of tower roof (figure 6.32).

Shangri-La roof with negligible break

4 examples of this type were observed during 2013 surveys (figure 6.33) ; none was found in initial surveys of 2011.

Figure 6.31 — Negligible break dutch gable roof. Source : S. Abidi

Figure 6.32 — Negligible break hip and valley roof. Source : S. Abidi

Figure 6.33 — Negligible break Shangri-La roof. Source : S. Abidi

Figure 6.34 — Säteritak with prominent break. Source : S. Abidi

Säteritak with prominent break

2 Säteritak with prominent break in the main roof of the house were discovered in 2011 while 4 in 2013 (figure 6.34).

Dutch gable roof with prominent break

5 in 2011 whereas 13 in 2013 surveys mentioned this category of houses (figure 6.35).

Hip and Valley roof with prominent break

Only 2 houses belonging to this category were observed in 2011 (figure 6.36) ; none was seen in 2013.

Figure 6.35 — A prominent break in the roof, Dutch Gable roof can be observed Above.
Source : S. Abidi

Figure 6.36 — Houses with hip and valley roof on tower roof. Source : S. Abidi

Figure 6.37 — Houses with Shangri-La roofs and prominent attic. Source : S. Abidi

Shangri-La roof with prominent break

6 such roofs were found in 2013 surveys (figure 6.37) ; none was identified in 2011.

Combination roofs with prominent break

2 combination roofs were found in 2011 surveys while 6 were discovered in 2013 surveys (figure 6.38).

6.1.3.4 A space formed independent of the main structure

These types of tower roofs have (i) the walls made of purely CGI sheets and no wooden elements are used or (ii) the walls standing with the help of timber frame while CGI sheets provide clad. The first type was not found during both 2011 and 2013 surveys and is only mentioned in UNHABITAT unpublished draft, 2012.

Hipped roof on independent structure

1 in 2011 while 2 in 2013 surveys identified this type of tower roof (figure 6.39).

Dutch gable roof on independent structure

None in 2011 ; 9 roofs in 2013 surveys found belonging in this category (figure 6.40).

Figure 6.38 — Houses with prominent break and combination of different roofs. Source : S. Abidi

Figure 6.39 — Hipped roof on independent structure. Source : S. Abidi

Figure 6.40 — Dutch gable roof on independent structure. Source : S. Abidi

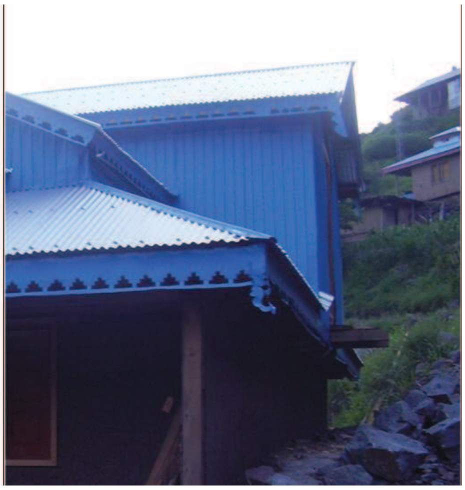
 

Figure 6.41 — A space formed on the roof and is independent of the main structure while it has gable roof on its top. Source : S. Abidi

Gable roof on independent structure

One of this type of roof was observed in 2011 and one in 2013 (figure 6.41).

Dormers as independent structure

2 tower roofs with dormers were found in 2011 surveys and 4 during 2013 surveys (figures 6.42 and 6.43).

Figure 6.42 — Under-construction house having dormers. Source : S. Abidi

Figure 6.43 — Reconstructed house where dormer is used for entrance. Source : S. Abidi

6.1.4 Basic components of tower roof

The different roof types of tower roof are discussed in previous section, here the components other than roof are briefed about.

6.1.4.1 Frame

Square sections and wide spacing is common in tower roof frame construction (figure 6.44). This is widespread in Säteritak construction where no trusses or bracing is used. This allows easier use of the space, but provides less stiffness and greater quantities of timber are con-

(a) (b)

Figure 6.44 — Frame of tower roof. (a) Source : UNHABITAT, Unpublished Draft, 2012 ; (b) Source : S. Abidi

Figure 6.45 — CGI Sheets make the cladding for attic. Source : S. Abidi

sumed (UNHABITAT, unpublished draft, 2012). Similarly the structures built independent of the ground floor plan have high walls where timber is used excessively. However in some cases lighter wooden frames or low height vertical wooden elements are also used.

6.1.4.2 Cladding

Only CGI sheets are observed to clad the frame of tower roof (figure 6.45). These sheets were mostly reused from the shelters where people had resided immediately after earthquake.

Figure 6.46 — Tower roof houses showing dhajji dewari on ground floor. the upper structure is covered with CGI sheets and is distinctly framed out of ground floor. Source : S. Abidi

6.1.4.3 Openings

In the houses where tower roof has the walls, windows are placed in most of them. These windows can be more properly categorized as ventilators ; both one in one wall or serially placed in one wall (figure 6.46).

Some houses also have the doors in these walls to access directly from the adjacent mountain (figure 6.47). Roof dormers found in the houses are mainly used for the access. The size of these dormers was found large and these were not merely to be used for light and ventilation.

6.1.4.4 Floor

The floor of tower roof is either covered with mud or left in wood (figure 6.48).

The floor has a puncture in all attic spaces (figure 6.49). This is used to approach the tower roof from ground floor.

6.1.4.5 Ceiling

In most of the cases the tower roof has pitched roof from inside while few examples are present where a ceiling is added beneath (figure 6.50).

Figure 6.47 — Tower roof having a door. Source : S. Abidi

Figure 6.48 — Left : Wooden floor ; Right : Mud covered floor. Source : S. Abidi

Figure 6.49 — A puncture in the floor of tower roof. Source : S. Abidi

Figure 6.50 — Left : Pitched roof can be Seen from inside ; Right : Ceiling is added in tower roof. Source : S. Abidi

Figure 6.51 — Only few houses are found with coloured CGI sheets on the roof. Source : S. Abidi

6.1.4.6 Colours

All the tower roofs are covered with CGI sheets, which are mostly found in original color. In reconstructed houses those CGI sheets were used which people received for shelter construction. However now a days many styles of sheets, which are already painted in various colors are available in the market. Only few examples of colored sheets are noticed during surveys (figure 6.51). These were those houses which replaced the roof (only2 cases) or which completed reconstruction recently (8 cases).

6.1.5 Wide spread of tower roof : In the light of policies and socio-cultural characteristics

It was investigated during this research that how tower roof prevailed in the surveyed areas. Results show that both the authorities and the socio-cultural characteristics of AJK have played their role in this spread.

6.1.5.1 Policy analysis

ERRA did not make any policy on tower roof however its different policies produced room for people to practice it. The study shows that the idea of tower roof prevailed in the society primarily to cope with space deficiency. On the authority's side, neither any solution

Figure 6.52 — A reconstructed single storey house truly following erra's guidelines. source : S. Abidi

was provided to broaden the space nor was there any system to keep a track of this spread. Here six aspects of policy and implementation which promoted tower roof during and after reconstruction are discussed.

1. The provision of guidelines just for small scale single storey house construction

When people were asked in both surveys, "Did ERRA allow to build two storeys?" all of the respondents said, "No". ERRA distributed flyers, posters and other documents among communities just guiding about single storey construction. Technical advice and standards of ERRA promoted construction of single storey houses, although this limitation was advisory rather than non negotiable ([UNHABITAT, 2012a]). Hence though ERRA did not prohibit second storey, it did not encourage it in anyway. Figures 6.52) and 6.53) show the examples of single storey houses.

This strategy promoted confusion among people. The instruction page mentioned in figure 6.54 presents the two storey house construction as more complicated construction.

2. The system of inspection

When the question was posed, "Had ERRA planned to give you last tranche after roof

Figure 6.53 — Another single storey house in Muzaffarabad. Source : S. Abidi

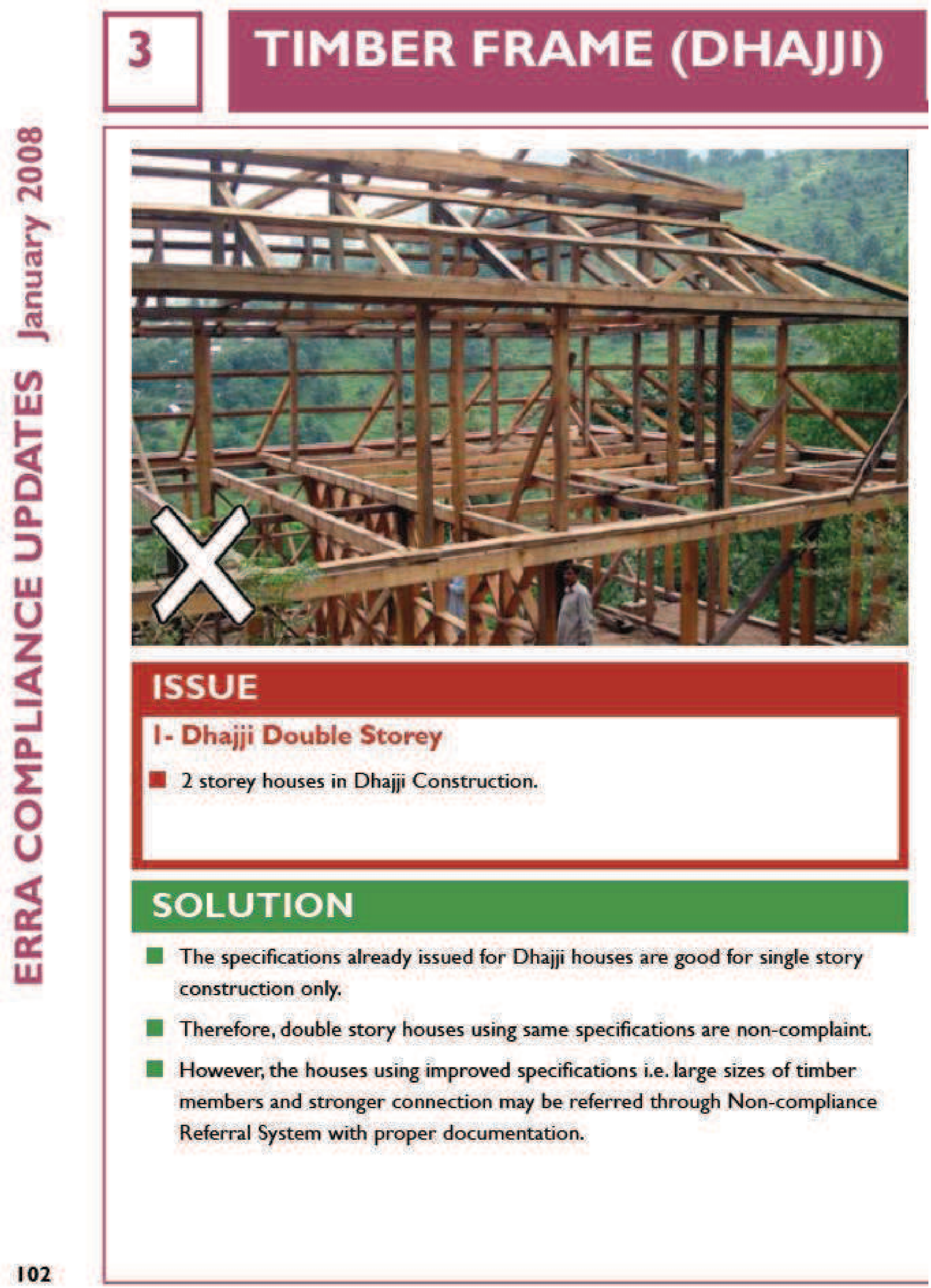
inspection, you would have still practiced tower roof the way you have done it now?" Just 3 of them said, "We don't know". All of the others said, "Yes".

This simply means that the community considers it earthquake resistant, no matter which form of tower roof they have adopted.

Under Rural Housing Reconstruction Program (RHRP), ERRA had the policy of Owner Driven Reconstruction (ODR) with financial and technical assistance. This support was linked with construction progress and compliance and was assessed by Assistance & Inspection (AI) teams. A total amount of PKR 175,000 was given in four tranches to the house owner of completely destroyed house ; ([ERRA, 2011]) :

- 1^{st} tranche of PKR 25,000 to cover immediate shelter needs ;
- 2^{nd} tranche of PKR 75,000 for mobilization ;
- 3^{rd} tranche of PKR 25,000 upon completion of plinth level ;
- 4^{th} and final tranche of PKR 50,000 upon completion of the walls.

In initial strategy document for rural housing reconstruction ERRA mentioned its strategy as :



ERRA COMPLIANCE UPDATES January 2008

3 TIMBER FRAME (DHAJJI)

ISSUE

I- Dhajji Double Storey

- 2 storey houses in Dhajji Construction.

SOLUTION

- The specifications already issued for Dhajji houses are good for single story construction only.
- Therefore, double story houses using same specifications are non-complaint.
- However, the houses using improved specifications i.e. large sizes of timber members and stronger connection may be referred through Non-compliance Referral System with proper documentation.

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Figure 6.54 — Instructions about two storey dhajji house. Source : [ERRA, 2008a]

Figure 6.55 — Flat roof with no connections with the walls. Source : S. Abidi

"A final technical inspection of the roof will be made for compliance with structural designs provided." ([ERRA, 2006])

However the last tranche was delivered to the community on lintel level compliance, without assessing roofs. UNHABITAT independently started an assessment of roofs but this program was on small scale and did not have its impact on whole rural area of Kashmir. As ERRA inspection was terminated on lintel level, community was free to adopt any style for roof construction. As roofs were not assessed, few cases of flat CGI roofs are also observed in the area (figure 6.55).

3. The system of financial aid

When people were asked ; "Was ERRA financial aid sufficient to build a house for 7 to 8 people?" Everyone replied "No". ERRA financial assistance did not have a direct impact on tower roof construction. It however promoted the reasons which ultimately resulted in tower roofs. Different related aspects are discussed step by step.

a. Volume and uniformity of aid

A uniform package of PKR 175,000 was offered to all affected families. The average size of family in Kashmir is 7 (AJK Official Website). The aid amount was not sufficient for the people to construct a house for a big family. This system was a better solution to avoid administrative issues of assessing needs and compensation of a family (which could ultimately result in a slow reconstruction rate). But on the other hand families with more members (and needing more space) had to resolve the issue of space themselves.

b. Families got separated

To construct a suitable house, families started becoming split. One family which had a seven-member extended family became nuclear with average size of two to three members. People mentioned to the authority that they lived in nuclear families prior to earthquake too. Owing to absence of detailed pre-earthquake data of families, authority considered one extended family as 3 nuclear families (for details see change in family system section of this chapter).

c. Families had less land in new scenario

When families became nuclear, though now they could enjoy three financial packages instead of one, they were lacking land for construction. During surveys it was observed that two types of families were short of land[1].

- Those who got separated from extended families and reconstructed on agricultural land
- Those who got separated from extended families and reconstructed on pre-quake house land

In former case, people did not want to waste agricultural land hence they tried to build on lesser area. In second case one big house land was to be used for almost three houses. By subtracting circulation areas people were left with small pieces of land for construction. This reduction of horizontal land resulted in vertical expansion of houses in the form of tower roofs.

4. Site supervision

During pilot surveys when people were asked, ”If ERRA had objected someone on site

[1]Another type of case is of those who lost their land in landslides and constructed new house on relocated land under ERRA's program for landless but this category was not found in the surveys.

to build tower roof ; could such construction prevail?” All of the respondents replied, ”Yes, because ERRA asked to build it”. This response was surprising as no policy was seen on tower roof till then. However compliance catalogue has a section related to this practice and will be discussed in next point. Here those attics are centered which had more heights, were observed by the site supervisors and could be banned by them but they did not. Monitoring and evaluation was of key importance to spread/squeeze the tower roof. As stated by GFDRR (2012), earlier problems are not easily detectable but solvable whereas later problems are easily detectable but insolvable. During reconstruction, houses were at different stages in any specific time. For example if few houses were practicing tower roof, others were on lintel level ; still others were laying the plinth. There were cases found where no work was started at all. Hence tower roof did not take its roots after the site supervisors (authorities) had left the area. But as mostly this roof is made of light weight CGI sheets and timber frames, implementers could not make any objection on its design, material and construction. More specifically, they had no direct policy on tower roof. Moreover site supervisors had the primary goal of guiding people up to lintel level ; they did not interfere in this construction.

5. Allowing ceiling and permitting storage in the roof space : An invitation to build tower roof

In the Compliance Catalogue it is mentioned that (figure 6.56) :

- A ceiling structure adds bracing and stiffness.
- Storage in the roof space should be evenly distributed.

These two points had a direct impact on the spread of tower roof. People were asked to add ceiling and make a space above the ceiling for storage. Although these two policies are good solutions for structural stability and the storage provision but all the attic related details are missing in the documents. It is not explained that

- What is meant by **evenly distributed** storage? Is it based upon the number of items or the weight of items?

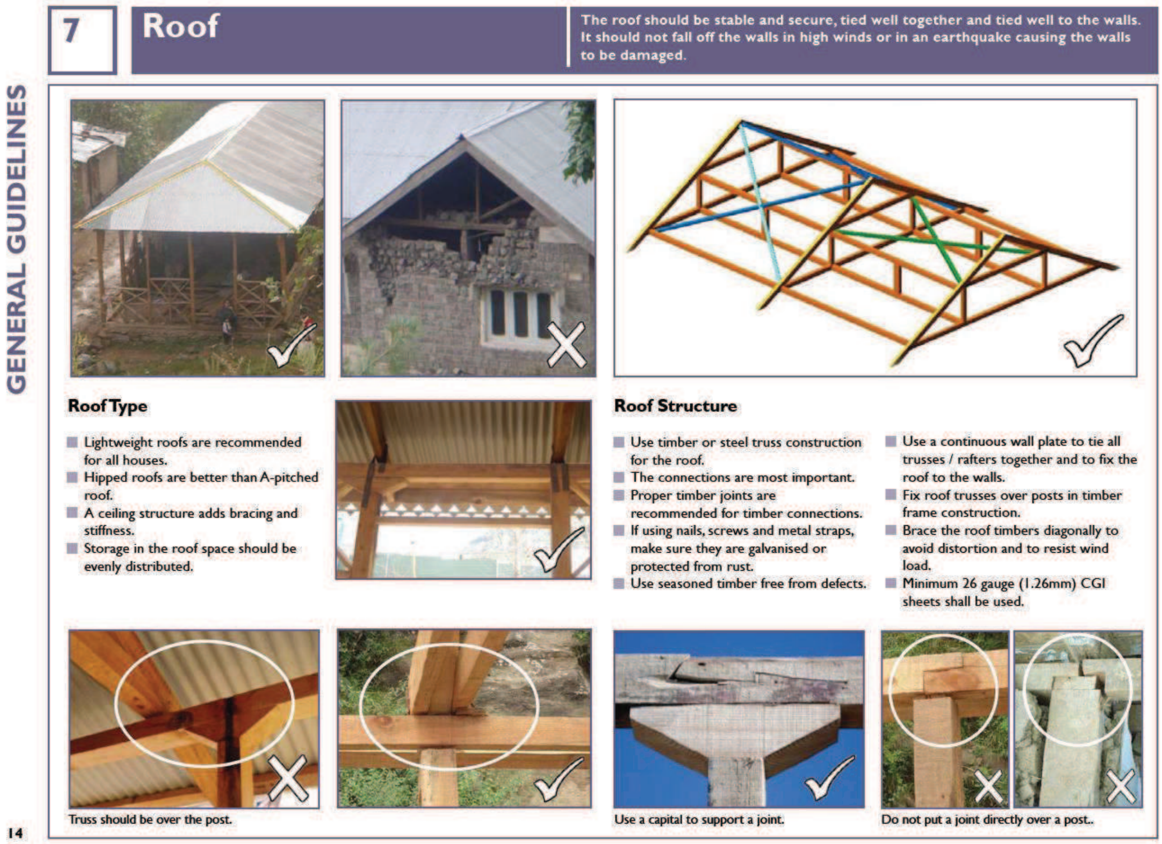


Figure 6.56 — Guidelines on ceiling and storage. Source : [ERRA, 2008a]

- What should be the **per unit mass of the storage** items in the attic? Can additional timber be stored in the attic? Surveys show that storing timber in huge quantities is a culture in rural Kashmir (figure 6.57).

- How one should **access** that space?

- What should be the **height** of the storage space? To avail the attic for storage, one has to build the roof of attic at least as high as average human height so he can stand there easily (no one can crawl to use storage space ; although people do it in tower roofs with no break or negligible break). This simply means increasing the original prescribed height of the house. By remaining the height of the house low, storage becomes difficult (figure 6.58). This policy has also lead to increase the height of the houses.

Figure 6.57 — Huge quantity of timber is stored in the houses. Source : S. Abidi

Figure 6.58 — User has to crawl in the attic where no reasonable height is provided. Source : S. Abidi

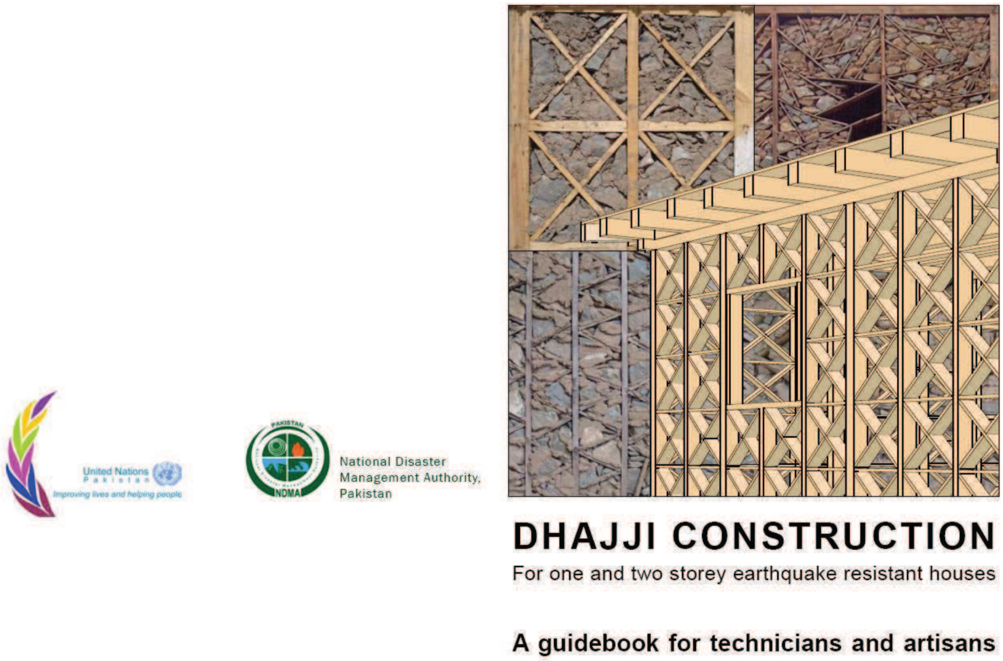


Figure 6.59 — The cover page of dhajji manual, 2010. Source : [Ali and Schacher, 2010]

6. The non availability of latest information material on construction

This reason is more associated to the spread of tower roof in recent days. It was found during surveys that masons were unaware of the manual prepared jointly by National Disaster Management Authority (NDMA) and United Nations (Authors : [Ali and Schacher, 2010]) for one/two storey earthquake resistant dhajji house construction in 2010 (figure 6.59).

All of the respondents from under construction houses expressed their liking for tower roof houses (figure 6.60). This inclination shows that tower roof construction is deeply penetrated in the society. Even if people do not require space now, they find it a better solution for future family needs.

6.1.5.2 Socio-cultural characteristics

This was not just ERRA's policies which compelled people to spread tower roof on such a large scale rather few socio-cultural characteristics of the community are found which are linked with this architectural novelty.

Figure 6.60 — Exterior and interior views of different under-construction houses in Muzaffarabad. Source : S. Abidi

1. The way they built : Lari houses

During one to one interview, an ERRA official linked the tower roof with the attic provided for storage in multi storey houses. Those houses were frequently found in the Neelum Valley (a valley in Kashmir) where ground floor was used as cattle sheds, the middle floor/floors were occupied by the residents and attic was left for storage purposes (figure 6.61). Eight such houses were also present in the surveyed areas. Those houses were more commonly named as Lari. In that particular case the walls were run throughout the height of the house and there was no variation in vertical structure.

Mason Qayoum mentioned the existence of tower roof in pre-quake architecture of Kashmir. He practiced tower roof as he learnt it from his father. What he expressed :

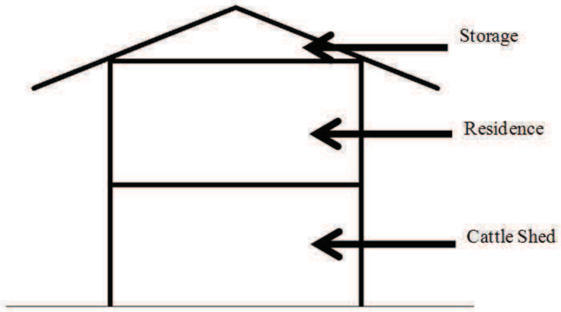


Figure 6.61 — A typical Lari house found in Neelum valley of Kashmir before 2005 Earthquake. Source : S. Abidi

Figure 6.62 — Attic in urban buildings of Kashmir. Source : [UNDP and UNESCO, 2007]

"The community was familiar with this structure before earthquake but its practice was rare in rural areas of Kashmir. People either used tower roof for storage purposes or this was left as dead space to thermally insulate the house in extreme weather conditions. However the height of tower roof was always lesser which we do not find in few cases of post quake tower roofs."

A link of tower roof with pre-quake Kashmir construction can be found in the manual prepared by UNDP and UNESCO for Indian Administered Kashmir reconstruction. However they had tower roof with gable roofs (figure 6.62) while now in AJK mainly hipped roofs are in practice.

This is true that the culture of rural surveyed areas of Kashmir to build such houses was limited to few units ; they were familiar with this style. However the acceptability of tower roof has few other socio-cultural reasons as well.

2. Living in large spaces

Kashmiris have the culture of living in large spaces. One of the reasons of quake destruction is identified as the collapse of large rooms. To avoid seismic failure of structures, the limit of unsupported room size set by technical experts was 15'x15' ([ERRA, 2008a]). Rooms larger than this limit were proposed to be braced.

As tower roof provides uninterrupted space for the residents, it became an attraction for Kashmiris. In most of the houses partition walls are not observed in this space. Tower roof hence becomes perfect for living rooms.

All the respondents mentioned this aspect to be the primary reason for selecting tower roof.

3. Replication It was a common practice by the community that they used to copy the structures from others. In Kashmir after earthquake few NGOs built shelters for immediate needs but people copied them for the construction of their permanent houses (Mumtaz et al, 2008). This behavior was also evident in the surveys with reference to the spread of tower roof. 122 out of 217 house owners mentioned one of the reasons to practice tower roof : "we constructed it because all others were constructing it". It was obvious through their responses that they had waited for a reliable person (might be a mason or a well educated neighbor etc) to commence this structure. While they observed the advantages of tower roof, they started replicating it. The respondents also mentioned that ERRA asked them to build tower roof (as stated earlier).

4. Aspiration to beauty & modernity All of the 217 respondents consider tower roof as a beautiful addition in the architecture of Kashmir. Though every one told that he adopted tower roof unwillingly in the start, he admired the new form of his house. According to the community, pre-quake houses were not as attractive as post quake houses are.

Table 6.1 — : Different purposes of tower roofs in the surveyed houses

Category	Storage Space	Bed Room	Dining Room	Guest Room	Multipurpose Space	Total
Cases	152	12	7	3	30	204

The aspect of modernity was noticed through the responses of people who are practicing tower roof for new house construction. They consider tower roof to be a modern structure.

6.1.6 Utilization of tower roof

The surveyed houses have the utility of tower roof as storage, bed rooms, guest rooms or dining room while many are using it as multipurpose space (table 6.2). The multipurpose space here is that which is used as bed room, dining room, store room and guest room at the same time. Leaving 14 under construction houses, the utility of tower roof can be categorized as :

6.1.6.1 Storage space

All the spaces where roofs have no/negligible breaks are used for storage purposes. The other spaces like bedrooms, dining rooms etc also found to have the storage items. Here the eaves are utilized to store wooden logs in almost all houses (figure 6.63). It was found that people store timber panels and boards in great quantity. Grains are also stored in the attic. People store their quilts and cotton mattresses in the metal trunks which are placed in the tower roof. Suitcases and other belongings were also found here.

6.1.6.2 Bed rooms

The bedrooms in tower roofs are not like the urban style bedrooms. The beds are basically charpais (char means four and pai means stands) which are traditional beds made of jute or

Figure 6.63 — Left : wooden logs and boards are stored in the eaves ; Right : planks are scattered on the floor. Source : S. Abidi

Figure 6.64 — Different types of charpais (single beds) found in Kashmir. Source : S. Abidi

nylon (figure 6.64). These charpais are not always placed in tower roof ; they are mainly available on ground floor and taken to the attic whenever necessary.

Second type of bedroom is that where just cotton filled mattresses are spread on the floor for sleep purpose. After use, these mattresses are stored in the same space (figure 6.65).

6.1.6.3 Dining room

Dining space is designed in tower roof only where many guests are to be served at same time (figure 6.66). This was mostly practiced during wedding ceremonies. Kashmiris have a culture of having meals in the same area where food is prepared. This area is not necessarily a kitchen ; it might be a room which serves the purpose of cooking, dining, living and sleeping. As kitchens (rooms with cooking provision) are on ground floor, families generally are used

Figure 6.65 — The cotton mattresses are encircled in the Photo. Source : S. Abidi

Figure 6.66 — The boards placed on the sides of tower roof ; these serve the purpose of dining table. The bed (charpai) laid aside is used to sit for meals. Source : S. Abidi

to have meals there. Chimneys which have their origin in the ground floor pass through the eaves of tower roof (figure 6.67).

6.1.6.4 Guest room

Just 3 houses have allocated the space of tower roof for guests only. Here the entrance of guests is made directly from outside to the guest room (figure 6.68). The family living in the house occupies this space in case there are no guests.

Figure 6.67 — Left : venting pipe passing through the eaves. right : the same pipe projecting out. Source : S. Abidi

Figure 6.68 — Direct access for guests to the guest room. Source : S. Abidi

6.1.6.5 Multipurpose space

30 tower roofs do not have separation for different rooms (figure 6.69). Among these 30, 21 are just halls while 9 have (structurally) insignificant separations (as just hard boards are erected with the help of nails). Beside storage, sleeping and eating functions, wet clothes are sometimes spread here. In Kashmir, rain and snow fall make it difficult to leave the clothes under open sky for drying.

Figure 6.69 — Left : clothes hanging on the rope ; right : metal trunk and other storage in tower roof. Source : S. Abidi

6.1.7 Is tower roof a sustainable construction? Community responses

As discussed in last chapter, this is not only construction style which produces sustainability rather this is also the way community practices it. Second dimension of sustainability is that people must be satisfied with what they have. If they are not, they can move towards susceptible solutions of their problems. To analyze the tower roof from community point of view, different questions in the surveys were asked. The responses helped explore the embedded merits and demerits of this space. In addition to community responses, all the aspects are dicussed according to personal observations too. This has provided a comparative analysis of what people think and what the experts consider about any specific feature of tower roof.

6.1.7.1 Tower roof and earthquake resistance

What do people say?

Except 3, all the respondents said that tower roof is earthquake resistant construction.

Personal observation :

The natives of Kashmir have learnt several lessons about earthquake resistant construction techniques. One of these lessons is that lighter construction is better construction. All of the 204 tower roof houses which were surveyed during this study had used CGI sheets to

Figure 6.70 — Tower roof with accommodation. upper storey sheeted out in CGI sheets adopting light weight solution. Source : UNHABITAT Unpublished Draft, 2012

clad the walls. These sheets are light weight material and can be easily installed resulting in seismically safer construction.

Although UNHABITAT has categorized the house mentioned in figure 6.70 a good example of tower roof but none of the surveyed houses is having only CGI sheets ; wooden frame is also provided in all of them. The rafters and purlins are made of timber and are connected together by nails or joinery (figure 6.71). Guidelines provided by ERRA were not centered on tower roof construction with high walls. The specifications of walls of ground floor were devised considering the roof truss construction. Tower roof uses additional timber hence the ground floor walls bear more loads which can result in a seismic-susceptible structure.

The houses having no/negligible break in the main roof are found closest to the ERRA guidelines as far as the frame and cladding are concerned. But the same time few other examples are observed which, though fall under this category, are highly earthquake vulnerable. Figure 6.72 shows two houses which have minor breaks in the roof but the span of roof generates 6 to 8 feet height of tower roof. This is almost as another storey.

Huge quantity of timber stored here is also a threat. The weight of the ceiling on the ground floor walls increases to great extent which can fail the structure in earthquake event.

6.1.7.2 Tower Roof and Strength

What do people say?

All of the respondents find tower roof a strong construction. During discussions it was

Figure 6.71 — Rafters and purlins in timber frame. source : S. Abidi

Figure 6.72 — Although negligible break in the roof is evident, the span of the roof has increased the height of attic. Source : S. Abidi

found that people tried to defend this construction.

Personal observation :

The strength of tower roof is explored with two variable loads :

1. Wind Load
2. Live Load

It was read in a local news paper that 80 CGI roofs were blown away in Haveli and dozens in Bagh (Two districts of Kashmir) during March 2012 stormy winds ([Newspaper, 2012]). Hence it is deduced that the strength of practiced pitched roofs is in question. If only CGI sheets are used to build tower roof (as mentioned in UNHABITAT unpublished draft), they can not resist the wind load which sometimes rises up to 150 Km/h during storms (Pakistan Meteorological Department). Additionally, ERRA had provided guidelines to avoid wind load but people have not followed these rules (figure 6.73). As prescribed in Compliance Catalogue, 2008 :

- **Brace the roof timbers diagonally to avoid distortion and to resist wind load (see figure).**
- **The roof should be stable and secure, tied well together and tied well to the walls. It should not fall off the walls in high winds or in an earthquake causing the walls to be damaged.**

Not a single house is found to follow this rule ; timbers are not braced diagonally (figure 6.74).

Houses where attic is used as dining space for the community members during wedding ceremonies are found at risk. The structure which is designed for few people has to bear the weight of more than 60 people at the same time. In this scenario the floor of attic can collapse even without any earthquake.

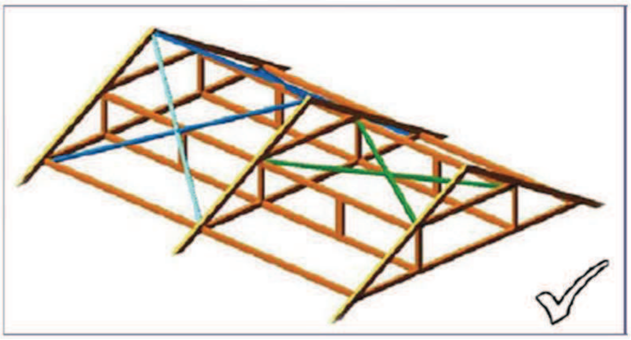


Figure 6.73 — ERRA guideline to brace the timber elements. Source : [ERRA, 2008a]

Figure 6.74 — A view of tower roof frame from the ground floor. no diagonal elements are observed. Source : S. Abidi

6.1.7.3 Tower roof and cost

What do people say? People did not consider this structure to be a costly one. Even those who had to buy extra timber to reconstruct, find it relatively cost effective. Personal Observation : It was noticed that the more rich a family is, the more variety it puts in the tower roof construction. The CGI sheets which were provided to meet the immediate shelter needs in the aftermath of earthquake were reused to construct tower roof in many houses. Timber panels, logs and boards were also reutilized in this construction. Old windows and doors were placed in the new structure which helped the community to cope with the financial crunch.

Figure 6.75 — Left : A ceiling is added to make a user friendly cuboid ; right : attic has a pitched roof. Source : S. Abidi.

6.1.7.4 Tower roof and thermal & noise insulation

What do people say?

People find the attic to be relatively colder than ground floor. The issue of noise produced due to rain or hail is also mentioned.

Personal observation :

Tower roof structures surveyed during this study had two types of internal spaces :

1. Flat ceiling was added to make a cuboid (Only 5 such cases are found).

2. Roof was left pitched (199 cases).

In the first case, tower roof has walls made of CGI sheets but a ceiling is added beneath pitched roof (figure 6.75, left). This ceiling is generally made of chip board or hard board. The upper part of the tower roof is left as dead space and no activity is performed there. The lower area becomes a user friendly cuboid as it is warmer in winter. Noise created by hail or rain is also reduced to a great extent. In the second case, tower roof is thermally less insulated area as roof and walls are made of CGI sheets (figure 6.75, right). Though CGI sheets protect the structure from rain induced water, this space gets extremely cold during winter. In both cases tower roofs are good above ground floors as an insulator against extreme weather conditions.

6.1.7.5 Tower roof and access to attic

What do people say?

The respondents mentioned that it is not easy to approach tower roof.

Personal observation :

The current study is in accord with the respondents. Staircases are not observed inside or outside the houses. Two means of access are found in the rural areas of Kashmir to approach tower roof : 1. Attic/loft ladders to climb up from ground floor 2. Direct access from adjacent mountain

In first case generally wooden loft ladders are used to reach the tower roof (figure 6.76). These ladders are placed on the ground floor, inside the house. A variety in the form, material and size of the ladders is not found. The risers are found between 8 to 12 inches while treads lie between 4 to 6 inches. Though bamboo ladders are common in other areas of Pakistan, the study did not discover one in Kashmir. The ladders placed on the ground cover a run of 3 to 5 feet.

In second case the house has both ways to enter the attic i.e. from ground floor and from the neighboring mountain (figures 6.80 and 6.81). A door is provided in the wall of attic which generally remains locked unless some guests are to enter the space from outside. This way provides privacy to the resident women as well.

The opening in the ceiling which allows an entrance to the attic from ground is covered with a door if a second entrance is also there (figures 6.77 and 6.78). However it is open in case only single access is provided. Both the accesses were found treacherous. Loft ladders do not provide a safe access to the upper portion. They become more dangerous when one has to take a heavy object with him. As many houses have bed rooms in the attic, big volume objects like charpais (single beds) and quilts are sometimes have to be taken from the ground. By holding such objects, one can not keep his balance. This way of access is extremely unsafe especially for the children and old age people. Similarly second option is also not much safer. In figure 6.79 (left), owner of the house is jumping a three feet wide ditch to reach the door. He unlocked the door by standing in the position shown in the photograph. Figure 6.79 (right) shows the wooden board which he placed for the surveyor to

Figure 6.76 — Wooden ladders belonging to different strata of families. Source : S. Abidi

Figure 6.77 — The punctures in the ceiling to access tower roof. Source : S. Abidi

Figure 6.78 — The ceiling showing opening to enter tower roof. Source : S. Abidi

Figure 6.79 — Access from adjacent mountain, Thub. Source : S. Abidi . Source : S. Abidi

cross the ditch. Several cost effective and user friendly solutions can be offered to overcome access issues but for this purpose an interaction of experts and the community is essential.

6.1.7.6 Tower roof and maintenance

What do people say?

People say that they do nothing to maintain the roof and walls of attic. But 32 respondents mentioned the primary issue as rusting ; 11 complained about water seepage.

Figure 6.80 — Access from adjacent mountain, Salmia. Source : S. Abidi . Source : S. Abidi

Figure 6.81 — Access from adjacent mountain, Jabar/Jandali. Source : S. Abidi

Personal observation :

Not saving the CGI sheets from water can damage the structure in future. This issue is discussed in detail in chapter 7.

6.1.7.7 Tower Roof and environmental degradation

What do people say?

No one mentioned that tower roof is a threat for the environment.

Personal observation :

If structural timber comes from managed forests, it may be called a renewable and sustainable material. The growing of timber benefits the environment, and its harvesting, production and transport are seen to produce less CO2 than other construction materials such as concrete and steel. The environmental benefits of timber frame construction are reduced when timber is imported from sources outside non local and requiring substantial fuel consumption in transportation ([Studies, 2003]). UNHABITAT launched a program to assess roofs of Kashmir. They surveyed more than 1000 houses and found different roof related issues. Advice on more efficient use of timber was provided in some areas but no comparison between wood consumption of two storey houses and tower roof houses is provided in the reports. However for tower roof it was found that the wood consumption was excessive in its structure. As an excerpt from rural housing progress report (August-December 2008 ; [UNHABITAT, 2009]) says :

..... the new pattern of constructing 'tower roof' as the second storey in timber frame (and to a very less degree the endorsement of Dhajji construction), has resulted in the cutting of approximately 250,000 trees for reconstruction.

The statistics of the impact of tower roof on the environment can not be provided in this study however a passage from ERRA International Conference, ([EIC, 2010]), page : 75 can be referred :

With regard to sources of timber for reconstruction, Mr. Lutfi listed recovery from damaged houses, timber depots, guzara forests, and illegal cutting of protected forests. He said it was very difficult to estimate precisely how much was coming from each source, but field *surveys of over 132 villages and 2,100 houses indicated that 25-46% was recovered timber, and 54-75% was new timber. He calculated that the new timber used in rural housing reconstruction was equivalent to 262,833 trees.*

During the same conference, Maggie Stephenson provided a comparison of dhajji house with simple hipped roof and brick house with tower roof (ERRA International Conference, 2010, page : 36) :

Referring to the need to protect the environment and natural resources such as wood, Ms. Stephenson pointed out that dhajji construction used far less timber than modern construction techniques. A house built of dhajji walls and a simple roof used 300 cubic feet of timber compared to 342 C. Ft. for a comparable size house made of brick walls and tower roof

Where less timber consumption could be devised through experts' opinion, its excessive use appears threatening for the environment safety.

6.1.7.8 Tower roof and the change in its current use

What do people say?

People were asked during 2011 surveys, "do you plan to add a kitchen/toilet/bathroom in tower roof in future?" 65 out of 79 said, "May be". But they never thought about it before.

During 2013 surveys 37 said that they can plan to take their kitchen in tower roof. 2 said that a bathroom can be added here if the floor is finished with tiles.

Personal observation

It was explored during surveys that kitchen and toilets were not available in many of the reconstructed houses (rooms and verandas are used as kitchens). If people are willing to construct any of these spaces in tower roof, detailed structural analysis would be required to avoid instability of the house. Second issue as discussed earlier is that people copy one another. If one individual will start modifying the use of tower roof, others will immediately commence following him. This can lead to a physically vulnerable society. While timber is exposed in present structure, risk of fire can not be ignored if kitchens are built here.

Simultaneously, water will also be a threat for the structure if it does not get channelized properly.

If bathrooms are built here, structural complications can lead to susceptibility of the house. Water can damage dhajji houses adversely as a result the structure will not sustain the seismic tremors.

6.2 Change in family system

While forming policies decision makers sometimes can not foresee the way which community will select for moving forward. Rules are made with set parameters and it is expected that people will follow them according to pre decided patterns but it does not happen always. This phenomenon was observed when extended families started to become nuclear in the aftermath of earthquake.

6.2.1 Cultural characteristic : Family system

In pre-earthquake scenario Kashmiris had a tradition of living in extended family system. If extended family was split, the nuclear families were mostly settled in close proximity. Average family size was 7.2 (AJK Official Website) in Kashmir while 7.1 in Muzaffarabad and 7.4 in Bagh ([ERRA, 2007g] ; [ERRA, 2007c]). The present study explored the culture of getting separated from the extended families. It was stated after UET, Lahore 2010 pilot surveys that extended families have become nuclear families during the reconstruction. To test this hypothesis the pre-quake family system had to be explored first.

The surveys discovered that before the earthquake if a family's elder son got married, he resided with the family for few years and afterwards got separated. Similarly other sons separated from parents after marriage. The parents hence resided with the youngest son even though he got married. In many cases, if the parents had grand houses, their sons resided with them for long time. The situation became bit different if houses were multi storey. In this case every son occupied one floor with his family. With extended families people not only resided together, they equally shared all the responsibilities. For financial assistance, mostly everyone shared same amount for monthly expenditure. But in case one couple was economically weak, others tried to take all the responsibilities to give him relief. The kitchens were generally combined ; even if people resided on different floors, they used to eat together. Crop yield was for ”family” not for ”individuals” or ”couples”.

After the earthquake of October 2005 it was observed that a great number of extended families became nuclear during reconstruction period. UNISDR, 2004 document considers the extended families as the strength of the society ([UNISDR, 2004]) :

A foundation of disaster risk reduction throughout the Pacific is that island communities have inherited a resilient social system. The strength of this system is in its extended family values and communal mechanisms that link to national systems. It requires only a little restructuring and advocacy to integrate these into a practical organizational framework that will foster ownership and promote joint participatory approaches to mitigation management between government and other stakeholders.

The change in family system of Kashmir enhanced/reduced the social vulnerability of different groups differently. With the help of survey results the diverse dimensions of this change will be described.

6.2.2 Change in family system : In the light of policies and socio-cultural characteristics

Though unintentionally but the authorities and different socio-cultural aspects of the society drove this shift.

6.2.2.1 Authority’s role

Three dimensions of authorities’ role influenced this shift

1. Non availability of data on pre-quake houses

2. Policies of ERRA

3. Corruption

1. Non availability of data on pre-quake houses

The last census conducted before the earthquake was of 1998. During seven years many changes were obvious in the region ([ERRA, 2007g] ; [ERRA, 2007c]). The real situation of destruction in the rural areas of AJK could not be properly estimated for rescue and relief operations ([Authority, 2006]).

With this situation ERRA had no idea that how many houses were actually damaged. As stated by an ex-official of UNHABITAT, ”Prior to earthquake, authorities had the record of 200,000 houses to be completely destroyed in all earthquake affected areas but when we carried out household and livelihood surveys to substantiate damage assessment, the figure changed to 600,000”. Moreover it is mentioned on SERRA official website that the affected population was 1.8 million. If 7.2 was average family size, house destruction could not exceed 250,000 units ; on contrary it was reported around 314,474. It is therefore obvious that number of housing units was increased during post-quake reconstruction.

This increase in destroyed houses number was not only due to the increase in population but other reason mentioned by several respondents was that people made fake cases to avail ERRA financial grant. This was done only because population statistics were not updated since 1998. If it is considered that above mentioned discussion does not have strong proofs of increase in number of housing units, the discussions with house owners unveiled numerous fake cases of CDs (completely destroyed houses). This aspect will again be discussed later in this section.

2. Policy of ERRA

None of ERRA policy changed the family system rather it produced room for this change.

The policy of ERRA which influenced family structure of AJK most is one stove-one compensation. In Rural Housing Reconstruction Program (RHRP) ERRA had the policy of giving PKR 175,000 to one completely destroyed (CD) house. This amount was not sufficient to rebuild grand houses for extended families. Ultimately a shift towards nuclear family system was a better solution for earthquake victims. Generally people gathered salvaged material on agricultural land where they did not have any house before earthquake. The surveyors from authorities considered it as CD and approved it for financial assistance.

The detailed discussion is available in section 6.1.5.1

3. Corruption

The respondents in the surveys mentioned this aspect. According to them three groups played a role in changing the status of partially destroyed house (PD) to completely destroyed house (CD) ; the patwaris (who keep a record of land), the social mobilizers, and the AI team members. People mentioned that by giving few thousand rupees to the patwaris, they could get a proof of CD and hence an additional financial assistance from ERRA. According to UNHABTAT official, the authorities were guided by the social mobilizers about the existence of pre-quake houses. People, who wished to get additional financial support, approached these mobilizers to mention them as a nuclear family. Few respondents told that ERRA AI teams received bribe and changed the status of houses. ERRA itself was also found unable to audit the cases properly. Here are few excerpts highlighting the storeys behind the scene. According to Pattan Development Organization ([PDO]) :

”At a seminar held in Islamabad on Tuesday, officials of the Earthquake Rehabilitation and Reconstruction Authority (ERRA) admitted the shortcomings of ERRA and post-earthquake corruption.”

The most alarming report was published in a daily, Dawn, 14.04.2008 ([Khan, 2008]) :

”A review of 4,267 assessment forms showed that the authority had paid Rs 94.125 million at Rs 75,000 per head to 1,255 individuals whose forms had been marked ‘no house‘ or ‘rejected‘ by the army’s inspection teams.

These payments were made without adhering to prescribed checks and internal controls at the assessment, processing and payment stages.

During audit and field visits, it was observed that the basic manual record provided by assistance and inspection teams lacked information critical to the process of assessment and filing of forms.

It was noted that net disbursement of Rs 410.77 million required confirmation.

The audit also found that beneficiaries were overpaid Rs1.35 million. In six cases, Rs 400,000 was paid twice on rent forms bearing the same identity cards while Rs275,000 was *paid to four beneficiaries without MoU.*

In nine cases, damage assessment forms were accompanied by computerised national identity cards (CNIC) which differed from the ones on MoUs, but the authority paid Rs75,000 to each of the claimants.

In 13 of the cases, signatures of the patwari and representatives of the Army Engineering Corps and the government did not tally with their signatures on other forms from the same area.

ERRA also paid advances amounting to Rs50.7 million to the Army Engineering DTE of the GHQ for inspection of rural housing and Coordinator Livelihood Cash Grant for training and workshops. Only Rs12.5 million was subsequently verified. During scrutiny of complaints received by the disbursing agencies, it was observed that at the initial stage, army's inspection teams had entered incorrect or incomplete data, rendering individuals ineligible under the criteria set by the authority and the same was processed by NADRA, thus delaying or denying payment to beneficiaries.

The audit noted that the financial management capacity at the authority's headquarters and its representative units in Azad Kashmir and the NWFP needed to be strengthened. It was observed that Erra did not put in place effective Management Information System (MIS) with banks for tracking of funds, because of which Erra, Provincial Earthquake Reconstruction and Rehabilitation Authority (Perra) and State Earthquake Reconstruction and Rehabilitation Authority (Serra) were unable to confirm the status of payments to beneficiaries.

The financial review also revealed that Rs3,311 million of the total housing reconstruction cash grant had not been confirmed by banks till November 2006 for funds released to beneficiaries till June 30, 2006."

6.2.2.2 Socio-cultural aspects changing the family system

Besides aforementioned policy/implementation-oriented reasons, two main factors are found under this study for rejecting extended family system and adopting nuclear family structure :

1. Deprivation

In an interview, Israr Ayyub (ERRA) highlighted this fact. He said,

"If a nation has experienced centuries of slavery, it does not behave the same manner as free nations do. As Sub-Continent was ruled by different emperors and suffered from colonialism, deprivation has become its cultural part. Owing to this, no matter people need money or not, they will try to avail every possibility of financial assistance. In the aftermath of earthquake, people exploited ERRA policy. They made fake cases of CDs to avail maximum funding from the authority. Just to acquire more money, they did not consider the consequences. Hence even if the family members wanted to live together, they were split in the form of nuclear families." This aspect was never mentioned in any of the surveys conducted in both districts. Although people told that false claims were made to avail aid, they had not pinned point the responsible characteristic as deprivation.

2. Disputes among family members

The reason mentioned by the respondents was mainly that they had issues in joint family. Generally the differences between personalities of family members aggravated when they got married. More problems were experienced when disputes were transferred to youngest generation. The same feature was also mentioned by few policy makers.

2011 Survey Results :

During 2011 surveys, shift in family system was not quantified. A general discussion on this shift was however conducted with all the 80 families. In the surveys the most satisfied group of people found for nuclear family system was young women.

The Positive Aspects of This System Revealed By Every Young Lady Were :

We have lesser responsibilities than before. It was observed that young people are a bit reluctant in looking after elders. Similarly women do not like to be responsible of other couples' children.

We can bring up our children as our own will. In joint family system often the grand parents look after children and parents do the work of house. Consequently children are more influenced by grand parent's personalities. Parents, especially mothers, want to raise their children according to their priorities, which is somewhat impossible in extended families.

We have liberty. In joint families everyone is answerable to all. Women have to be too careful in shopping, outing and spending money. We can stop extravagancy. The couples who earn more sometimes have to spend more in extended families. Most of the women appreciated new lifestyle after earthquake as they could save the income of their husbands for the future of their children.

Issues Created by Nuclear Family System

This shift in family structure also generated several issues among families. The major drawbacks revealed by people of different age groups were :

More responsibilities. Though nuclear family system has reduced the responsibilities in some cases, it has enhanced many others. Respondents told that before earthquake every person had a specific task to accomplish. In this way everyone could select his favorite job and had nothing else to do whole day. Rest of the time could be utilized to meet neighbors, see parents (of married women), do embroidery (a renowned feature of Kashmiri women) or any other preferred activity could be carried out. In divided families one woman has to do all jobs without any help.

More financial burden. The couples, who had low income before earthquake, could easily manage basic needs of their children in extended families. They had to share a little for the meals and monthly expenditures. In case there was a financial problem with them, they could enjoy food prepared for all. In nuclear families no one can go to others home for every meal. The couple has to manage basic required items in any case.

Few respondents mentioned that in pre-earthquake life style they had to share a particular amount. But these days they spend money in their homes as well as they have to give a handsome amount to their parents. This way, financially they are more stretched in post-quake situation.

Insecurity. This demerit was mentioned by every woman, even though she preferred nuclear family. In Kashmir there are limited ways of earning. People either go to other parts of Pakistan or they go abroad for work. There is no tradition of taking the families along hence women and children have to live in native land. In extended families one or more male members were always present to look after rest of the family. If the family had no young male member, father or father in law was considered to be a support for the whole family. In new family system women have become insecure. They not only have to do work at home they also have to perform outside-home tasks. Many respondents mentioned that the worst situation is when there is a medical emergency.

Changed position of wadairas (elders). In pre-earthquake scenario extended families were governed by a wadaira which was the eldest person of family. All the disputes and matters were presented in front of him and he had the right to give decisions. Nobody could dare to argue or disrespect. Wadairas were present on village level too. Elder people of the village were given respect in all matters. In post-earthquake situation when the families became nuclear, these people have become a less important person. Consequently families now have no option for resolving small disputes which by time become large disputes.

2013 Survey Results :

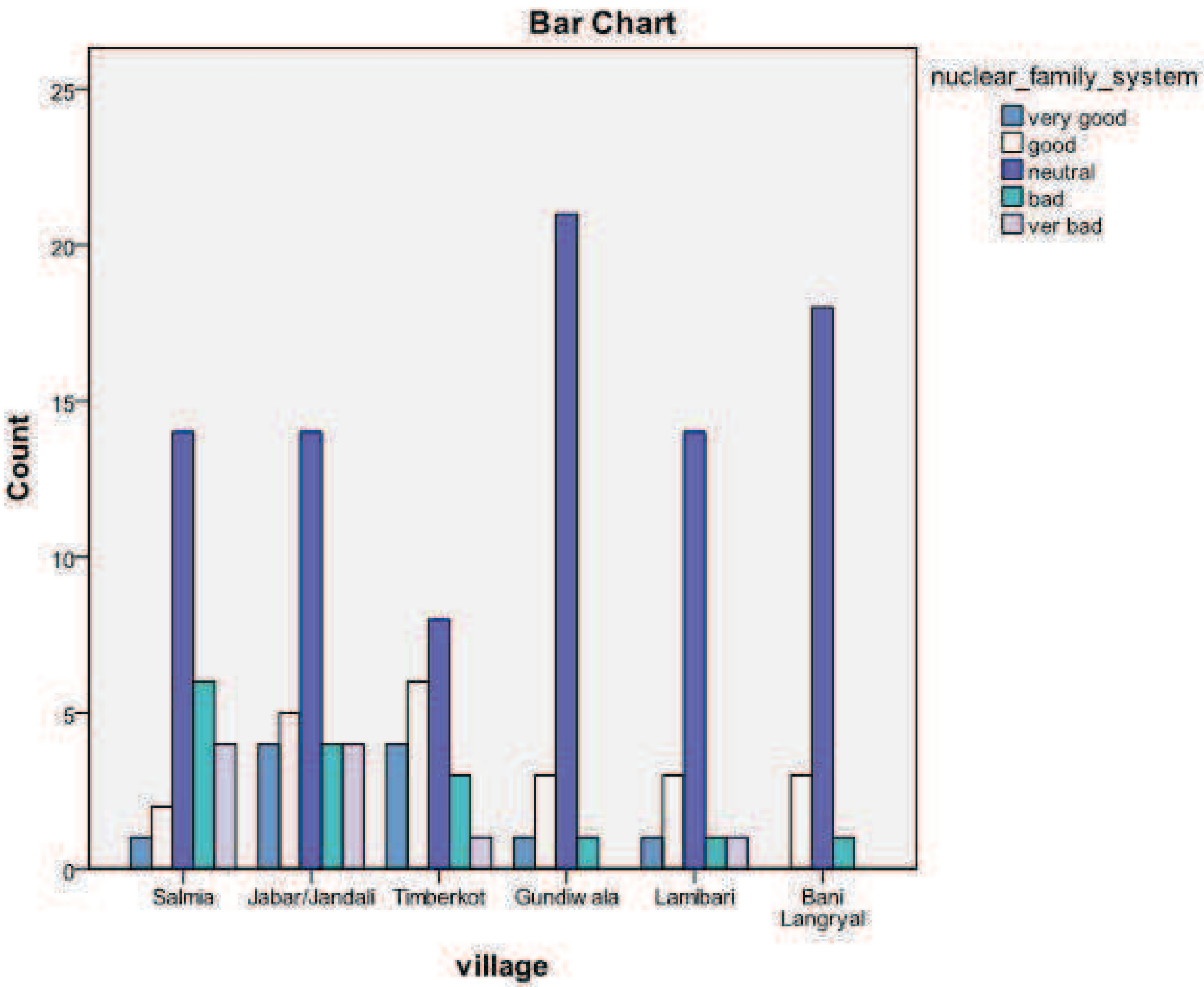
Here it will be discussed that how people rate the new family system with reference to social, cultural, economical, environmental, ease, functionality and durability dimensions. Seven options under positive and seven under negative aspects of nuclear family system were given to the respondents. They had to mark whatever they thought about merits and demerits of residing independently. This questionnaire was given to all families ; no matter extended or nuclear.

The analysis of responses does not provide sharp quantities of every aspect. It is considered that more positives and fewer negatives mentioned will generate a positive inclination of people for the nuclear family system. If they had selected all the positive and negative aspects, it will be considered as neutral. Although this scale does not present the true idea of ”what people feel”, it can generate a generic perception. Hence after subtracting the negatives from the positives : ? +5 is considered as ”very good” +2 to +4 is considered as ”good” +1 to -1 is considered as ”neutral” -2 to -4 is considered as ”bad” ? -5 is considered as ”very bad”

It is evident from the table 6.2 and corresponding chart that the majority has come out from the fantasy of living in nuclear families. They are well aware of both positive and negative aspects of the shift.

Table 6.2 — : Survey results of 2013 for Nuclear family system

		nuclear_family_system					Total
		very good	good	neutral	bad	very bad	
village	Salmia	1	2	14	6	4	27
	Jabar/Jandali	4	5	14	4	4	31
	Timberkot	4	6	8	3	1	22
	Gundiwala	1	3	21	1	0	26
	Lamibari	1	3	14	1	1	20
	Bani Langryal	0	3	18	1	0	22
Total		11	22	89	16	10	148



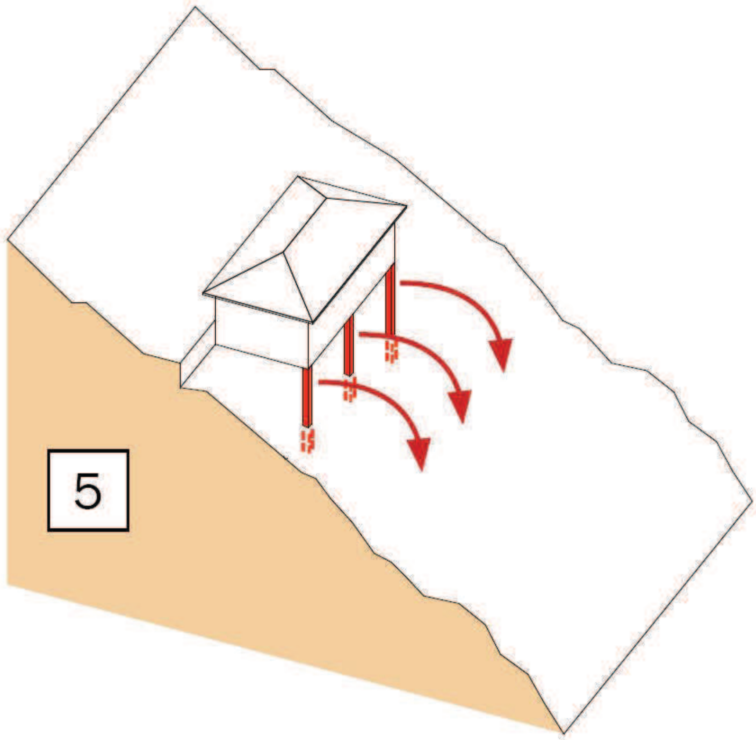


Figure 6.82 — Guideline to avoid building on free-standing posts. Source : [Ali and Schacher, 2010]

6.2.3 Effects of shift in family system on the sustainability of society : Personal observation

If sustainability is not generated through reconstruction, vulnerability will be enhanced.

The physical factors encompass susceptibilities of location and the built environment, and can be represented through factors such as population density, remoteness of a settlement, location, and construction materials and techniques employed to build infrastructure ([Villagrán, 2006]). Although building on hazardous sites was not recommended by authorities (figure 6.82), few cases are observed where less flat land was available to build a house for nuclear family. In this situation people extended the land by placing columns on steep slopes and constructed whole house on hazardous site (figure 6.83). The construction on hazardous sites has enhanced the physical vulnerability of the community.

The social factors are related to social issues such as levels of well-being of individuals, gender, health, literacy, education, the existence of peace and security, access to hu-

Figure 6.83 — People have built on hazardous sites. Source : S. Abidi.

man rights, social equity, traditional values, beliefs, and organizational systems ([Villagrán, 2006]). The insecurity of women heading the house and the change in importance of elderly has increased the social vulnerability of these groups.

The economic factors are related to issues of poverty and can include levels of individual, community, and national economic reserves, levels of debt, degrees of access to credits, loans, and insurance, and economic diversity ([Villagrán, 2006]). The families with less income were more comfortable in extended families. They have become economically more vulnerable after reconstruction.

Finally, environment factors include natural resource depletion and degradation ([Villagrán, 2006]). It includes diminishing agricultural land by constructing a residential unit there. 52 families out of 80 and 93 out of 134 are settled on the land which was used for agriculture before earthquake (figure 6.84). Kashmir was already deficient in plain lands.

Figure 6.84 — Reconstructed houses built on agricultural land. Source : S. Abidi

During reconstruction people have reduced their cultivation area.

The psychological effects of the shift in family system can not be ignored. The major factor which increases the effects of trauma is the duration of any change. Shifting from one culture to another is not bizarre for societies. This is the symbol showing they are alive. If these changes are gradual, they are more absorbed in the society. In case of a hazard these changes are often reckless which intensify the impact of disasters. People not only lose their loved ones, property, livelihood and basic facilities, they are compelled (either through policies or because of their own decisions) to pass a life which is entirely different from pre-event situation. Extended to nuclear family system is not less than a disaster for Kashmir rural society. As one of the respondents of age around 90 years told me, *"Earthquake scenario is ended since long, we still feel this disaster every moment by living in the changed family system, in a changed house."*

6.3 Conclusion

This study justifies both the hypothesis made by U.E.T, Lahore, Pakistan :

1. During reconstruction, Tower Roof is deeply penetrated in rural Kashmir architecture.

2. Family system is shifted from extended to nuclear.

The study concludes that the tower roof could be a good solution to overcome space deficiency if it was technically tested before being employed. Focusing on the structure of tower roof, experts gave different opinions while discussing with me. According to one school of thought this is an unsafe structure under wind and earthquake conditions as it does not give a box-like effect. Extra load of timber frame is hazardous for the ground floor walls. First floor ceiling (floor of tower roof) if not constructed with proper joints, this structure is more dangerous than single storey houses. Second opinion calls it a safe structure under every existing loads and pressures. According to them the timber frame cannot be unsafe as people have learnt to build strong connections in walls and ceiling. Therefore the construction is seismically resistant. To test both of these opinions, much research work is needed. The future of tower roof is uncertain so far. People are practicing it in new construction but they can alter its use. To reduce the current issues they can practice unsafe structures. It will be discussed under chapter 8 that how the community is moving towards more vulnerable building practices. Tower roof spread is a unique feature of Kashmir post quake reconstruction. This innovation has not only altered the present architectural ambiance of the region, it has penetrated deep into the construction culture of rural Kashmir. Although authorities could not foresee tower roof at the time of policy making, they can now promote research to minimize its vulnerability against different disasters. Already constructed structures can be strengthened through remedial measures if they are found at risk. It is hence concluded that implementers and technical experts must not leave the reconstructed area after their task is over. They must constantly stay in contact with the community to guide them according to their future needs. Similarly the shift in family system is also a big change for the society. People belonging to different age groups and gender have different opinion on it. Although the people got benefit from the policy, they seem nostalgic. In many cases this shift has increased the physical, social, economical and environmental susceptibility in Kashmir rural areas.

CHAPTER 7

Vulnerability through reconstruction

VULNERABILITY of a community to hazards can be reduced through post-disaster reconstruction however it is sometimes enhanced through it ([Jigyasu]). ERRA's RHRP has resulted into an outstanding reconstruction in earthquake hit areas yet this research has discovered few aspects which can reinforce the susceptibility of community towards future hazards. As far as community's role is concerned, it is its responsibility to follow the guidelines provided by policy makers. However issues are identified particular to this domain as well. This is not about individual cases of non compliance rather it is related to the approach largely. In chapter 6 it was discussed that time is needed to regard the vogue outcomes of reconstruction as sustainable or vulnerable. In this chapter the approaches discussed do not have a margin of doubt for enhancing susceptibility. Five major dilemmas of approach and attitude which can lead to hazardous future are analyzed here. These are

1. Absence of Guidelines on Thermal Insulation in House Reconstruction
2. Absence of Guidelines on Basic Spaces in House Design
3. Absence of Guidelines for Maintenance
4. Vulnerable Families
5. Deviation of the Community from Guidelines

7.1 Absence of guidelines on thermal insulation in house reconstruction

7.1.1 The background as stated by UNHABITAT ([UNHABITAT, 2012a])

'The majority of pre earthquake houses were constructed with 15-18 inch stone walls with mud plaster inside and outside. The masonry may have been dry stone or with mud mortar. Other traditional construction technologies included Dhajji stone and mud infilled timber frames, or timber double wall construction in Leepa and Neelum (two valleys of Kashmir). The buildings' good thermal performance was based on either high thermal mass or the insulative qualities of thick mud plaster or timber and cavity wall construction. This was of particular importance in high altitude areas where winter lasts 4-6 months and temperatures are more severe. Snow cover ranges from 1-8 feet according to location. It is important to note that temperatures in the surveyed areas reach up to high 30's centigrade during the summer but high temperatures do not constitute a concern in building terms compared to cold. Lower lying areas of Pakistan experience the opposite problem of very high temperatures in a long hot summer and buildings need to ensure cool internal night temperatures, or people use verandahs and courtyard spaces. While active cooling with fans and air conditioning is a concern and cost in the south, active winter heating is the greater problem in the northern areas affected by the earthquake.

To have comfortable interior environment in extreme weather conditions, the house should be well insulated. This aspect was not considered in ERRA initial guidelines.

In the same document it is also mentioned :

From 2006 to 2009 ERRA management restricted technical support activities to compliance with safety standards and financial disbursement. ***From 2009 onwards, when over 80% of households had reached practical completion, ERRA permitted the remaining technical support partners to use small remaining budgets to develop and implement a package of technical support and awareness activities to improve wider aspects of quality and performance including water supply, rainwater harvesting, sanitation, site drainage, fuel and***

energy efficiency, insulation, maintenance and improvements for durability and building life spans, slope stabilisation, tree conservation and reforestation. *These measures were designed to contribute solutions and develop skills and awareness for sustainable rural housing construction, service provision and rural settlement all linked to natural resource management.*

Some of these aspects of 'building back better' could have been incorporated into the technical support and awareness promotion activities from the outset or early stages of the programme and benefited from the larger scale implementing partner capacity and extended time to develop awareness, learn from feedback and support sustainable replication. Earlier development of solutions could have been incorporated into demonstration and model houses, into training and awareness activities. ***The omission of environmental performance indicators from the formal inspection criteria and financial support mechanism relegated these infrastructure and environment to secondary importance.*** *ERRA rural housing focused on meeting the targets of completion and compliance in the rural housing reconstruction programme, but additional activities to optimise the investment in housing by improving quality and performance of housing were a lesser priority than redressing deficits in other sectoral programmes. Sectoral segregation had limited potential synergies between related ERRA programmes which might have brought a more integrated and holistic perspective to housing.*

Similarly : *As with the conventional technologies promoted, the primary criterion was seismic resistance, rather than any other performance criteria such as thermal performance or durability.*

Although experts proposed to include thermal insulation in the very early stages of reconstruction strategies but authorities overlooked this extremely important measure. As reported in UET document related to the reconstruction and rehabilitation ; presented to the Governor of Punjab, Pakistan (UET Unpublished Report, 2005) :

A large number of fatalities occurred due to heavy stone walls and mud roofs, where a major reason for the use of stone and mud was thermal insulation. Even for other structures where heavy materials are not used, such as timber pitched roofs, absence of insulation was a hindrance to their popular use. ***It is, therefore, imperative that lightweight insulation***

materials, that are also cost effective, are introduced in the region.

7.1.2 The consumption of wood to insulate the houses

Agha Khan Foundation-Gilgit says that people cut down 70,000 live trees each year to heat their dwellings, only in northern areas of Pakistan ([Jumbolon, 2010]). UNHABITAT discus this problem :

In high altitude areas of Kashmir, due to increased cold and timber supplies, the average consumption (of wood) in summer is approximately 20kg rising to 40-50kg in winter. This amounts to a range of 3600 kg to 18000 kg per annum. If 1 cft dry timber weighs approximately 10 kg, this translates to around 360 cft to 1800 cft timber consumed per annum. An estimated 150,000,000 cft timber was used in reconstruction of 400,000 houses, approximately 100,000,000 was newly cut timber, but 144,000,000 cft timber is consumed annually by 400,000 households (assuming 360 cft per annum per household)

These figures are extremely important in the context of the environmental concern expressed over the endorsement of timber frames for reconstruction. Almost the equivalent of the timber required to construct one dhajji house is consumed annually as firewood in the lowest altitude households, and ***a quantity of timber equivalent to four Dhajji houses is consumed annually by households at high altitude.*** *At least in construction, if houses are built with well seasoned and protected timber there is at least 50 years use value from the timber, unlike the use of timber for firewood.* ([UNHABITAT, 2012a])

The stoves introduced by UNHABITAT in collaboration with other NGOs (figure 7.1) reduced the consumption of timber by an average of 40%, and reduced cooking time likewise by around 40%. This represents a significant reduction in timber use, smoke emissions and time for wood collection and cooking by women.

But the same time when people find their houses cold, they burn timber in excess.

- **Previous houses were thermally more insulated than reconstructed houses : Community opinion**

Figure 7.1 — Efficient stoves using local materials, introduced by UNHABITAT. Source : UNHABITAT

Each and every respondent during the surveys said that previous houses were more insulated than reconstructed houses. An old man of age 73 said :

My pre-quake house was constructed by my grand father. It was big, strong and elegant. I could never imagine that this house will be ruined under earthquake. Our kitchen was so big that we could lay 3, 4 charpais (single beds) there. We used to gather in the kitchen after Maghrib (the time when sun sets) and had gossip till Isha (2 to 3 hours after sunset). That house never allowed outside cold winds to touch our babies. It was like a mother holding her children in her lap.

When asked about his views on new dhajji house he responded with a smile of deprivation :

This mother is different ; it invites the cold to make us shiver during night.

During surveys, all the 10 single storey houses (without having tower roof, figure 7.2) complained that when they compare their houses with others, they find their own houses be extremely cold during winter than others. The reason was that these houses were having a pitched roof on top and the whole inner space was larger.

The other issue found during surveys was that people left open space on top of the doors and between walls and ceiling (figure 7.3). This was obvious that these open spaces can invite cold winds especially during night but the house owners had a reason behind this. All

Figure 7.2 — The internal space of single storey houses. Source : S. Abidi.

Figure 7.3 — Open spaces on top of the doors. Source : S. Abidi.

of them said, ”We used to do it in our old houses.”

Studying the literature and discussing with other experts it was explored that before 2005 earthquake the people of Kashmir used to store dried grass in big quantity in the upper floor ([UNHABITAT, 2012a]). The openings between walls and ceiling allowed proper ventilation which was a mean to save the grass from decaying. Although storing the grass was not found in single storey houses, the community was still practicing the old technique.

In addition to the above, 52 respondents said that their houses are warmer on ground floors while tower roof space is colder. Its details are already provided in chapter 6 under the section 6.1.7.4.

- **How absence of thermal insulation can influence susceptibility : Personal observation**

People are found convinced that adding mud layers on the structure can thermally insulate the house. This attitude is alarming as far as the seismic vulnerability is concerned. The event of 2005 earthquake has unveiled the fatal characteristics associated with heavy mud layers. Repeating the same practices will certainly provoke another disaster in the future.

To make the interior warmer, people burn wood (details are already mentioned above). This practice is a threat for the environment.

Although different agencies are working on projects to insulate houses in Pakistan (Agha Khan Foundation, 2011) but the condition of surveyed houses in AJK is not made better through reconstruction program.

7.2 Absence of guidelines on basic spaces in house design

Mentioned in a presentation by Diamond Jumbolon ([Jumbolon, 2010]) :

”BUILDING gives the most authentic record of the history of civilization. Written in the form of materials, design and orientation, it gives the complete truth about the scientific, cultural, social and economical achievements of a nation at a particular time. Architects, Engineers and Builders are the true historians of their time.”

The house in not merely a combination of basic construction elements ; it fulfils all the physical, socio-cultural and psychological requirements of the residents. The reconstruction was aimed to ”build back better” hence it could have encompassed all the basic needs of the community.

Financial assistance was aimed to facilitate the owners of both katcha and pucca houses, by disbursing money, directly into the accounts of eligible beneficiaries, with the condition that the houses are constructed in compliance with ERRA standards, with a core house between 250 to 400 square feet ([ERRA, 2011]). This ”core house” generally had two rooms joined with a veranda. Neither kitchens nor toilets/bathrooms were considered to be integral part of the housing unit (figure 7.4). The table 7.1 mentions the presence of kitchens,

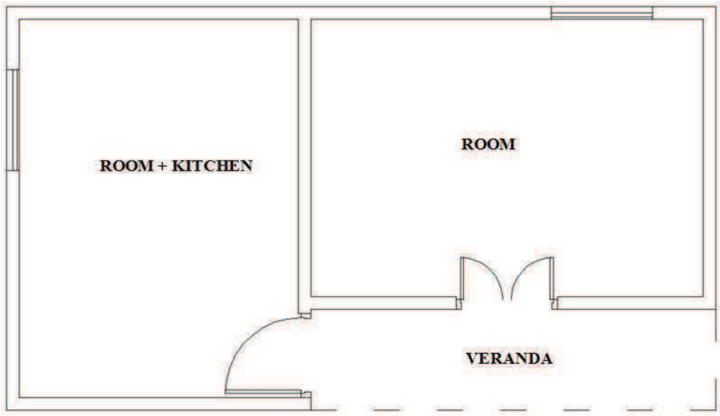


Figure 7.4 — A generic house plan found in the surveyed houses. ERRA prosed the core house with 250-400 sq ft

Table 7.1 — : The table below shows the pre-quake situation of kitchens, bathrooms and toilets in AJK. Source : Population Census Organization-Islamabad

HOUSING (1998 Census Data)	
HOUSING UNITS BY DIFFERENT FACILITIES	
Separate Kitchen	136513
Shared Kitchen	105257
No Kitchen	163587
Separate Bathroom	93832
Shared Bathroom	55646
No Bathroom	255879
Toilet	66994
No Toilet	298544
Toilet shared	39819

bathrooms and toilets in AJK befor earthquake. Tables 7.2 and 7.3 and their corresponding charts brief about the pre-quake situation of kitchens in surveyed areas.

7.2.1 Basic spaces according to respondents

During the surveys 203 out of 214 respondents included kitchens in basic spaces. However they preferred the kitchens in the room. 11 said that kitchen is not a space, cooking can be

Figure 7.5 — The surveys were conducted during summer. photos above provide the idea of kitchenettes in veranda. Source : S. Abidi.

done anywhere.

182 out of 214 consider the toilets as basic spaces. However the rest still consider that they do not need such areas as part of their house.

7.2.2 Effects of absence of guidelines for kitchens

Kitchens are present in every surveyed house of Kashmir. Tables 7.4 and 7.5 and their corresponding charts mention the post-quake situation of kitchens in surveyed areas. These kitchens are not necessarily a separate entity ; these are built in the rooms (figure 7.6) or verandas (figure 7.5). The two room house which was already a small space for the family has one room occupied with kitchen elements (e.g. stoves, vessels and kitchen accessories).

A few of the respondents mentioned that they take the kitchenette to the verandas during summer while they keep it inside during winter. This strategy makes cooking easier in hot days and allows the heat to warm the room in cold climatic conditions.

It was observed that people are practicing the stoves which were guided by UNHABITAT but they still need a lot to know about kitchens.

The primary problem was noticed that fabric or jute/nylon rope made charpais (single beds) are present near the stove. The burning timber in some cases was found adjacent to the

Table 7.2 — : 2011 Survey results on kitchen before 2005 earthquake

		pre_kitchen			Total
		room as kitchen	separate kitchen	additional kitchen in veranda	
village	Kaimanja	12	7	1	20
	Haryala	5	5	0	10
	Kharabiyan	5	3	2	10
	Thub	1	15	5	21
	Mallot	4	3	1	8
	Jaglari	3	8	0	11
Total		30	41	9	80

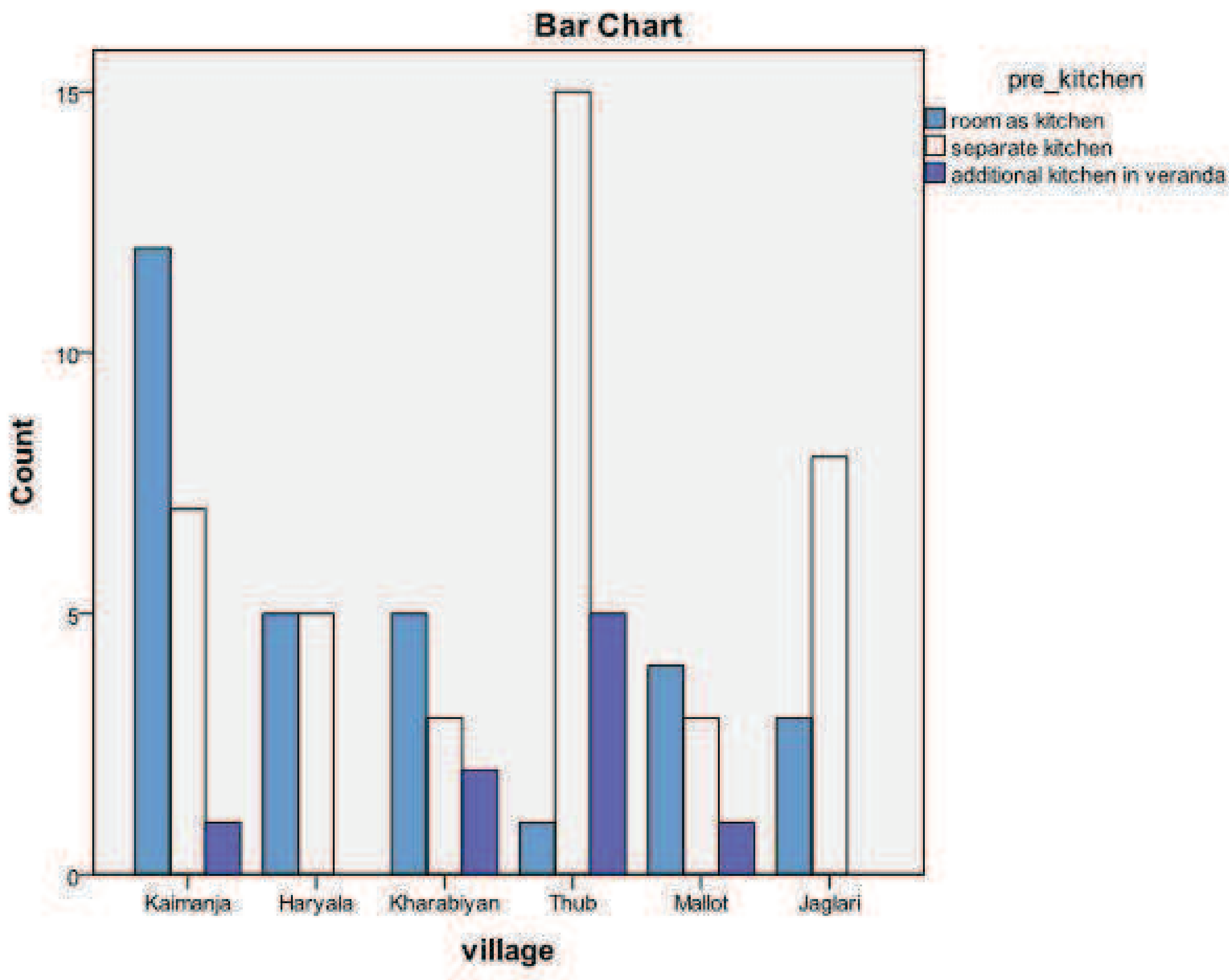


***Table 7.3* —** : 2013 Survey results on kitchen before 2005 earthquake

		Pre_Kitchen		
		In the Room	Separate Kitchen	Total
village	Salmia	14	10	24
	Jabar/Jandali	24	4	28
	Timberkot	8	12	20
	Gundiwala	18	7	25
	Lamibari	12	5	17
	Bani Langryal	11	9	20
Total		87	47	134

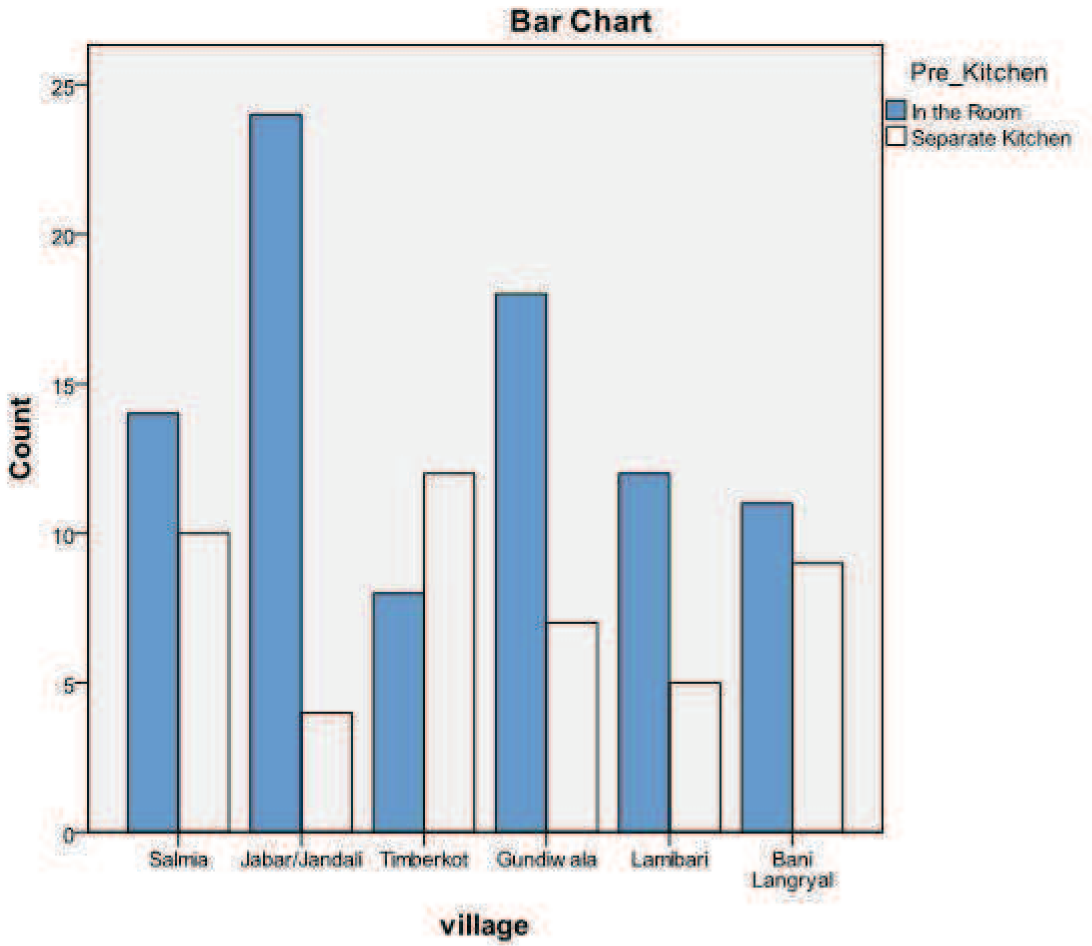


Table 7.4 — : 2011 Survey results on kitchen after 2005 earthquake

		post_kithen			
		room as kitchen	separate kitchen	additional kitchen in veranda	Total
village	Kaimanja	14	0	6	20
	Haryala	3	0	7	10
	Kharabiyan	6	0	4	10
	Thub	7	10	4	21
	Mallot	7	1	0	8
	Jaglari	6	3	2	11
Total		43	14	23	80

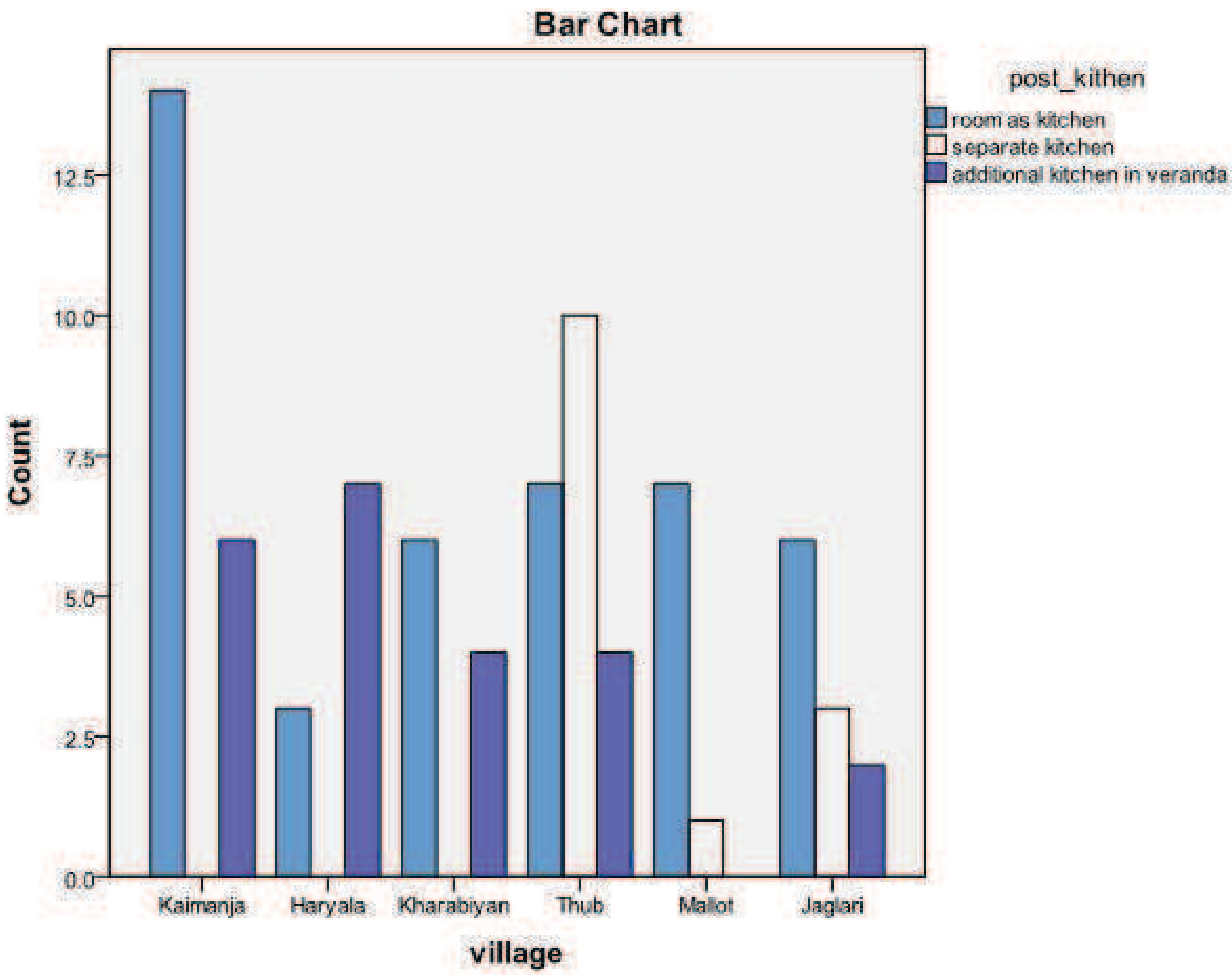


Table 7.5 — : 2013 Survey results on kitchen after 2005 earthquake

		Post_Kitchen			Total
		room as kitchen	Separate Kitchen	Veranda Kitchen Also	
village	Salmia	5	18	1	24
	Jabar/Jandali	15	9	4	28
	Timberkot	4	15	1	20
	Gundiwala	16	6	3	25
	Lamibari	8	7	2	17
	Bani Langryal	5	15	0	20
Total		53	70	11	134

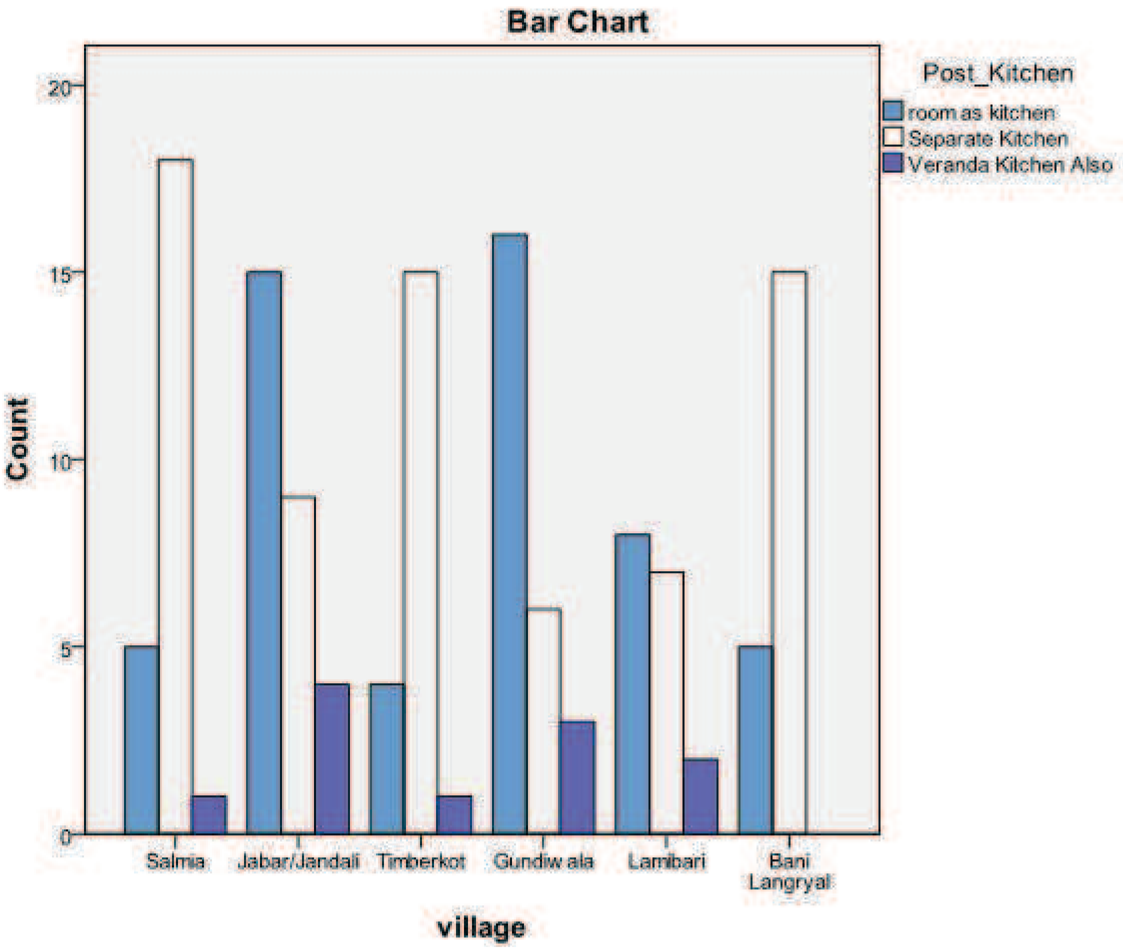


Figure 7.6 — Inside kitchens built in the rooms. Source : S. Abidi.

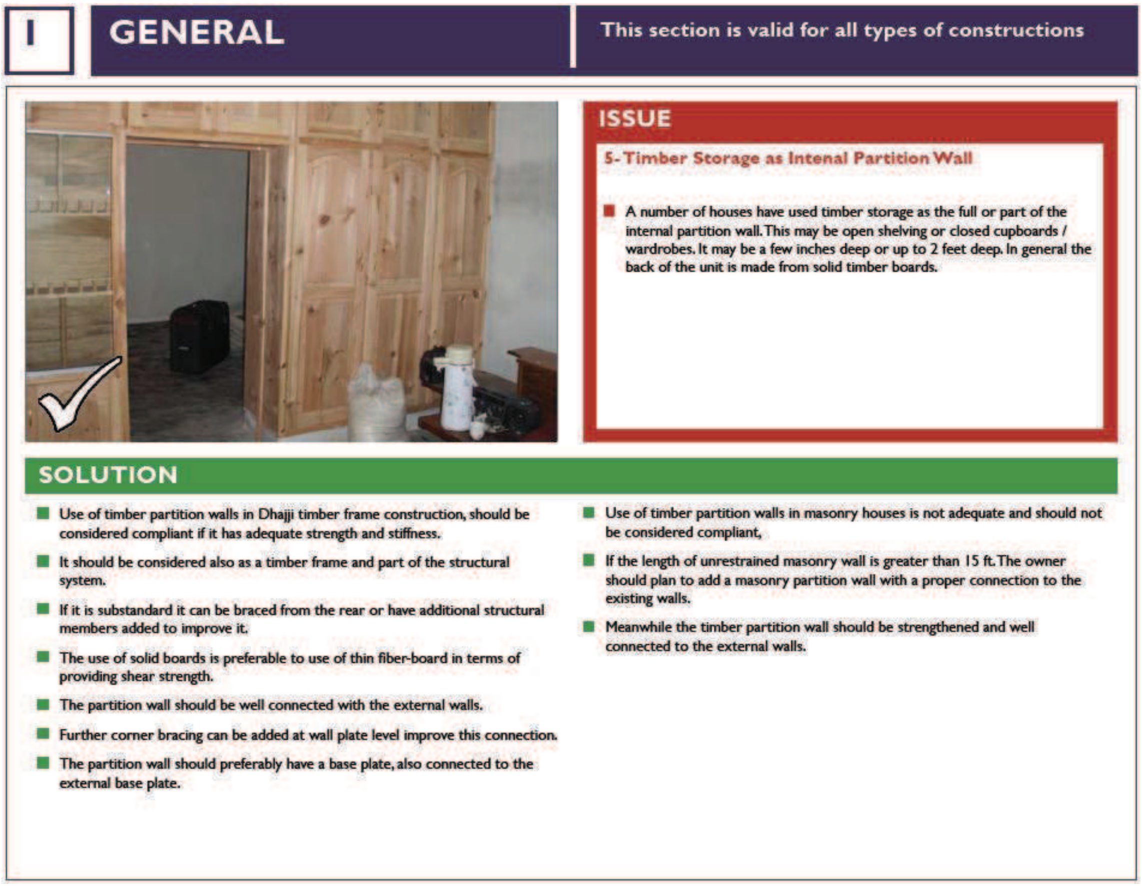
cloth. In both figures 1 and 2 (above, will be numbered) this problem is evident. Fire hazard can not be ignored in this case.

Second issue was explored that people have fixed a wooden cupboard on the walls of dhajji dewari (figure 7.8). The dhajji wooden frame is already light weight hence an additional load is dangerous for the structures. Moreover by fixing the cupboard on the wall, flexible behaviour of dhajji is restricted. The energy which can be dissipated by the movement of dhajji wall under an earthquake will be accumulated and probably whole wall will fall down.

People when asked about their practice, they gave reference to the ERRA guidelines and considered their way to be earthquake resistant. However ERRA did not guide the people the way they understood. The guidelines were to store additional timber by making cupboards/wardrobes and this was not to be built in the dhajji wall (figure 7.7). People are practicing it in hazardous manner.

Third issue detected was that in many cases chimneys are not well treated (figure 7.9). Hence they leave smoke impression on the walls (either inside or outside)

In some cases the pipes might not harm the structure but they hinder the passage from outside (figure 7.10).



I GENERAL

This section is valid for all types of constructions

ISSUE

5-Timber Storage as Intenal Partition Wall

- A number of houses have used timber storage as the full or part of the internal partition wall. This may be open shelving or closed cupboards / wardrobes. It may be a few inches deep or up to 2 feet deep. In general the back of the unit is made from solid timber boards.

SOLUTION

- Use of timber partition walls in Dhajji timber frame construction, should be considered compliant if it has adequate strength and stiffness.
- It should be considered also as a timber frame and part of the structural system.
- If it is substandard it can be braced from the rear or have additional structural members added to improve it.
- The use of solid boards is preferable to use of thin fiber-board in terms of providing shear strength.
- The partition wall should be well connected with the external walls.
- Further corner bracing can be added at wall plate level improve this connection.
- The partition wall should preferably have a base plate, also connected to the external base plate.
- Use of timber partition walls in masonry houses is not adequate and should not be considered compliant,
- If the length of unrestrained masonry wall is greater than 15 ft. The owner should plan to add a masonry partition wall with a proper connection to the existing walls.
- Meanwhile the timber partition wall should be strengthened and well connected to the external walls.

Figure 7.7 — The solution to utilize additional timber by making cupboard. Source : [ERRA, 2008a]

7.2.3 State of toilets/bathrooms

Before the earthquake, UNICEF, in collaboration with the Local Government and Rural Development Department (LGRDD), was implementing a rural water supply and sanitation project, with limited resources for improving sanitation conditions and hygiene promotion. However, despite such good efforts, prevalence of waterborne diseases remained high and communities at large had little realization of the link between poor hygiene and sanitation, and disease ([Khan *et al.*, 2008]). Tables 7.6 and 7.7 and their corresponding charts show the pre-quake situation of toilets in surveyed areas.

The post-quake rural construction was a great opportunity to create awareness for toilet construction. Where financial assistance was linked with construction compliance, same strategy could be adopted to improve hygiene conditions in the area. As Maharashtra govern-

Figure 7.8 — Wooden Cupboards fixed on the walls can affect the performance of dhajji under earthquake. Source : S. Abidi

Figure 7.9 — Smoke Stains are evident on the inner and outer sides of the wall. Source : S. Abidi

Table 7.6 — : 2011 Survey results on toilets before 2005 earthquake

		pre_toilet			Total
		no	detached	attached	
village	Kaimanja	19	1	0	20
	Haryala	7	2	1	10
	Kharabiyan	10	0	0	10
	Thub	13	8	0	21
	Mallot	7	1	0	8
	Jaglari	11	0	0	11
Total		67	12	1	80

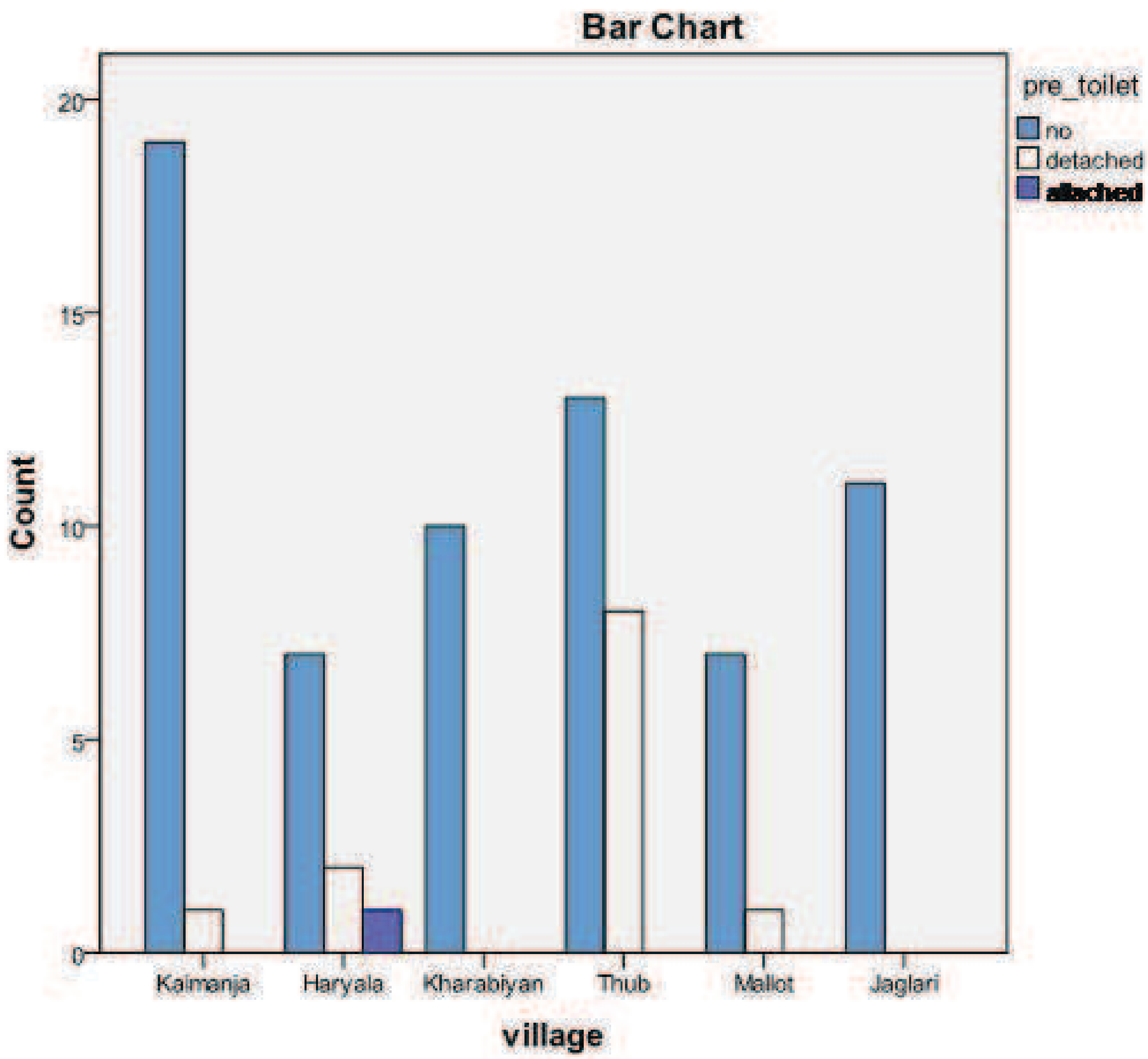


Table 7.7 — : 2013 Survey results on toilets before 2005 earthquake

		Pre_Toilet			Total
		No	Detached	Attached	
village	Salmia	7	16	1	24
	Jabar/Jandali	21	7	0	28
	Timberkot	10	10	0	20
	Gundiwala	20	5	0	25
	Lamibari	7	10	0	17
	Bani Langryal	13	7	0	20
Total		78	55	1	134

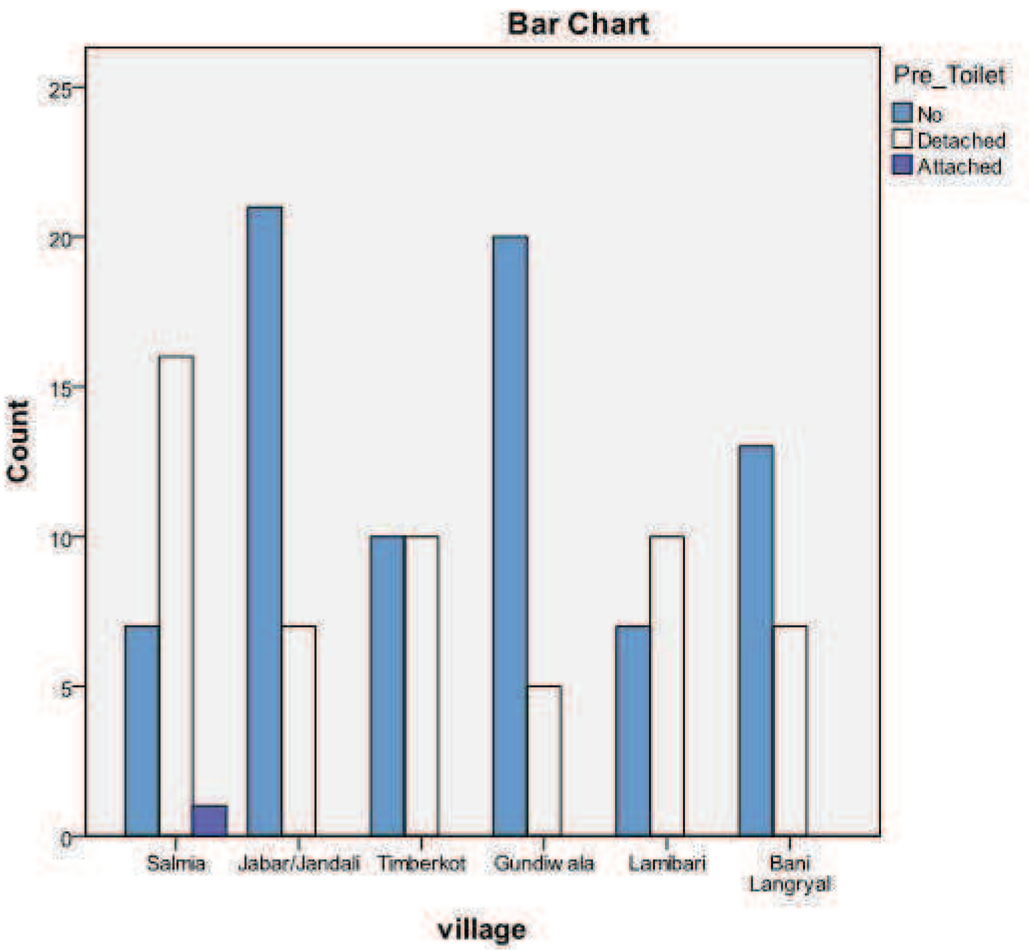


Figure 7.10 — Chimneys are hindering the outside passage. Source : S. Abidi

ment had made it compulsory to have a toilet at home for getting admission in junior colleges in the rural areas, ([Updates, 2011]) a similar policy could make Kashmir better place against diseases. Tables 7.8 and 7.9 and their corresponding charts show the post-quake situation of toilets in surveyed areas.

It was observed during surveys that in the area of Kaimanja, the toilets were rare. Also a report jointly prepared by UNICEF and Jehlum Valley Human Welfare Society ([UNICEF, 2008]) justifies this statement. Among 40 surveyed houses in Kaimanja, only 2 had toilets after reconstruction. The condition was better in Bagh where 10 out of 40 had toilets. In Salmia and Sena Daman, 64% (85 among 134) of the houses had toilets. No pit toilets are in the use of respondents. Different toilets are shown in the figures 7.11.

7.2.3.1 How people build the toilets

As discussed earlier, authorities did not provide any guidelines to the community for building a toilet ; either attached or separate. However people had a pre-quake knowledge of constructing them. The material used to build the toilets is generally CGI sheets, wooden planks, fabric or a combination of all of these. The roofs of the toilets are made up of CGI

Table 7.8 — : 2011 Survey results on toilets after 2005 earthquake

		post_toilet		
		no	detached	Total
village	Kaimanja	20	0	20
	Haryala	9	1	10
	Kharabiyan	9	1	10
	Thub	15	6	21
	Mallot	7	1	8
	Jaglari	8	3	11
Total		68	12	80

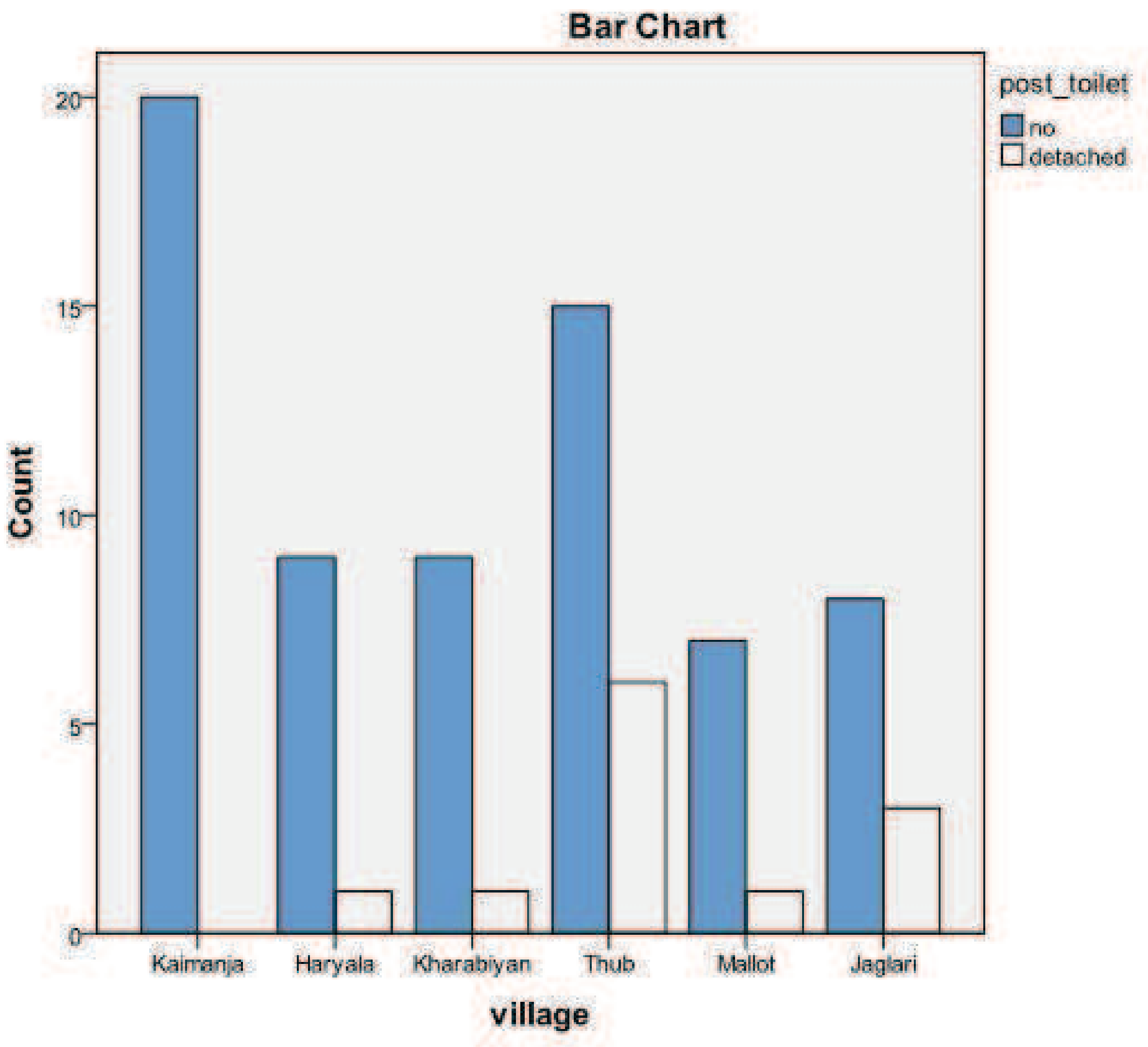


Table 7.9 — : 2013 Survey results on toilets after 2005 earthquake

		Post_Toilet			Total
		No	Detached	Attached	
village	Salmia	2	20	2	24
	Jabar/Jandali	11	16	1	28
	Timberkot	3	16	1	20
	Gundiwala	19	6	0	25
	Lamibari	4	13	0	17
	Bani Langryal	10	8	2	20
Total		49	79	6	134

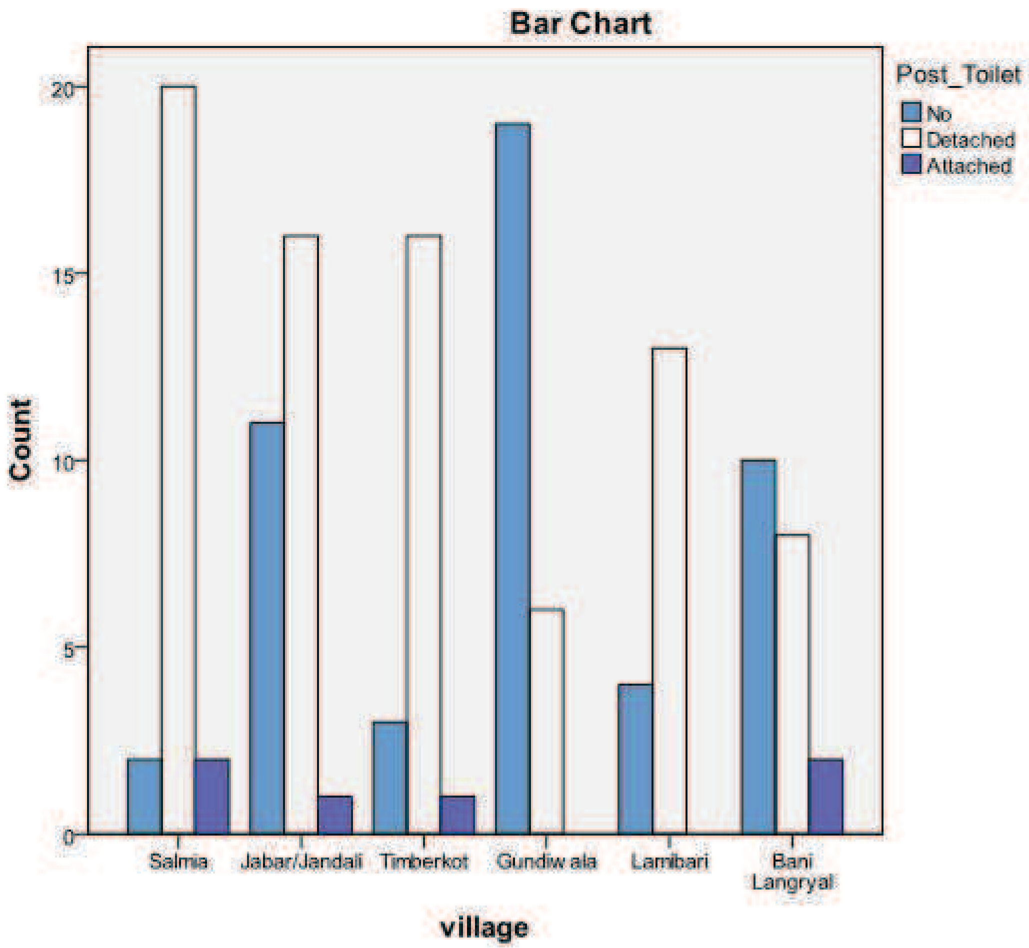


Figure 7.11 — Toilets found in the region of Kashmir. Source : S. Abidi

sheets.

While visiting Bagh, an under construction toilet was observed (figure 7.12). The ditch of 7’x7’ with a depth of 5’6” was dug to dump the waste coming through the pipe from toilet. When asked the mason about the related issues, he and owner mentioned that technique was safe.

Exploring this feature the toilet construction in Abbottabad (a hilly area of KPK and shares many features with Kashmir) was studied. People there also construct toilets in same manner. The major issue found there was that the drinking water gets mixed with contaminated water as people use boring wells. This water causes typhoid, cholera, hepatitis, worm infestation, diarrhoea, skin infection, eye infection, stomach problems and allergies ([Jabeen *et al.*, 2011]).

Fortunately Kashmiris do not use boring wells hence the water is not mixed with con-

Figure 7.12 — Ditch is dug to dump the waste. Source : S. Abidi

Figure 7.13 — Attached toilets and bathrooms belonging to low income families. Source : S. Abidi

taminations.

7.2.3.2 Effects of absence of guidelines for toilets

In total, 6 cases were found where toilets are built joining the main structure. These toilets are not just toilets ; they are also used as bathrooms. While water falls on the walls during taking bath, dhajji house can be damaged. The figures 7.13 and 7.14 show different examples of attached toilet with bathrooms.

As AJK has almost 100% Muslim population, water is used for washing purpose after using the toilet. This water comes either from pipelines or a water barrel is placed inside


Figure 7.14 — Attached toilets and bathrooms belonging to higher income families. Source : S. Abidi

Figure 7.15 — Rain water is collected in a ditch (can be seen in the right-bottom corner of photo). It is then used by filling the buckets. Source : S. Abidi

or outside the toilet. However few examples were found where the condition of water was unhygienic (figure 7.15).

The people who do not have private place to defecate and urinate ; they use fields and bushes found on the mountains. In group discussions with women, they mentioned their concerns on toilets. They can not go alone for this purpose as the area is hilly and anyone from elevated region can have a glance. To overcome this problem they have to wait whole day so that they may go outside during night. But for this, someone has to assist them to avoid any unpleasant situation. The fear of snakes and insects is inevitable during night.

7.3 Absence of guidelines for maintenance

The increased risk of building destruction during earthquakes not only results from poor quality construction rather poor maintenance of the structure is also a reason of its collapse. ([Spence, 2007]). The vulnerability of buildings, the rigor of constructions and the reliability of their maintenance define the effects of disaster ([Motamed, 2005] ; [Cartier, 2013]). Some of the major historic buildings which suffered destruction and damage due to earthquakes were reported as less maintained ([Look, 1997]).

In Kashmir, stone masonry construction before the earthquake was common in rural areas. One of the reasons of practicing it was apparent less maintenance fatigue. The same trend is obvious in other parts of the world too where people prefer stone masonry due to its less maintenance issues ([Mañá *et al.*, 2006]). In the surveys, where the respondents mentioned their liking for the CGI pitched roofs as these are not to be repeatedly mud plastered ; they showed a dislike for the maintenance fatigue of dhajji houses. In chapter 5 it was discussed that in how many ways people protect the walls of their houses but here the practices which are harmful for the structure are talked about. Among 214 households, 176 somehow covered the wooden frame but remaining reconstructed houses have fully/patially exposed walls. The major dilemma was that people were not guided to maintain the structure. Those who covered the walls used just their common sense and those who did not cover those were ignorant about the sensitivity of this field.

Another issue seen in Kashmir was that people make heaps of wooden logs and planks beside the walls (figure 7.16). Generally they do it to make the freshly cut wood dry but out of 214, 6 cases are unsafely practicing it. They have erected the wooden columns with some gap from the wall ; hence a space is prepared to fix the logs in between for storage. The examples where timber is stored in excess are susceptible houses due to force exerted by the timber on the structure. Corroded pieces of CGI sheets and few waste materials are also found beside the wood.

People are not guided to protect the roofs made of CGI sheets. Not only the corrosion

Figure 7.16 — Timber is stored beside the dhajji wall hence making the structure susceptible.

Source : S. Abidi

observed on the sheets, also water gets penetrated through these. The solutions adopted by the community to avoid water seepage are not rational. In few cases people have installed many small pieces of CGI sheets on the main sheet (figure 7.17). If not fixed, they have just put pieces of CGI sheets and placed stones on the top to avoid the risk of its blowing away (figure 7.18).

11 mentioned that water seepage through the roof is a big problem for them.

32 people mentioned that rusting is an issue of CGI sheets (figure 7.19).

Figure 7.17 — Small pieces of CGI sheets are fixed through nails and bolts. Source : S. Abidi

Figure 7.18 — As leakage from around the chimney was to be avoided, the owner has just put a small piece of CGI sheet and then put stone. Plastic is also surrounding the chimney. The owner was still facing water seepage. Source : S. Abidi

Figure 7.19 — The reconstructed houses are experiencing corrosion. Source : S. Abidi

7.4 Vulnerable families

ERRA paid special attention to the most vulnerable groups of the society which needed assistance in all domains of life. It provided land for the people who somehow lost the land during earthquake. Social Welfare Complexes (SWCs) and Women Development Centres (WDCs) were opened in nine districts of earthquake affected areas. Moreover it also assisted people to cope with their legal issues by arranging Legal Aid Centres (LACs) ([ERRA, 2011]). But the program of ERRA which is strongly linked with this talk is Livelihood Support Cash Grant programme (LSCG).

The Livelihood Support Cash Grant programme (LSCG), one of the world's largest post-disaster cash grant recovery initiatives, disbursed funds of USD 30 per month per family to 268,000 families for six months and was extended for another six months ([ERRA, 2008b]). Zaidi et al provide the detail of LSCG as ([Zaidi *et al.*, 2010]) :

The LSCG was launched in March 2006, received around 750,000 applications from all nine earthquake-affected districts, and claimed that more than 30 per cent of registered families received the cash dividend. The WB notes that 'the program gave priority to the most vulnerable groups, including female-headed households, children and orphans, and the poor' ([Bank, 2006a])....Criteria for selecting vulnerable families included :

- those that experienced damage to their housing stock ;
- civil servants with a rank of less than Grade 17 or non-officers ; and
- more specifically, households without male members aged between 18 and 60 years (that is, families with female heads or elderly male heads), with male members aged between 18 and 60 years with a disability, and families with five or more children3 ([Bank, 2006b]).

Research has already been conducted to assess this program with regard to its success and shortcomings. As stated by Zaidi et al ([Zaidi *et al.*, 2010]) :

"Yet the evidence suggests that targeting of cash at families based on eligibility criteria was problematic and largely ineffective. Our analysis of 2,001 records that matched LSCG data shows that only one-half of beneficiaries who received the cash grant were eligible. Nearly one-half of deserving families, such as those with a female head and no adult male, a disabled adult male member, or with five or more children, were excluded. Moreover, one in two families that did not deserve the benefit because they were ineligible according to the ERRA-WB criteria were selected and awarded the dividend."

After the termination of above mentioned program, ERRA conducted Targeted Vulnerability Surveys (TVS) in the earthquake affected districts to obtain information on most vulnerable groups of the society. TVS was an outcome of ERRA's Social Protection Strategy and it was conducted internally by ERRA from Nov. 20, 2007 to Jan. 05, 2008. The TVS had identified 432,130 vulnerable persons in 365 UCs of ten EQ affected districts ([ERRA, 2010]). The Survey had collected socio-demographic data on four vulnerable groups :

- Orphans

- Female-headed Households
- Persons with Disabilities
- Elderly without Care

According to the same report, the objective of TVS was to share the TVS Database with all stakeholders for efficient planning, funding, and coordination of rehabilitation interventions for the vulnerable groups. A budget of PKR 40.237 million funded by ADB and GOP was allocated for this program to assist the targeted vulnerable groups monthly. Priority was given to families with no males or those that were unable to earn an income because of a disability and then to families with five or more children.

Earthquake resulted into vulnerable families : UNHABITAT discussion

UNHABITAT found the most vulnerable families heading towards another seismic risk through reconstruction (table 7.10). The organization formulated the data with reference to several related aspects (tables 7.11, 7.12, 7.13). Where low income families were almost totally reliant on ERRA funding, 175,000 PKR had not been sufficient and sometimes resulted in non completion, non compliance or poorer quality work ([UNHABITAT, 2009]). During April to June 2009 surveys of UNHABITAT, the number of vulnerable families found was 2133. These vulnerable families were discussed with reference to :

- Family condition
- House condition
- Housing distribution in different regions
- Construction progress
- ERRA financial assistance

Finally these houses were categorized from 1 to 4 (from extremely vulnerable to least vulnerable). Based on this survey, the estimated full caseload was expected to be approximately 3000 vulnerable households of whom an estimated 1350 did not have adequate durable shelter.

Table 7.10 — : Geographical distribution of vulnerable households, Source : [UNHABITAT, 2009]

HRC	Vulnerable Households	Vulnerable Households %
Patika	342	16
Muzaffarabad	718	34
Hattian	254	12
Dhirkot	33	1.5
Bagh	118	5.5
Haveli	182	8.5
Rawalakot	163	7.5
Abbaspur	323	15
Total	**2133**	**100%**

Figure 7.20 — House condition of visited vulnerable first family. Source : S. Abidi

Table 7.11 — : House and family vulnerability, Source : [UNHABITAT, 2009]

	No.		Current Housing	Household	Priority	Note
	167	7.8%	Tent		1	
	602	28.2%	Non durable shelter	Widow, orphan, disabled, elderly	2	
	340	16%	Non durable shelter	Extremely low income	2	
	164	7.7%	Unsafe non compliant houses	Widow, orphan, disabled, elderly	3	Now eligible for final payment with affidavit unless NCBR
	125	5.8%	Unsafe non compliant houses	Extremely low income	3	Now eligible for final payment with affidavit unless NCBR
	661	31%	Previous kacha houses	All	4	
	74	3.5%	Other	All	4	
Total	**2133**	100%				

Table 7.12 — : Reconstructed houses vulnerability, Source : [UNHABITAT, 2009]

	No.	%	New Reconstruction Progress	Note
	150	7%	House finished, no roof	
	164	7.7%	House finished with defects	Now eligible for final payment with affidavit unless NCBR
	366	17.1%	House underway between plinth and lintel	
	1065	50%	Plinth only	This is the majority situation.
	388	18.2%	No work started at plinth	May be struck off by ERRA as ‘drop out cases’.
Total	**2133**	100%		

Table 7.13 — : ERRA financial assistance received by vulnerable families, Source : [UN-HABITAT, 2009]

	No.	%	ERRA Financial Assistance	Note
	155	7.3%	No payment	No MOU
	29	1.4%	1st Tranche only	
	268	12.6%	2 Tranches only	
	1476	69.2%	3 Tranches only	This is the majority situation.
	204	9.5%	4 Tranches only	Not eligible for further payments
Total	**2133**	100%		

7.4.1 Surveyed vulnerable families

Zaidi et al discussed the gaps in the LSCG program while UNHABITAT discussion and data suggest including more types of families into vulnerable groups. During this research 6 vulnerable families were found in addition to 228 surveyed houses. All these six families were different from each other in their condition and in the quality of their habitat. Two of these families did lie in the priority list prepared by ERRA but did not receive any cash grants. Detailed interviews were carried out with these families but only three are presented here.

7.4.1.1 Family 1 : Surveyed during September 2011

Family structure

This family was a part of extended family but has become nuclear in the aftermath of earthquake. The woman named Uzma (the actual name is not mentioned here) of age 30 is residing with her four children ; the third one of them was born one month after the earthquake. At the time of surveys her children were of age 10, 8, 6 and 1 year. The husband does not do anything to earn money and generally does not come home for several months.

Economic condition

The lady is supported by relatives and neighbors for daily meals. While she was residing with her in-laws before the 2005 event, she was more protected and less humiliated. As the parents of her husband have moved to the city, they can not support her financially.

Habitat condition

She is residing in a shelter which was built with the help of neighbors in December 2005. The outer cover is made up of tin sheets which are spoiled now with rust. The inner layer is made up of CGI sheets (figure 7.20).

ERRA support

ERRA did not give her any funds as she did not own a house prior to earthquake. The house of joint family was owned by her father in law hence he availed the funds of ERRA. As a result she is bound to live in the shelter.

Case analysis

ERRA did not include the above mentioned family in its LSCG program. The reasons being that the woman was not a widow, she had less than five children, she did not suffer from a major injury and there was no elderly present. Hence she could not get financial assistance per month. The shelter in which she is residing till now (till September 2011) was made to meet immediate shelter needs. This not at all fulfills the requirements of a family of six members as the proper house can. A habitat of 10'x25' which is a long space without partitions does not provide privacy for different ages of family members. Neither there is a kitchen nor a toilet linked with the shelter. The whole space appears to be store room as all the items are placed in that area. When asked about future of the family, Uzma was not very hopeful. Before the earthquake she belonged to an upper middle class family (her in-laws) where a reasonable life standard was maintained. But for the future she expects that the current situation will prevail for her children as well. Although two of her children go to school but she says that future requirements to complete standard education can not be managed by her.

7.4.1.2 Family 2 : Surveyed during October 2011

Family structure

This is the case of Kaimanja, Muzaffarabad. The woman is residing with five daughters and one son. All of the children are of the age 14 or below. Her husband, Abbas Shah has remarried and left this family (The woman was reluctant in mentioning her own name). The relatives of the woman reside nearby.

Economic condition

The only son of 14 years of age is the sole earning member. He works at a burger stall in Islamabad and earns PKR 3,000 (30 $) per month. As the capital of Pakistan is at 7-9 hours drive from Kaimanja and travelling expenses are not bearable for poor, the boy can not come home for several months. He sends money to his mother and sisters through other Kashmiris who work with him.

Habitat condition

The house was started adopting dhajji as construction practice (figure 7.21). As there was no male member present at that time and the woman had responsibilities of small children, the condition of the construction was found vulnerable. Foundation was nearly absent. The stone for infill were larger than recommended size. Half of the walls' height was constructed in dhajji, rest had mixed construction ; either just wooden frame was built or mud walls without any reinforcing material were constructed. Fabric used in shelter is now hanging to cover the gap between walls and roof. CGI sheets which were used in shelters are reused in roof.

ERRA support

After immediate shelter need's assistance of PKR 25,000, ERRA gave her 2nd tranche of PKR 75,000 for mobilization. She could not utilize this aid properly. Consequently non compliant house up to plinth level resulted into the termination of further aid.

Figure 7.21 — House condition of visited vulnerable second family. Source : S. Abidi

Case analysis

This family could be included in LSCG program but was not. It was observed that her children were bare footed and wearing torn clothes. Here again the issue was that this family did not belong to lower class before earthquake. The event of 2005 destroyed their lives and the act of father also played a major part in it.

7.4.1.3 Family 3 : Surveyed during November 2011

Family structure

This family is headed by a widow (Her husband's name was M. Yusuf, like previous case she also did not want to mention her name). The woman is residing with her four children. As they do not have a house, they reside with woman's brother family.

Economic condition

Whole family is completely dependent upon the brother of woman. They neither own a land nor have any savings. The positive aspect is that all the children are studying. The lady is hopeful about the future of her children. Her elder son is in his early teens and aims to support the family soon.

Figure 7.22 — House condition of visited vulnerable third family. Source : S. Abidi

Habitat condition

The house is reconstructed in reinforced block masonry but lacks roof and finishes (figure 7.22). The foundation is laid in stone masonry. The house is not habitable though its cost is far beyond the cost of dhajji house. The residence which they are availing now is reconstructed in dhajji.

ERRA support

ERRA granted her all four tranches ; the last after lintel inspection.

Case analysis

The widow was eligible for LCSG program but could not get any support. She was reluctant in telling about the quality of life she is experiencing but when promised to not mention her statements in front of her sister in law, she talked about daily routine. According to her, she has to do most of the house work alone. As she does not want to disturb her studying children, she does not take help from them too. Despite doing all efforts, she has to remain conscious while taking meals (as her sister in law considers them an additional burden for her family).

The owner of this house had availed all the funds and utilized them properly but she was unable to complete the house. The reason of adopting such type of construction was that she wanted to build strongest house for her children. She was so much afraid of any upcoming earthquake that she invested all her reserves in building the house. The woman had a feeling of insecurity ; during reconstruction from earthquakes and during post reconstruction phase because of living with her relatives. Here ODR has resulted into an incomplete reconstruction. The family in consequence has become socially more vulnerable. While the structure is exposed to harsh climatic conditions, the amount provided for reconstruction is wasted.

7.5 Deviations from guidelines : Personal observation

The main objective of ERRA to ”Build Back Better” was not only to reconstruct the houses but also to generate seismically resistant culture of construction. For reconstructing the destroyed houses, tranches were linked with the compliance. But for the houses built after the reconstruction period, it was expected that people will follow the guidelines they learnt during the reconstruction period. Although people have started to construct in safe manner, they have still used such techniques which are not recommended by the experts. This section provides the major issues observed in reconstructed houses considering community’s role.

7.5.1 The site

To reconstruct on safe sites ERRA guidelines covered several aspects (one can be seen in the figure 7.23) however the most relevant to this work were :

1. Avoid steep and unstable slopes.
2. Avoid construction on loose or filled ground.
3. Build the house away from the retaining wall uphill.
4. Build the house away from the edge of the retaining wall downhill.
5. Manage site surface water drainage to protect the building and to avoid site erosion.

In 80 initially visited houses, 5 were observed not following the above mentioned rules. In later surveys, 9 such houses were discovered. Few examples can be found in the figure 7.24.

Figure 7.23 — ERRA guidelines about plinth. Source : [ERRA, 2008a]

Figure 7.24 — Issues of the sight in reconstructed houses. Source : S. Abidi

7.5.2 The foundation

No issues of foundations were observed in the reconstructed houses. One reason is that the foundation was already covered and could not be investigated in detail. For 10 under-construction houses, all were above the level of foundations. It was hence not possible to evaluate the construction of foundations.

7.5.3 The plinth

Three primary instructions about the plinth provided in the [ERRA, 2008a] are :

1. Protect the base of the wall from ground water and site surface water.

Figure 7.25 — Direct contact of walls with the ground. a hole is observed in the wall due to water seepage. Source : S. Abidi

Figure 7.26 — Wall is Showing dampness which can be observed by its changed color. Source : S. Abidi

2. Do not construct the plinth higher than 3 ft above natural ground level.

3. Make sure the plinth is constructed with well packed masonry using long stones or blocks to strengthen the corners (figure 7.28).

For point 1, 20 out of 134 houses had a direct contact of the walls with adjacent ground. The examples are evident from the figures 7.25 and 7.26.

Figure 7.27 — more than 3 feet plinth height. Source : S. Abidi.

Figure 7.28 — Guidelines provided by ERRA about the gap in plinth stones. Source : [ERRA, 2008a]

For point 2, none of the initially surveyed houses mentioned this issue. However in 2013 surveys, 6 out of 134 houses had the plinth height more than 3 ft (figure 7.27).

For point 3, 3 out of 134 had gaps between the stones in plinth (figure 7.29). None such example was observed in initial surveys.

7.5.4 The base plate (Dhassa)

The base plate is a plinth beam which, according to ERRA guidelines, should not be

Figure 7.29 — During surveys, gaps were found in the plinth. Source : S. Abidi.

- Missing
- Under Sized (less than 4”x4”)
- Discontinuous

As most of the houses were covered with skin, no case with issues in Dhassa was observed. Those wherever walls were exposed, were found in good condition (figure 7.30).

7.5.5 The Columns

The success of dhajji houses is their flexibility which dissipates earthquake energy while their walls remain intact. The use of concrete columns in dhajji houses ruins their flexibility as they behave like a rigid element (figure 7.31). Only 3 out of 80 initially visited houses used concrete columns in dhajji houses (figure 7.32). Other houses had either covered walls (plastered or through other means) or they did not have this problem.

7.5.6 The studs, bracing boards and their Connections

The studs must no be placed at more than 6 feet apart. Bracing boards should also be in good proportion to the main posts (figure 7.33). As guided in Dhajji Manual p 10 (for details see [Ali and Schacher, 2010], p : 10 and 11) :

Figure 7.30 — Base plate was found compliant in the reconstructed houses. Source : S. Abidi.

Figure 7.31 — Guidelines about concrete columns in dhajji houses. Source : [ERRA, 2008a]

Figure 7.32 — Presence of concrete columns in dhajji houses. Source : S. Abidi.

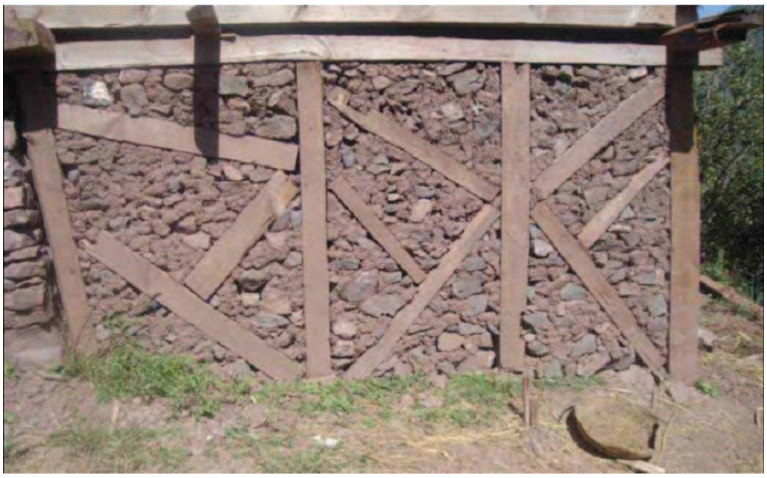


Figure 7.33 — Non compliant construction due to size of bracings, larger distance between studs and poor connections. Source : [Schacher, 2006]

For the secondary subdivision use timber half as thick as the posts (that is 2"x 4" instead of 4" x4") and place it at 2 ft, 3 ft or 18" depending on the chosen final subdivision pattern.

Many of the surveyed houses walls had skin on them. But for the exposed walls, issues could be identified (figures 7.34 and 7.35).

Over and under sizing of the bracing and poor connection were observed in 5 houses.

Figure 7.34 — Left : Discontinuous stud ; Right : No connection between bracings. Source : S. Abidi

Figure 7.35 — Example of large distance between studs, under/over sized bracings and lack of connections. Although upper floor was treated with remedial measures, lower part has connection issues. Source : S. Abidi

Figure 7.36 — : Vulnerability is increased due to too many openings. Source : S. Abidi

7.5.7 The openings

It was observed after the investigative studies on Kashmir earthquake that among numerous other reasons, large and several openings in walls weakened the structures. Guidelines about the sizes, number and placement of openings were provided by the authorities (for details see page 13 of [ERRA, 2008a]). However the surveys conducted during this study identified the weakness in this regard.

Initial surveys identified that among 80, 38 had either too many openings in the wall, were less than 24 inches apart from each other/wall corner or were too big (figure 7.36). 2013 surveys showed that 53 out of 134 had non compliant openings (figure 7.37, 7.38, 7.39 and 7.40).

7.6 Conclusion

In this chapter it was discussed that the authorities and communities both are responsible to aggravate vulnerable construction in AJK. If the focus was not kept just on seismic resistant construction, several dimensions of sustainable development in rural areas of AJK

Figure 7.37 — Too many openings covering more than 50% of the wall area. All the openings are too close to each other. Source : S. Abidi

Figure 7.38 — Too many openings in the wall. Source : S. Abidi

could be promoted by the authorities. A holistic approach could reduce the vulnerability of reconstruction related issues. The pre-quake bad practices could be removed by using the opportunity of post-quake reconstruction. The community in response to the guidelines could generate a durable construction. It is seen that the lessons learnt through the earthquake are on the way of disregard as different deviations from the guidelines are pointed out. Astonishingly all the households which deviated someway from the rules, received all the four tranches by ERRA. When ERRA officials were asked about this aspect, they did not accept the responsibility. According to them, the responsible entities were POs. To focus all the POs and analyze their tasks and performance was beyond the objective of this research. Hence it

Figure 7.39 — Openings closer than 24 inches to each other or from the corner source : S. Abidi

Figure 7.40 — Reconstructed house with door placed on the edge. Source : S. Abidi

is said that ”the authorities” had the responsibility to keep a check on deviations committed by user in his house. In the next chapter the situation of under construction houses in Salmia and Sena Daman will be presented. It will be analyzed that after eight years of the earthquake and three years of the end of reconstruction program, how community is moving forward. These houses are the conclusion of whole thesis discussion. If these are compliant according to guidelines, we can infer that the reconstruction has generated a sustainable construction culture in the rural areas of AJK. Moreover the threats to the houses of rural Kashmir in the form of double storey vulnerable houses will also be analyzed.

CHAPTER 8

Conclusions and recommendations

THIS chapter will summarize the major findings of the current study and will also provide policy recommendations to reduce present and future vulnerability of the community. The most relevant dimension of the research to the conclusion is expressed as ”under-construction houses”. The fourteen houses present in different villages will be discussed with reference to their seismic compliance primarily. This will conclude that how far seismic resistant construction techniques are penetrated in the community after reconstruction. Based on the literature and survey results, the suggestions are provided for the authorities both for policy making and implementation. The future research scopes are also mentioned especially for exploring the risk associated to two-storey houses in rural Kashmir.

8.1 Summary and conclusions

The present study had the basic objective to investigate the influence of policies by authorities and sociocultural characteristics of the community on reconstruction and, on each other, consequently determining the level of vulnerability in the society.

Vulnerability reduction can play the pivotal role in seismic risk reduction in any area. All the post quake reconstruction programs have the primary focus to reduce vulnerability and enhance capacity of a community. In post event scenario all the agencies and the community is generally found more receptive in practicing disaster resistant techniques. However it should be kept in focus that any approach ; either of authorities or of communities, can have a mega impact on the social and architectural fabric of the society. This does not remain the matter of few houses ; the reconstruction after a disaster affects whole area. The consequences can have an impact which lasts for generations.

The post quake rural Kashmir reconstruction was assessed in this study to find out the extent of sustainability and vulnerability produced by authorities and communities. As this research was collaborative to the UET, Lahore mega project of evaluating reconstruction, their hypotheses after pilot surveys were taken to be tested in initial stages of the current study. Dhajji, ODR, tower roof, nuclear families and reconstruction compliance were mentioned during these hypotheses. After termination of this project in initial stage due to non availability of funding, this study was conducted independently both to (a) test UET's hypotheses and to (b) find out more on reconstruction. It was then examined in detail that which issues are associated to the above mentioned aspects. In addition to these, five more features of the policy and community behaviour were identified through the study which should be purely considered as ”vulnerability generating aspects”.

Experts and Authorities Call these Aspects ”Sustainability Generating” Dhajji and ODR are two features which are proven sustainable. It was however explored in this research (see chapter 5) that people need much to know about seismic behaviour of dhajji. The community which had witnessed the better performance of dhajji during earthquakes was more confident in practicing it to avoid seismic threats. Similarly people are not satisfied to the strength of this structure. They also have issues of maintenance fatigue and thermal performance of dhajji. The cost and aesthetics seem satisfying for the people.

ODR is an approach which satisfies people to great extent. However the issues found in this study encompass the trouble in acquiring financial aid, elevated wages of masons, confusion about policy, delays in policy and changes in policy. Those who were belonging to vulnerable families became more vulnerable when they could not handle the funds properly.

Experts and Authorities Do Not Have Clear Opinion About These Aspects That Whether These Are ”Sustainability Generating” or ”Vulnerability Generating”.

To the best of knowledge, tower roofs and nuclear family system focusing rural AJK, are not discussed in detail by the experts and authorities. Different sociocultural characteristics and policies which have influenced these two are analyzed by this study (see chapter 6).

Tower roof is having a variety in its form and purpose. Several risks are associated to this construction culture. It is however discussed that authorities and researchers can get involved in reducing the vulnerability of reconstructed houses. As this phenomenon is evident through the architecture of rural Kashmir, it is foreseen that tower roof will spread in future too. To avoid the susceptibility of such structures, policies must be introduced at mega level.

Shifting of extended families to nuclear families is discussed with reference to policies and sociocultural aspects. This is then explored that how this change is playing a role in enhancing and reducing different types of vulnerability.

Experts Call These Aspects ”Vulnerability Generating” But In Few Cases the Authorities Are Silent While In Few Others, Community Is Responsible

Four major dilemmas of policy and one of community behaviour are identified which have generated vulnerability in rural Kashmir. Providing guidance on thermal insulation, basic spaces, maintenance and focusing all the extremely vulnerable families were the responsibility of authorities. However this matter was not handled appropriately in rural AJK. The effects of absence of guidelines on vulnerability of the area are mentioned in this study. The vulnerable families which are lacking basic facilities should be privileged. It is also discussed that how people have deviated from the guidelines during reconstruction.

The research justifies the hypotheses initially conceived in this thesis. These are :

1. *Strong and resilient cultural roots can change the policies. It was explored in dhajji related research that the local knowledge, which was also resilience generating, changed the ERRA policies.*

2. *Community would have found its own way of fulfilling its needs in the absence of culturally compatible policies. Several such aspects are discussed under tower roof and family system sections*

3. *Not only disaster but policies can also affect the cultural stability of a society. This was evident from the shift in family system.*

4. *Reconstruction program can enhance, though it is aimed to reduce, social, economic, physical and environmental vulnerability. The reconstruction program lacking policies on certain dimensions has played such role in post-quake rural AJK's reconstruction. This is discussed in detail in chapter 7.*

5. *Community satisfaction on reconstruction is essential for sustainable development. The issues identified in dhajji, ODR, tower roof and family system sections bring forward few dissatisfaction factors among community. It is analysed that the community can practice hazardous solutions to overcome such issues in future.*

The forthcoming section will provide the state of under construction houses in Kashmir. By discussing every house with reference to few major earthquake resistant policies, the condition on ground will be discussed.

8.2 Under-construction houses: The conclusion of RHRP

The authorities have winded up the RHRP for rural houses. The under construction houses are solely funded by the owners. It is interesting to explore which way the community will follow in the absence of a check from the authority. One should keep in focus that these fourteen houses are the reflection of present state of rural AJK houses.

House 1

Figure 8.1 — The house is constructed on hazardous site. Source : S. Abidi

8.2.1 Village: Salmia

3 among 27 were the houses under construction in Salmia.

8.2.1.1 House 1 :

This single storey house is built on a sloping site (figure 8.1). As obvious from the figure 8.2, the plinth is not constructed with well packed masonry using long stones or blocks to strengthen the corners. The gaps between stones are also visible. The plinth should be at least of 12 inches high from the ground but the figure 8.3 shows no plinth on left side.

Tower roof of this house is as high as the ground floor (figure 8.4). Issues related to frame and weight with reference to the use all already discussed in chapter 6. This example will be no different from other structure having high tower roofs.

Figure 8.2 — Different elevations of the house. Source : S. Abidi

Figure 8.3 — Plinth issues. Source : S. Abidi

Figure 8.4 — Tower roof with more height. Source : S. Abidi

House 2

Figure 8.5 — Extremely vulnerable house. Source : S. Abidi

8.2.1.2 House 2 :

This house will be proven extremely vulnerable under an earthquake. As evident from the figure 8.5, the family has stopped bracing the frame. Currently four family members has started residing in the tower roof. The soft storey impact can throw the residents down the hill as the house is constructed on the edge of the hill. No plinth is visible in the photo (figure 8.5, left). As all the activities are done in the tower roof, weight is a big threat for the structure even without an earthquake. Figure 8.5 (right) shows that the uphill is also not protected with a retaining wall.

House 3

Figure 8.6 — Issues of site, plinth and base plate. Source : S. Abidi

8.2.1.3 House 3 :

As shown in figure 8.6 (left), the site of this house is hazardous. Vulnerability of the house is increased many folds as it is built on the edge of the hill while hill has no retaining wall. The columns beneath the ground floor are fixed in the hill to erect the structure. Dhassa (base plate) is also missing in the ground floor (figure 8.6, right). This issue can lead to collapse of the house under seismic tremors.Also no plinth is observed in the house.

The openings in the house are non compliant to the guidelines provided by authorities. In spite of 24 inches, the distance between door and window is 4 inches (figure 8.7).

8.2.2 Village: Jabbar/Jandali

3 among 31 surveyed houses are under construction in Jabar/Jandali.

Figure 8.7 — Issue of openings. Source : S. Abidi

8.2.2.1 House 4 :

Here again, the primary issue found is of site. Neither the house is constructed on plain land nor retaining wall is built to stabilize the hill. Dhajji frame and wooden beam are touching the loosely bound stones. The gaps between stones are also evident from the figure, 8.8. It can also be seen that the door is placed at the corner of the room. As visible from the figure 8.9, the Dhassa (base plate) is discontinuous. The bracing members in the frame are not connected properly (figure 8.10).

All the issues related to tower roof can be expected here as well.

The other side of the house is also showing lack of connections between timber frame members (figure 8.11). The stack of stones has no use here as this is not used as a plinth ; nor as a retaining wall.

8.2.2.2 House 5 :

Like House 1, this house also exhibits issues of plinth. Figure 8.12 shows no plinth on left side of the house. The condition of the plinth is found better as the stones are properly stacked however small size stones are also used here. The ground is found in direct contact with the wall of dhajji in side elevation (figure 8.13). This can cause the decay of wooden dhajji frame.

The tower roof associated issues should be considered true for this house as well.

House 4

Figure 8.8 — The house is constructed on hazardous site. Source : S. Abidi

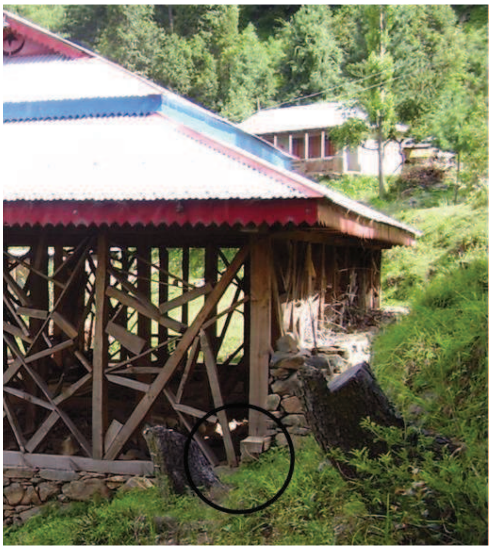


Figure 8.9 — Discontinuous base plate. Source : S. Abidi

Figure 8.10 — Lack of proper connections between the bracing members. Source : S. Abidi

Figure 8.11 — The corners of this stacked stone wall have already started loosing the stones. Source : S. Abidi

House 5

Figure 8.12 — Plinth problem. Source : S. Abidi

Figure 8.13 — Wall contacting ground directly. Source : S. Abidi

House 6

Figure 8.14 — Absence of plinth and hazardous location. Source : S. Abidi

8.2.2.3 House 6 :

This house was on initial stages of construction when surveyed. The primary issue found was absence of plinth (figure 8.14 right). Second problem was detected that the house is constructed adjacent to the hill. Retaining wall is not provided to avoid land slide (figure 8.14 left).

8.2.3 Village : Timberkot

2 among 22 visited houses were under construction in Timberkot.

House 7

Figure 8.15 — Left of the house shows that two opening are not 24 inches apart.

8.2.3.1 House 7 :

This house is also not constructed on plain land (figure 8.15). Plinth has gaps between the stones and small size stones are used here.

Figure 8.16 shows that few bracing members are undersized or without proper connections. Openings are adjacent to each other which may enhance the seismic vulnerability of the house (figure 8.15). Tower roof can affect the structure if not used properly.

8.2.3.2 House 8 :

This is a double storey house. Like the previous double storey case, this house was also built without having knowledge on two storey construction.

Figure 8.16 — Plinth and bracing member sizing problem. Source : S. Abidi

House 8

Figure 8.17 — Two storey house with tower roof on top. Source : S. Abidi

House 9

Figure 8.18 — Different aspects of construction. Source : S. Abidi

No retaining wall is built beside the hill (figure 8.17). Tower roof on top of two storey houses can be more dangerous than on single storey houses.

8.2.4 Village : Gundiwala

Only one out of 26 houses is found under construction.

8.2.4.1 House 9 :

This house was also not finished yet. No site and dhassa issues are detected here. However as visible from figure 8.18 (right), the plinth was absent. The presence of tower roof (figure 8.18, left) shows the vogue future of structure.

House 10

Figure 8.19 — Lines in black mention the area where there is a room underneath. Source : S. Abidi

8.2.5 Village : Lamibari

2 among 20 were under construction houses found in the surveys.

8.2.5.1 House 10 :

In this house one fourth of the construction is done on a site which is not flat (figure 8.19). Hence an additional room is provided beneath the main structure. This room, like other examples, does not have retaining walls. Whole house is built on the edge of the hill which is not having retaining wall to avoid land slide (figure 8.20). Tower roof utilization will decide the extent of susceptibility of the structure in future.

Figure 8.20 — Absence of retaining wall and presence of a dhajji built room beneath the house. Source : S. Abidi

8.2.5.2 House 11 :

The site is hilly and lacking retaining wall (figure 8.21, right). Like previous house, this is also constructed with a room beneath main structure (figure 8.21, left). Retaining walls are missing in the room but the plinth is in good condition. Dhajji framework is found compliant to the guidelines. The säteritak type tower roof is present on the top.

8.2.6 Village : Bani Langaryal

3 among 22 were under construction houses.

8.2.6.1 House 12 :

Like previous case, this house is also built on a sloping site which is treated for construction by adding a room below (figure 8.22). The retaining wall has loosely adjusted stones while dhajji wall is placed beside the hill as a retaining wall (figure 8.23, up). As shown in figure 8.23 (down), the bracing members are not well connected. The distance between posts is also non compliant.

House 11

Figure 8.21 — Left : A room is present beneath main structure ; Right : The site is hazardous. Source : S. Abidi

8.2.6.2 House 13 :

This is just a single storey house and could be expected compliant to the guidelines as plain land is used for construction and the site of the house is not hazardous (figure 8.24). However problems are identifies here as well. The plinth of the house had loosely connected multi sized stones with gaps in between (figure 8.24). Plinth on two sides of the house is present just for half of the wall length. As evident from the figure 8.25, the dhassa (base plate) is absent in one wall of the house.

The owner aims to use the attic for storage purposes.

House 12

Figure 8.22 — The issue of retaining wall. Source : S. Abidi

8.2.6.3 House 14 :

Built on agriculture land, this house did not show deviations from guidelines. However the tower roof use might generate vulnerability in this structure (figure 8.26).

8.2.7 How compliant the under-construction houses are?

The table 8.1 shows that only 4 houses have a non-hazardous site. It should be noted here that even if the whole construction is compliant to the guidelines provided by ERRA (for reconstruction), only this issues will destroy the house under an earthquake. As mentioned by Andrew Coburn and Robin Spence in the book Earthquake Protection ([Coburn, 2002]) :

Sloping ground or rock masses which are stable under normal loading can lose their

Figure 8.23 — Retaining wall and bracing members issues. Source : S. Abidi

stability during an earthquake causing effects ranging from a slow progressive creeping of the ground to a dramatic landslide, rock fall or flow failure. Slope failures are particularly likely to occur when the ground is saturated following rainfall. Whether sudden or slow, such slope failures are liable to cause complete destruction of any building founded on them or in the path of the slide. Slope failures can contribute a high proportion of the losses from earthquakes in mountainous terrain. Earthquakes in mountainous terrain can also trigger rockfalls and mudflows large enough to engulf whole settlements. Landslides and lateral spreads can also cause extensive property damage. The only effective means of protection from the landslide hazard is to avoid building on sites which may be affected. Sites on or at the top of steep slopes, or where there is evidence of recent instability, are those most obviously at risk. Known landslides can sometimes be stabilised through drainage, excavation, retaining structures or other geotechnical work, but while this may protect structures below

House 13

Figure 8.24 — Plinth issues. Source : S. Abidi

Figure 8.25 — Dhassa is absent. Source : S. Abidi

House 14

Figure 8.26 — The house shows compliance to the guidelines. Source : S. Abidi

the slide, it is unlikely to make the site safe for building. In some areas maps of previous and potential landslide areas may be available.

The retaining walls which should be of extreme concern of the user, are not seismic resistant in any house. Just 4 houses had an appropriate plinth. Base plate, which is the primary element in dhajji construction, was missing, undersized or discontinuous in 6 houses. Among 8 houses which were at the stage of bracing, 3 did not have proper posts and joints. 4 houses had problems in openings while 5 seemed alright. One house had soft storey. Tower roof is present in 13 houses. All the dimensions of tower roof discussed in chapter 6 are assumed true here as well. Misuse of attic can make these structures more vulnerable.

If construction style is focused upon, all of them have used dhajji which shows their greater trust on it. Tower roof is also present in 13 of them (the 14th is also planning to build tower roof) which is the symbol of their liking for it. The analysis of these houses shows extreme vulnerability in the new construction.

Table 8.1 — Different aspects relating the house with compliance/non compliance as per ERRA guidelines

House no	Site	Retaining wall	Plinth	Base plate	Posts and bracing	Openings	Soft storey	Tower roof
1	NC	NC	NC	NA	NA	C	NA	NC
2	NC	NC	NC	NC	NC	NC	NC	NC
3	NC	NC	NC	NC	C	NC	NA	NC
4	NC	NC	NC	NC	NC	NC	NA	NC
5	NC	NA	NC	NC	NA	C	NA	NC
6	NC	NC	NC	NC	NA	NA	NA	NA
7	C	NA	NC	C	C	NC	NA	NC
8	NC	NC	NC	C	NA	NA	NA	NC
9	C	NA	NC	C	NA	NA	NA	NC
10	NC	NC	C	C	C	NA	NA	NC
11	NC	NC	C	C	C	C	NA	NC
12	NC	NC	C	C	NC	C	NA	NC
13	C	NA	NC	NC	NA	NA	NA	NC
14	C	NA	C	C	C	C	NA	NC

C= Compliant

NC= Non Compliant (tower roof is also considered a non-compliance factor)

NA= Not Applicable (or could not be determined during surveys)

8.2.7.1 The way to non-compliance

Keeping in view the under-construction houses, five non-compliance producing scenarios were observed.

First of these is that the authorities did not provide policies on a specific matter. Tower roof is the major example of this case (see chapter 6 for details). The community is exercising this structure in under construction houses which is the clear indication that people must be provided with detail policies on it.

Second case was observed where, though the authorities provided ; the community did not receive the guidelines. The best example of this case is the manual jointly prepared by different agencies on one/two storey dhajji houses in 2010. Not a single mason, carpenter or house owner was aware of this document.

Third issue noticed was that in few cases although people were guided by authorities and they received the guidance too (both the above mentioned issues were not true for this case), the community did not understand the rules. For example where people have not braced the frame properly, they thought it was according to the guidelines ; which was not right.

Fourth scenario is that where all the three issues are not true (guidelines are provided, guidelines are received, guidelines are understood) but still people are practicing in hazardous manner. Primary reason is that they are focusing the immediate needs first. For them the earthquake has become history and they will not see such event again in their lives. That is why it should be least bothered about. Building on hazardous land is due to the reason that people are lacking proper sites. Their immediate need is to have a dwelling. Hence their present needs have blurred their future risks.

Fifth and most threatening matter is that even if people do not have any constraints, they start considering the rules worthless. It was observed in some cases that although people knew the details of guidelines but they considered, ”this does not matter much”. For example where people had issues with base plate, they considered it to be alright, though they knew what was guided to them.

The role of authorities for the implementation of policies is crucial for sustainability. Discussing this aspect with H. Mumtaz after completing the latest surveys it was explored that no authorities are responsible to look after the new construction in rural areas of AJK. Although a proposal containing post-reconstruction phase suggestions was presented to SERRA from UNHABITAT but the plan could not become mature. He strongly related the non compliance with economic conditions of people, rapid growth in population resulting into less land for construction, and lack of awareness/understanding. He endorsed the study findings discussed above and stressed to formulate an organization to guard new construction practices for resilient future communities.

8.3 Policy recommendations

The relation of policies and sociocultural characteristics is multifaceted and complex. To reduce the vulnerability of any region this relation must be understood well by researchers and authorities. This section will provide few recommendations for the authorities especially for rural remote areas keeping in focus the research findings of the thesis.

8.3.1 Recommendations : Pre-disaster measures

The disaster provides an opportunity to build back better but there are many other vulnerability affecting factors which must be handled in peace time. GIS database of each and every dwelling must be present for policy making. This not only should include the major dimensions like geographical and topographical details, it must also have minor details like ways of access to the houses. This can help the authorities to approach the sufferers during any hazard. This will not only reduce time to provide medical assistance to a community, concentration of resources in one area will be overcome. As a result the death toll will be reduced and injured will be aided in good manner.

Every existing house should be recorded with all details related to construction type, material, form, site, openings, storeys, roof style etc. This record will be helpful in assessing the damage in an area with reference to the hazard intensity.

Every new house should be recorded by the authorities in peace time. They must be well aware of the details of the rural houses.

The authorities must have a detailed record of new born babies, died persons and marriages held in any area. People should report of any such affair to the authorities. This data should be appropriately updated on daily bases. This way the authorities can analyze the susceptibility of any structure in relation to the occupants needs. Not only physical vulnerabilities but also social vulnerabilities must be recorded by the authorities. They must be well aware of marginalized people. They must also calculate the susceptibility of the families in accordance with the economic condition.

8.3.2 Recommendations : Policy making

The policies should be made prior to any hazard assuming different levels of expected destruction and chaos. The primary features of these policies :

The capacities in a community and its local knowledge to produce seismic resistant construction should be kept in focus by the authorities. Dhajji is the best example of such case where people had the knowledge of indigenous construction and it was also earthquake resistant. The authorities however took several months to accept it as a reconstruction style just because they had no rich knowledge on this technique prior to earthquake.

The sociocultural requirements are always different for the communities. The policies which were proven good for one area might not produce similar results in any other area. The guidelines should be based on flexibility. Several solutions should be provided for any single issue.

Although ODR provided a variety of options for construction techniques, people were not involved in early stages of decision making. This issue led the people to practice what suited them most resulting into non compliant construction in many cases. If CBOs are strengthened before any hazard, they can be proven a good platform for community expression on any particular aspect.

Sustainability should be kept in focus while making the policies. Sustainability is not just reconstructing seismic resistant houses ; it is the holistic approach to weave the solutions pertaining to every aspect affecting the present and future of the community.

8.3.3 Recommendations : Policy disbursement

It was discussed in this thesis that policy disbursement is directly linked with the compliance in construction.

The policies should be made without any delays. The timeline shown in chapter 5 reveals the delays in different policies. Sometimes people can not wait for months to start reconstruction. It is therefore advisable to avoid delays in making and disbursing the guidelines.

The guidelines should be initially prepared in such a manner that they cover every sort of details and aspects. It is wise to not change the policies after being disbursed. Otherwise people get the initial policies and sometimes remain unaware of the latest material. This way confusion and chaos prevails in the society and this result into frustration against authorities. Sometimes the initial policies do not cover the overall dimensions of reconstruction. However when authorise and researchers find out the gaps, they promote research. This case was observed in two storey house construction. Initially the guidelines for only single storey houses were provided. This affected the reconstruction on grand scale. After winding up the reconstruction program, authorities launched new manual on two storey houses. This information could not be obtained from anywhere except UNHABITAT. The manual was neither present in the field, nor anyone was aware of it. Hence it is recommended that the latest research material should be disbursed in the community with same zest as the original guidelines were done.

The policies must be clear and direct. Incomplete guidelines can generate vulnerability. This case was observed in relation to tower roof. Only two sentences were given by the authorities to store the items in the attic. All related information and detail guidelines were not provided to the community. This has resulted into susceptibility of the structures (see chapter 6).

8.3.4 Recommendations : Policy implementation

The implementers and site supervisors should be well trained to cope with any awkward situation related to reconstruction in the field. It was noticed during the surveys that the site supervisors did not have solutions for every query. They, in response, had to consult the higher ups for guidance. The reply from the higher ups took time which enhanced irritation among people.

The POs should be assigned task in an organized way. The partner organizations had different tasks in different regions of Kashmir. Sometimes the positive results of any action remained limited to a specific region and could not prevail in the whole society.

A major impact of corruption during implementation of policies was observed in the rural AJK (see chapter 6). The authorities should have a complete record of every type of case to avoid forgery.

8.3.5 Recommendations : Post-disaster measures

There should always be an authority to keep a check.

ERRA had provided guidelines to the community and trained more than 700,000 people to build seismically resistant techniques. But this does not mean that all of them have become experts in this domain. The discussion on under construction houses in this chapter has unveiled the height of excellence on seismic safe construction knowledge in the community. It is therefore recommended that the experts and authorities must always remain in contact with the community.

Tower roof spread needs considerations. This is not the matter of few houses, the whole region will be proven susceptible under any upcoming earthquake if tower roofs are not made safe.

Several issues are identified in this thesis, which need immediate attention of the higher ups. There are the reconstructed structures which are physically vulnerable. These structures must be provided with remedial measures. It will be a wise decision to link the construction of new houses with some privileges. ERRA had linked the financial tranches with the compliance of the reconstructed houses. This strategy worked very well to spread safe structures. Another case of Maharashtra (India) was discussed in chapter 7 where admission in college was linked with toilet construction in the house of applicant. This had resulted into the spread of toilets. It appeared in this study that people have started forgetting the disaster of 2005. Their immediate needs drive their decisions and earthquake risk is becoming fade from their minds. The authorities should not let them forget the risk which they are facing due to living in Himalayan region and inhibiting susceptible houses. The awareness campaigns should be launched not only in Kashmir but in whole country especially in the regions where earthquake risk is more.

8.4 Future research prospects

Beside different aspects of reconstruction in rural AJK, two-storey house construction is also observed in surveyed areas. 23 among 228 houses are found double storey. However this research had few limitations for which this topic was not examined in detail.

Research is being conducted worldwide on non-engineered wooden frame houses to avoid seismic vulnerability of structure ([et al, 2013]). Yet the gap between research and policy making as well as between policies and implementation is not covered to satisfactory level. Although a detailed investigation of this type of houses is required in Kashmir, here the study only briefly presents the cases after referring to existing literature on soft storeys.

Primary issues found in two storey houses : Soft storeys

To join the structural elements properly should no doubt be the primary concern while building two storey houses. However another major problem which plays part in collapsing the wooden structures is ”soft storey”. A soft storey building is a multi-storey building in which one or more floors have windows, wide doors, large unobstructed commercial spaces, or other openings in places where a shear wall would normally be required for stability as a matter of earthquake engineering design ([Selna, 2008]). In a technical context, a soft story arises when the stiffness of one story is significantly less than the stiffness of the story above it ([David Bonowitz and Rabinovici, 2013]). The figures 8.27 and 8.28 show that under earthquake forces, many buildings collapse due to soft storey failure ([Cheung, 2000]). As stated by Dogangün, ([Dogangun, 2006]) :

”During the earthquake, the presence of a soft story results with increased deformation demands significantly, and puts the burden of energy dissipation on the first-story framing elements. In structural system for some traditional timber framed buildings there are no

Figure 8.27 — A soft storey failure of a timber framed house not resulting in collapse. Source : [Morris *et al.*]

Figure 8.28 — Heavily damaged traditional wooden buildings due to soft story. Left : Large laterally displaced traditional building ([Bayulke, 2004]) ; Right : Laterally displaced traditional building ([et al, 1999])

strong and stiff elements such as bracing to attract the full lateral force of the earthquake. In these cases it is difficult to survive during a strong earthquake for such a traditional frame. Thus, while these structures do not have much lateral strength, they do have lateral capacity. These buildings respond to seismic forces by swaying with them, rather than by attempting to resist them with rigid frame that have bracing elements."

Figure 8.29 — Soft storey houses found in AJK. Source : S. Abidi

ERRA policy

As discussed earlier, ERRA did not provide guidelines for constructing two storey houses. The manual on this construction was prepared by NDMA and UNHABITAT in 2010 ; when reconstruction was almost completed (ERRA Official Website, accessed on 20.12.10).

Socio-cultural characteristics leading to adopt two storey houses

The primary socio-cultural factor which influenced people to construct in two storeys is :

To live in large space : This aspect is already mentioned under tower roof section.

To live in extended families : Where people were willing to live in extended families and the horizontal space was not sufficient for them, they went for two storey houses.

The surveys

8 in 2011 and 15 in 2013 surveys detected two storey houses. These houses have extended the space vertically in the form of another floor and tower roof is constructed on the top (figures 8.29, 8.30, 8.31).

Other issues in two storey houses

Other than soft storey these houses are either built on hazardous sites, lack proper retaining wall or the ground floor structure has the specifications right for just single storey houses. A generic increasing trend of vulnerability is shown in the figure 8.32.

Figure 8.30 — These houses gained ERRA funds for the ground floor area. First floors are constructed with own funds. The tower roof above is the indication of the changed construction culture of rural AJK. Source : S. Abidi

Figure 8.31 — Houses built on hazardous sites or have improper retaining wall. Source : S. Abidi

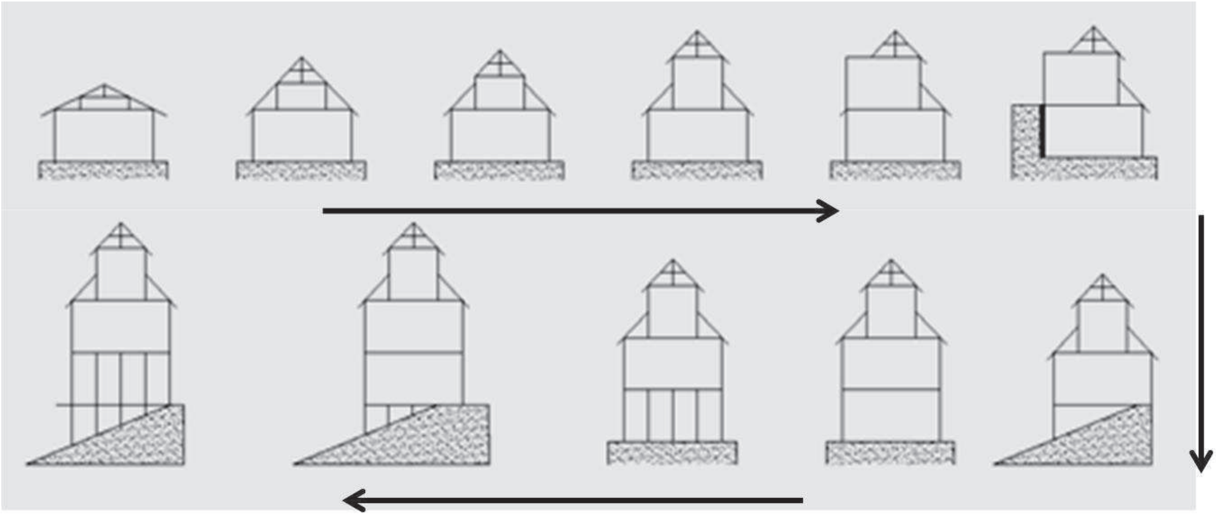


Figure 8.32 — A generic trend of increasing vulnerability in single and double storey houses.
Source : S. Abidi

Only few relations of policy and sociocultural characteristics were examined in this research. There are several other which should be explored.

Different types of houses in practice should be structurally tested by researchers and engineers. Although much work is going on focusing dhajji dewari but tower roofs still require detail structural analysis.

Long term impacts of reconstruction on society should be researched upon. This study could focus only few features of these impacts however several others have a dire need to be explored. It should be investigated that how culture changes with the change in architecture.

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Research activities during thesis

Conference communications

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[2] Abidi, S.R., Akbar, S., Bioret, F., "Post-Event Reconstruction in Asia since 1999 : An Overview Focusing on the Social and Cultural Characteristics of Asian Countries", *International Conference of Earthquake Engineering and Seismology*, NUST, Islamabad, Pakistan, 25-26 April 2011.

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[1] 2nd ERRA International Conference, "Converting adversity into opportunity: Learning from experiences in reconstruction and rehabilitation for rebuilding lives and commu-

nities after disasters", Islamabad, Pakistan, 19-21 April 2010.

[2] Formation AFCE, "Gestion de projets : les outils de pilotage", Brest, France, 26 March 2010.

[3] Formation AFCE, "Valoriser son doctorat pour sa poursuite de carrière Professionnelle", Brest, France, 10 May 2010.

[4] Formation AFCE, "Management de projets : quelles compétences docteurs transférables ?", Brest, France, 21 May 2010.

[5] Formation URAFF, "Recherche d'information sur le web et dans la base de presse Factiva pour la recherche et l'enseignement ", Brest, France, 9 April 2010.

[6] Forum des doctorants ALL et SHS, "Partager les motifs de recherche des doctorants", Brest, France, 27-28 April 2010.

Internship

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ANNEXE

Questionnaire for 2013 field surveys

Form no. ________ Date : __________ Village : __________ UC : __________

General information

Name of respondent
Relation with owner
Education
Source of income of household
Average income/month
How many tranches of financial assistance you obtained from ERRA

Destroyed house details

Area (ftxft) :

Construction style
1. Dhajji construction
2. Stone-mud construction (katcha)
3. Dry stone construction
4. Stone-cement masonry
5. Brick masonry
6. Block masonry
7. Concrete and steel construction
8. Mixed construction
9. Shelter type
10. Any other

Was that house on same site?

No. of storeys :

Type of roof :

No. of rooms you had :

The type of kitchen :
1. A room was used as kitchen purpose
2. Separate kitchen
3. kitchen in veranda as well

Toilet :
1. No toilet
2. Pit toilet
3. Flush toilet

Reconstructed house details

Main structure is

1. Old
2. New

Area (ftxft) :

Type of construction :

1. Dhajji construction
2. Stone-mud construction (katcha)
3. Dry stone construction
4. Stone-cement masonry
5. Brick masonry
6. Block masonry
7. Concrete and steel construction
8. Mixed construction
9. Shelter type
10. Any other

No. of storeys :

No. of rooms :

The type of kitchen :

1. A room is used as kitchen purpose
2. Separate kitchen
3. kitchen in veranda as well

Toilet :

1. No toilet
2. Attched (with main structure) flush toilet
3. Detached (from main structure) flush toilet

No. of family members residing in this house :

If the house is found in dhajji-dewari

How much confidence about dhajji's resistance against earthquakes you have?

1. Strong confidence
2. Confidence
3. Neutral
4. Weak confidence
5. No confidence

How strong you have experienced dhajji?

1. Extremely strong

2. Very strong
3. Strong
4. Weak
5. Very weak

Was ERRA aid sufficient to build a core house (250-400 sq ft) in dhajji?

1. Yes
2. No

How do you maintain your house?

1. by covering the walls
2. by maintaining the gap between plinth and ground
3. by maintaining the infill
4. any other (please specify)

How do you cover the walls of dhajji?

1. exposed
2. exposed+ other material to cover
3. mud plaster in combination with CGI sheets/wooden planks
4. mud plastered
5. CGI covered
6. with wooden planks
7. with fabric cover
8. any other (please specify)

How do you rate dhajji for its aesthetics and modernity?

1. very good
2. good
3. neutral
4. bad
5. very bad

How do you value the future of dhajji?

1. very good
2. good
3. neutral
4. bad
5. very bad

What was the primary reason in your mind to select dhajji for reconstruction?

1. to get ERRA aid
2. material availability
3. lesser cost
4. earthquake resistance
5. lesser time required to build

ODR

Who selected the construction type of your reconstructed house?

1. I
2. friend/relative
3. mason/carpenter
4. ERRA
5. other

How much you are satisfied with this type?

1. extremely satisfied
2. satisfied
3. neutral
4. a bit unsatisfied
5. not at all satisfied

When you observe deviations from guidelines (non compliance) in any house, which primary reason comes to your mind?

1. less than 4 tranches received
2. guidance was not received
3. delay/change in policies
4. more than one reason

Which type of difficulty you faced during reconstructing the house?

1. policy related issues
2. material related issues
3. labour related issues
4. weather related issues
5. more than one

During reconstruction, whom you consulted for queries related to construction most of the time?

mason/carpenter

1. VRC/AI teams/UNHABITAT
2. HRC
3. poster/flyers etc
4. other (please specify)

In post-reconstruction period, whom you consult for queries related to construction most of the time?

1. I myself know construction
2. mason/carpenter
3. other (please specify)

Tower roof

Type of roof of tower roof :

1. no roof
2. no break hip roof
3. no break dutch gable roof
4. no break hip & valley roof
5. negligible break, hip roof
6. negligible break, dutch gable roof
7. negligible break hip & valley roof
8. negligible break shangrila roof
9. prominent break, sateritak
10. prominent break, dutch gable roof
11. prominent break, shangrila roof
12. prominent break, combination roof
13. independent structure, hip roof
14. independent structure, dutch gable roof
15. independent structure, gable roof
16. independent structure with dormers
17. no break gable roof
18. no tower roof

Did ERRA allowed to build two storeys?
1. yes
2. no

Had ERRA planned to give you last tranche after roof inspection, you would have still practiced tower roof the way you have done it now?

1. yes
2. no
3. we do not know

Was ERRA financial aid sufficient to build a house for 7 to 8 people?
1. yes
2. no
3. we do not know

Have you received any document providing guidance on two storey house construction?
1. yes
2. no

Why you adopted tower roof? (more than one can be selected)
to gain space
1. everyone practiced it so we also practiced it
2. ERRA asked us
3. it is beautiful
4. it is modern

Which purpose you are using tower roof for?

1. storage
2. bedroom
3. dining room
4. guest room
5. multipurpose space
6. any other (please specify)

Do you think it is earthquake resistant construction technique?
1. yes
2. no
3. do not know

Do you think it is structurally strong construction technique?
1. yes
2. no
3. do not know

Do you consider the construction of tower roof as “expensive”?
1. yes
2. no
3. not much

Is this space colder than ground floor?
1. yes
2. no
3. not much

Does this space provide insulation for ground floor?
1. yes
2. no
3. a bit

Does this space receive more noise of hail/rain than ground floor?
1. yes
2. no
3. a bit

Do you find any issues in approaching the attic?
1. yes
2. no
3. a bit

Is it easy to maintain tower roof?
1. yes
2. no
3. few difficulties are found

If # 3 is selected in above question, which issues you find to maintain tower roof?

Do you consider this construction a threat for the environment?

1. yes
2. no

Do you plan to add a kitchen/toilet/bathroom in tower roof in future? (open ended)

Change in family system

Pre-quake culture of splitting from extended family (generic)

At what age people used to separate from their parents?

What were the primary reasons?

In such situation, whom did the parents live with?

Were they agreed for this separation?

Did the separated son (and his family) used to share responsibilities even after separation?

Did the nuclear family use to construct the new house near old house of parents?

Pre-quake situation for living in extended families (particular to respondent)

No. of family members

What was primary crop yield of the family?

Was it distributed equally among all couples?

What was the number of livestock of the family?

Was every couple a beneficiary of those animals?

How many rooms were under use of every couple?

Were the home tasks justly assigned to everyone?

Post-quake situation for splitting from extended family (particular to respondent)

At what age you have separated from your parents?

What were the primary reasons?

Whom do the parents live with now?

Were they agreed for this separation?

Do you share responsibilities with your parents even after separation?

Is your reconstructed house near your old (parents') house?

Have you reconstructed on agricultural land?

Post-quake situation for living in extended families (particular to respondent)

No. of family members now in your reconstructed house :

Is the crop yield of the family increased or decreased for your nuclear family?

Is it distributed equally among all couples?

Is the number of livestock increased or decreased for your nuclear family?

Is every couple a beneficiary of those animals?

Are all other couples present in extended family independent now?

Were the home tasks justly assigned to everyone?

Which are the positive aspects of nuclear family system (please select all the options which you consider correct) :

1. More independence
2. More privacy
3. Less economic burden
4. Fewer liabilities
5. Less fatigue
6. Less disputes among family members
7. Kids can be brought up in a better way

Which are the negative aspects of nuclear family system (please select all the options which you consider correct) :

1. Loneliness
2. No one shares the home tasks
3. Insecurity
4. Less free time now
5. None to look after your kids in your absence
6. Family strength is reduced
7. Outside work to be done alone

Basic space needs

Which spaces should be essentially a part of the core house? (More than one options possible)
1. Bed room
2. Kitchen

3. Living room
4. Toilet
5. Bathroom
6. Other (please specify)

Which of the above selected space you lack in your house?

Will you add that structure, (selected previously), in this house?

Will you construct that structure in the same construction style?

Lack of thermal insulation

Do you feel dhajji houses provide more thermal insulation than your previous houses during extreme weather conditions?

1. yes
2. no
3. both are same

If yes, which options you opt now to fight cold? (More than one options possible)

1. Wear warmer clothes
2. Burn more wood
3. Use heavy quilts
4. Any other (please specify)

Do you know any latest materials to insulate the houses? (e.g. glass-wool, polystyrene, polypropylene, bubble-wrap sheets etc)

How can you make your house warmer (More than one options possible)?

1. Adding mud layers on inside and outside of walls
2. Providing additional wall around the house (hence making a cavity in between)
3. Adding latest thermal insulation materials
4. Any other (please specify)

Do you think that adopting above selected solution can make your house seismically vulnerable?