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Cultural Capital for Earthquake Vulnerability Reduction: The case of Kathmandu Valley

Punya Sagar Marahatta

Nepal

Supervisor:

Dr. Wim Blauw

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This study "*Cultural Capital for Earthquake Vulnerability Reduction: The case of Kathmandu Valley*" aimed to understand the earthquake vulnerability in Nepalese context from a social perspective. The attempt was therefore to have an in-depth and better understanding of low income group people and their knowledge of earthquake vulnerability reduction. Similarly it has tried to analyse the techno-centric and community-based approaches of earthquake vulnerability reduction. One of the major objectives of this study is to explore culture as an asset useful to reduce earthquake vulnerability.

To fulfil the objectives, study took case study method and attempted to test the hypotheses. Eventually, it is the result of 10 household interviews, 16 expert interviews and 2 focus group discussions.

Collected data revealed that there is a significant role of capitals for sustainable livelihood. Since, the low income people are more exposed to disasters, earthquake disasters are not exception to them. They are vulnerable in all respect but they have their own knowledge to reduce it. The knowledge they have is practiced as culture but are ignored by the stakeholders like households, communities, government, NGOs and academic institutions. Often, the local knowledge is being practiced as culture by the households in communities and they themselves are not very aware of the potential of their knowledge. Over the top, the modern approach of engineering and technology has overcastted the local knowledge/ technology; often by considering them to be rudimentary or superstitious. This study found out that all the knowledge and technology at the local level are not superstitious neither they all are contextual too. This proves that the local knowledge embedded in culture in tacit form is to be revealed and researches are needed to identify them and to explore the scientific aspects of local knowledge for their contextual use. This study has shown that earthquake vulnerability reduction is possible by working all stakeholders together. Earthquake vulnerability is rampant so the strategy to reduce it should have a holistic approach. Technological means are the best instruments to reduce earthquake vulnerability but such technologies have to respond the culture of the particular context which eventually humanises the technology. This has identified that the policies, technologies and approaches developed to reduce the earthquake vulnerability are seldom responding the culture of the community because there is a significant gap between lab and the field.

In developing countries like Nepal, modern engineering approach has dominated local knowledge in terms of building technology which has forced the local people to imitate the modern technology without understanding the discipline of the particular material. This eventually has added vulnerability to them. Therefore, to reduce earthquake vulnerability, the local practices and understanding of local technologies are to be incorporated in policies, in academic exercises and curricula and reincorporated in livelihood. These steps make the livelihood sustainable.

This study has revealed that the approaches adopted for earthquake vulnerability reduction are always techno-centric but there are two technologies being based on modern knowledge and local knowledge. All techno-centric approaches have to be

developed by the cultural responses and being based on community. This study also revealed that the term ‘non-engineered building’ is not appropriate. The ‘so- called’ non-engineered building is more of locally engineered building. It has been proved that in several historical disasters, such locally engineered buildings have withstood the impact of earthquake and eventually proved to be less vulnerable.
Finally, the significance of local knowledge has been identified by this research to be very much useful to reduce earthquake vulnerability. This stressed to promote local knowledge which is practiced by communities as a part of culture. Hence, it has articulated that culture is capital which is useful for the sustainable livelihood; earthquake vulnerability reduction is not again an exception.

Key words: Earthquake, livelihood, local knowledge, cultural capital, stakeholders

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I shall have only myself to blame for any shortcoming of this study despite all contribution from these people.

Foreword

Nepal is considered to be one of the poorest countries of present day world. It has horrifying history of several natural disasters; earthquake being one of such prominent disasters. Nepalese people are living under globally admitted line of poverty and therefore they are considered to be the most vulnerable during natural disasters like landslides, flooding, earthquake etc because of inadequacy of capitals to mobilise to make their lives sustainable. However, households, communities and societies often are not aware about what they have as capital to make them sustainable.

Back to beginning, sustainable human settlements development in urbanising world as the theme of Habitat II conference held in Istanbul in 1996 have stimulated the author to think in this area of study. Very often, earthquake vulnerable reduction strategies refer to the sustainability of human settlements so it is an attempt to study the context from the perspective of Urban Social Development.

This thesis is a documentation of a research conducted as a partial fulfilment of MSc in Urban Management and Development through a peer of Urban Social Development. It is the document of insights and knowledge gained by the author in the area of earthquake vulnerability reduction and the culture. Hopefully this contribution can be useful for other professionals and policy makers involved in the process of making the communities less vulnerable, safer, sustainable and more suitable in present day context.

Many knowledgeable people have put their efforts to make this experience possible. This thesis has incorporated the views of the experts on their own word. Since several such interviews were conducted in Nepali language and translated, there might be some blunders in translation. I apologise for such short-comings if they pertain.

Finally I would like to thank you all for your personnel commitments to reduce earthquake vulnerability by using local knowledge inherited in culture and look forward to receive the comments in my professional career.

Abbreviations

BS: Bikram Sambat (Hindu calendar used in Nepal officially)

CBO: Community based organisation

CDS: Centre for Disaster Studies

DMC: disaster Management Committee

GTZ: German Development Cooperation

I/NGO: International Non-governmental Organisation

ICIMOD: International Centre for Integrated Mountain Development

ICRC: International Council for Red Cross

JICA: Japan International Cooperation Agency

KMC: Kathmandu Municipal Corporation

NCDM: Nepal Centre for Disaster Management

NGO: Non-governmental organisation

NSET-Nepal: National Society for Earthquake Technology, Nepal

RCC: Reinforced Cement Concrete

SLA: Sustainable livelihood approach

SONA: Society of Nepalese Architects

VDC: Village Development Committee

Table of Contents

Chapter 1: Introduction

1.1. Research Topic

Cultural capital for Earthquake Vulnerability Reduction: The case of Kathmandu Valley.

1.2. Motivation for conducting research

Natural disasters, e.g. landslides, floods and earthquakes have been the cause of tremendous loss of lives in South Asia. Their impacts are very severe on urban and rural communities in the above mentioned region. Effects of such disasters are severe because of the vulnerability of low income group people. In this research, attempts are done to study the earthquake vulnerability on low income group people of Kathmandu and the possible approaches for its reduction.

Earthquakes are unavoidable phenomena in the Nepalese rural and urban context. Nepal itself lies in a very active earthquake prone zone and the aim of this research is to compare the techno-centric approach and community-based approaches with regards to the earthquake vulnerability reduction of low income group people in the Nepalese context. These days a techno-centric approach for vulnerability reduction is dominant which seems to be an expensive option in countries like Nepal.

In the past, several civilisations, settlements and the entire history of a several places have been disappeared by devastating natural disasters. However, Kathmandu, even facing devastating earthquakes in a regular interval, has maintained its identity with minimal loss. It could be presumed that is because of the tacit knowledge Nepalese communities had; which consistently might have stimulated people to bring back normalcy in their life. It, therefore, could be said that fighting with earthquakes is part of the culture in Nepal.

Currently, there are no specific policies designed or implemented at any level of government in Nepal regarding pre-earthquake preparedness, although there are some building codes, institutions and mechanisms for post disaster rehabilitation. The study is expected at the least be able to draw attention of the stakeholders and authorities and alarm them about the impending disaster.

It is experienced that most of the research in this context has taken into consideration a techno-centric approach where structural engineering is focal; the proposed research, although acknowledging the importance of engineering, makes use of the theory of the sustainable livelihood frameworks, which establishes people at the focal point. The theory of sustainable livelihood frameworks has emerged and had been predominantly used in rural settings and basically deals with five assets of the poor: human, social, physical, financial and natural capital (DFID 1999). The present research has used it in a sub-urban context. **This research helps to understand 'culture' as a capital of low income group people which is useful for reduction of vulnerability**. This is to gain better understanding into the livelihood of low income

group people in Kathmandu and their knowledge of earthquake vulnerability reduction at their level.

The researcher being a full time faculty member of the Department of Architecture and Urban Planning, Institute of Engineering, Tribhuvan University, the outcome of the research will also be instrumental in setting up a future course at the centre for Disaster Studies as Tribhuvan University, Nepal.

1.3. Concepts, situation and problem statement

An earthquake is a natural phenomenon. It is a sudden and violent motion of the earth caused by volcanic eruption, plate tectonics, or manmade explosion, which lasts for short time and within a very limited region. Most earthquakes last for less than a minute. The large earthquakes are followed by a series of aftershocks which also may be dangerous. (Bothara, 2002)

Historically, seismicity is the collection of historical records of earthquakes preserved in different form such as written history, chronicles, inscriptions etc. in Nepal. Historical events must be available for a long period of human civilisation which should throw light on the extent of damage besides the information on date and place of occurrence.

The earthquake of 1255 has been reported to destroy many houses and temples and killing one third to one forth of the population of Kathmandu. Earthquake of 1408, 1681 and 1810 also damaged Kathmandu a lot. In 1833 another earthquake devastated Kathmandu; though this quake had brought less human losses because of possible occurrences of foreshocks. (Billham, 1995). The earthquake of 1934 was the most devastative which killed 16,000 people. The latest earthquake of 6.6 Richter scale in 1988 hit Kathmandu valley with a minimal impact as the epicentre was distant. Even though, there was 1% life loss, 6% of houses collapsed and 17% of buildings damaged. (JICA, 2002) The records of that disaster suggest that the heavy impact was in the eastern city of Dharan, however, some nearby sub-urban areas in Kathmandu valley, namely Godawari, Lubhu, Sunakothi and Thimi, were impacted as well.

From the record of previous earthquakes, it has been observed that there is a threat of a major earthquake every 75 years in Nepal. Based on the statistical data, the Himalayan region is likely to get another shocking quake in the near future. It is predicted that if an earthquake of a 5.7 Richter scale hits Kathmandu, killings of 40,000 people, injuries to 90,000 people and collapses of 60% of existing buildings is possible. People at large and including low income group people are living in such territory which has a horrifying history. They are living with lack of in-depth understanding of their own vulnerability and the government is not paying direct attention in the form of policies and/or institutional support. Governmental institutions are failing to a large extent to guide and help the people to reduce earthquake vulnerability. An earthquake, which can not be avoided, but the degree of vulnerability could be less if worked out prior to the event.

Vulnerability denotes the inadequate means or ability to protect oneself against the adverse impacts of natural impacts of natural events and, on the other hand, to recover quickly from their effects (Garatwa and Bollin, 2002).

An earthquake as a disaster hits hard to the poor and leads them to deeper poverty however it is the case to well-being families as well. According to Nabi et al., in the article 'Waves of Disaster' usually such type of disaster does not affect only physical assets; it destroys also the social class structure. It might vanquish the middle class. The same article states that people understand disaster from a social approach. An earthquake is considered as an environmental factor which is non-manipulative, but a person or group of people decides how much of its impact is desirable and how to reduce its vulnerability. (Gans, 1972). Gans argues that vulnerability is always connected to the "effective environment". According to him, the effective environment is the conglomeration of the 'best used' physical environment. The physical environment is only then the 'best used' if it is the product of social system and culture of people. It could be said that if the effective environment prevails, there is less chance of insecurities which, is in other terms 'less vulnerable'. According to Rakodi (2002) vulnerability reduction is possible by transformation of the available livelihood assets towards more income, and intensifying existing, developing new or discovering their strategies. The case of Bangladesh has shown that women and children are most vulnerable during a disaster. The article on Bangladesh shades light on both external and internal factors which are responsible for vulnerability. Jigyasu (2000) has suggested understanding the earthquake vulnerability from the local level with local knowledge and practices by being closer to the people. This however helps to reduce its impacts on locals. As he states, people understand earthquakes from a social approach, which is entirely different from the physical or techno-centric approach. A social approach is linked to the local culture and tradition. An earthquake is part of culture in south Asia. But the cultural continuity, which signifies the human dimension of sustainable development, is diminishing these days, which is the cause of increment in vulnerability (Jigyasu, 2000). Similarly, in south Asian context, as in Bangladesh case, it is seen that those who are weak in physical wealth can unite together and solve the problem collectively.

Vulnerability reduction is now widely used as a term that encompasses the two aspects of disaster reduction strategy: 'mitigation' and 'preparedness'. According to TERAFUND definition, 'mitigation' as the measures that can be undertaken to minimise the destructive and disruptive affects of hazards thus lessen the magnitude of a disaster. Similarly, TEARFUND defines 'preparedness' as all measures undertaken to ensure the readiness and ability of society to forecast and take precautionary measures in advance of imminent threat, and respond and cope with the effects of a disaster by organising and delivering timely and effective rescue, relief and other post-disaster assistance.

As stated earlier, the techno-centric approach is dominant in Nepal which according to Jigyasu may not be the appropriate tool in vulnerability reduction. It is needed to explore other options of reduction of earthquake vulnerability. Non-governmental institutions (like the National Society of Earthquake Technology), academic

institutions (like the Centre for Disaster Studies, Institute of Engineering, Tribhuvan University) and some communities/ professional organisations (like the Nepal Engineers' Association, the Society of Nepalese Architects) are working in earthquake risk preparedness but they are focussing on techno-centric approaches. According to Jigyasu (2000), almost all 'vulnerability reduction strategies' are wrong official policies, or in many instances, a result of emergency, relief and rehabilitation models by NGOs'. Vulnerability reduction will be more effective if techno-centric efforts are put into context by the cultural dimension of the society.

Finally, having discussed the aspects of earthquake vulnerability reduction, it is clearly seen that the solution of the problem lies in understanding earthquake vulnerability of low income group people, its reduction and obviously lack of appropriate strategies and policies. So, the question arises: What is earthquake vulnerability and how to reduce it?

1.4. Research objectives

- Providing in-depth and better understanding of low income group people and their knowledge of earthquake vulnerability reduction;
- Analysing the techno-centric and community-based approaches of earthquake vulnerability reduction;
- To explore culture as an asset useful to reduce earthquake vulnerability;

1.5. Research questions

1.5.1. How can earthquake vulnerability be reduced?

Hypothesis*: Utilisation of assets of local community can reduce disaster vulnerability.*

1.5.2. What is the role of a low income group community in the reduction of earthquake vulnerability?

Hypothesis: *They use their capitals (Human, social, financial, physical and natural).*

1.5.3. Does 'culture' function as an asset of capital of low income group people to reduce vulnerability?

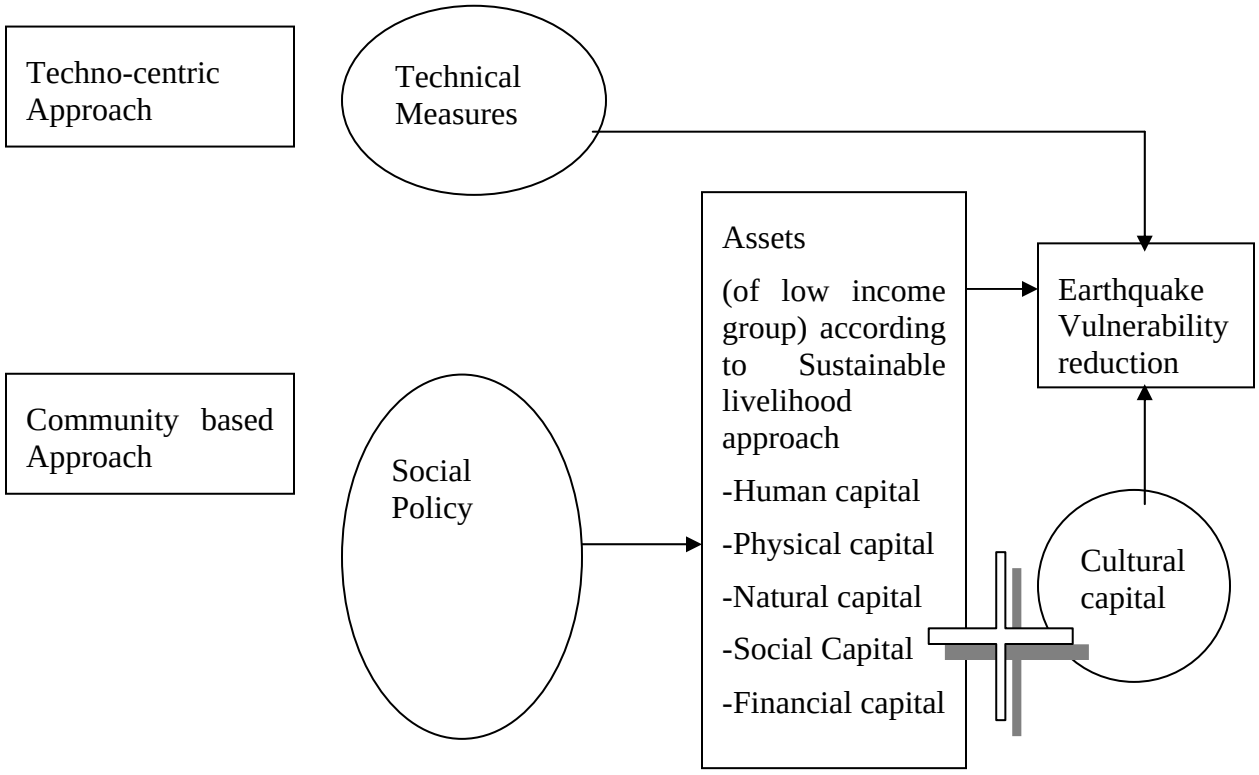
Hypothesis: *Culture is a potential capital of low income group people.*

1.5.4. What is the role of a community based organisation, non- governmental organisations and governmental institutions in reduction of earthquake vulnerability?

Hypothesis: *These organisations and institutions develop mechanism to reduce the earthquake vulnerability taking in account of social policies and cultural values.*

1.6. Research Methodology

1.6.1. Research model



1.6.2. Research Design and units of analysis

Social researches basically are based on case studies in which materials are gathered with the help of participant's observation, interviews, focus group discussions and written or audio-visual materials. The research conducted a case study with two focus group discussions and some interviews in the area described below.

Based on the problem definition, research question and research model presented above, a case study approach is considered the most appropriate basis for the research.

The research case is selected from a sub-urban area namely Godawari 6KM from Kathmandu city centre which had been affected by the earthquake in 1988 in order to understand earthquake hazards and indigenous knowledge adopted to overcome the impacts of earthquake. Following table gives an overview of the selected site.

Table 1: Primary data of Godawari Village Development committee

SN	Description	Details	Units	Remarks
1	Population	6257	number	3081(F) and 3176 (M)
2	Total no of households	1353	number	
3	women saving groups	25	number	
4	health posts	2	number	Cater two settlements/villages in vicinity
5	Schools	3	Number	Primary, secondary and Higher secondary
6	Resorts/Hotels	2	number	
7	Industries	1	number	Marble industry
8	Distance from district HQ	2	KM	
9	Distance from Kathmandu Centre	6	KM	
10	Recreational area	2	number	Botanical garden and a playing field

Source: District profile of Lalitpur-2004,DDC, Lalitpur.

This research is based on the case studies taken from a suburban area of Kathmandu valley; owing to the assumption that the settlements in other regions in Nepal are equally susceptible to earthquake and the technical as well as socio-economic condition of the regions remain similar. Therefore, the outcomes of this research will be applicable for the Nepal and some other neighbouring Himalayan regions only. Since the research is based on the quality of data available from the respondents, the outcomes are dependent on the respondents and their attitude during the research's interaction period.

1.6.3. Instruments of the research

In order to investigate this topic, uses are made of qualitative methods. More precisely, by means of structured house-hold interviews, semi-structured expert interviews and focus group discussions with women and youths group and coming up with audio and video recording, still photography etc. Since the theory is based on livelihood approach of the poor, the participant observation is most appropriate instrument to gain a close and intimate familiarity with a given group of particular community and their practices through an intensive involvement with people in their natural environment. Such observation is usually undertaken over an extended period of time. The allocated time for field work of maximum for 5 weeks was during

monsoon time in Kathmandu, household interviews were conducted to avoid unnecessary problem to the respondents as most of them are farmers. As monsoon period is peak time of their agricultural activities, research comprised of interview method instead of direct observation.

There are two main reasons for using four different instruments for research. Firstly, to gather much information on the vulnerability context and setting by taking into account different stakeholders and different perspectives, a deeper understanding of the phenomenon of earthquake vulnerability was aimed to be reached. Secondly, the collection of data obtained from different sources allowed for triangulation and thus enhanced the reliability of collected data, and consequently, the reliability of the research findings.

1.6.4. Research scope, population and sample

The scope of this research is earthquake vulnerability of low income group people in Kathmandu and its reduction through community based approach. The research population thus comprised low income group people communities in Godawari.

Due to large area to be covered, the research was based on a sample of target population. For semi-structured expert interviews and household interviews, samples were selected in a random way being based on the impacts on the community by most recent earthquake in 1988, accessibility to the community and the socio-cultural behaviour of the community.

For focus group discussions the sample are selected so as to represent both female and youth.

1.6.5. Data collection and analyses

Collection of secondary data started in March 2007 and is used for the further processing. A research associate and a research assistant with local knowledge and efficient language skills (both local and international) had been responsible for household and semi-structured interviews administration. They were provided clear explanations about the objectives of the research.

Two focus group discussions were conducted. The number of expert interviews is 16 covering experts and institutions/ organisations at the local, national and regional level from governmental, non-governmental and community level organisations.

Focus group discussions and interviews were conducted by the researcher himself with the help of research assistants. Data processing and analysis is also done by the candidate.

1.7. Limitations of the study

This study will contribute to explore a social approach to reduce the earthquake vulnerability which could be more appropriate in low income countries like Nepal. The biggest limitation of this research is its generalisation. Due to the vast diversity of cultural ethnicity in a

country like Nepal, research findings on a particular ethnic culture might not be applicable to other communities however this research is expected to be more balanced, generalised and useful to all other ethnic communities. The findings of this research might hence only be extended to very similar cases of low income group people in sub-urban fringe, populated by mainly of an ethnic community or blend of not more than two communities. This is a trade off of a case study research, which offers in-depth understanding of the subject, yet limits its external validity. Time might bring more consolidation on external validity as series of replication of such researches are done; and not only to case study designs.

The inherent complexity of this research lies in its data collected. This is because of the time that has passed since the last earthquake which hit Kathmandu and memorising of its impacts. This forces the research to depend on the informants' memories and secondary data which sometimes may not be as accurate as expected. Similarly, techno-centric and community based bias of the focus group respondents might be also a problem if not handled properly. To overcome such issues, time allocated for the research itself seems less as in such cases researcher could feel forced to put his own view which could be proved to be immature. Eventually, to avoid such problems, researchers should be rigorous and precise.

1.8. Thesis structure

The thesis comprises of six main chapters and bibliography.

Chapter one deals with basic introduction of the topic including the author's motivation, problem statement, research objectives and methodologies to achieve the goal. In order to make reader a comfortable reading, this chapter is composed in a manner that problems, objectives and research model/ methodology are presented under the same chapter which might be quite unusual than the standard format used in most of the universities.

Chapter two lays the foundation of the present research. It starts with a historic overview of development of four concepts (earthquake, vulnerability of low income group people, culture as an asset of livelihood and concept of technical and non-technical approach for earthquake vulnerability reduction). The chapter discusses the context of earthquake and its impact, sustainable livelihood framework and use of cultural capital for earthquake vulnerability reduction, and presents theoretical framework that will guide the research.

Chapter three of this thesis will attempt to answer the research question 2 being based on the fieldwork and literatures collected. The chapter discusses about the case study area, the livelihood of low-income group people in sub-urban area of Kathmandu and the understanding of earthquake vulnerability in the area mentioned.

Chapter four is dedicated to explanations on building practices based on modern knowledge and traditional or local knowledge inherent in the culture of the people, the importance of socio-cultural institutions and their role in earthquake vulnerability reduction and causes for marginalisation of local knowledge, and it will answer research question 1 and 3.

Chapter five shades lights on the policies, regulations and codes if those are developed to make people less vulnerable during earthquake. Similarly, it will discuss about the pitfalls of existing practices, policies and approaches of earthquake vulnerability as well as potential role of assets of low income group people as well as role of governmental institutions, NGOs, CBOs, households to reduce the earthquake vulnerability especially useful for the low income group people.

Chapter six reflects the conclusion, thus providing answers to the major question, question 1, of this research. Conclusions summarise the findings of the study, and discusses the importance of stakeholders as well as usefulness of cultural capital to reduce the earthquake vulnerability of low income group people in Kathmandu valley. Similarly this chapter will help to lay the foundation for further research in its area.

A bibliography follows the last chapter and annexes are attached at the end of the document.

Chapter 2: Literature Review/Theory

This research is focussed on three basic concepts namely earthquake vulnerability, existing approaches for its reduction and use of cultural capital for its reduction. In this case, cultural asset is considered as a different capital other than the five forms of capital of the sustainable livelihood approach.

The first section of this chapter explains earthquake vulnerability taking considerations earthquake as a natural disaster. This section defines earthquake and vulnerability separately to make clearer connections to the theories. Besides, this chapter consists of some facts and figures about the earthquake in past in Nepal.

The second section of this chapter discusses the approaches adopted to reduce the earthquake vulnerability in general and specifically in Nepalese context.

Cultural capital and its use in vulnerability reduction are discussed in the third section of this chapter. This chapter shades light on the cultural practices in Nepal and their potential use in earthquake vulnerability reduction. In order to clarify the concept of cultural asset, this chapter discusses the sustainable livelihood approach which distinguishes five basic capitals (excluding the cultural capital).

The chapter ends with a summary of findings which shows possible relationship/links of the different concepts discussed earlier in chapter.

2.1. Earthquake vulnerability

Earthquake vulnerability is to be studied as two different concepts: earthquake and vulnerability, separately.

2.1.1. Earthquake

An earthquake is a natural phenomenon. It is a sudden and violent motion of the earth caused by volcanic eruption, plate tectonics, or manmade explosion, which lasts for short time and within a very limited region. Most earthquakes last for less than a minute. The large earthquakes are followed by a series of aftershocks which also may be dangerous. (Bothara, 2002) The definition considers an earthquake as a natural disaster. It is to be understood that an earthquake is sudden and violent, which has an impact not only on nature but also on people and manmade structures. An earthquake is the result of a sudden release of stored energy in the earth-crust that creates seismic waves. In most a generic sense, the word earthquake is used to describe any seismic event –whether a natural phenomenon or an event caused by humans-that generates seismic waves. An earthquake may result in decease, lack of basic necessities, higher insurance premiums, general property damages, road and bridge damage and collapse of buildings or destabilization of the base of buildings which may lead to collapse in future earthquake (Wikipedia, 2007).

The definition of earthquake, to be tackled more in depth in this section, reflects also a social perspective. The definitions from various sources describe an earthquake as a natural phenomenon, but its societal impacts are equally important. The history of earthquakes has recorded a massive human casualties and loss of physical, social and cultural capital of human beings. Therefore, earthquake is always to be studied along with vulnerability by social scientists.

2.1.2. Earthquake history in Nepal: Some facts and data

Historical seismicity is the description of historical records of earthquakes preserved in different forms such as written history, chronicles, inscriptions etc. which play an important role in the seismic hazard assessment because instrumentally recorded earthquakes are lacking before the current century. Historical events must be available for a long period of human civilization to throw light on the extent of damage besides of the date and place of occurrence.

The earthquake of 1255, which has been reported, destroyed many houses and temples and killed one third to one fourth population of Kathmandu Valley. The earthquake of 1408 destroyed the Machhendra Nath temple of Patan. Similarly the earthquakes of 1681 and 1810 have been reported but the exact location of these earthquakes is not known.

Recent research on historical data has well constrained on the source, size, magnitude and possible location of 1833 (Bilham, 1995) which devastated Kathmandu valley. Its magnitude is reported to be of 7.8 Richter scale with a possible rupture length of more than 70 km and the event is located at 50 km North - North East of Kathmandu. The human casualties are reported to be less than 500, which may be due to occurrence of two large foreshocks.

The great earthquakes, which occurred in Nepal, were Bihar- Nepal earthquake of 1934, Assam great earthquake of 1897, Kangra earthquake 1905. Assam and Kangra lie on the Indian Territory, former at east of Nepal and later at the west.

The earthquake of 1934 is the most devastating earthquake ever occurred in the territory of Nepal with casualties of more than 16,000 people both from Nepal and India. The rupture length is estimated to be 200 Km ± 100 Km (Molnar and Pandey, 1994).

Assam earthquake of 1950 was also felt in Nepal.

The record of historical earthquake is not complete which poses a problem in assessing the recurrence period of great earthquakes. From the available data there has been no great earthquakes of magnitude more than 8.0 in the gap between the earthquakes of 1905 A. D and 1934 A. D. and there is a real threat that a major earthquake may occur in this gap that will affect Western Nepal.

2.1.3. Vulnerability

Vulnerability denotes the inadequate means or ability to protect oneself against the adverse impacts of natural impacts of natural events and, on the other hand, to recover quickly from their effects (Garatwa and Bollin, 2002).

Similarly the other definition of vulnerability is the likelihood that some socially defined groups in society will suffer disproportionate death, injury, loss or disruption of livelihood in an extreme event or face greater than normal difficulties in recovering from a disaster (Handmer and Wisner, 1999).

Vulnerability is a pervasive socio-economic condition; it is the reason why poor and disadvantaged is the predominant victims of disaster (Musser, 2002).

The mentioned definitions consider vulnerability as a social issue and an exposure to a natural hazard. Vulnerability represents the interface between exposure to the physical threats to human well beings and the capacity of people and communities to cope with those threats (UNEP, 2002).

Since vulnerability is related to human casualties, it is wise to understand it in the urban context because human concentration is found in urban areas.

"Urban vulnerability to natural hazards such as earthquakes is a function of human behaviour. It describes the degree to which socio-economics systems and physical capital in urban areas are either susceptible or resilient to the impacts of natural hazards. Vulnerability is independent from any particular magnitude from a specific natural event but depends on the context in which it occurs. The characteristic of the urban community that can be assessed through a combination of ecological factors associated with the physical conditions of the population in that place. The physical and social conditions are inextricably bound together in many disaster situations that we can use former as indicative to the latter. Vulnerability is continuously modified by human actions and therefore it varies over space and time. Vulnerability can not be assessed in absolute terms; performance of the urban place should be assessed with respect to specific spatial and temporal scales. Vulnerability therefore could be assessed by the adaptive and coping capacities that determine the extent to which a society can tolerate damage from extreme events without significant outside assistance" (Mileti, 1999).

Vulnerability, as discussed by different scholars, can be understood as a highly context specific phenomenon, which makes it difficult to generalise beyond broad lines; it is selective which requires caution in investing it and has implications in its reduction strategy.

2.1.4. Earthquake vulnerability and perceptions

Since vulnerability is context specific phenomenon, earthquake vulnerability has to be studied in its context. People from low-income and least educated group in developing countries understand Earthquake as a killer. In fact, earthquake never is a killer; instead it is purely a natural phenomenon which has two basic effects (Bothara, Guragain and Dixit, 2002):

(i) Ground effects- like surface faulting, liquefaction (ground water impacts on soil and soil tends to settle), landslides and rock falls etc.

(ii) Effects on buildings- failure mechanism, damages of buildings etc.

In both cases, usually people residing nearby or within the premises are impacted a lot. Therefore, human losses are frequent in such disasters. Here the question arises: does an earthquake kill people or it is people who kill themselves? It is said that people kill themselves during earthquakes. Natural disasters, as earthquake, are having an increasing impact on societies as a result of rising levels of human vulnerability. In this respect earthquakes are not isolated events, but a manifestation of deficiencies and weaknesses within a society, including human determined path of development (Trobe and Venton 2003).It is true, as the experiences has shown that poor design and construction of buildings and other infrastructures have been largely impacted and failed during earthquakes. Failures of such structures have caused a heavy damage in human lives. It eventually explains earthquake vulnerability is highly depended on human behaviour. Therefore, it is prioritised to understand but yet largely understood from a technological perspective which basically deals with building technology, strength of construction materials, engineering attribute etc.

Earthquake vulnerability could therefore be defined as the inherent weakness of people in an urban environment which is susceptible to harm due to social, natural or design characteristics (Musser, 2002).

2.2. Earthquake vulnerability reduction: approaches adopted in Nepal and elsewhere

The earlier part of this chapter has elaborated about the sensitivity of earthquake vulnerability and its impacts in urban context. Since urban areas are more concentrated with people of different income group and full of infrastructure; damage of which is often irreparable, they have to be protected. In such cases, both from a social and economical point of view, people and infrastructures need to be less vulnerable. Usually, attempts for vulnerability reduction are carried out both by governmental and non-governmental organisations.

Vulnerability reduction is now widely used as a term that encompasses the two aspects of disaster reduction strategy: ‘mitigation’ and ‘preparedness’. According to TERAFUND definition, ‘mitigation’ as the measures that can be undertaken to minimise the destructive and disruptive affects of hazards thus lessen the magnitude of a disaster. Similarly, TEARFUND defines ‘preparedness’ as all measures undertaken to ensure the readiness and ability of society to forecast and take precautionary measures in advance of imminent threat, and respond and cope with the effects of a disaster by organising and delivering timely and effective rescue, relief and other post-disaster assistance.

The primary strategy of vulnerability reduction is to increase the capacities of local communities and organizations to prevent, prepare for, and respond to the impacts of

disasters. It is a strategy that combines changes effected at the community level with changes to national and international policies and practices.

Nepal has some experiences on earthquake vulnerability reduction in terms of disaster risk preparedness. The following sub-headings discuss the approaches adopted in earthquake disaster context in Nepalese context till date.

In case of earthquake related disasters, the Nepal government has identified some arrangements in the form of functional arrangements and risk assessments.

2.2.1. Functional arrangements

The legislative framework for disaster risk management has experienced recent arrangements. In early days, disaster risk management was very much focused on post-disaster activities and were much more concentrated under the command of the Ministry of Home Affairs, Department of Social Welfare, Nepal Police and Royal Nepalese Army. Some non-governmental organizations like Nepal Scout, ICRC (International Council of Red Cross) and international donor agents were actively participating in post disaster management but the conditions are being changed after the introduction of Local Self Governance Act-1999. This act has given a fresh momentum to the decentralization process and devolution of authority by empowering local governments to undertake disaster management activities. Currently, Kathmandu Metropolitan City act is being formulated to provide a comprehensive legal and policy framework for an effective governance of the capital including disaster risk management. This act was expected to be enacted by the end of the year 2004, but it has not yet been so perhaps because of the political conditions in Nepal. In addition, Kathmandu Valley Town Development Act has been in effect since 2000 which also somehow address the disaster risk management issues.

The disaster management section, under the department of social welfare in Kathmandu Metropolitan, has two employees. It is the city agency responsible for identifying and informing city residents about potential disaster zones, arranging for disaster relief, providing temporary shelters and establishing a Disaster Relief Fund. The building permit process comes under the jurisdiction of the urban development department. Several wards of the municipality have constituted ward level disaster management committees (WDMC) that include representatives from community-based organizations, non-governmental organizations, businesses and clubs.

Earthquake risk preparedness is therefore an issue which has been heard loud these days in Nepal. Several organizations, both from governmental and non-governmental sectors, are working on it. NSET has a leading role from the non-governmental sector which is basically working on sectors of awareness and technology. The major focus of NSET, as it claims, is to make people aware of the earthquake risk and hence is considering several community based initiatives in this regard taking the school as the point of departure. Very recently, the Institute of Engineering of Tribhuvan University has also established a Centre for Disaster Studies in this endeavor which has as one of the objectives to study the earthquake risks in the Country.

2.2.2. Risk assessments

The seismic records of the country seem to suggest that a major earthquake on par with the 1934 earthquake occurs approximately every 75 years. Although this is only the statistical estimate, no one questions that major earthquakes are an unavoidable part of Nepal's future. Poor building practices and insufficient emergency and hospital risk preparedness elevate the risk of mass mortality and injuries from collapsed structures during an earthquake. As the records are evident, the proposed area of the Kathmandu core has also 60% of the buildings which are of mud mortar joints, 70% of such structures are in a fair condition whereas only 15% are in good condition. This helps to predict the casualties in the case of an earthquake.

On request of the Nepal government, the Japan International Cooperation Agency (JICA) recently conducted an earthquake disaster assessment of Kathmandu valley. This report predicts to have a magnitude 5.7 earthquake in the valley implying significant human, physical and economic losses. Similarly, the National Society for Earthquake Technology (NSET) has produced a report on casualties by a projection of 6.8 Richter scale intensities of shaking in Kathmandu which suggests the death of people to be more than 40,000, injuries more than 95,000, building collapses more than 60% making more than 700,000 people homeless. Both of those reports have not taken account of the sub-urban areas of Kathmandu valley where most of the population is of low income group people. However it could be easily predicted that the area would be heavily affected by the earthquake disaster.

Similarly, Nepal being a developing country has got less support from several developed or rich countries in the area of earthquake vulnerability reduction. The rich world's scant investment in natural disaster risk reduction is illogical and indefensible. Rich nations, when facing a threat to their security or well being, mobilise and invest massive resources to protect their interests. They do not do the same for poor countries threatened by disaster, although they frequently plough major resources into relief and recovery operations once a disaster has struck. It would make greater moral sense for the rich world to help prevent needless loss of life from disasters in the developing world than simply to provide aid and sympathy after earthquake strikes (Trobe and Venton, 2003).

Globally, the approaches to reduce earthquake vulnerability basically can be classified into two approaches. The most prevailing one was techno-centric approach prior to Kobe earthquake of 1995. However after Kobe earthquake, an approach has emerged so strongly which eventually promotes the idea of community participation. This is called as a non-technical or often community based approach.

Nowadays, there is a great deal of speculation but little consensus about the best way to improve a community's performance in an earthquake. Is retrofitting the best solution? What about insurances? One reason for the uncertainty has been the lack of a technique that allows decision makers to evaluate the overall effectiveness of different earthquake mitigation strategies. (Salisbury, 1997) As Salisbury indicates, earthquake vulnerability has a multiple dimension. Therefore only considering the techno-centric approach, in his terms retrofitting, may not be adequate. In this

context, the following story may highlight the local peoples' knowledge to reduce the vulnerability.

…At January 25 fishermen have reported to have eye-witnessed abnormal phenomena, such as small fishes floating, a tide becoming turbid in brown colour and so forth, signalling a tremor in the strait of Akashi which is just above the epicentre on the preceding day of tremor. Experts say "We are not sure that those statements are scientifically proved at this point, whether they were signalling tremor, but they must be recorded." They will be useful statements for the further research on earthquake prediction. .. (Abnormal signs in the strait of Akashi on the preceding day of quake).

As the story explains locals have felt phenomenon of an abnormal or pre-disaster nature. This sensing of abnormal nature could reduce vulnerability in a large extent. Similar stories could be read with the tragic Tsunami in the coastal areas of Indian Ocean. These small stories might have big impacts while talking of reducing earthquake vulnerability. Specially, in developing countries, people have maintained their tacit knowledge along with prevailing culture. One should not forget that sometimes, perhaps, cultural practices are dogmatic and superstitious however they are strong while understanding their surroundings. Revealing such people-friendly and economical knowledge is needed which might be useful to reduce vulnerability.

2.3. Cultural capital and its possible use in vulnerability reduction

This sub-chapter is presented in order to have an overview of sustainable livelihood approach (SLA), the importance of cultural capital in SLA and the possible use of cultural capital in vulnerability reduction. Culture as a capital is learned and practiced throughout the life of people.

2.3.1. Sustainable livelihood approach

The sustainable livelihood approach has been emerged in order to identify the household strategies of poor community and understand their livelihood. According to Carney (1998), "a livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural base." The livelihood of low income people therefore is assumed to be less sustainable and hence low income people are more vulnerable during shocks and stresses. Such shocks and stresses might be caused by manmade or natural disasters.

Households are, by definitions, less vulnerable if they have assets which can be used during recurrent and stressful times. Assets as SLA defines are five basic forms of capitals: Human, Social, Physical, Financial and Natural capitals. (DFID, 1999)

Human capital refers to the labour resources available to households, which have both quantitative and qualitative dimensions. The quantitative dimension of human capital refers to the number of labour force within the household and time available to engage in income-generating activities. Similarly, qualitative dimension refers to the level of education and skills and the health status of the household members.

Social capital takes account of the social resources (networks, membership of groups, relationships of trust and reciprocity, access to wider institutions of society) on which people draw in pursuit of livelihoods. Social capital is associated with political capital as the access to the governmental institutions and local leaders is also capital to the household. In developing countries, social capital is very important as it is said that 'what you know' is less influential than 'whom you know'.

Physical capital of a household is the availability of basic infrastructure (transport, shelter, water, energy and communications), production equipment and other means which enable people to pursue their livelihoods. Very often, for low income group people, jewelleries, precious metals and other goods are also the items of physical capital.

Financial capital deals with the resources available to the people (including savings, credit, remittances and pensions) which provide them with different livelihood options.

Natural capital is the set of natural resources stocks including land, water and other environmental resources, especially common pool resources. In urban and sub-urban context, natural capital might have some other characteristics however the possibility of use of the natural resources is always an asset to the households.

2.3.2. Cultural capital

Although there is no standard definition of culture, culture could be understood as the system of beliefs, values, customs, behaviours and artefacts that the members of society use to cope with their world and with one another, and that are transmitted from generation to generation through learning (Wikipedia, 2007). In general, the term culture denotes the whole product of an individual, group or society of intelligent beings. It includes technology, art, science, as well as moral systems and the characteristic behaviours and habits of the selected intelligent entities. In particular, it has specific more detailed meanings in different domains of human activities.

Anthropologists most commonly use the term "culture" to refer to the universal human capacity to codify/classify and communicate their experiences symbolically. This capacity has long been taken as a defining feature of the humans. It can be also said that culture is the way people live in accordance to beliefs, language, history, or the way they dress. Therefore, different human societies have different cultures, and the 'personal culture' of one individual can be different than another one.

Cultural capital (, le capital culturel') is a sociological concept that has gained widespread popularity since it was first articulated by Pierre Bourdieu. Bourdieu and Jean-Claude Passeronn first used the term in "Cultural Reproduction and Social Reproduction" (1973). In this work Bourdieu attempted to explain differences in educational outcomes in France during the 1960s. It has since been elaborated and developed in terms of other types of capital in The Forms of Capital (1986); and in terms of higher education, for instance, in The State Nobility (1996). For Bourdieu, capital acts as a social relation within a system of exchange, and the term is extended

‘to all the goods material and symbolic, without distinction, that present themselves as rare and worthy of being sought after in a particular social formation (cited in Harker, 1990:13) and cultural capital acts as a social relation within a system of exchange that includes the accumulated cultural knowledge that confers power and status.

Cultural capital refers to forms of knowledge: skills, education, and any advantages a person has, which give him or her higher status in society, including higher expectations.

Cultural Capital comprises three subtypes: embodied, objectified and institutionalized (Bourdieu, 1986:47).

Embodied: This is where cultural capital is embodied in the individual. It is both the inherited and acquired properties one’s self. Inherited not in the genetic sense, but more in the sense of time, cultural, and traditions bestow elements of the embodied state to another usually by the family through socialization. It is not transmittable instantaneously like a gift. It is strongly linked to one's habitus - a person's character and way of thinking.

Objectified: This relates to those things like scientific instruments or work of arts. These cultural goods can be sold physically as an exercise of economical capital and symbolically as cultural capital. Owning a painting could merely be physical or economical capital however understanding the painting is possible while the owner has embodied cultural capital.

Institutionalized: This is institutional recognition of the cultural capital held by an individual, most often understood as academic credentials or qualifications. This is mainly understood in relation to the labour market. It allows easier conversion of cultural capital to economic capital by guaranteeing a certain monetary value for a certain institutional level of achievement.

Famous economist and Noble laureate Amartya Sen (2001) has defined cultural capital as the composition of the following three factors: knowledge of production, business organisational skills and commercial networks developed over generations, often seen to spread through family and kin-based institutions, as opposed to those acquired a period of few years in the formal educational institutions.

In both the cases, culture has been accepted as a capital in the form of knowledge.

Knowledge is defined (Oxford English Dictionary) variously as (i) facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject, (ii) what is known in a particular field or in total; facts and information or (iii) awareness or familiarity gained by experience of a fact or situation. Philosophical debates in general start with Plato's formulation of knowledge as "justified true belief". There is however no single agreed definition of knowledge presently, or any prospect of one, and there remain numerous competing theories.

Knowledge is either explicit or tacit. Explicit knowledge is easily transferable and hence could be studied in schools however the tacit knowledge is embedded or inherited with in the society which is not easily taught. It is transferred only through cultural means.

One of the objectives of this research is to understand the knowledge of earthquake vulnerability of low-income people which might be possible by understanding their tacit knowledge. By definition, tacit knowledge is the knowledge that people carry in their minds and is, therefore, difficult to access. Often, people are not aware of the knowledge they possess or how it can be valuable to others. Tacit knowledge is considered more valuable because it provides contexts for people, places, ideas, and experiences. Effective transfer of tacit knowledge generally requires extensive personal contact and trust (Wikipedia, 2007).

Tacit knowledge is based on experience, behaviour, mythology and natural factors. These are difficult to express in words and to teach to someone. Tacit knowledge is learning by virtue of nature itself, by observation, experience and hearing. For instance, when you feel cold you tend to wear warm clothes, when you get thirsty you take a glass of water. Have you ever studied this wearing of warm clothes and drinking water in adverse situation or situation in need? It is natural, comes by nature as you grow up. We gain tacit knowledge by story telling, songs, everyday practice, generation transfer, observing, hearing, talking etc. This domain of knowledge is difficult to convert into text or codify for future use and only a small portion of tacit knowledge can be converted into an explicit form (Bhatt, 2001).

The District Development Committee of Mustang decided the canal intake construction at Lo Manthang. The engineers constructed a new cemented intake; which later found was too narrow for the water extraction. The engineers were not aware that the local people use the same water for some other domestic purposes too. The officers soon realised that shortcoming and allowed the locals to break the construction and make new intake based on the local knowledge and technology. The farmers built 'non-engineered (?)' intake is serving in Lo Manthang. In such case, local knowledge is best suited to keep the irrigation system work while meeting the needs of local farmers. (Chettri, 2005)

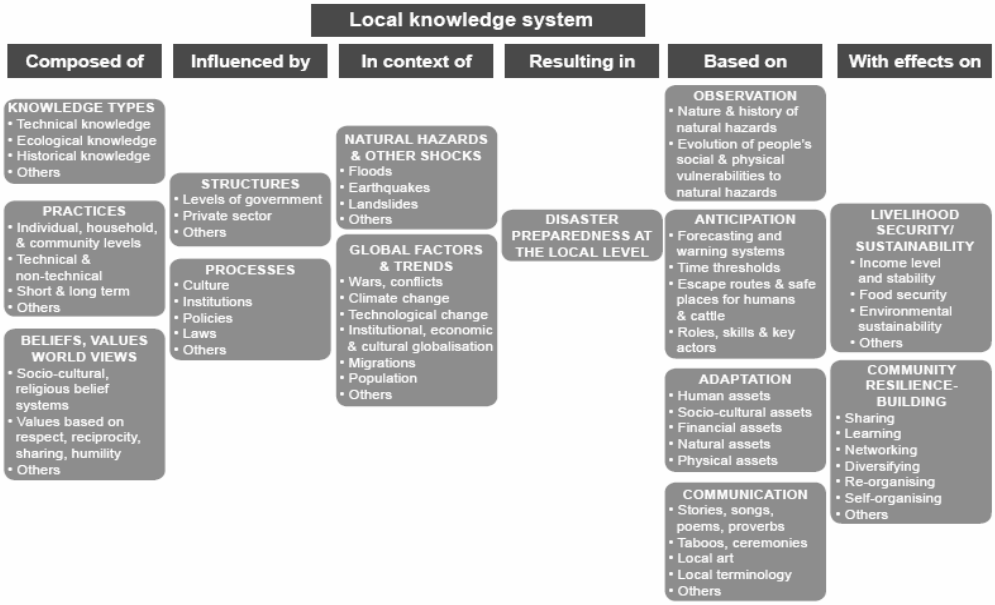
The above story tells that the local knowledge which, perhaps is more of tacit nature, was useful to fulfil the purpose. A similarly story tells about the importance of indigenous knowledge, often in tacit nature, resulting in favour of local people. In this case, the technology adopted in the neighbouring country by generations from generations was friendly to the farmers than the modern technology evolved in laboratories.

Indigenous knowledge when shared correctly can result in favour of farmers. Centuries old technologies used by the local farmers in Mali by building terraces to conserve soil to boost up crop yields and restore barren land, is getting popular among the farmers of Kenya. The Kenyan farmers are requesting Local Government Authority to create terraces such that it can retain rain water and ultimately meet the dry spells. This was basically proposed from the small holder farmer which means the

poorest of the farmers are getting aware of new technology and are trying to adopt it (Warren and Cashman, 1988).

Local knowledge including indigenous knowledge and practices has been acknowledged since 1970s' (Agrawal, 1995). However local knowledge has rarely been explored in disaster and hazard literatures. Until recently, disaster vulnerability reduction was focused on relief aid but this is now slowly changing. An example comes from the impact of the 2004 tsunami in South Asia. Following the disaster, the media especially reported how some communities managed to save their lives and property using their local knowledge through the ability to identify early warning signals of the tsunami from local songs and observed change in animal behavioural patterns. Still to implement local knowledge in overall disaster vulnerability reduction is on its way and never yet accomplished. A better understanding of local knowledge and practices can help to identify what is important and can be promoted at the local level. Building upon local knowledge and practices, which is capitalising on local strengths whenever relevant, can decrease dependencies on external aid. On the other hand, and from a social point of view, accounting for local knowledge and practices can contribute to build up mutual trust, acceptability, common understanding and community sense of ownership and self- confidence (Dekens, 2007).

Following framework for local knowledge on disaster preparedness could be a proper analytical map to identify the linkage and relationship between local knowledge and practices and disaster management and what influence them. The framework can be used as a check list of key issues to be taken in account.



Framework for Local Knowledge on Disaster Preparedness

Adapted from DFID (1999) and Ellis (2001) livelihood framework, and Gardner and Dekens (2007)

The framework itself could be summarized in four key areas of (i) understanding local knowledge, (ii) understanding the vulnerability context and contextualising local knowledge/ practices and disasters, (iii) the key dimensions of local knowledge related to disaster preparedness,(iv) livelihood security and community-resilience-building.

As the framework suggests, disaster vulnerability reduction could be possible by linking local knowledge, disaster preparedness and sustainable livelihoods for poverty reduction.

2.3.3. Culture of Nepal

The previous part of the chapter has highlighted the importance of tacit and local knowledge which is widely embedded in the culture. Therefore, it is necessary to understand the basic character of Nepalese culture.

The culture of Nepal has evolved over centuries. This multidimensional cultural heritage encompasses within itself cultural diversities of various ethnic, tribal, and social groups, located at different altitudes, and is also manifested in various other forms, including music and dance; art and craft; folklores and folktales; languages and literature; philosophy and religion; festivals and celebrations; and foods and drinks.

Nepal, a landlocked country of South Asia situated in the Himalayas and the worlds only country with domination of Hindu population, shares its borders with the People's Republic of China, (Tibet Autonomous Region) and India, and the population of Nepal mainly consist of Tibeto-Burman, from the north, and Indo-Aryans from the south. This ethnic diversity and proximity to neighbouring giant cultures have also influenced the culture of Nepal, and Nepal has inheritated several customs and cultural practices from the north (China and Tibet) as well as from the south (India), and over a period of time attuned the same to its own indigenous requirements based on its topography, available resources and climate.

One of the legend states dances in the Indian subcontinent originated in the abode of Lord Shiva - the Himalayas, and the Himalayan country of Nepal - where he performed the *Tandava* dance, and this indicates that dance traditions of Nepal are of very ancient origin. With altitudes and the ethnicity, dances of Nepal slightly change, in style as well as in the costume. Accompanying music and musical instruments also change in tune with the themes, which revolve round topics like crop harvestings, marriage rites, war stories, a lonely girls yearning for her love, and several other themes and stories from everyday life in the villages (Wikipedia, 2007).

2.4. Conclusion

Earthquake is a natural disaster and its impact on human lives is an unavoidable phenomenon. In countries like Nepal, an earthquake is a constant threat from the dates of history immortal. It has created a tremendous loss of human lives and infrastructure. In the present day context, Nepal is one of the most vulnerable countries during earthquake disasters.

Earthquake vulnerability is the inherent weakness of people in an urban environment which is at risk to harm due to social, natural or design characteristics.

Vulnerability reduction is possible only when the capacities of local communities and organizations to prevent, prepare for, and respond to the impacts of disasters is increased. It is a strategy that puts people first and develops the policies and practices being based on the 'peoples say'.

Nepal has been practicing two approaches for earthquake vulnerability reduction: a Techno-centric approach (technical) and a community based approach (non-technical). Nepal is economically weak and the approaches in Nepal to reduce the earthquake vulnerability is mostly techno-centric and donor driven. It is more of a top-down approach. However, in the Nepalese case, the use of a non-technical approach might be useful as it is a country of diverse ethnicities and a multi-cultural country. Perhaps the non-technical approach is limited to the 'presently understood' community based approach which is predominantly training the local people to adopt the techno-centric approach. Eventually it turns to be top-down approach and never a participatory. It might impact negatively in the mind set of poor people because of non-participation during policy setting. Similarly, the techno-centric approach is unaffordable to low income group people as they lack of financial resources to adopt it.

As it had been discussed earlier, earthquake has to be understood as a natural disaster which impacts the livelihood of a commoner and often to the low-income group people. In order to reduce the vulnerability of those people during earthquake disasters, SLA should be taken into account. However, SLA is more focused on the household level whereas in cases of disaster, SLA should incorporate the community on itself which might help to get the community less vulnerable, especially during the shocks and stresses.

The conflicts and trade-offs between the principles outlined by SLA is inevitable as writes Rakodi (2002). In the book 'Urban Livelihoods: A people centred approach to reducing poverty', Rakodi writes a cohesive, mutually supportive and enduring household also has strong ideological and religious underpinning. This means the ideological ideas and religious faiths could be considered as capital of the household. While taking ideological ideas and religious faiths in account, one should not forget the significance of culture. Therefore, it is a challenge for social scientists to identify culture as a capital onwards. This might emerge a new polygon confronting with the mostly used pentagon with the sixth but the important corner.

Often policy makers and academics undermine the importance of culture practiced by the society whenever understanding earthquake vulnerability and finding possible solution for its reduction. The culture could be useful to explore the tacit knowledge which, is embedded or inherited within the society which is not easily taught. It is transferred only through cultural means. As noted above, tacit knowledge is learning by virtue of nature itself. Hence, the use of tacit knowledge, found in embedded form of cultural capital, could be explored, exposed and used to reduce the earthquake vulnerability. It is could be easily implemented in the low-income group people as

they are the ones who hold a strong stake in cultural practices. In developing countries, the higher and middle class people rarely practice their own culture in order to show them civilised, cultured and compatible to developed societies.

Especially in Nepalese context, local and tacit knowledge, as in the form of embedded cultural capital, could be highly useful for earthquake vulnerability reduction because of its availability in different forms within diverged ethnicity but yet available in a closer proximity and inside a political boundary.

Chapter 3: Livelihood of low-income people in case study area and their understanding of earthquake vulnerability

3.1. Introduction of the chapter

This chapter is an attempt to understand the livelihood of low income group people in sub-urban area of Kathmandu valley and identify the role of low income community in reduction of earthquake vulnerability. Low-income is a complicated term which directly is related to the term poverty. Since the case is of Nepal and which lies on the list of poorest countries in the world, it might be helpful to take this case as completely of a local context.

National poverty rate of Nepal is 42% however 23% is the poverty rate of urban population. Similarly people living on less than 1 US $ a day are 37.7% of the total population. The total percentage of people living on less than 2 US$ a day is 82.5%. These figures indicate that most of the people in Nepal fall under the universally agreed definition of poverty. (Source: Earth trends country profile, 2000)

3.2. Introduction of the case study area

The case study area is located in the south eastern part of Kathmandu valley by the name of Godawari Village Development Committee[1]. Godawari is surrounded by 9 VDCs and is some 6 KM distant from the municipal boundary of Lalitpur sub-metropolitan city. The VDC has total of 1353 households with a total population of 6257 amongst them 3081 is the population of women. The major economic activity in VDC is agriculture. Total 433 households are engaged in non-agricultural economical activities in VDC. This proves that there are some non-agricultural economic activities however the data indicate that 920 households who are completely dependent in agricultural economic activities. (Source: Central Bureau of Statistics, 2002).

Godawari VDC has 3 major pilgrimage sites and is the venue for some 10 religious festivals celebrated annually or in a periodical manner of 12 years.

Women are active in this VDC for community activities which is proved by the number of women groups which are about seven. (Source: VDC secretariat, Godawari VDC). Similarly, people at community level active in nature conservation and attempting to be self-sustained for fuel and fodder as there are 4 such community forests managed by local community.

VDC has a marble factory in its premises which has created some job opportunities to the locals. Similarly, Godavari has a botanical garden which also has created some

[1] Village development committee commonly called as VDC is the lower unit of local government in Nepal.

kind of job for the local people. The impacts of botanical garden in the premises could be seen along the roadside of Godavari as some practices of floriculture and nurseries.

Some renowned higher and secondary education institutions are situated in the VDC. However the locals, especially low income people are not getting enrolment in such institutions because of the high fee structures, usually unaffordable to them. Eventually, there are some governmental schools which are serving the purpose of educating the low income people in lower school fees. It should not be forgotten that education is not completely free in governmental schools of Nepal but perhaps being located nearby the urban area and by understanding the usefulness of education, low income people send their children to school.

Godavari is famous for some recreational activities as it has some hotel and resort located in its premise. Such facilities have, to some extent, contributed for economic upgrading of the VDC but eventually it is also not enough.

There are two community buildings and a senior citizens home in Godawari. The senior citizens home is conducted by the private company by charging fees.

There is a community playground and VDC is containing forest, river, streams, mines, water springs too. Therefore, it could be said that the people of Godawari have the access to the natural resources to some extent as all such resources are licensed and VDC secretariat collects the revenues out of them annually. Therefore, people at local level rarely are using such resources for free.

Around 250 households are poorest of the poor in VDC and are of indigenous ethnicity. They live within a cluster, are least educated and based on agrarian economy. Traditional farming is the major source for their livelihood expenses. They are the people who work in marble factory as labours and some of them work as drivers in urban areas too. Some of them are away from home to work in Gulf countries and they send money back home as remittance.

Basically, the social composition of inhabitants of Godawari could be classified into three major groups: the high caste people (*Brahmins, Kchetriyas*), low-caste people (*Dalits*) and people of indigenous ethnicity (*Tamang, Newar*). Some data sources indicate that there are some Indian immigrants in VDC number of which is 13 (Source: Central Bureau of Statistics, 2002).

The impacts of culture and tradition in all groups of inhabitant in Godawari are very deep-rooted as in all settlements in Nepal. This is reflected in their livelihood and is associated with the religious aspects in a large extent.

As mentioned earlier in this chapter, there are some community based organisations. Some non-governmental organisations (both of national and international characters) are working in several areas in VDC. However none of them are involved in disaster risk reduction.

During post earthquake rehabilitation in 1988, VDC had been supported by local and central government. Similarly, International Council of Red Cross (ICRC) was also deeply involved in the process of rescue.

The case study has covered basically two wards[2] of Godawari VDC: ward no 1 and 9 by the names Taukhel and Lelinthok respectively. Due to monsoon season and hence the season of farming, the fieldwork was slightly modified as participants observation was changed to household interviews[3] with 10 households covering 4 households of indigenous ethnicity, 2 households of low caste people, 4 households of high caste people (2 Brahmins and 2 Kchetriyas). Household interviews are conducted taking consideration of age of head or the leader of the household and which varies from 84 to 23. Here, head or leader household means either the person who takes decision in house or the person who earns major amount for household expenses.

Similarly, there were 2 focus group discussions[4] conducted in both the wards. A focus group discussion was conducted with a women group active in micro-credit and finance at the community level in Taukhel. Next focus group discussion was conducted with the members of youth club in Lelinthok which is involved in youth activities like social service, sports etc. The major objective of such household interviews and focus group discussion was to understand the livelihood and knowledge of local people on the earthquake vulnerability.

There were 16 semi-structured expert interviews were conducted in Kathmandu. The details of such interviews would be discussed later in following chapters wherever appropriate.

3.3. Livelihood of low income group people in Godawari

Though the household interviews conducted are very less in percentage of total population of Godawari VDC, it has covered the representative caste groups in order to understand the livelihood of people. As mentioned earlier in this chapter, such sub-urban population covered within the interview frame are poor or fall under universally agreed line of poverty.

It has been found that all the respondents are living in the case study area since history. The reason for not migrating from the particular area is more related to their financial condition and the livelihood by at large. Since the agriculture is their major occupation, they tend to live nearby the farmlands. All interviewed households have land as asset with them despite of their size, irrigation facility, location (on terraces or on flat plateau) and the accessibility to the plot. In Nepal, land ownership lies with person therefore those lands are easily sold or property can be transferred to the next

[2] Wards are the lowest units of local government in Nepal.

[3] Questionnaires and other details are presented in annex.

[4] Details are presented in annex.

generation. In such conditions, lands held by households are liable to be sold or transferred to next person.

The average family size in the case study area of Godawari is 4.5 being based on the household interviews. Despite of one household, all family members are healthy and not mentally or physically challenged. This study has identified that there are educated members in every household being different at the educational level they have pursued. Such indications are observed as almost all children of interviewed households go to schools and there is a significant investment in child education.

All families own basic electronic items like television and radios. People from the high caste do own telephone or mobile phone but that is not the case with lower caste. However, some people of indigenous ethnicity are using the communication facility. This indicates that people in Lelinthok and Taukhel are connected to the external world with the help of means of radio and television. None of such households hold neither motorised vehicles nor the agricultural machineries or equipments like tractors, power tillers or water-pumping and lifting machines. Some young family members work as drivers for some vehicle owners and usually such vehicles connect people with city and Godawari.

In terms of earning, it is seen that households are mainly depended on agriculture. However some young family members work in some of the offices in Kathmandu or Lalitpur city. Since the income is fairly low for recurrent expenses, all such households do not have any savings.

Apothecary is one of the methods of healing and medicating in this area. Though there is nearby medical health-post, people from the indigenous ethnicity prefer to have a dual medical approach as they think that *Dhami* also has knowledge of medicating so they go both to Dhami and health-post. Dhami is the person who is healer and physician who treats with botanical extracts and sometimes psychological means. Specially, people from lower caste, less educated and of indigenous ethnicity believe in such treatments too but they take this method of medication as a first response. The ill person of the family is then forwarded to the nearby facilitated hospitals in the city.

Culture has very significant role in the livelihood of people in Godawari. All respondents have their typical festivals to celebrate around the year. Respondents of household interviews follow two basic religions: Hinduism and Buddhism. But religious tolerance is felt in the region as no clashes between two religious groups have happened in history. Basically, Hindus celebrate their festivals some 6 times a year with family and close relatives whereas Buddhists celebrate some 7 times a year. Hindus celebrate *Dasain* and *Tihar* as major festivals whereas Buddhists celebrate *Buddha Purnima*. It is interesting to observe that major festivals of either religion are celebrated by both Hindus and Buddhists. It is a good example of religious tolerance and could be understood as a culture of tolerance at the local level. According to the respondents, such religious festivals are celebrated by people in Godavari for the continuation of tradition practiced by their ancestors.

A strong culture of having socio-cultural institution by the name of Guthi has been observed in Godawari. Guthi is a socio-cultural institution which is an informal organisation at the community level, basically formed within the family tree or sometimes with some kind of affiliation amongst each other in order to help the Guthi members during their hard times like rituals, death, and disasters. Guthi could be understood as a micro-finance institution at the community level and accepted by the practiced culture where Guthi members collect grains, fuel wood and/or some money according to the mutual understanding. They select the chief of Guthi being based on age or the activity of the person whose decision is the last in case of controversies. All respondents of household interviews are members of their respective Guthis. Meetings of such Guthis are held according to their need. Otherwise, they have a good practice of meeting annually and eating together the grains they collected. This is a good platform for them to share their views and ideas to run the institution and perhaps to analyse the development so far. Similarly, such gatherings help to plan the activities of Guthi for the coming year. Different researches have been conducted to study the usefulness and productivity of such Guthis for the betterment of livelihood.

3.4. Understanding of Earthquake vulnerability of low income people in Godawari

All the respondents are aware of earthquake but the perceptions of the local people about earthquake are different in Godawari.

As it is clear that earthquake is a natural disaster but people have their different opinion on it. Being illiterate or being more religious in their livelihood, they have mixed opinion. Most of the people of low income are less exposed to the external world and have been involved with their traditional livelihood. They say that earthquake is related to the god's anger against the sin of the people on the earth. Some of such concepts are still prevailing in the livelihood of the low income people. Similarly, some of them claim considering earth as a goddess who sometimes feel overloaded and want to change her position and earthquake happens. One other consideration of the local people about the earthquake is about the snake king '*Shesh Naag*' having 1000 heads who is holding the planet earth on one of his head. When he gets tired and wills to change it over to next then earthquake happens. All such examples are somehow related to the religion which means that there is a strong hold of culture in terms of understanding earthquake in Nepalese context.

In contrary, women and youth active at the community level have their different opinion to define earthquake. The youths strongly claim that there is nothing related to the god, it is merely a natural disaster and which is purely geophysical disorder under the soil. Women also say that earthquake is natural disaster. According to women in focus group discussion, there is a possibility of cracks on the field during earthquake. They told that earthquake comes after the volcanic eruptions which occur suddenly and there is a high possibility of life casualties. However they do not forget the mythologies which say that the planet earth is located on the head of snake king, once the snake king tires, he tends to change the position of the planet and therefore

Earthquake occurs. This suggests that there are both conceptions and misconceptions at the local level about the earthquake.

In terms of forecasting earthquake, none of the respondents of household interviews and participants in focus group discussion agreed that forecasting of earthquake is possible. Similarly there is a mixed opinion about the abnormal activities of animals and birds prior to earthquake disaster. One of the respondents told that when there was a shake in 1934, cows have shown abnormal activities and birds were crying and flying away. None of the respondents however said that human being has that capacity to foresee earthquake. Even the Dhamis, who are considered to be closer to the natural sciences, do not have that capacity as respondents told. *Ms Radhika Tamang (23) in answer to question QN 33 of Household interview says "…Ke janncha ra hajoor Dhamile? Ulle khali dhyangro thokna janeko chha, ali lai jadibuti ni chinchha, tyatro pralaya tyalle kasari janos?? Hamro biswas matrai ho Dhami le janchha bhanne….. tyalle ni jandaina hajoor …."(***Translated:*** No, how can a Dhami predict earthquake Sir? He knows how to play his traditional drum, knows a bit of herbs, that great disaster is beyond his knowledge. It is only our faith and belief that Dhami might predict… no Sir he cannot…)

In terms of vulnerability, local people think that earthquake is a killer and it destroys everything. The term everything leads to life casualties, building damages, deeper poverty and damages of infrastructures. However they understand that stronger buildings reduce the vulnerability which means that the technology can resist earthquake. These people have some experiences of devastative earthquakes of 1934 and 1988. The respondent who experienced 1934 earthquake is only one but most of them were respondents who experienced earthquake of 1988.

There are numbers of local poetry '*sawai*' written in remembrance of 1934 earthquake. One of such Sawai published as '*Lokmanjari*': the folk-bud by Lok Nath Pokharel has explained about the devastation of earthquake of 1934 which is known by earthquake of '*Nabbesaal'*. *Nabbesaal* is translated as year of Ninety which is 1990 BS. BS is *Bikram Sambat*, which is the official calendar still being practiced in Nepal. The folklore in form of poetry has shade the lights on earthquake of Nabbesaal and has minutely explained about vulnerability. In one of the stanzas of Lokmanjari it is written that local technology and small huts are less vulnerable and the poet has prescribed to have one such hut for each family.

Most of the respondents agree on the fact that traditional technology is best to make earthquake safe buildings. They stress that earthquake vulnerability could be reduced by making strong buildings with local knowledge. Women and youths expressed that traditional buildings are hygienic and economical. They claim that such traditional buildings are less vulnerable and promote the use of local knowledge, materials and technology which from the other end supports the poor artisans. Besides all, traditional building is close to their practiced culture. However they agree that traditional knowledge and technology has been marginalised because of the following reasons:

- Competition of mindset for modernisation

- Lack of motivation to use local technology
- Change in lifestyle
- Lack of artisans, materials and access to natural resources

3.5. Role of low-income group people in reduction of earthquake vulnerability

"…….*Bhukampa khabar garera aaudaina*…"Earthquake never alarms of its coming. This is a piece of statement of popular audio-visual advertisement frequently watched in national television to make people aware about the earthquake vulnerability. This indicates that earthquake vulnerability is equal to all. This advertisement further talks how to make people safe and avoid human casualties during earthquake. There are several NGOs at various levels working to reduce the earthquake vulnerability. Even agreeing on the point that earthquake hits everyone without any difference of class, caste and community, this research is more concentrated at the lower level of society: the low income group people who are most exposed for natural disasters.

The low-income group people are most exposed during natural disasters. There are clearly two verdicts on this statement. Some of the experts told that low-income people are less vulnerable during earthquake because they live in small buildings and such buildings are constructed by local materials and technology. The other verdict claims due to the prevailing caste system, people of low income group are forced to construct their dwellings on slopes, loose soil and in the less prioritised lands. This adds the vulnerability to such people.

Earthquake vulnerability could have been nullified if earthquake could be forecasted. Technologies are still not capable for such forecasting so people of the concerned specialisation have developed earthquake vulnerability reduction strategies which revolve around three basic phases: a) pre-earthquake actions, b) during-earthquake actions and c) post earthquake actions.

The role of low income group people for earthquake vulnerability reduction also revolves around afore-mentioned three phases. People from high income group have strong buildings, which perhaps are earthquake resistant or they are more acquainted with modern technology and could afford for the information related to technology, and after disaster it is easier for them to restart the life again. All such opportunities are not available to low-income group people. Therefore, there is a significant role of them to make themselves less vulnerable. Basically, they are practicing such a culture which has the potential to reduce earthquake vulnerability. The proof of such culture is the construction of their buildings. All respondents in household interviews agreed that traditional buildings are less vulnerable during earthquakes and they are living in such buildings too. Eventually, they meet almost all the modern requirements in terms of spatial arrangement. The only concern about the continuity of such technology is related to the availability artisans and the access to natural resources. *Mr Shambhu Prasad Ghimire (58), talking about the traditional buildings during household interview says "…. Na manche bakichhan, na bhayekako ijjat chha…. na ta bhanejasto kathpaat, dhunga nai jhikna payinchha jangal bata..ani kasari banaune*

ta…ghar ta hernuhola ni Nabbesaal ma ni kehi nabhako ghar tyahi bato muni ta chha ni, majjaile chaliraakai chha…photo khichera lanu hola ni….."**Translated:** "….neither artisans are left much who knew the local technology and those survived are also not respected…. Nor we have the access to collect the timber, stones like materials from forests…you can see the building which survived the earthquake of 1934 and which is still being used, it is located on the lower terrace from the road…..do not forget to take the snap of that house….

This culture of traditional buildings could be used for earthquake vulnerability reduction as the evidence in the form of building[5] tells the story of its durability.

The other culture being practiced at the community level in form of Guthi is also an asset for low-income group people. All the respondents of household interviews and participants of focus group discussions agreed that there is a significant role of such Guthis- the socio-cultural institutions to make people aware of natural disasters, to conduct rescue operations and to help to restart the life to the victims. Even such Guthis could contribute for the rituals like cremating the dead bodies, to medicate the injured and cleaning the debris as well.

3.6. Conclusion

The livelihood of sub-urban area of Kathmandu valley has demonstrated a transition towards the modernisation. However, most of such sub-urban areas are agrarian in nature. The livelihood of Godawari proves that there are particular roles of five capitals as physical, social, human, natural and financial capitals.

As stated earlier in theoretical chapter, earthquake vulnerability is the inherent weakness of people in an urban environment which is at risk to harm due to social, natural or design characteristics. But one should not forget that the assets they have as capitals are most useful during earthquake.

Earthquake vulnerability reduction has three phases: pre, during and post earthquake phase. In all three phases, the livelihood of low-income group has some sort of capitals and assets to use and reduce the intensity of vulnerability. Such capitals could be classified at two basic levels:

a) Individual level
b) Community level

One of the respondents said that she is going to sell all the things sellable to restart the life again if such disaster occurs. This indicates that she has some assets/capitals that are useful to reduce earthquake vulnerability at individual level. Similarly, she did not forget to ask the almighty to prevent her world to face such disasters though. She was confident that her neighbours, the god himself and the Guthi of which she is

[5] Photographs attached in annex.

the member will rescue her and help her to bring back the life to normalcy. Guthi is nothing but the collective asset/capital of low-income group people useful during disasters.

People however forget that they are practicing culture which has the inherent knowledge of building technology which could be used to make them less vulnerable. In fact, there is tremendous potential to promote the local knowledge because it has been practiced as culture and used for some other purposes, often by only following as a tradition because the same their forefathers did. Promotion of such technology not only helps people to reduce vulnerability, but promotes the local knowledge, artisans, technology and upgrades the quality of life of low-income group people. Governmental institutions have to take lead as the initiation only at the local level might result less in this regard.

Chapter 4: Building practices and the importance of local knowledge

4.1. Introduction of the chapter

In the previous chapter, the views of local people in the case area about the earthquake vulnerability have been explained. This chapter is dedicated to the explanations of contemporary building practices and the importance of local knowledge on building construction. This chapter will attempt to explore the role of culture in earthquake vulnerability reduction as one of the hypotheses of research suggest that culture is also a potential capital of low income group people. The relation of culture and local knowledge is direct in nature. Theories on cultural capital also strengthen this fact as the cultural capital is embodied in the individual or in a community. It is both the inherited and acquired properties one's self. Inherited not in the genetic sense, but more in the sense of time, cultural, and traditions bestow elements of the embodied state to another usually by the family through socialization. It is not transmittable instantaneously like a gift. It is strongly linked to one's habitus - a person's character and way of thinking. Eventually such local knowledge is embodied not only in the person and perhaps in the community too. This local knowledge might be useful for the livelihood of people and their knowledge on natural disasters developed by the experiences are most useful to reduce the vulnerability.

This chapter is based on the outcomes of semi-structured expert interviews but there are some facts extracted from the focus group discussions and household interviews.

4.2. Building practices

Fundamentally, there are two types of building practices popular in sub-urban area of Kathmandu valley. One of those, which are more popular, is using modern technology. This modern technology refers to the engineered buildings (as it is understood) which involves the modern materials, engineering skills and masons. Modern technology uses materials like reinforcement bars, cement concrete and cement mortar. It still uses the brick as a major component of wall construction however the traditional brickwork has already been replaced. The next significant material of traditional architecture is use of timber which has already been minimised and are replaced by RCC beams and columns. In urban areas, timber frames for door and windows are almost vanquished however in sub-urban areas, they are still in use. The structural use of timber has been lost to a large extent. It is observed that cement technology has domination in building industries.

The local technology adopted in building construction is still in practice in sub-urban Kathmandu which promotes the use of mud, timber, stone/bricks in substructure and superstructure. Such buildings have roof structures with timber rafters and covering of hey, thatch and clay tiles. This technology has been marginalised due to stagnancy in its evolution and unavailability of suitable materials in the vicinity. Generally, people in the case study area agree its usefulness and level of comfort the traditional

building offer; however they are not using the local technology. A young man in Lelinthok said he would not construct his new house using the traditional knowledge and technology simply because he is living in 21st era and the traditional house was good only for his grandfathers and great-grandfathers. But he agrees that there are spaces for modification and contextualisation of the building technology so that they can live in such buildings in his days too. He agreed that such buildings are less vulnerable during earthquake disasters.

Similarly, experts from various disciplines also believe that there are two basic building practices based on modern and local knowledge. The modern knowledge refers to the engineering that had been exported by the developed world. They unanimously agree that there is indigenous knowledge on building technology but in tacit form. One of experts Dr. Jigyasu during interview placed the idea in a bold way: *"…there is no doubt of local knowledge in building technology but these days they are lopsided because of the limited resources in terms of skills and materials…"* This undoubtedly indicates that the local technology was prevalent in building practices in past. The statement raises a question of existence of local technology and its location. All the experts believe that such technologies are the outcome of the local knowledge and practices. As stated earlier, the local knowledge in Nepalese context is practiced in culture hence the knowledge is located in the culture. This belief leads the research towards the understanding of culture from the perspective of local knowledge.

4.3. Culture and its use in earthquake vulnerability reduction

Culture has multi-faceted character. It is an abstract form of beliefs and mutually agreed practice of a particular society.

Since, Nepal has been heavily influenced by ancient Hindu practices, the culture of relating knowledge with religion is felt dominating. Everything is god…as one of the mythological heroes Lord Krishna of Hindu in *Bhagbat Geeta* presents himself as omnipresent. This is how nature is observed in Nepal. Even non-living things like books, coins, building elements, structural parts are also considered to be the incarnation of one of the gods Hindus worship. This culture of worshipping of such living and some non-living objects has a strong logic of obeying the local knowledge whether it might be natural or man-made, but unfortunately they are ignored in present day livelihood. In Nepalese context, it is hard to segregate the local knowledge from cultural practices.

Prof. Tiwari in expert interview defined culture as a local know-how practiced by the particular society by the time immortal. He further quoted: *"…culture is the rules of behaviour which is agreed by all…"* Similarly, he further says: *"… culture is the comprehensive experience which could be used anywhere for the benefits of people…"* These statements indicate that culture is reflected in the knowledge as experiences of the locals and is used for the livelihood of the people. Cultural anthropologist Prof Regmi also has similar verdict as he says: *"…culture is necessary instrument for societal existence as it contributes for institutional building…"*

Indication of above statements is about the existence of the entire society within bondage of commonly agreed instrument.

The senior cultural expert Mr Joshi has connected the definition of culture with the livelihood of people explaining it to be a part of practiced knowledge. In Kathmandu context, Mr Joshi clearly stated that culture is reflected in several rituals and religious festivals celebrated around the year. Sometimes, such cultural practices seem to be very dogmatic but they have scientific base as well however, no-one has attempted to study the scientific part of such cultural practices. People are either forced to follow such practices in the name of god or they followed it blind-folded without understanding the scientific part of it. Dr Jigyasu agrees on this point by saying: "*…in this context, researches are needed to identify scientific aspects of traditional knowledge…*" Prof Pokharel says: "*…cultural practices have consonance with natural science but modern science has not accepted it…*"

Honourable Vice chairperson Dr Pokharel also agreed the existence of local knowledge in culture of Nepalese society by saying as Nepal has entered to the modern era some 240 years ago and till then Nepal was practicing the local knowledge.

All experts eventually agreed that the culture is an asset to the people which could be used pre, during and post-disasters to reduce the vulnerability. But as culture is a multi-faceted entity, it is needed to explore the local knowledge, which is tacit in form, and has in some way, addressed such disasters.

4.3.1. Local knowledge

Nepalese society has preserved their local knowledge in their culture. People sing, compose poems and made some proverbs out of the impacts of natural disasters. Medieval architecture of Kathmandu valley consists of well planned towns having large and small squares, ponds, water spouts, wells and temple complexes. It is obvious, without the knowledge how they could have been so planned and still serving the livelihood of urbanites? Prof Maskey has, during the interview, said that the knowledge has been marginalised. He further says "*…We can take the example of Nyatapola (five tired temple at Bhaktapur)*[6] *which was less impacted with several earthquakes and it is standing since 300 yrs because it has got a grand plinth. This plinth was made after the lesson they learnt from other temples in valley which were destroyed during previous earthquakes. They not only made the plinths but gave some cultural values to them. These plinths are used for several social purposes and culture has defined its uses too. As a structural engineer, I might say that the bed rock theory has been implied in this structure as the plinth works as amplifier to the large shock and reduces the intensity over it. This perhaps was a 'learning by mistake' phenomenon or 'learning by observation'. Therefore there are no written evidences and people were specialised by their experiences and learnt it through their fathers and grandfathers. This plinth technology has made several temples safe after*

[6] Refer picture of the temple in annex.

earthquake…" He admits the existence of local knowledge on building technology but the knowledge has been lost because there are no written documents and the knowledgeable people of local technology are no longer living. According to him, local knowledge still can be explored by conducting the researches and talking to the family of such great artisans.

Talking about the same temple of Nyatapola Prof Aryal quoted that this was the temple made in 1702 by local artisans within 100 days. Without knowledge, such a grand architecture is never possible which not only stands firm but has faced so many earthquakes with minor damages. He stresses on the knowledge of local artisans for site selection and building earthquake resistant buildings. Similarly Prof Aryal talks the history of switch over of architectural style from stone masonry to bricks. He says: "…*As history tells, before 9th century earthquake, the architecture of valley was based on stone technology which proved to be more vulnerable and therefore there was a great shift in architectural style from stone to timber and brick architecture. This we can say as a process of learning by doing which made a significant contribution of reduction of earthquake vulnerability and hence was practiced till 18th century*…" Here the importance of local knowledge in earthquake vulnerability reduction could be clearly understood.

Pr Tiwari, while talking about the medieval architecture of Kathmandu valley, says: "… *Our architecture is engraved in culture which one can find looking at the materials used, local technology and the plan forms. To identify all the essence of the aforementioned elements knowledge is must which is in tacit form and I can say that this knowledge can reduce earthquake vulnerability…"* He further quoted: "….*The culture of leaving open spaces in the streets is for social reason but which had been used for earthquake vulnerability though… The culture of leaving socially agreed space for public use by the name la: chhi*[7] *has been historically documented to be the most useful space during earthquake time…*" Talking on local knowledge and technology Prof Tiwari says: "…*local technology is quicker for rebuilding because of the local materials…we had knowledge on post disaster rehabilitation by restarting life by rebuilding*…" He adds that earthquakes have cultural responses too because during earthquake people tend to evacuate themselves to the open spaces by shouting *Narasimha-* the name of earthquake god, which was nothing but alarming other people who might not have felt the earthquake. Therefore it could be said that there is the cumulative knowledge on earthquake vulnerability reduction particularly in Kathmandu culture. Prof Tiwari also admits that this knowledge could be seen in the building practices with high plinths. These high plinths are given a religious touch for a cultural acceptation and enforcements too. This kind of religious touch for structural elements of the building can prove the ample relationship between local knowledge and culture.

[7] La Chhi is a socially agreed set back left on the streets on medieval towns of Kathmandu which creates open space in street intervals. Refer picture of La Chhi in annex.

Mr Dixit, an NGO activist says that local knowledge of earthquake technology lies within individual and within the culture of particular community. According to him local material, technology and knowledge are still there in such communities but they are marginalised. He quoted "*…once while training the masons of Nakhel (a village of brick masons) one young mason told at the end of the training day as the skill he learned that day was told by his great-grandfather long time back but he did not pay attention because he thought it was rudimentary and conservative idea…*" This example elaborates that the inherent knowledge lies at the local level, sometimes it is within the reach of an individual or a single household or often at the community level. The knowledge community inherits could be observed during the festivals of that particular community. Extensive studies are needed to locate such knowledge. The NGO by the name of NSET-Nepal is actively devoted in earthquake technology and Mr Dixit is executive director of NSET-Nepal. He further said that the local knowledge of building practices have several scientific reasons behind. In history, local tradition of punishing faulty artisans was also of a strict type and interesting for us. The hands of artisans were chopped off by the society if they found vertical joints in brick masonry. This is however scientific as the vertical joint in brick masonry is liable to crack and ends with fracture on the wall.

It could be understood, after reading such statements by the experts, that, local knowledge has been existent in the society of Kathmandu and which is engraved in the culture.

Arch. Singh, a senior architect and president of SONA has also articulated his views on local knowledge. He says that Kathmandu had indigenous knowledge of earthquake resistant buildings which was developed by intuitive knowledge and experiences. But unfortunately, this knowledge has not been acknowledged by so-called white coloured professionals and therefore the artisans are living with a kind of hesitation and discrimination in the Kathmandu society. They do not know the modern technical terms, and to some extents even the Nepali language. "*…they speak Newari (local Kathmandu language) and once someone from Germany came to Kathmandu to conserve their technical words which are in Newari. GTZ has developed a dictionary out of this project…it is pity that government does not take such initiations in Nepal…*" Senior engineer Mr Baidhya stresses the schooling of the children in their mother tongue to preserve such local knowledge and even the vocabularies. On this note Er. Pyakurel, a governmental engineer says that there is building act-1998 and building codes are also formed but all of them are very much techno-centric and none of them have acknowledged the cultural aspects and indigenous knowledge. According to him there is an act by the name of Historic monument conservation act-1956 which has talked about the importance of traditional skills and recommended to use local material, technology and skill to renovate, revitalise the monuments but it never has dealt with the local knowledge for new

constructions. He further says the breaking of local practices (bhajan, Gayine)[8] has also impacted for the loss of traditional knowledge.

Local knowledge has another dimension as well. Ms Dekens (2007) in her book 'Herders of Chitral: The lost messengers?'(pp 62) writes: "*…some traditional and local practices are becoming obsolete and irrelevant…*" In the same book she further writes "*… taking local knowledge and practices into account can help promote mutual trust, acceptability, common understanding and the community's sense of ownership and self-confidence…*" During the interview she revealed the fact that Nepal has very recently started to think to promote local knowledge because of its low cost. She also admits that local knowledge is important to reduce vulnerability but it has been ignored by technical people, governments and non-governmental organisations. Discussions on local knowledge have stressed that local knowledge is useful for all and it is more useful for the livelihood of local people. But why local knowledge is still backward? According to Ms Dekens this is predominantly related to its identification. Once one can identify it, it is more of a challenge to incorporate it with modern day scientific requirements as well as its relevancy in specific objective meeting. She also adds that it is more related to the social dignity as well because following local knowledge is considered to be dogmatic and conservative. She says "*…Traditionally made buildings are earthquake resistant for sure but who makes them these days if they are of null social dignity?*" and if they are willing to make traditional buildings there is a severe scarce of building materials. She adds "*…In present day context of Kathmandu valley, access to natural resources is limited therefore people are more vulnerable during disasters because they are forced to forget their local knowledge of making themselves safe during disasters. This is because the knowledge they had were more close to nature and natural materials they used…"* Shading lights on the local knowledge and its use in earthquake vulnerability Prof Pokharel says: "*…In 1975 Feb. 4th, Chinese city Haicheng had a good result in earthquake vulnerability reduction as prediction was of 90000 peoples loss but the only 2000 people were killed, it was possible because of Chinese indigenous knowledge of earthquake forecast by observing snake activities. They studied the activities of snakes at that time and for that 100000 people were mobilised to study the activity of snakes…*" Prof Pokharel has been working in this area of snake farming to reduce earthquake vulnerability but he complains that the scientific world does not believe it saying non-scientific approach. "*… If science trusts on sniffing of dog, why the same science doesn't believe on the snake activities of evacuating in the time of their hibernation? Even science says that there is tremendous heat generated under the soil, emission of several gases and number of minor shocks prior to the earthquake on the surface…. The animal activity for earthquake forecast has base of biological science as snakes come out of hibernation before earthquake because of the shake, temperature and gas under the soil. If the snakes come out from their holes and die, we can predict that there is likely an earthquake in recent future. If they do*

[8] Bhajan is religious folklore and Gayine is a caste which composed folklores and sang as a part of their earning.

not die, it could be said that they accidentally came out and they will return again back to their holes…"

VC Dr Pokharel also admits the idea of local knowledge and its contribution to the modern world taking the examples of traditional medical science of the neighbouring cultures. Both *Acupuncture* of Chinese medical science and *Ayurveda* of Indian medical science have proved to be very scientific and have the capacity of curing some such diseases which modern science is trying to cure. He says "*…Our local knowledge is existing in behavioural part and physical part. Physical part is more explicit but behavioural part is in tacit form…Taking example of solar eclipse, there is a tradition of taking bath and fasting during the eclipse, it is because to protect the people from the harmful radiation but it has been transferred into religious belief which was important to make people disciplined for enforcement…*"

According to aforementioned issues, the identification of cultural practices and local knowledge is a challenge and the potential locations of such practices are the rituals and festivals those are still being practiced in Kathmandu context.

4.3.2. Rituals and festivals: location of Local knowledge?

Rituals, festivals and religious celebrations are the integral part of the society in all walk of live of Nepalese people. Kathmandu itself is called as the city of thousand temples. Some of such cultural practices have been devoted in Kathmandu valley for the regular maintenance of public spaces, water reservoirs and even the public buildings. One of such festivals is called as *Sithi Nakha*. According to Prof Tiwari, Sithi Nakha, a pre-monsoon festival in Kathmandu was observed for up-keeping of urban services, building services and structures. This was done annually which was very much useful to observe the life of the building every year and repair it as needed. This had made the building strong during monsoon and perhaps this could have made it a kind of earthquake resistant too. This has been again associated to a social feast by inviting married daughters for a family dinner. This culture is being lost which is pity. However, senior culture expert Mr Joshi differs with the idea of Prof Tiwari about Sithi Nakha. He says: "*….I differ with the point that Sithi Nakha was the festival for building renewal but it is true that Sithi Nakha is festival celebrated to repair the water related urban services. However, Gathe Mangal*[9] *is the festival which is celebrated to clean and repair the buildings…*"

Prof Aryal has also admitted the fact that there must have been some such festivals in the past which have some kind of relation with earthquake. He said that in history people of Kathmandu even established entirely a new calendar after a devastative earthquake. He says: "*….Nepal has been hit by large earthquake since history and there are some evidences of earthquake from 9th century as a new calendar by the name Nepal Sambat had been started in 20th Oct 879. It was started after a devastative earthquake which killed more than 50% of the inhabitants of Kathmandu valley. In memory of those killed the new calendar was started. They did it after*

[9] Gathe Mangal is a festival celebrated in Kathmandu valley during Monsoon season.

having a grand worship of National god Pashupatinath and the worship was named as Kchyama Puja which literally is translated as Mercy worship. This means they believed that earthquake was the reflection of anger of the god… There is a great significance of religious beliefs in Kathmandu society. At the time of post earthquake in 9th century, people of valley thought that the life has to be restarted and there was a god graced tremendous power with them by the means of human and physical capital. So they started to worship their own bodies by themselves which culture is still being practiced by the name of Mha Puja…."

Experts' views on rituals, festivals and cultural celebrations, be it Mha Puja, Sithi Nakha or Gathe Mangal, show the possibility of existence of local knowledge in such practices. This indicates that culture, in terms of religious beliefs and practices, is very much influential in Kathmandu context even these days.

4.4. Conclusion

This Chapter has placed the ideas of different knowledgeable people about the contemporary practices. It has discussed the importance of local knowledge in the livelihood of the people.

Local knowledge has been prevalent in livelihood of Kathmandu people; be it the building practices or other livelihood activities. Eventually, the local knowledge of building technology is being overcastted by the modern technology. Use of RCC and other cement technology is prevalent in livelihood of Kathmandu valley. Unfortunately people have learnt the material but not the discipline of using the material. Besides, such materials are not the product of local industries so they are costly. In order to reduce the building costs, people are using such materials haphazardly. Therefore they are adding vulnerability to themselves in all aspects of life, dominantly exposing themselves to natural disasters having weaker adobes to live in.

In contrary, the use of traditional knowledge has had contributed to have a better livelihood to the locals and eventually to reduce the earthquake vulnerability in past. However, this knowledge has been marginalised.

There are several rituals, festivals and religious celebrations through out the year and people of different ethic background celebrate them in Kathmandu. Very often they celebrate them without knowing the scientific part of it. An example could be taken of celebrating a snake festival. On that particular festival, *Naag Panchami*[10], people offer milk to the snakes, their idols and pictures. This perhaps might have a connection to the agrarian livelihood as snakes are the enemies of rats and mice. Irate farmers might have worshipped snakes considering that they will help to reduce the activities of mice. Perhaps this is related to the local knowledge of snake activities. As the local respondents were relating the earthquake with the mythology of Shesh

[10] Naag Panchami is a Hindu festival which is celebrated during monsoon. On this day, they worship Cobras as Cobras are considered to be divines in Hindu mythology.

Naag- the snake king, there might be some knowledge of earthquake in Nepalese culture as the Chinese have. Similarly it is seen that the traditional architecture of Kathmandu valley has the symbolic representation of serpents: on the wall, over the door, on the struts, everywhere virtually[11]. Therefore, it somehow could be related to the earthquake vulnerability reduction. It indicates that the local knowledge is in the tacit form and often coated with religious mythologies and cultural practices. Eventually, the serpent bands around the building in the superstructure is a structural band of carved timber fixed between two brick masonry works which work against shocks and quakes. Therefore, it could be said that the local knowledge of using timber bands around the buildings has a scientific logic behind it and symbolic representation of snake is for the cultural believes. This cultural symbolisation is significant as locals still believe that snakes are the creatures to save their buildings.

Local knowledge is not only reflected in architecture of Kathmandu valley but it has significant role in planning too. All medieval towns of Kathmandu valley are planned. They are planned being based on some religious symbols. Once symbolic representation is there, it could be easily said that there is knowledge of understanding those symbols too. Similarly, all such towns have open spaces either in the form of La Chhi or *Chowk*[12] at the end of almost every street where one can find a temple, water reservoir *jaru*[13] or water spout *Hiti*[14], a temporary shelter by the name of *Pati*[15]. These open spaces with such public facilities have socio-cultural significance too. Such socio-cultural spaces are useful during earthquake disasters.

In case of Kathmandu valley, the local knowledge has the nature of 'intuition' and 'learning by experiences'. They are neither documented nor considered as useful for earthquake vulnerability reduction. They are in tacit form and practiced by the locals in their culture and religious beliefs. Researches are needed to identify them and their usefulness in contemporary livelihood. But at this point of time it might be said that local and tacit knowledge, as in the form of embedded cultural capital, is useful for earthquake vulnerability reduction because of its availability in different forms within diverged ethnicity but yet available in a closer proximity and inside a political boundary. Culture is available in the community which is closer to individuals and is a booster of self-belongingness so this is an asset to the people which is useful to reduce the vulnerability.

As discussed earlier, local knowledge has been inherited in cultural practices in Nepalese context. Since, the Hindu and Buddhist system of schooling was prevalent

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[11] Refer pictures in annex.

[12] Chowk is a public courtyard or square used for several social and cultural purposes in medieval towns. Refer picture in annex.

[13] Jaru is a typical Newari term which literally means the water reservoir, usually established to serve the community in the vicinity or a particular neighbourhood. Refer picture in annex.

[14] Hiti is the water spout which functions similar to Jaru. Refer Picture in annex.

[15] Pati is a small inn like structure, usually of single storey and used for over night shelter. Refer pictures in Annex.

in ancient and medieval Nepal, many of such great knowledge had been transferred from generation to generation as a part of culture. This is therefore the caste system in society emerged as culture. This caste system was more of professional class. A child of a mason was brought-up as a mason professionally. Therefore, the knowledge had been limited within a household or in community. It could be therefore said that culture of that particular household or community inherits the local knowledge and which is contributory for sustainability of their livelihood and vulnerability reduction as well.

This chapter has not been able to discuss exclusively about the reasons of marginalisation of local knowledge. In this case, following chapter is presented to discuss the reasons of marginalisation which eventually will discuss the approaches taken to reduce the earthquake vulnerability.

Chapter 5: Approaches adopted to reduce earthquake vulnerability and role of stakeholders

5.1. Introduction of the chapter

In earlier two chapters, earthquake vulnerability and possible measures for its reduction has been discussed. But both the chapters have not discussed about the role of stakeholders in this context. This chapter therefore will highlights the approaches made so far to reduce earthquake vulnerability and eventually the stakeholders and their role. This chapter considers the reason for marginalisation of local knowledge in earthquake vulnerability is highly dependent on the policies and approaches adopted so far and activities of stakeholders.

5.2. Approaches on Earthquake vulnerability reduction

Approaches on earthquake vulnerability reduction has to be classified into three basic stages of pre, during and post-disaster. Similarly, earthquake vulnerability reduction has taken two major dimensions so far in global context. Earlier in the introduction part, they are called as techno-centric and community based. Eventually the techno-centric approach deals with pre-earthquake stage of vulnerability reduction however community based approach is minimised or limited to post-disaster management. According to Arch Singh, who is also the chairperson of ward 17 Disaster Management Committee (DMC) of KMC which is working with the partnership with local community and NSET, says "…*Earthquake vulnerability reduction is a part of disaster management, which is not very much technical rather it is more human as I personally think that technology is the tool for management*…" This indicates that post earthquake vulnerability reduction is more of management and non-technical. According to Arch. Singh the main idea of forming such institutions at the community level is to make self-sustained communities by forming self-help groups and work extensively during golden period of 72 hrs. This golden period is considered that timeframe when live people could be rescued from debris of disaster. Talking on achievements of this venture he articulated that there are several such DMCs formed in different wards of Kathmandu Metropolitan City which have motivated youths and trained them as volunteers. The contact list of such volunteers is updated so that they could be called during disasters; whether it is an earthquake or other forms of natural disasters. Mr Dixit also agrees that such community based approaches will reduce vulnerability but it is some 10-15% reduction of total loss according to him. Acknowledging this approach, he opined that it is useful approach as it rapidly responses at the community level. Therefore the question of techno-centric and community based approach leads the research to another direction to an extent. It could be said that the local community has to be less vulnerable in a high percentage and this is possible having pre-earthquake vulnerability reduction approaches. Ultimately, does this mean that only technical measures can reduce the vulnerability? Or does only modern knowledge and technology can solely solve the

problem? Mr Dixit states "…*Knowledge required for alleviation of all risks is available in modern theories*…" However in the later part of his interview he states "…*We had our building science but we've lost it due to western engineering schools and we came to understand that the imported technology merely saves us from disaster, we have to identify our own knowledge which perhaps is embedded in our culture..."* Contradicting on his own statements, Mr Dixit admitted that NSET has taken initiations to identify, document and use of local knowledge. During the same interview, he defined the vulnerability context as rampant and therefore NSET considers risk as vulnerability. According to him, NSET has considered buildings as the sources of risk and quantifies vulnerability in terms of life casualties and building damages. NSET has lobbied to come up with 'National Building Codes' as it has identified 93% of Nepalese buildings are non-engineered. Similarly, he strongly quoted the success of NSET in creating the public awareness about the earthquake disasters.

Similar observations are seen during the interview of Er Pyakurel as he also mentioned that most of the buildings are non-engineered in Nepal and such non-engineered buildings are the prime sources of risks. He says regulating building construction is a tough job in Nepal where 90% of housing units are made by individual being based on their own needs and budget. He claims that only 5% of the total buildings in Nepal are properly constructed with engineering design and supervision. However Dr Jigyasu argues that there should not be such terms of engineered and non-engineered structures. He says "…*I do not believe that buildings are non-engineered, redefining of engineered buildings is must…*"This argument leads to define building practices into two terms; provably *engineered based on modern norms and standards* and *engineered based on local knowledge*. Er Pyakurel also admits "…*Local knowledge is useful for vulnerability reduction, it is felt by the architects, engineers and technicians in governmental authorities but surprisingly no one has contributed to place the idea in policies…we could identify the technologies of locally engineered buildings…*"Eventually, this argument helps to close the discussion on techno-centric or non-technical approach.

Coming back to the technical measures, NSET claims that it has developed retrofitting technology which according to Mr Dixit is the product not very much favourable in terms of cost to the low income group people. He stated that this the issue to be tackled by NSET and it will address soon as in his words "…*NSET is such NGO which not only raise the problems but explores the solutions too*…" However NSET is heavily criticized by the community by calling it as consulting agency instead of NGO. Mr Dixit doesn't agree it stating that there are pitfalls in policies which have forced NSET to work on all the fields of earthquake technology and no governmental institutions are working in this area. According to Mr Dixit, people on the chair understand the problem but government never takes it seriously and asks "*we are working on the field where government is yet to arrive and we are blamed …isn't it a strange phenomenon…?"*

Similarly, Er Pyakurel discloses the problem of link between earthquake and policies. He says "… *Nepal government has building act-1998 which has addressed the issue*

of earthquake which seem to be very late…" he adds "*…Being based on building act-1998, National Building Code has been introduced which is very much techno-centric and has not touched the cultural aspect and the indigenous knowledge…*" This practice of codifying the building practices is liable to reduce the earthquake vulnerability but as mentioned earlier in this chapter, if there are some 90% buildings which do not follow the modern engineering properly, is not it adding the vulnerability to the people? On this question Prof Regmi says "*…law enforcement can not solely resolve the earthquake vulnerability…*" according to him, it is better to humanise the technology taking account of the culture and beliefs "*…it might take time but this is the sustainable approach as I would say…"* Prof Pokharel however says "*…Laws and acts are needed to make the use of indigenous knowledge used to develop disaster vulnerability reduction approach… We have to find technological solution to any problem and this is true in the case of the disasters also…*"Prof Pokharel claims that there are some local low-cost technologies developed by NCDM, CDS like NGOs and institutions which are favourable for low-income group people. This discourse on approaches, laws and policies again stresses on the local knowledge embedded in culture and beliefs. Adding another dimension on this concept, Prof Tiwari says "*... education system of modern engineering has reduced the culture of research in local technology as we all thought that modern engineering solution is enough for earthquake vulnerability reduction, now the context has been changed and people have started to think about the local knowledge… Local knowledge could be accommodated in formal education system but the contents have to be reviewed. We have to redesign our curricula according to the local context…*" Dr Jigyasu expresses on educational policies saying "*…This is possible if we could teach local knowledge in universities and which should be brought up with national policies…*" Arch Singh has his point on this issue as he stated "*…Formal education in earthquake vulnerability reduction and role of local knowledge is must and it has to be taught to newer generation…"*Similar opinion is of VC Dr Pokharel as he states "*…We have to fit in the local knowledge in formal education system and for that researches are needed…*" This indicates that educational policies can definitely persuade the earthquake vulnerability reduction approach. Eventually, why such practice is not seen in contemporary education system? Answering this question VC Dr Pokharel articulates "*…We don't have any policies it is because we have adopted western education system which contradicts with our local knowledge. Local knowledge is more based on beliefs. A Chinese medication technique of acupuncture is the best example in it…"* Senior culture expert Mr Joshi argues in this point saying "*…We are overcastted by the western technology. It started from 2005 BS (1948) when first public building was made with cement technology. Since then cement and concrete technology was introduced in all kind of buildings like public, residential and other services too. We cannot say that our technology was of 'so called' formal engineering but it has all the essence which makes buildings stronger and safe during earthquake too. It was intuitive knowledge. Our artisans knew the impacts of earthquakes so they learnt the technology by the process of 'learning by doing'. We had developed a good technology of building construction in a combination of brick and timber. We have lost it..."* Very nobly Mr Joshi admits the importance of western

knowledge and technology but he expresses "…*Western technology is good but for west, we had our technology good for our context. We had to preserve it but we did not do it. Now westerners started to talk it so we are again motivated to do it. It is pity…"*The reason for loosing such a grand knowledge according to Mr Joshi is the lack of foresight of ancestors. He says "…*Our ancestors lacked foresight therefore we don't find any document for construction of grand architecture these days…We have the oral tradition of transferring the local knowledge but it is related to the Newari language which is not spoken by the younger generation of the valley so the knowledge is being lost… There is less motivation for younger generation to preserve our heritage and culture and perhaps that has also made us more vulnerable… We should not blame west rather we should confess that we have dogmatism. The knowledge 'we had' was considered to be non-questionable and no-one had the right to ask how and why? Therefore we lost it because the death of Guru was the demise of knowledge too if it was not properly understood by his follower…*" Mr Joshi also adds that the governmental policies are also causes of loss of local knowledge as they are not focused on traditional practices and culture of the particular community. He says "…*We can take example of chariot construction of Machhendra Nath which as a part of festival is being celebrated since 1000 years in Lalitpur and the chariot they build is remarkable. Machhendra Nath trust is one of the richest trusts in the valley which has all the administrative mechanisms but has got a religious framework so no one can penetrate into the system. It is more dogmatic but the technology they have developed is very interesting. Earlier it was said that if Chariot fails to stand for almost a three months time and collapses means there would be a tragedy in the valley. Perhaps it is said so because the construction process was so precise. Now- a-days neither the materials are available of that neither quality nor the selection process of such materials are done accordingly. It is again because the people who knew the process died and the newer generation never tried to learn it. So annually there is problem with the chariot. In ancient days, people knew the quality of materials and the characteristics therefore catastrophes were less. Government has taken initiative to protect this heritage but it has been unsuccessful as community is not involved in it. The devotion has been lost. UNESCO also took interest to preserve the heritage but failed because we have a sort of dogmatism. We are worried at the local level about the future of this local knowledge. This local knowledge might have been transferred in building construction to make people less vulnerable but alas!!..."* This indicates the community has also responsibility of preservation of such knowledge.

5.3. Stakeholders and their possible role in earthquake vulnerability reduction

In previous sub- chapter, the approaches of earthquake vulnerability reduction were discussed. The sub-chapter also highlighted some of the achievements like acts and codes in this area. Similarly it was able to identify the reasons of marginalisation of local knowledge. It clearly indicated that there are different stakeholders and they have their role to play in the area mentioned. This sub-chapter will attempt to identify the institutions and their possible role in earthquake vulnerability reduction.

Basically, there are five major stakeholders in the area of earthquake vulnerability reduction.

5.3.1. Government

The first and foremost stakeholder as the experts stated is the government. Government not only has the authority to constitute policies, strategies, action plans; but its role is not limited to afore-mentioned activities. However it has the right to monitor the implementation of such policies as well. Similarly, it can take the issue of earthquake vulnerability reduction to a broader and holistic network and influence other stakeholders. Therefore, government has leading role in earthquake vulnerability reduction and it has to work as an integral part of laboratory too.

In case of Kathmandu, the metropolitan corporation has constituted its own Disaster Management Section under its Social Welfare Division which is a positive step forward however it is only focused on post disaster activities. The Local Self-governance Act-1998 has given autonomy to the local governments to take necessary actions to prepare such policies and constitute such divisions as KMC has constituted.

As Er Pyakurel has stated in the interview government only cannot do a lot in this regard but eventually government can act as a conservator of local knowledge as he says "*…To promote the local knowledge and skills, researches and guaranty of employment to the local artisans is must, and government has to do it…"*. He says "*…Department of Urban Development and Building Construction under the Ministry for Physical Planning and Works has been playing role of facilitator, manager and policy maker. But government solely can not do anything so it has been collaborating with leading I/NGOs specialised in the area…there have been several researches conducted by numerous scholars being funded by NGOs and there could be several such documents fairly important for earthquake vulnerability reduction which government has to collect and use for policy formation…"*This means that the role of I/NGO is also of a high significance.

5.3.2. Non-governmental Organisations

Non-governmental organisations both of national level (NGOs) and of international level (I/NGOs) have a significant role in earthquake vulnerability reduction. As records in this thesis reveal that non-governmental institutions are effective in identifying the issues. They are able to work in every stage of earthquake disasters. As mentioned earlier, government also has taken steps to work together with NGOs. Arch Singh articulates "*…There is a big gap between lab and field in this arena therefore NGOs are to go to the community and learn instead of teaching them the modern technology; there should be linkage between lab and field. NGOs are working as lab these days, we should not forget their contribution in awareness building but they have to involve themselves to identify the local knowledge and technology…because they are far distant with the local context; especially in terms of local technology…*" Here the term lab is laboratory which develops software and hardware for earthquake vulnerability reduction. Field is the venue of testing the software and hardware developed which is none other than the community. This

theory agrees that the role of NGOs is to bridge those two distant stands. Senior engineer Baidhya has complaints on NGOs as he says they are governed by white-collared people. He says "*…I don't mind if modern knowledge is active to reduce the earthquake vulnerability but the problem is that only white-collared people are involved to relay it to the local people and hence it is not easily transferred. The best way in my view is that we have to explore our indigenous technology from the people and transmit to the community and which has to be done by gray-collared people…*" Arch Singh puts his point in this context by calling the locals to the laboratory. According to him, the access of local people to the lab is limited or often ornamental therefore NGOs have to create an environment so that locals have their say in the lab too.

Ms Dekens, working in ICIMOD an active I/NGO working in Nepal, while talking about use of local knowledge says that confidence building of the locals could be done by NGOs. She writes in her book Herders of Chitral: The lost Messengers? (pp 5-7) "*…local knowledge still lacks legitimacies as far as outsiders are concerned, mainly because of lack of their own knowledge, mistaken assumptions and power relations (knowledge is power!). Most importantly, the lack of legitimacy attributed to local and indigenous knowledge is as much a problem from within as it is from outside: communities themselves need to be convinced (may be by governments and NGOs) that they have knowledge and some of it can be useful…*" During the interview she stated that most of the time approaches on disaster vulnerability reduction are of trickling down nature however more sustainable approach is bottom up where NGOs can play their role. They can collect the issues from the grass-root level where government reaches late after so many bureaucratic hurdles. Mr Dixit admits that NSET as a NGO has tried to come up with the bottom up approach to solve the problem. Similarly Ms Dekens in her book Local Knowledge for Disaster Preparedness: A literature Review (pp 7) writes "*….the importance of local knowledge and coping strategies is entering national policies. For example, The Nepal Disaster Management Policy mentions the need to strengthen communities' coping strategies. This policy was drafted by the Nepal Centre for Disaster Management (NCDM) and Oxfam-Nepal and currently being reviewed by government of Nepal…*" This also indicates that NGOs are the stakeholders and they have noticeable role in earthquake vulnerability reduction and even in the context of identifying the local knowledge on it.

5.3.3. Universities and academic institutions

There is no doubt of importance of universities and academic institutions in terms of earthquake vulnerability reduction. Mr Dixit complains "*…Even the engineers are less aware about earthquake vulnerability reduction because it is nowhere taught in academic schools…*"

As it has been discussed previously, that there are two types of building practices as *engineered based on modern norms and standards* and *engineered based on local knowledge.* There have been long practices of educating the younger generation with modern knowledge however the local knowledge had been ignored considering them

obsolete. The scenario has been changed a bit but formalising the local knowledge and making it in academic curricula has not been done so far. Prof Tiwari says "…*Studies are too limited in terms of learning the local knowledge…There is a bit of transmission of local knowledge through the curricula of Bachelor in Architecture under the subject History of Architecture but it never had been taught to make them aware of use of such knowledge in vulnerability reduction…Local knowledge could be accommodated in formal education system but the contents have to be reviewed. We have to design our curricula according to the local context*…" VC Dr Pokharel also adds his view in education system Nepal has saying "…*We have to change the education system we have adopted till date to explore local knowledge*…" This clarifies that there is a need of education in earthquake vulnerability reduction being based on local knowledge. Er Baidhya has his bold statement on education. He says "…*unless you teach children in their mother tongue, you can not teach them the local context, once one cannot understand the local context, how can s/he understand the local knowledge*?..."

Universities and academic institutions have the tremendous potential of researches as well. In Nepalese context, the culture of research has not been so rich. Referring to this poorness VC Dr Pokharel says "…*We have lacking in research culture because the knowledge in east is non-questionable. No-one earlier had the right to ask the question to the Guru*…" Adding the importance of local knowledge he adds "…*We have to fit in the local knowledge in formal education system and for that researches are needed...*" Differing a bit with VC Dr Pokharel, Mr Joshi says "…*There was tradition started for questioning but it did not last long. Buddha was asked so many questions and the same was in Hindu traditions too. But since we had to fight with Christianity and Islamism in order to maintain the knowledge we developed we turned our knowledge to be unquestionable and we turned ourselves to be dogmatic*…" So, now there is no need of confrontations with diversified ideologies as he says that Nepal has to revitalise the culture of questioning. Being based on such issues raised by the experts, academic institutions and universities are also predominantly appearing to be one of the key stakeholders.

Academic institutions and universities are the integral part of the laboratory to develop the policies for even of those technologies based on local knowledge. Such institutions are more conducive to work both with local communities and governmental institutions. Besides all, they have the tremendous store of knowledgeable people from different cross- section of society, age and ethnicity who can contribute for development of earthquake vulnerability reduction policies, strategies and approaches. All together, universities are the stakeholders in terms of vulnerability reduction too.

5.3.4. Community and community based organisations

Community of people is defined as a group which is often clustered within a geographical boundary and share their environment together. The reasons for such clustering could be the knowledge they have, the beliefs they comprise, the intents they contain, the resources they use or even the risks they confront with. Therefore,

community is one of such vital stakeholders which can play a noteworthy role in earthquake vulnerability reduction. Since earthquake vulnerability is rampant, community working together can reduce it. As it has been discussed in the earlier sub-chapter, community is the field for the theories those are developed in the lab. In Nepalese context, it has been seen that there is a huge gap between lab and the field. There are several reasons of having such a huge gap but everyone as expert says that community also has to come up with a confidence with the knowledge they have in terms of earthquake vulnerability reduction. The community in the case area also poses that there exist practice of being united for common welfare in the name of Guthi.

Mr Silwal, the local politician and former VDC chairperson of Godawari, stresses the importance of community based organisations saying "*…Immediately after earthquake of 1988, several community organisations in the name of Guthi were developed …*" As discussed earlier, Guthi is a community based organisation often without the legal framework and is formed by the locals who follow same caste structure, religion or sometimes own similar social status. The statement of Mr Silwal indicates that the concept of Guthi is very useful for earthquake vulnerability reduction otherwise they might not have been emerged immediately after disaster. Almost every respondent have the similar idea on Guthi. The importance of Guthi has been discussed in chapter 3 earlier as well.

Mr Joshi while talking on the role of community states that community has to be open-minded while making it contextual to the present day livelihood. As he says "*…We are trapped with the dogmatism and therefore we have made ourselves more vulnerable. We are not using the local knowledge which we developed by our tremendous experiences of earthquake disasters…we are just celebrating the festivals without understanding it why we have to celebrate it and what is the knowledge embedded in the culture of festivals…*" which means there should be a humble attempt to get rid of superstitions and dogmatism as well. This is the role of CBOs.

Er Pyakurel says community never is strong in advocacy of which 'they have'. He articulates "*…Nepal is facing the problem of less advocacy and advertisement of traditional knowledge and skills and has been overcastted by modern materials and technology…*" This point outs that the community based organisations can play the role to advocate their knowledge. Eventually, as discussed earlier, communities are discriminated and marginalised however CBOs can collectively work for the advocacy and advertisement. As it had been quoted earlier, communities are less aware of their potentials therefore CBOs collaborated with NGOs can convince the community that some of the knowledge they have is most important in vulnerability reduction. Similarly, communities are the primary respondents of disasters therefore they have their significant role pre, during and post earthquake vulnerability reduction approaches.

While talking about the stakeholders, professional organisations like Society of Nepalese Architects, Nepal Engineers' Association, and Nepal Geological Society etc also have the role to play as they can promote the local knowledge and technology by

convincing the community about their strength. They can even influence the lab as their fellow members are the part of it. As Er Baidhya was calling them the white collared professionals, such professionals have a significant influence in local community and they are highly admired by the low income people.

In this case, researches and formal educations on earthquake vulnerability reduction are also an important. This also proves the universities and academic institutions are also the stakeholders about which have been talked before in this sub-chapter as well.

Similarly, this research has revealed households as key stakeholder in earthquake vulnerability reduction.

5.3.5. Households

According to definitions, a household includes all the persons who share a housing unit. Such persons are called as occupants of a household. Occupants may be a single family, one person living alone and two or more families living together. In Nepalese context, a household consists commonly of two families of two different generations. The span of generations from grand parents to grand children under a roof is common in Nepalese settlements. This is perhaps a good practice in terms of transferring the culture. Very often, the grandchildren are closely associated with their grandparents and therefore they learn the culture of their ancestors easily.

As discussed earlier, the caste system as a cultural practice is prevalent in Nepalese society which has a system of transformation of knowledge from generation to generation so every household has some specific professional aptitude being based on their caste. Often, building construction skills are also associated with some or other castes. This culture of caste system and transformation of knowledge from generation to generation has significant role in livelihood of households. This is seen in the case area as well. Eventually, it is observed that almost all respondents (especially from the people of indigenous ethnicity and so called lower caste people) are engaged in the same profession as their ancestors had. This relates again to the cultural capital of any individual household.

Similarly, household is the smallest unit of any community therefore this is the first unit to face the disaster. A household is less vulnerable in earthquake disaster if it has sufficient capital to use to make its livelihood sustainable. Besides all, all the respondents in the case area agreed that culture of being together, sharing the life and cooperating to construct, repair pre and post earthquake and rescue during earthquake is a capital for them. This eventually proves that culture is also a capital to reduce earthquake vulnerability reduction. Therefore, household having such a culture is a stakeholder to reduce vulnerability which not only reduces its vulnerability however could help others in the community too. The only problem observed in this case is again related to the contextualisation of local knowledge the household holds; this is also to be solved by detailed studies and researches in labs.

5.4. Conclusion

"….sabaile aafno-afnai damphoo bajaune ho bhane kasari mitho dhun niskinchha ta?" (**Translated**: if every own plays his drum in his own then how can a good melody is heard?) This is a common proverb in Nepali language which stimulates all the stakeholders to get united and accept the importance of each unit to achieve the goal.

The product of the laboratory should always be useful to the field. In case of earthquake vulnerability reduction, laboratories are often working alone in Nepal and the field happens to be the sufferer. Usually, community has been forced to act as a 'genii pig' no matter they like it or not. Communities have been accepting the theories by force whether they are useful for them or not.

Usually, the local knowledge is often useful for disaster vulnerability reduction. This has been proved in several disaster cases. But the local knowledge has been overcastted by 'so called' modern knowledge which rarely contains the local context. More specifically, such modern knowledge is explicit in form and more easily transferred to the locals. Therefore, NGOs are advocating the importance of modern knowledge. Sometimes, they are using the term non-engineered in terms of traditional building technology. It has been discussed in this chapter earlier that local technology is also engineered but with local knowledge which has never been studied in formal schools.

There is no question about the technological advancement of modern era but one should not forget about the cost of use of such advanced technologies in countries like Nepal. Nepal has to use its own resource, provably the most easily available and proved 'contextually fit' resource is the local knowledge, which is in tacit form and which has been practiced by the society since a long time. It could be the best strategy to adopt local knowledge while developing policies of earthquake vulnerability reduction.

To incorporate local knowledge in earthquake vulnerability reduction, all stakeholders have to come around the table and work together. It is obvious that the government has to take the initiation in this venture and play the lead role. NGOs have also their role to play to identify the related issues and lobbying them with the stakeholders. Universities and academic institutions have to accept the local language as an integral part of their curricula if it is not possible to change the language of instruction. They have to co-operate government by conducting researches and suggesting the appropriate findings. Households, communities and CBOs also have to build their confidence level high and work hand in hand with the government; after all, the entire product is for them to use. Professional organisations also have their duties for lobbying the importance of the local knowledge the communities have.

It has been observed that without the involvement of locals, several practices and policies have been failed in past. Therefore, stakeholders have to develop the mechanisms to reduce earthquake vulnerability taking in account of local knowledge which is often found in social policies and cultural values.

This chapter has also been able to relate the concept of culture and local knowledge by peeping through different perspectives and observations of experts and respondents. All experts and respondents are representatives of their respective profession/ specialisation and even the livelihood. All of such respondents are the representatives of stakeholders and have admitted the role of local knowledge being practiced in culture is a capital useful for sustainable livelihood. This concept is however related to earthquake vulnerability reduction as well.

Chapter 6: Conclusion

6.1. Introduction of the chapter

This chapter is the summery of all the conclusions drawn in various chapters earlier in this research. Eventually, it attempts to answer the research questions. This will finally analyse the theoretical framework and lays the foundation for further research in relevant area.

6.2. Earthquake vulnerability

Earthquake being a natural hazard is inevitable in Kathmandu context. It has forced the society to be exposed and has added vulnerability to a large extent. The vulnerability in this context should be understood as widespread which includes life casualties, building damages, collapses of basic infrastructures and addition of poverty to the people. In this case people make their livelihood sustainable using their assets of various capitals. Such capitals are physical, social, financial, human and natural capitals.

6.3. Role of culture for sustainable livelihood

Nepalese society is in the transition to modernisation which is felt in sub-urban area fairly clear. Sustainable livelihood framework fits in Nepalese society too but it misses a significant capital which is culture. Culture is a capital which is destined with every individual from birth to death. Culture teaches any individual to live, struggle and enjoy. It inherits the local knowledge which is often in tacit form but it is predestined.

Culture is comprehensive experience. It is used for the benefit of the people. Sustainability thus could be achieved by using culture as a capital. Since, culture is multifaceted; the local knowledge embedded in culture has to be taken in account. Local knowledge had been evolved by experiences of the civilization of the particular locality and practiced as culture which is very much useful to reduce the disaster vulnerability. Here earthquake vulnerability is again not an exception.

Vulnerability reduction is directly related to the sustainability of livelihood, hence it could be concluded that culture reduces vulnerability and which contributes for sustainable livelihood.

6.4. Incorporation of local knowledge in present day context

Culture is capital which inherits local knowledge. Local knowledge is often in tacit form therefore has been excluded in formal education system. Stakeholders have to work together to incorporate local knowledge in contemporary livelihood of people.

Incorporation of local knowledge in present day context is a challenge. All the Cultural practices are not always useful for present day context but they all are neither obsolete. Researches, academic exercises, advocacies, promotions, policy formations

and motivation for the younger generations in the studies of local knowledge will contribute for its incorporation.

Incorporation of local knowledge will contribute for upgrading of livelihood of individual households of low income group people. Very often this is the group of people who use local knowledge as a part of their livelihood. Such incorporation puts them at the front which brings their confidence level high. Communities and organisations based on community activities have to play a leading role for lobbying this issue.

65. Foundation for further research

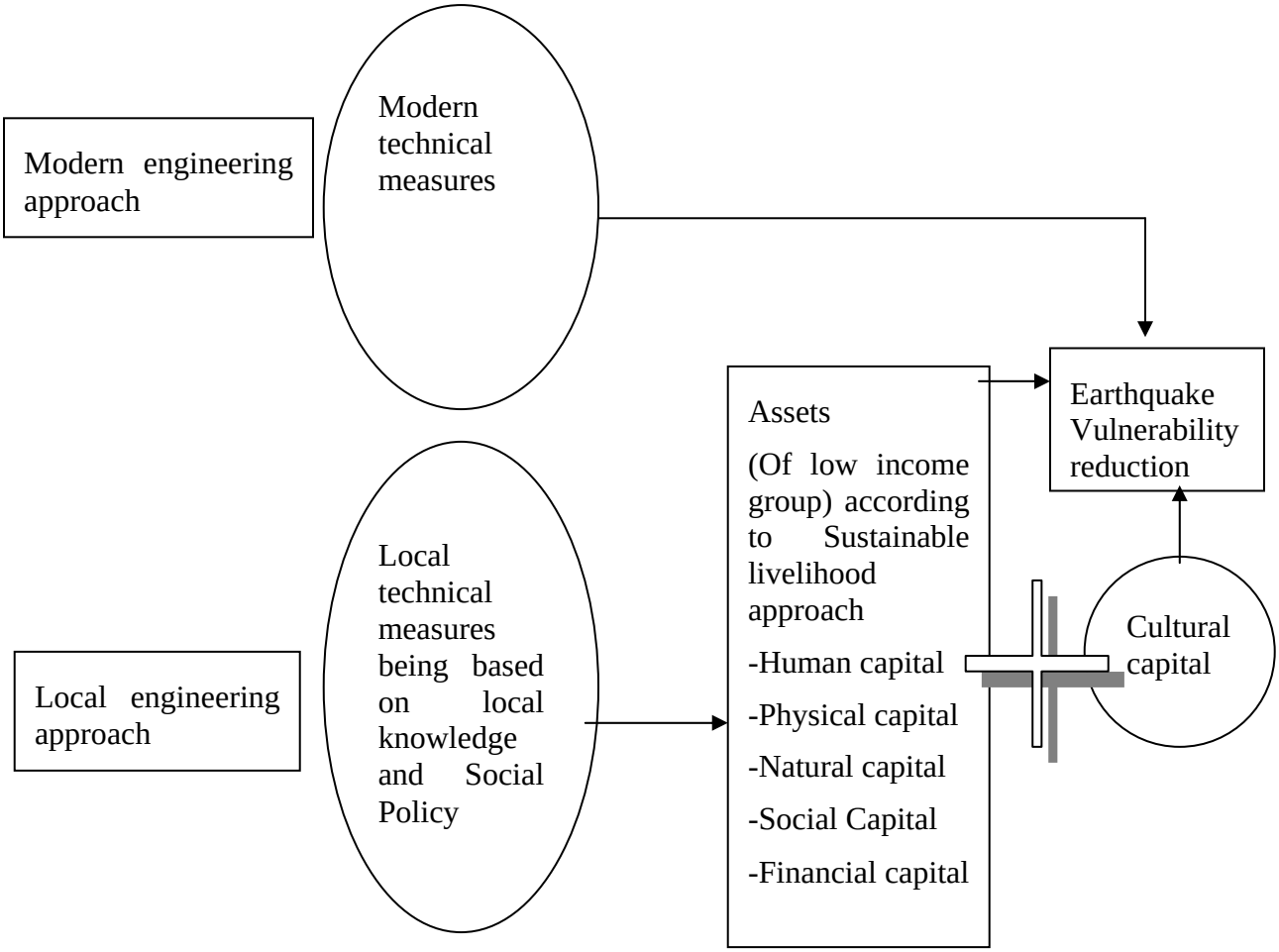
This research is believed to identify the culture as an asset to people which is useful to reduce earthquake vulnerability. It has highlighted the understanding of earthquake vulnerability of low income group people too. This is therefore a step forward to fulfil the two out of three objectives of the research itself. However it has brought a new phenomenon as well. One of the objectives of this research was to analyse the techno-centric and community based approaches of earthquake vulnerability reduction; for that the research has initially took its assumption that there are two approaches as techno-centric and community based approaches of earthquake vulnerability reduction which argued that techno-centric is based on technology and which trickles down to the community. This however is the partial truth as modern engineering practices are of trickling down approach. Ultimately, this approach also reaches the community so it could not be said as non-community based. It is community based too but it is more direct approach and therefore community are left behind. Very often, in this case household of low income people or people less exposed to modern knowledge tend to imitate this approach instead of internalising it, which has added vulnerability to them.

The research has shown that there are basically three stages of earthquake vulnerability reduction. They are as stated several times earlier: pre, during and post earthquake vulnerability reduction. It has identified that technology has a significant role in the pre-earthquake vulnerability reduction. Therefore, there is nothing like techno-centric and community based approaches as all the technologies are developed in laboratories and tested on the field. The only question is how the technologies developed in labs respond the community's' practices. Very often labs are distant from field. This has led the theories to fail humanising the technology whereas access of local knowledge to the laboratories is must which puts people first and this is more sustainable approach making them more close to the humanities as well. It is not to be repeated again that local knowledge is located in culture.

In contrary, earlier quoted community based is more of local engineering practices which incorporate the local culture, knowledge, beliefs and confidence of local community. Therefore, further researches could be done using the terms like modern engineering practices and local engineering practices because earthquake vulnerability reduction is of a highly technical base. Without, technological means, pre-earthquake vulnerability reduction approach may fail. However, during and post

earthquake vulnerability reduction approach might be of both technical and managerial aspects. The debate of whether to consider management as a technical aspect or human aspect still remains unanswered.

Finally, this research has identified culture as a capital and local knowledge as one of its assets, further researches could be carried out further. Hence, following framework is proposed for further researches.



Bibliography

http://earthtrends.wri.org/pdf_library/country_profiles/eco_cou_524.pdf

3cd Sound Practice Series, NSET, Kathmandu, Nepal. (Source: http://emi.pdc.org/soundpractices/Kathmandu/SP1-KMC-School-Safety-Program.pdf)

Abnormal signs in the strait of Akashi on the preceding day of quake (Source: www.vathena.arc.nasa.gov/curric/land/kobe.html)

Bothara, J., Guragain R. and Dixit, A., *Protection of Educational Buildings Against Earthquakes, A Manual For Designers And Builders*, NSET, OFDA/USAID and UNSESCO-Kathmandu, 2005.

Cila,J.(2006) *Making A Livelihood: A Study of Rural Migrants In Bathore, Tirana*, MA Thesis ,IHS, Rotterdam.

DDC Lalitpur, *District Profile of Lalitpur-2004*, DDC Lalitpur. (In Nepali) (Source: http://www.ddclalitpur.gov.np/)

Dekens, J. (2007), *Local Knowledge on Disaster Preparedness: A Framework for Data Collection and Analysis*, Sustainable Mountain Development, Vol.52, spring 2007, ICIMOD. (Source: www.disasterpreparedness.icimod.org)

Dekens, J. (2007), *Herders of Chitral: The Lost Messengers? Local Knowledge on Disaster Preparedness in Chitral District, Pakistan*, April 2007, ICIMOD.

Dhungana, M. (2006), *Theoretical Model of Knowledge Management for Water Users Association in South Asia*, MSc Thesis WM 06.20, UNESCO-IHE, Delft, August 2006.

Gans, Herbert J., "*The potential Environment and the Effective Environment*", in: *People and Plans*, Harmondsworth: Penguin press, 1972, pp.5)

Historical Earthquakes, (Source: http://www.seismonepal.gov.np/historical_eqk.htm)

Jigyasu, R., *From Natural to Cultural Disaster*, conference paper presented in UNESCO-ICOMOS International Conference on Seismic Performance of Traditional Buildings, Istanbul, Turkey, 2000. (Source: http://www.radixonline.org/resources/jigyasu.doc)

Jigyasu, R., *Sustainable Post-disaster Reconstruction Through Integrated Risk Management-The Case Of Rural Communities in South Asia.* (Source:http://www.neduet.edu.pk/Arch_2Jne/Arch11/JRAP-2004/JRAP%204/Revised%20Rohit%20Paper%2019-111.pdf)

Nabi, Rashid u., Datta, D. and Chakrabarty, S., *Waves of Disaster*, (Source: http://www.worldbank.org/prem/poverty/voices/reports/lands/lanbangla.pdf)

Nippon Koei co. Ltd and OYO Corporation, *The Study On Earthquake Disaster Mitigation in Kathmandu Valley Kingdom Of Nepal, Final Report*, HMG/N Ministry of Home Affairs, JICA, Kathmandu Nepal, 2002.

Novianti, D., (2001), *Community Based Approach in Human Settlement Improvement Activity*, Thesis, IHS, Rotterdam.

Okazaki, K. (2006), *Keeping Schools Safe from Earthquakes*, International workshop on Keeping Schools Safe from Earthquakes, 1-2 June, 2006, Kathmandu. (source: http://www.nset.org.np/nset_new/html/uncrd_workshop/uncrd_workshop.htm)

Population of Nepal, Central Bureau of Statistics, HMG Nepal with collaboration with UNFPA, June 2002.

Rakodi, C. (2002), " *A Livelihood Approach-Conceptual Issues and Definitions*", in: Carole Rakodi with Tony Lloyd-Jones (eds), *Urban Livelihoods: A People centred Approach to reducing Poverty*, London- Sterling VA: Earthscan, PP 3-22

Salisbury, D.F. (1997), *optimising earthquake mitigation strategies*, (Source: http://news-service.stanford.edu/pr/97/970827sec.html)

Shakya, M. (2004), *Role of Cultural Capital in the Context of Globalisation In Nepal: Exportable Ready-made Garment Industry as a Case Study*, Conference paper for 18th European Conference on Modern South Asian Studies, organised by SANSET and Lund University, 6-9 July 2004.

Thywissen, K. (2005), *Core Terminology of Disaster Reduction*, United Nations University-Institute for Environment and Human Security (UNU-EHS), Source (www.ehs.unu.edu/SOURCE No.2)

Trobe, S. and Venton, P., *Natural Disaster Risk Reduction: The policy and Practice of Selected Institutional Donors*, TEARFUND, UK (2003).

Uprety, S. (2006), *Nepal's Efforts towards Environment- Friendly and Disaster-safer schools.* International workshop on Keeping Schools Safe from Earthquakes, 1-2 June, 2006,Kathmandu. (source: http://www.nset.org.np/nset_new/html/uncrd_workshop/uncrd_workshop.htm)

Annexes

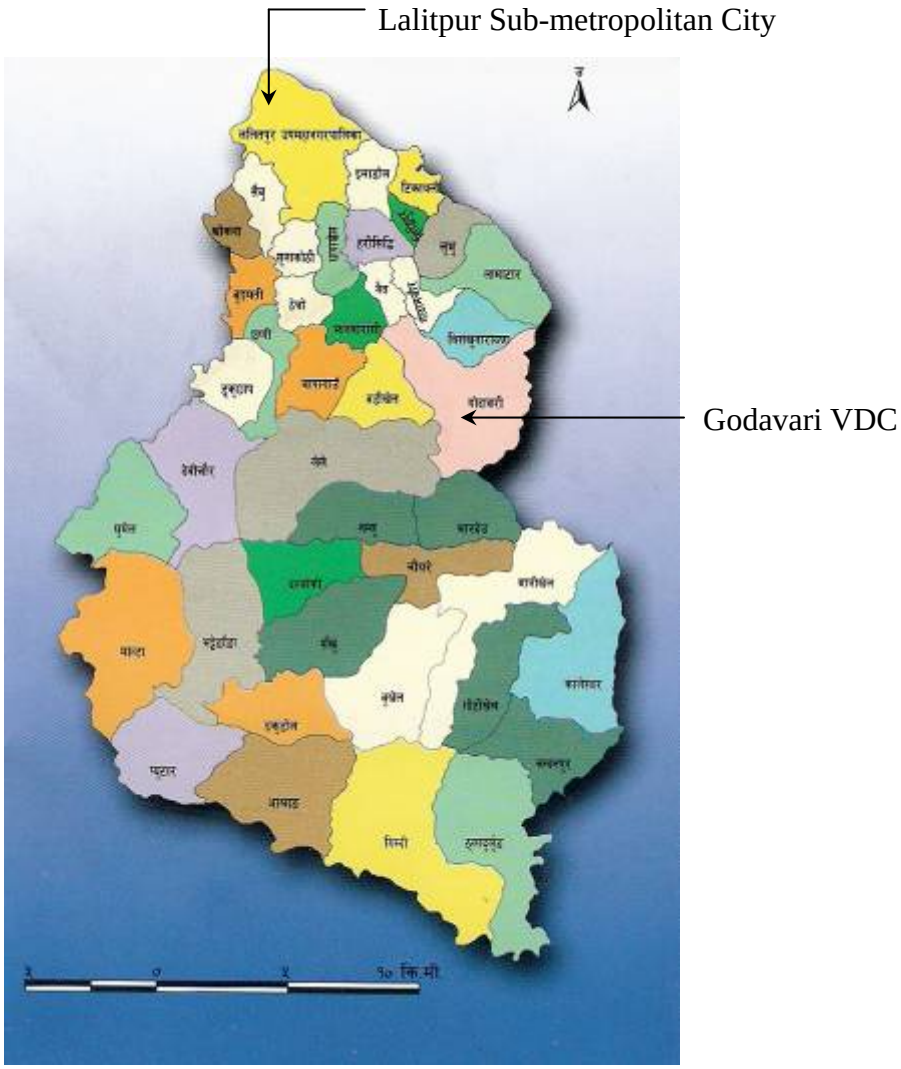


Figure 1: Location of Godawari VDC in Lalitpur District

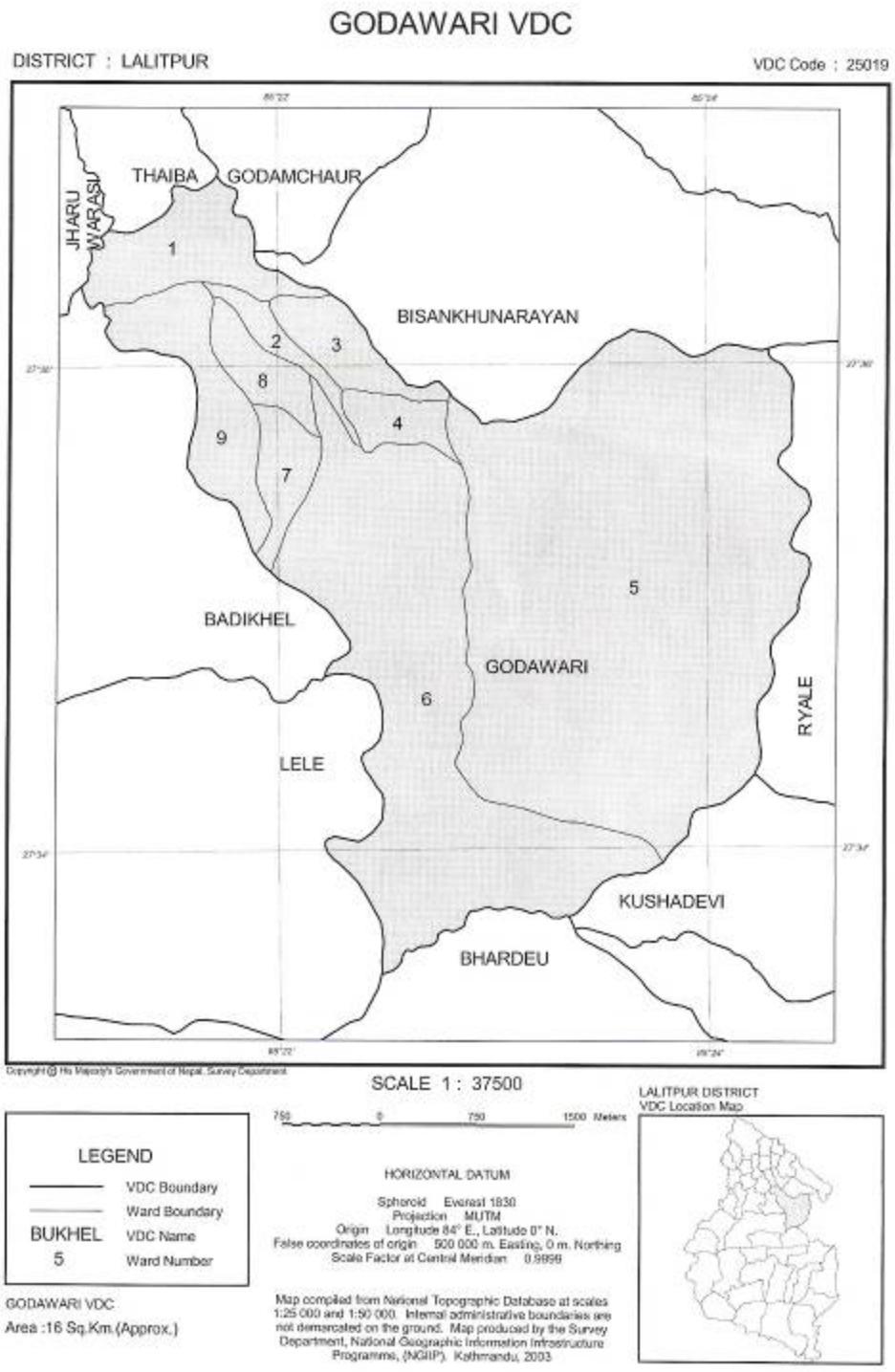


Figure 2: Location map of case study area- Godawari VDC

A.1. Household interviews

List of respondents for household interviews in Godawari

S.N.	Name	Age	Sex	Caste structure	Economic status
1	Atmaram Pokharel	48 yrs	M	So called upper caste	Fair
2	Dhukure Sarki Bisunkhe	84 yrs	M	So called low caste	weak
3	Govinda Silwal	57 yrs	M	Middle caste	Weak
4	Harke Tamang	47 yrs	M	Indigenous ethnicity	Weak
5	Kalu Mizhar	32 yrs	M	So called low caste	Weak
6	Lahure Tamang	45 yrs	M	Indigenous ethnicity	Fair
7	Purna Dhongwa	30 yrs	M	Indigenous ethnicity	Fair
8	Radhika Tamang	23 yrs	F	Indigenous ethnicity	Weak
9	Sanubabu Silwal	60	M	Middle caste	Good
10	Shambhu Pd. Ghimire	58 yrs	M	So called upper caste	Fair

Questioner for an Interview in Godawari

1. What is your name?

……Age……

2. What is the number of your family member living in this house now?

……..

3. What is your religion?

- Hindu/Buddhist/others

4. Do you have any physically challenged or mentally retarded family member?

…… (Pls. specify what kind of)

5. What is age group of your family members?

	Kids (0-12)	Teen (13-19)	Youth (20-60)	Elderly (60+)

6. Since how many years have you been living in Godavari?

……

7. Do you have following items at home?

- Radio/ cassette player/ DVD player/ CD player
- TV
- Telephone
- Computer

- Internet
- Motorbike/ Car
- Other ….

8. Do you own any land?

    - Yes/no

9. If, yes how much and where?

……

10. Do you have a membership of any community based organization or club or Guthi? If yes, pls. specify the name.

Yes/ no. …….

11. How many times a month you go to meetings of such organizations or club?

……
12. Which kind of festivals you celebrate with relatives?

……
13. How many times you celebrate festivals in a year with relatives?

……
14. Why you celebrate the festivals?

    - For cultural continuity/ for fun/ for social binding/ I don't know

15. Do you have any specific festival to celebrate according to your caste structure?
    - Yes/No/ if yes which kind of…….

16. How much is average expenditure for your livelihood?

…….

17. How much do you spend for your children's education?

    - ……

18. How many heads in your family are employed for a regular paid job?

    ……

19. Do you have any saving from your income?

    - Yes / no/ I don't want to say

20. Where do you go to solve your primary health problem?

    - Health post in village/ hospital in city/ dhamis

21. Do you know what does earthquake mean?
    - Yes/ no

22. If you know earthquake, what do you think the most dangerous thing you have to face during earthquake?

    - Life casualty
    - Building collapse
    - Deeper poverty
    - Damages of infrastructure
    - All mentioned above
    - I don't know

23. Do you have suffered from earthquake of 2045 BS (1998)?

    - Yes/ no

24. If you where impacted by 2045 BS earthquake, what sort of damages you had to face?

- Building collapse (non-livable)
- Building damage
- Casualties (life/ minor)

25. Do you have anybody (relative/neighbor/ community) who can support you in crisis?

    - Yes/ no

26. If you have someone to help in crisis, how do they support you?

    - Financially/ physically/ culturally/ others (pls. specify)……

27. Which of the community facilities do you have in your neighborhood?

    - Health-post
    - Play ground
    - Parks
    - Temple squares
    - Pati/ pouwa
    - Inar/ pokhari
    - Community building
    - School

28. If you had been impacted by earthquake of 2045 BS who was the first to help you?

    - Government/ community/ relatives/ NGOs/ others

29. If you had been impacted by earthquake of 2045 BS where did you go first?

    - No where
    - In rental house
    - Community facilities (pls. specify) ……..

30. Do you think that earthquake can be forecasted?

- Yes / no/ I don't know

31. Do you think that animals and birds can predict earthquake earlier than it happens?

- Yes/ no/ I don't know

32. Do you think that human also has that power?

- Yes/ no/ I don't know

33. If yes who knows it?

- Scientists/ dhamis/ purohits/ others

34. What is the role of 'dhami/ jhakri' for earthquake vulnerability reduction?

- They can forecast
- They can heal
- They can do nothing

35. What is the role of 'Guthi' for earthquake vulnerability reduction?

- It can help to restart the life again
- It can heal
- It can do nothing

36. What is the best technology to make earthquake safe buildings?

- Modern technology

- Traditional technology

37. What is the reason for adopting modern materials and technology to build house in you area?

    - Because people say that modern technology is best against earthquake resistance,
    - Because we are living in modern time
    - Because we lost our local knowledge of building
    - Because we can not find traditional materials these days
    - All mentioned above
    - I don’t know

38. Finally how earthquake vulnerability be reduced?

    - By making strong buildings with modern knowledge
    - By making strong buildings with local knowledge
    - By other cultural means

Figure 3: Respondents from household interviews

A.2. Focus group discussion

FGD-1 with youth group (Nepal Youth Club) in Lelinthok-9, Godavari.

SN	Name of participant	Age	Contact number	Remarks
1	Dipendra Silwal	25	016203796	
2	Subash Silwal	23	9841651287	
3	Shyam GC	29	015560790	
4	Sanubabu Khatri	33	9851102083	
5	Maniram Silwal	27	015560528	
6	Acyut Subedi	29	9841677159	
7	Navaraj Giri	36	NA	
8	Sanat Silwal	21	NA	
9	Sushil BC	19	NA	

2. Major questions:

2.1. What do you understand by earthquake?

2.2. How earthquake vulnerability be reduced?

2.3. What is the role of youth groups in earthquake vulnerability reduction?

2.4. What is the reason of reduction of using traditional building technology?

2.5. What are the specialities of traditional buildings?

FGD-2 with women group (Shree Namuna Bikash Shakari Samshta Limited) in Taukhel-1, Godavari.

SN	Name of participant	Contact number	Remarks
1	Sita Silwal	5560619	
2	Muna Kunwar	016210996	
3	Indira Acharya	016205330	
4	Mina Silwal	NA	
5	Sarashwoti Puri	NA	
6	Sarita Lamichhane	NA	
7	Sunita Nagarkoti	NA	
8	Kamala Nagarkoti	NA	
9	Durga Nepal	NA	
10	Narayani Pokharel	NA	
11	Rupa Silwal	016222948	

2. Major questions:

2.1. What do you understand by earthquake?

2.2. How earthquake vulnerability be reduced?

2.3. What is the role of women groups in earthquake vulnerability reduction?

2.4. What is the reason of reduction of using traditional building technology?

2.5. What are the specialities of traditional buildings?

Figure 4: youths and Women participating in discussion

A.3.Expert interviews

SN	Name and date of interview	Abbreviated in thesis as	Organisation	Designation	Specialisation	Remarks
1	Aryal, Mukunda Raj (Prof) 12th July, 2007	Prof Aryal	Department of Culture, History and social sciences, Tribhuvan University, Kathmandu	Professor	History	
2	Baidhya, Hutaram (Mr.) 2nd July 2007	Er Baidhya	NA	NA	Agricultural Engineering	Senior engineer (86 yrs) and activist of cultural environment , first ever user of term Baghmati Civilisation.
3	Dekens, Julie (Ms) 19th July, 2007	Ms Dekens	Water Hazard and Environment Management, International Centre for Integrated Mountain Development,Kathmandu. (ICIMOD)	Institutional Specialist	Local Knowledge on Disaster Management	ICIMOD : International NGO working in Disaster Management
4	Dixit, Amod Mani (Mr) 20th July, 2007	Mr Dixit	National Society of Earthquake Technology-Nepal (NSET-Nepal)	General Secretary and Executive Director	Earthquake Technology	NSET-Nepal: NGO with experiences at regional level
5	Jigyasu, Rohit (Dr) 21st July, 2007	Dr Jigyasu	NA	NA	Local Knowledge on Earthquake vulnerability Reduction	
6	Joshi, Satyamohan (Mr) 23rd July,2007	Mr Joshi	NA	NA	Culture	Senior culture expert

SN	Name and date of interview	Abbreviated in thesis as	Organisation	Designation	Specialisation	Remarks
7	Koirala, Laxmi Kr. (Mr) 4th July, 2007	Mr Koirala	Department of Science and humanities, Institute of Engineering	Associate Professor	Nepali literature	
8	Kunwar, Ramesh Raj (Prof.) 4th July, 2007	Prof Kunwar	Department of Culture, History and social sciences, Tribhuvan University, Kathmandu	Professor	Anthropology	Dean of Faculty of Humanities and social sciences, Tribhuvan University
9	Maskey, Prem Nath (Prof.) 5th July,2007	Prof Maskey	Department of Civil Engineering, Institute of Engineering, Tribhuvan University.	Professor	Structural engineering	
10	Pokharel, Jibaraj (Prof.) 4th July,2007	Prof Pokharel	Department of Architecture and Urban Planning, Institute of Engineering, Tribhuvan University.	Professor	Architectural conservation	Director, Centre for Disaster Studies, Institute of engineering and Former Dean
11	Pokharel, Jagadish Chandra (Dr.) 23rd July, 2007	VC Dr Pokharel	National Planning Commission, Nepal Government	Honourable Vice-chairperson,	Planning	
12	Pyakurel, Nava Raj (Mr) 16th July,2007	Er Pyakurel	Urban and Environmental Unit, Banepa Municipality, Nepal Government.	Project Manager	Urban planning	
13	Regmi, Rishikeshav Raj (Prof) 18th July,2007	Prof Regmi	Department of Culture, History and social sciences, Tribhuvan University, Kathmandu	Professor	Cultural Anthropology	
14	Silwal, Purushottam (Mr.) 9th July,2007	Mr Silwal	NA	NA	Local politics	VDC Chairperson, (1986-1997)

SN	Name and date of interview	Abbreviated in thesis as	Organisation	Designation	Specialisation	Remarks
15	Singh, Bibhuti Man (Mr) 17th July,2007	Arch Singh	Society of Nepalese Architects (SONA), Kathmandu, Nepal	President	Architectural design	President of DMC17 (a community based organisation active in disaster management activities in ward no 17 of KMC)
16	Tiwari, Sudarshan Raj (Prof) 25th July,2007	Prof Tiwari	Department of Architecture and Urban Planning, Institute of Engineering, Tribhuvan University.	Professor	History of Architecture and culture	Former Dean of Institute of Engineering

Figure 5: Various pictures from different expert interviews

A.4. Photographs

Figure 6: Dwelling which survived 1934 earthquake (referred: page 33, Footnote 5)

Figure 7: Minor cracks seen on the external wall of the dwelling

Figure 8: *Nyatapola* The five tired temple at Bhaktapur which stands for 300 years (Referred page 37, Footnote: 6) in Bhaktapur

Figure 9: *Dattatraya* Temple which was devastated in earthquakes because of low plinth (picture taken from the top plinth of Nyatapola in Bhaktapur

Figure 10: Traditional setback for public purposes: An example of La Chhi with a Pati (referred page 38, footnote: 8) in Bhaktapur

Figure 11: The *Naag band* around the wall of 55 Windowed Palace in Bhaktapur and the traditonal scaffolding made of bamboo (Referred page 42, footnote:11)

Figure 12: Naag band seen in Nuwakot Durbar (Source: www.phalano.com)

Figure 13: Features of Naag in other utility structures

Figure 14: Chowk at the end of a street in Lalitpur (referred page 42, footnote: 11)

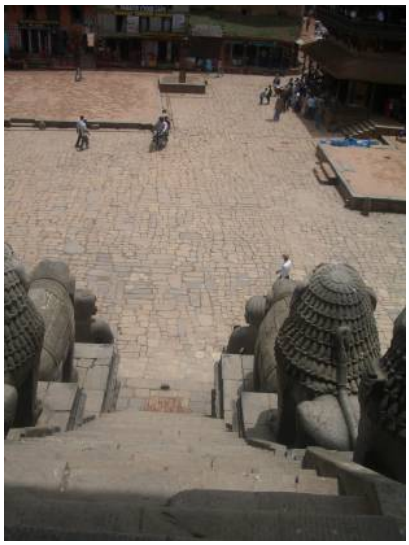


Figure 15: Open Square in front of Nyatapola and Dattatraya temples in Bhaktapur

Figure 16: *Pokhari* the water reservoir in community space in Harisiddhi, Lalitpur

Figure 17: *Jaru (?)* the water tank in a Chowk in Lalitpur (referred page 43, footnote: 13)

Figure 18: Hiti- the water spout in Bhaktapur Durbar Square (Referred page 43, footnote: 14)

Figure 19: Hiti still caters.

(Source: http://www5a.biglobe.ne.jp/~gustav/globalwalker/image/photo/np/np_ktm_hiti_0301.jpg)

Figure 20 : *Pati* in street crossing in Bhaktapur (Referred page 43, footnote: 15)