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**Livelihood Vulnerability Assessment to the Impacts of
Socio-Environmental Stressors in Raksirang VDC of
Makwanpur District Nepal**

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Declaration

I, Saroj Koirala, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature..... Date.....

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Abstract

This study was conducted to estimate the level of livelihood vulnerability (Livelihood Vulnerability Index- LVI) for the Chepang community of Rakshirang Village Development Committee of Makawanpur district in Nepal and compare the vulnerability level between female-headed and male-headed households. This research has examined how local people at the study community perceive livelihood vulnerability and in what ways they think sustainable livelihood outcomes can be achieved at the community level.

Eighty (16.77%) out of 477 HHs of Raksirang VDC's wards 8 and 9 were randomly selected for conducting a structured questionnaire survey together with unstructured in-depth interviews for data collection. The data was analyzed using the Sustainable Livelihood Framework (SLF) and Livelihood Vulnerability Index- LVI was calculated by using the pragmatic approach developed by Hahn et al. (2009).

The LVI for the studied community was found to be 0.5, which can be considered as a moderate level of livelihood vulnerability in terms of socio-environmental stressors. Households were most vulnerable in terms of financial capital (0.59), followed by social (0.54), natural (0.53), human (0.40) and physical (0.44) capitals. The female-headed HHs (0.53) were found to be slightly more vulnerable than male-headed HHs (0.47) in terms of LVI. However, these slight differences were not testable statistically as the samples were unequally represented.

Local people perceived their livelihood vulnerability as the product of poor infrastructures, limited access to basic public services such as education and healthcare, restricted access to the forest based natural resources and inadequate knowledge and skills on income generating activities. Frequent flooding in Manahari River and landslides over the hills during monsoon season has added addition pressure on local livelihood. According to them, provision of efficient technology and skills in agriculture, transformation from subsistence farming, rightful access and sustainable exploitation of natural resources, physical infrastructures such as proper road, irrigation systems, suspension bridge over Manahari River and electricity supplies were essential elements for enhanced connectivity, sustainable growth and over all development of the community.

Key words: Livelihood, Vulnerability Assessment, Sustainability, SLF, Chepang community, Livelihood Vulnerability Index

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Chapter I

Introduction

This study seeks to demonstrate livelihood vulnerability as a multifaceted challenge manifested in various forms within the given socio-environmental context of the households (HHs) in a community. In this study, I would argue that environmental changes such as climate change, though an important concern, cannot be understood as a sole reason for vulnerable livelihood in all contexts, but should be considered as one of the interacting factors which functions together with multiple socio-economic and cultural stressors within the given context to produce livelihood vulnerability.

Livelihood is understood as a means of making a living, which comprises people's capabilities, assets, income and other activities required to secure the necessities of life (Lamichhane, 2010). Sustainability is a way of resource use where future generations' ability to meet their own needs is not compromised, but still is capable of fulfilling the needs of the present (WECD, 1987). Sustainability of livelihood depends on the way a particular resource is used. 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 depleting the natural resource base (Cannon et al., 1992). Livelihood becomes vulnerable when it fails to cope with or recover from such stresses and shocks. Blaikie *et al.* (1994:11) has defined vulnerability as, "characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or in society." Vulnerability assessment is a process of study that involves diverse set of methods to systematically integrate and examine interactions between humans and their physical and social surroundings (Hahn *et. al.*, 2009).

Communities derive subsistence depending on the eco-system services and livelihood strategies. They develop set of strategies and adaptation mechanisms to adjust with the changing environment using range of social-economic and cultural components (Cline, 2007). Different communities have different ability to withstand, cope and adapt to such changes depending upon their adaptive capacity as well as scale, scope and intensity of socio-environmental stressors. It is crucial to identify strengths and weaknesses of livelihoods to keep community prepared for any kind of socio-environmental stress. It is equally important to

understand impacts of on-going environmental changes within the given socio-economic context of that particular community.

In recent years, the issues of environmental change, specifically climate change is being widely discussed while assessing rural livelihood vulnerability. The profile of climate variability is being considered as not just an environmental issue rather it has been received as crucial development concern (Lamichhane, 2010). Climate variability has been significantly changing the way community is living, clearly observable in the resource poor communities (IPCC, 2007). Substantial level of changes can also be observed in the livelihood components and strategies of communities globally. However, changes in socio-economic dimensions of these communities are not only driven by environmental factors in all contexts but also strongly associated with on-going process of globalization of market economy in many cases. A careful analysis of socio-economic and environmental dimensions associated with livelihood of a community is necessary to acquire a complete and clear understanding of livelihood vulnerability.

Various livelihood components determine the ability of HHs to cope with social-environmental stressors. The unsustainable exploitation of resources base (land, forest and water), high population growth, land degradation and deforestation increases the threats and makes livelihood vulnerable (UNDP, 2007). Similarly, illiteracy, poverty, poor institutions, insufficient health care, inefficient technology, poor access to the resources, conflicts and poor management capabilities contribute for vulnerable livelihood (Lamichhane, 2010). The identification of the livelihood components and their quantitative measurement is necessary to determine the vulnerability level. Understanding local people's perspectives on their livelihood is essential to get broader and more holistic picture of vulnerability context. A clear overview of vulnerability context helps to develop realistic and efficient tool for development interventions in a community by development partners.

Using Sustainable Livelihood Framework (SLF) this paper presents livelihood vulnerability within the socio-environmental context of ethnic Chepang community of Raksirang Village Development Committee (VDC) of Makwanpur district in Nepal. Five livelihood capitals (human, natural, social, physical and financial capital) identified under SLF were used for the assessment. I have further subdivided these five livelihood capitals into 12 livelihood components and 38 sub-components for assessment of vulnerability. I used structured questionnaire HH survey and unstructured in-depth interviews to collect data and used

Livelihood Vulnerability Index (LVI) and respondent's perspectives to present results and analysis.

The primary objective of this research is to identify, assess and analyse challenges posed by socio-environmental stressors in terms of livelihood vulnerability upon the ethnic Chepang community of VDC of Makwanpur district in Nepal. This research will estimate the level of vulnerability (Livelihood Vulnerability Index- LVI) using the pragmatic approach developed by Hahn *et al.* (2009). The research will compare the vulnerability level (LVI) between female-headed households (HHs) and male-headed HHs. This research will further examine how local people at the study community perceive livelihood vulnerability and in what ways they think sustainable livelihood outcomes can be achieved at the community level. Following research questions are formulated to address these problem identified:

- I. What were the vulnerability levels (Livelihood Vulnerability Index- LVI) of the studied community to the impacts of socio-environmental stressors?
- II. Were there differences in vulnerability levels (in terms of LVI) between male-headed and female headed HHs?
- III. How did local people perceive their livelihood vulnerability and in what ways do they think sustainable livelihood outcomes can be achieved at community level?

This paper can be used as a guide for better understanding of livelihood, designing or planning of development interventions for achieving sustainable and resilient livelihood outcomes.

Study community

I undertook this study upon the Chepang community of ward number 8 and 9 of Rakshirang Village Development Committee (VDC) of Makawanpur district (27.4167° N, 85.0333° E). The Chepang community belong to one of the 125 ethnic groups found in Nepal (CBS, 2011) and they inhabit the rugged hills of Mahabharata mountain range within Dhading, Makwanpur, Chitwan and Gorkha districts of central mid-hill region.

The overall development score of Makawanpur district is below national average. According to Nepal Human Development Report (2014), Makwanpur district has a population of 420,477 in 2014 and the Human Development Index (HDI) was estimated to be 0.497, which is lower than national HDI (0.54 in 2013). Makwanpur has adult illiteracy rate of 38.21. This varied between males and females. In 2012, Raksirang had the literacy rate of only 21.64% (Male-28.37%, Female-14.35) (Nepal Human Development Report, 2014), which is poorer than both district and national average. About 21.55% of population do not have access to safe drinking water and other amenities (Nepal Human Development Report, 2014).

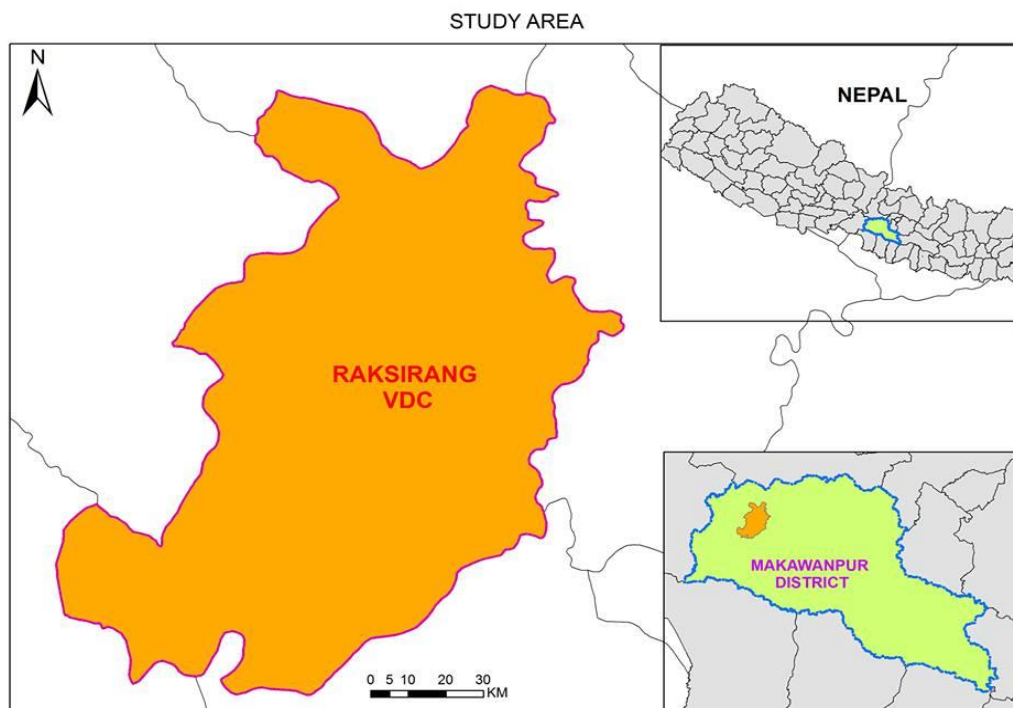
Raksirang VDC is one of the 43 VDCs of Makwanpur district. The community of this research-ward number 8 and 9 of Raksirang VDC can be reached after 2 hours of walk from Manahari Bazaar, which serves as the nearest market centre for the HHs at the study community. According to the VDC profile provided by the District development Committee's Office Makwanpur, Raksirang has total 991 HHs and total population of 6,385 with average HH size of 6 members (VDC profile, 2012). There are 477 HHs in ward number 8 and 9 of Raksirang VDC with total population of 3162 people (VDC profile, 2012).

Chepang community of Makwanpur district were selected for this study because they experience range of livelihood challenges shaped by long historical socio-economic and political marginalization, poverty, under-utilization of natural resources and environmental hazards. Problems regarding basic infrastructures for safe drinking water, sanitation, health facilities, and transportations are visibly prevalent. Natural disasters such as flash floods and landslides are frequent over the hilly terrains. The poor and marginalized ethnic communities inhabiting these difficult remote terrain and rugged hills are viewed as vulnerable groups to social-environmental stressors. National Adaptation Program of Action (NAPA) to Climate Change has listed these areas as highly vulnerable in the Climate Change Vulnerability Mapping for Nepal (NAPA, 2010).

Traditionally, Chepang community were dependent on the direct harvest of natural resources available in the surrounding forest. In past one decade, their livelihood has slowly shifted into more stable way of life and now it is mostly based on agriculture and animal husbandry. Maize, urad beans, millet and banana are major crops grown by Chepang community. However, the severe topography has made farming very challenging and the use of traditional techniques and low input farming has confined agriculture within subsistence level. The practice of slash-and-burn has posed challenges of erosion and land degradations. The study conducted by Khadka (2010) in four VDCs of Makwanpur district including Raksirang VDC found that the practice of traditional slash-and-burn has been decreasing and slowly shifting towards agro-forestry. Khadka (2010) has concluded that introduced agro-forestry can improve economic wellbeing of local farmers while ensuring environmental stability.

Illiteracy and lack of sufficient knowledge and skills on efficient use of resources are challenges visibly facing Chepang community.

Figure 1: Map of Nepal showing Makawanpur district and Raksirang VDC



Chapter II

Methodology

Research design and tools

Sampling techniques

Eighty (16.77%) out of 477 HHs of Raksirang VDC's wards 8 and 9 were randomly selected for conducting a structured questionnaire survey and unstructured in-depth interviews. The list of all HHs in wards 8 and 9 of Ranksirang VDC were acquired through the help of the staffs of local NGO, Manahari Development Institute (MDI). Each of the HHs were named after the HH head's name and numbered from 1 to 477. Then, 80 random numbers between 1 and 477 were generated using the online random number generator page www.random.org/integers. Finally, only the individual HHs assigned to those random numbers were chosen as the random sample for this research. The questionnaire survey was conducted only in those 80 HHs, which appeared in the random sample. Lamichhne (2010) has used similar sampling methods on climate vulnerability assessment of Chhekampar VDC of Gorkha district Nepal. However, he has used lottery technique to generate random numbers, while online random number generator was used in this research for choosing samples, which is equally reliable for generating random samples. The head of HH was requested to answer the structured questionnaire survey (see appendix 1), as they will have more experience and information about socio-economic and environmental aspects of their livelihoods. Structured questionnaire survey was followed by unstructured in-depth interviews to collect qualitative data. The purpose of un-structured in-depth interviews was to get optimum information on the perspectives of respondents on their livelihood and vulnerability associated with it. In both cases, male headed and female-headed households were targeted.

Structured questionnaire were used as research tool to collect quantitative data. Questionnaire was designed to get maximum quantitative data to be able to measure the subcomponents or the indicators of livelihood vulnerability. These quantitative data were used to calculate LVI as required to address my research **questions I and II**.

Following the structured questionnaire survey, open-ended and unstructured in-depth interviews were used to collect qualitative information to understand the dynamics between vulnerability context, livelihood assets, strategies and outcomes as outlined by Sustainable Livelihood Framework (SLF) (see below). In this step of data collection, respondents were

requested to freely express their opinions on the issues and challenges associated with their livelihood. Community observation, informal discussion with key informants (members of local NGO, teachers at local schools, political leaders, local shopkeeper etc.) and several informal group discussions with local people during the informal sessions of the field work was used as triangulation tool to provide contextual information to verify the results from the HH survey and basis for qualitative discussion. This process of data collection was done to acquire necessary data for my **research question III**.

All the interviews were conducted in Nepali language with the facilitation of staff from MDI. Interviews were recorded using phone and some interviews were filmed in a camera. Respondents were well informed before recording of all audio-visual information and it was conducted in respondent's consent. Ethical considerations including respondents' anonymity are respected during and after research process. All the recorded information from the respondents were transcribed and translated into English language. The meteorological data required for this research were acquired through the assistance of the Government of Nepal's Department of Hydrology and Meteorology.

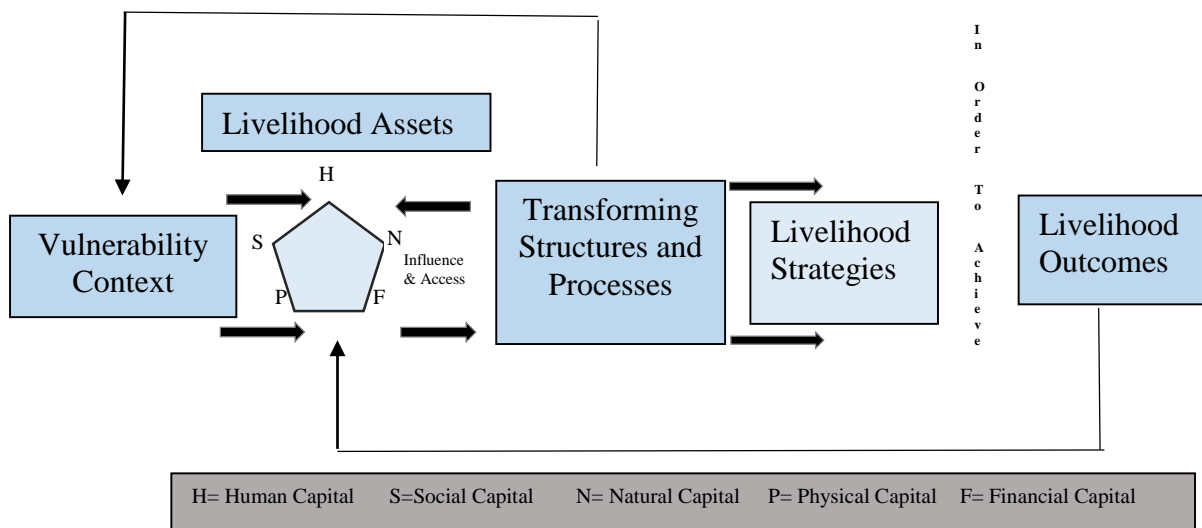
Analytical framework and data analysis

The data was analysed using the Sustainable Livelihood Framework (SLF) in order to understand livelihood vulnerability in socio-environmental vulnerability context. The underlying assumption in SLF is that people pursue all forms of livelihood outcomes (such as income, increased wellbeing or improved food security) based on a range of livelihood assets through the use of variety of livelihood strategies (Farrington J. et al., 1999). According to DFID (1999), the strategies that people use to generate livelihood outcomes and the way they reinvest in asset building are driven by the transforming structures such as government or private sectors and by the institutional structures such as culture, norms, values and formal laws. Within SLF, it is very crucial to take socio-economic and cultural factors into consideration together with exposure with hazard or risk while assessing vulnerability. I used SLF for livelihood vulnerability assessment because it looks upon all aspects of livelihood and provides freedom for researcher to focus upon range of selected livelihood components. It helps to provide holistic picture of livelihood, providing possibilities to focus upon major factors contributing to vulnerable livelihood.

Livelihood outcomes are largely influenced by the vulnerability context, which includes stressors, hazards and shocks (such as drought, poverty), overall trends (for instance, depleting

resource stocks) and seasonal variations (DFID, 1999; Farrington J. et al., 1999). **Figure 2** provides a systematic diagram of SLF where vulnerability context is presented as major determinant of sustainability of livelihood assets as it directly influences livelihood strategies, institutional process and livelihood outcomes of community (Lamichhane, 2010). Similarly, availability or abundance of livelihood resources, entitlement to those resources, functional institutional structures and efficient livelihood strategies are essential elements for sustainable livelihood outcomes. The asset pentagon lies at the centre of the SL framework, controlled by the vulnerability context (DFID, 1999). The schematic representation aims to visually represent the inter-relationships between the various livelihood assets. Here, in my analysis I will refer to livelihood assets as Human capital, social capital, natural capital, physical capital and financial capital all of which are described in Tables 1-5.

Figure 2: Sustainable Livelihood Framework. Adapted and modified from DFID (1999)



These five livelihood assets were divided into 12 components and these components were further sub-divided into 38 livelihood indicators. A group discussion with staffs of local NGO, Manahari Development Institute (MDI) was conducted while selecting the indicators, to keep it realistic and compatible to the socio-economic uniqueness of the studied community. These indicators were further triangulated during the fieldwork through informal discussions with, key informants and HHs interviews to make them more relevant for the study community.

The following sections provide an overview of the five livelihood capitals, twelve components and thirty-eight indicators of livelihood vulnerability used in this study.

Human capital

Following the DFID (1999) and Hahn *et. al.* (2009) I divided human capital into two components: human health and knowledge and skills. Three indicators were used to represent livelihood vulnerability in terms of human health: average time to reach nearest health centre, percentage of HHs with at least one chronically ill member and percentage of HHs with family member who is disabled. Knowledge and skills component was subdivided into four indicators: percentage of population that have never been to school, percentage of HHs not having access to TV and radio at home and percentage of HHs where any family member has not taken any kind of vocational training. Using the indicators, percentage responses to each category by the households were calculated.

Table 1: Components and indicators of vulnerability in terms of human capital.

Components	Subcomponents (indicators)
Health	Average time to nearest health centre
	Percentage of HHs reporting at least one chronically ill member
	Percentage of HHs with at least one disable family member
Knowledge and skills	Percentage of population that have never been to school
	Percentage of HHs not having TV at home
	Percentage of HHs not having access to a radio at home
	Percentage of HHs where no family member has not taken any kind of vocational training

Natural capital

Following Hahn *et. al.* (2009) and Lammichhane (2010), four components and 14 subcomponents were used as an indicator of livelihood vulnerability in terms of natural capital, which are presented in table 2. Inverse index has been used in case of land productivity as increased land productivity helps to reduce livelihood vulnerability.

Table 2: Components and indicators of vulnerability in terms of natural capital.

Components	Subcomponents (indicators)
Land	Inverse of land productivity index
	Percentage of HHs reporting land degradation by climate related extremes during past 10 years

Forest	Percentage of HHs using only forest-based energy for cooking purpose
	Average time to fetch firewood
	Percentage of HHs reporting that firewood is being scarce now in comparison to 10 years back
	Percentage of HHs using traditional cooking stoves
Water	Percentage of HHs reporting they have heard any conflict over water in the community
	Percentage of HHs that collect water directly from river, streams and ponds
	Percentage of HHs that do not have daily water supply
	Average time to fetch water
Climate variability and Natural disasters	Mean standard deviation of daily mean average maximum temperature by month
	Mean standard deviation of daily mean average minimum temperature by month
	Mean standard deviation of daily precipitation by month
	Percentage of HHs reporting injury or death of a family member due to climate related disaster

Financial capital

Available financial stocks (assets) and regular inflow of money (finance) were considered as two major sources of financial capital. Inverse of average land holding index and inverse of average agricultural livelihood diversification index were used to calculate asset vulnerability. Since increased land holding and increased livelihood diversification would help to reduce livelihood vulnerability in rural context, an inverse index has been used to estimate vulnerability level.

Similarly, percentage of HHs not having saving and percentage of HHs having debt were used as indicators of vulnerability in terms of financial capital.

Table 3: Components and indicators of vulnerability in terms of financial capital

Components	Subcomponents (indicators)
Assets	Inverse of Average land holding index
	Inverse of average agricultural livelihood diversification index
Finance	Percentage of HHs who have debt
	Percentage of HHs that do not have any savings

Physical capital:

Infrastructures and producer goods needed to support livelihoods are physical capital. Infrastructure consists of structures that make changes to the physical environment that help people to meet their basic needs and to be more productive and producer goods are the tools and equipment that people use to function more productively (DFID, 1999). Transportation and schools are two major components and three indicators were used.

Table 4: Components and indicators of vulnerability in terms of physical capital.

Components	Subcomponents (indicators)
Transportation	Average time to reach nearest vehicle station
	Percentage of HHs not having bicycle
School	Average time to reach nearest lower secondary school

Social capital

I have assumed social capital as social resources upon which HHs pursue their livelihood objectives. I also assumed female-headed HHs to be more vulnerable in case of my study community due to existing patriarchal social structure. I also assumed the higher dependency ratio and bigger family size as indicator of social vulnerability.

Table 5: Components and indicators of vulnerability in terms of social capital.

Components	Subcomponents (indicators)
Demography	Dependency Ratio
	Percentage of female-headed HHs
	Average family member in a HHs
Network and relationship	Percentage of HHs who have not received any kind of support and help from neighbour in past one month
	Percentage if HHs who have not given any support and help to neighbour in past one month
	Percentage of HHs that have not gone to local government for any kind of assistance in past 12 month
	Percentage of respondents who have not voted in local and national election
	Percentage of HHs where a family member is not affiliated with any social group

Data analysis

To address **research question number I**, I calculated LVI as a balanced weighted average approach where it was assumed that each sub-component or indicator contributes equally to the overall vulnerability (Sullivan et al., 2002; Lamichhane, 2010). Since all of the indicators were measured on a different scale/units, each of them was standardized as an index. The average of the standardized index of each indicator was calculated to estimate the indices for each livelihood assets. Finally, the balanced weighted average of all the components was considered as the final LVI score for the community (Shah et al., 2013; Sullivan et al., 2002; Lamichhane, 2010).

The LVI is scaled from 0 (least vulnerable) to 1 (most vulnerable).

The equation used for standardization of subcomponents was adapted from that used in the Human Development Index (to calculate the life expectancy index), which is the ratio of the difference of the actual life expectancy and a pre-selected minimum, and the range of predetermined maximum and minimum life expectancy (UNDP, 2007; Lamichhane, 2010):

$$\text{Index} = \frac{\text{Observed value} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}}, \text{ For each individual indicator}$$

I have used inverse indices in case of some indicators that contribute to reduced vulnerability level, for example landholding of a HH and livelihood diversification.

In case of inverse index, for example average, land holding, the following formula has been used:

$$\text{Index} = \frac{1}{1 + \text{observed index}}$$

Livelihood vulnerability index (LVI) = **average value of all individual indicators**

To address **research question number II**, I categorised all HHs into two groups: male-headed and female-headed HHs. I calculated LVI for both categories using the same formula I used for research question number I and compared both indices to see whether different levels of vulnerability is observed between male-headed and female-headed HHs.

To address **research question number III**, I looked upon the major trends, themes and crucial issues raised during the unstructured in-depth interviews. The aim here is to directly reflect the perceptions of the local communities.

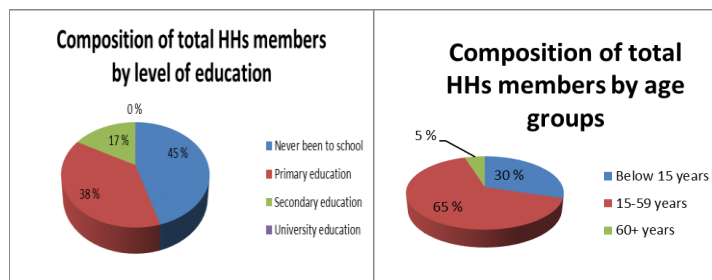
Chapter III

Results

General Findings

In the sample interviews 61.25% were male-headed HHs while 38.75% of HHs were female headed. All the respondents were involved in farming and livestock keeping by occupation, while a few HHs had other alternative source of income for their livelihood. The compositions of the sample HHs are shown by Figure 3.

Figure 3: Composition of study community by education level and age group



The overall LVI of the study community was 0.50, which can be considered as moderately vulnerable in terms of socio-environmental stressors. HHs were most vulnerable in terms of financial capital (0.59), followed by social (0.54), natural (0.53), human (0.40) and physical (0.44) capitals (Figure 4 and 5). However, none showed the extreme vulnerability level to their livelihood strategies. Nonetheless, the female-headed HHs (0.53) were found to be slightly more vulnerable than male-headed HHs (0.47) in terms of LVI. These slight differences were however not testable statistically as the samples were unequally represented.

Figure 4: Vulnerability radar diagram with five capitals of LVA

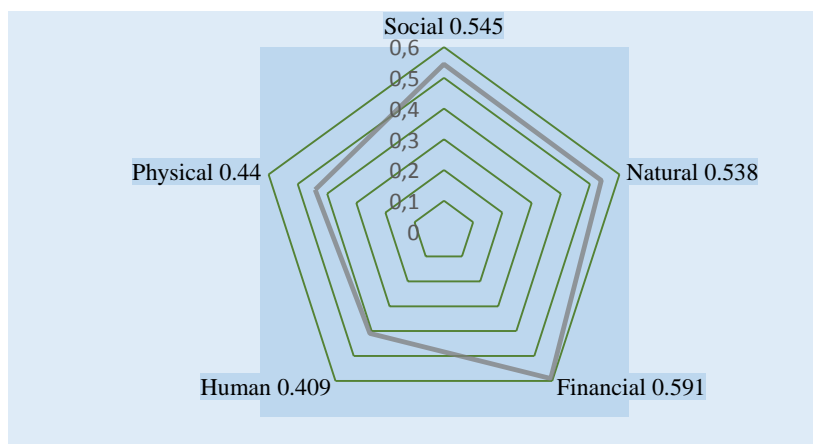
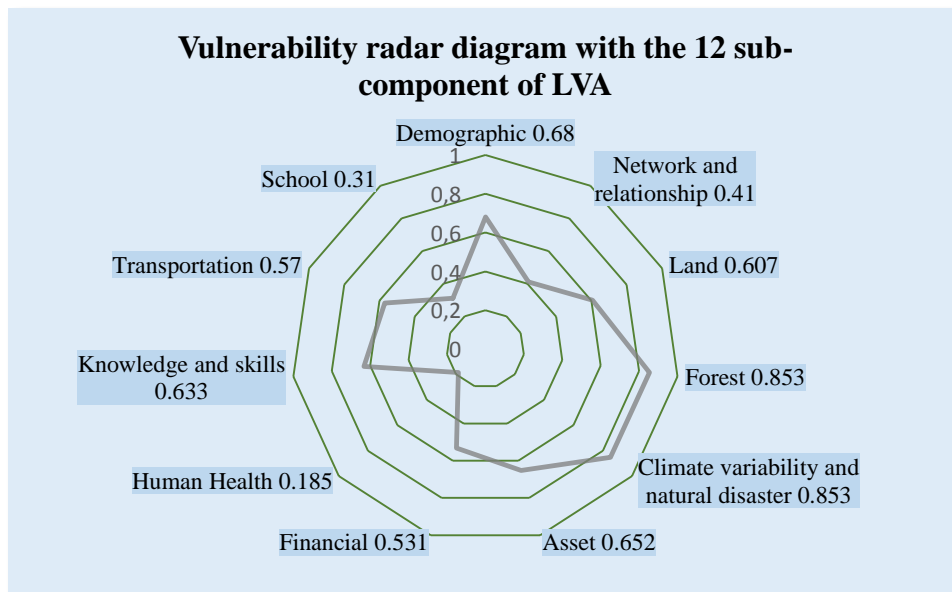


Figure 5: Vulnerability radar diagram with 12 sub-components of LVA



Livelihood vulnerability in terms of Social capital

The demographic vulnerability index for the study community was 0.68 (table 6). The weighted average for network and relationship vulnerability was estimated for 0.410. The overall social vulnerability index was estimated to be 0.545, which is moderate level of vulnerability in terms of social capital. An average HH had family size of 6 members. According to the respondents, the family size has been decreasing over the past years and this was attributed to the fact that bigger family size has become very expensive to afford economically. Many respondents wished that they could have bigger family size. One respondent said, “We (Chepang people) prefer living in bigger family. Living in big groups gives us happiness and makes us more secure. Sadly, it is very expensive to support big family now. More family members create more demand and we would need more money to make everyone happy. So even we prefer to have big family, it is becoming smaller and smaller day by day”.

One would assume that there is deliberate family planning to reduce family size in order to meet their basic livelihood requirements. This is shown by the female headed households, who expressed the obvious desire to having small-size families compared to male respondents. Reduced domestic workloads in small-size family was the reason that attracted most of the female respondents towards smaller family size. A female respondent said, “I personally prefer to have a small family, simply because there are less domestic works. And also there are also many benefits of having small family, for example it is easy to send children to school when there are few of them”.

Out of all members of the visited HHs, 34.65 % were of economically dependent age group (<13 and 55>) and the rest 65.34% were of economically active age group (13 to 55). The total dependency ratio was 53.04, which is less than the national average (65.92 in 2011) (Nepal Population Report, 2011). In this study, the lower age limit for economically active age group was reduced to 13 years because many under 15 years-old children were seen actively participating into various income generating livelihood activities. During the fieldwork, it was very common to meet children below 15 years engaged in various livelihood activities, such as agricultural works, carrying water for family or looking after their young siblings. However, their real input in income generation might be much less compared to that of adults. Invariably, this has limited the opportunities for education and personal development of the children. When questioned about involving children into domestic and agricultural works one of the female respondents said, “they (children) start working when they are ready for it and they work according to their ability. We grew up the same way; there is nothing wrong to help your family. It is better to send children to school, but we need them to help us too, as much as they can.”

In most of the female-headed HHs (38.75%) men were away from the family to bigger cities such as Hetauda, Narayanghat and Kathmandu in search for jobs or employment opportunities particularly to Middle-Eastern countries such as Saudi-Arabia and Qatar. The income generated by HH members away from the family has helped to secure livelihood by reducing financial vulnerability. This has, however increased the social vulnerability of HHs at same time. Most of the respondents considered widows, single-women or a female-headed HHs more socially vulnerable compared to HHs with regular family structure. During an interview, a woman from a female-headed HH allegorically said, “Men are the roofs of a house. If men are away, the house gets roofless, and all members have to suffer”. This provides an example of hegemonic masculinity existing in the Chepang community.

Table 6: Demographic vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Dependency Ratio	0.151
Percentage of female-headed HHs	0.387
Number of family members in a HHs	0.532
Demographic Vulnerability	0.680

HHs of the study community were found to be affluent in terms of social interaction and network (table 7). Majority of the HHs were receiving or providing help (monetary, labour, food etc.) to their neighbours. Looking at the HH's interaction, network and relationship within the community, only 24.25% of the HHs said they did not receive help from neighbours or friends in past one month, while 26.25% of them said they had not helped their neighbours during past month. In most of the cases, the HHs that did not received any help were also the same HHs, which did not offer any help to their neighbour. Different HHs had different reasons behind having poor social interactions such as some said their HH was isolated and far from their neighbours, some said they find it difficult to ask for help and some even claimed that they were happy with whatever they have got with them. However, this can be seen as an indicator of social vulnerability because strong social network and relationship are considered as an important aspect of socio-economic security in context of rural community. I can use an example here.

Arma-parma is a traditional form of labour exchange system existing in Chepang community. In *arma-parma* system, a family shares its labour (calculated in members and time) to its neighbour expecting same amount of labour in return during the future. Many respondents showed their worries about decreasing social interactions especially in terms of labour exchange. Many said the system of *arma-parma* is decreasing. In this regard, a 60 years old respondent said, “we are losing our culture very fast. Gradually, everything is disappearing. Chepang are known for being peaceful and social with each other. Now, people are becoming less and less social. It's difficult to get help these days.”

Table 7: Social network and relationship vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Percentage of HHs who have not received any kind of support and help from neighbour in past one month	0.242
Percentage of HHs who have not given any support and help to neighbour in past one month	0.262
Percentage of HHs that have not gone to local government for any kind of assistance in past 12 month	0.90

Percentage of respondents who have not voted in local and national election	0.30
Percentage of HHs where a family member is not affiliated with any social group	0.337
Network and relationship Vulnerability	0.410

Around 90% said they did not go to any government office for assistance in past 12 months. Long travelling distance and financial costs associated with it was limiting their access to public services. All of the government offices and services were concentrated at the district headquarter in Hetauda. Centralized governance structures, lack of local election, local representative and local government has contributed to the poor access to the basic public services for the people in the study area. The community strongly believed that they have been ignored and rarely represented by the government policy.

Looking at the social groups and affiliations, 66.25% of the HHs said they are not affiliated with any social/political groups. Other were affiliated with local NGO or active members of different political parties. More than 70% of the respondents said they have taken part and voted in constitution assembly election of 2013. This implies that although the government has failed to offer basic services, majority of the people still performed their duty by voting in the elections. It appears that for the study community livelihood vulnerability in terms of natural capital is of huge importance.

Livelihood vulnerability in terms of Natural Capital

Vulnerability index of natural capital was moderate (0.538). Livelihood of the HHs in the study community was largely based on farming and animal keeping. Average landholding was 11.87 kathha¹ (SD 4.24). Only 46.25% of the HHs had land certificates with legal ownership for the land. It was interesting to see that, almost half of the HHs had no land certificates that would ensure the legal ownership over the land. Most of the respondents were seen to have very little or no information or knowledge regarding land ownership. Assets and monetary status of HHs were assessed to estimate the financial vulnerability. Although all the visited HHs had access to 11.87 kathha of land in average, only 50% of the HHs said they had legal ownership over the land with proper land certificates. The knowledge about land certification and ownership

¹ 1 kathha = 338.57 m²

was also seen as major challenge as discussed in Natural capital part of this chapter. People were less aware about existing land policies and importance of having land certificate. Government should facilitate local people with access to public services regarding land use and land registration by establishing local office at the study community.

This issue was associated to the failure of government to provide sufficient information or assistance regarding land ownership to the local people. As the study community is located in hilly slopes, the soils were found to be extremely vulnerable to degradation due to erosions during season of heavy monsoon rain (June-July) each year. Majority of the HHs (75%) reported that their land has been degrading due to climatic events, such as flash floods, landslides and erosions. Lack of efficient agricultural practice to preserve topsoil, lack of proper terrace system for farming and practice of occasional slash and burn has made topsoil prone to degradation. Which potentially would make HHs more vulnerable in terms of food productivity and effect livelihood in multiple ways. These facts provide enough reasons to make a claim that the HHs of the study community are highly vulnerable in terms of land use. However, most of respondents also said that they have stopped practicing traditional slash and burn methods for farming in recent years. This can be viewed as a good sign in terms of soil conservation and would benefit community in multiple ways, specifically by reducing vulnerability in terms of natural resource.

Table 8: Land Vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Percentage of HHs without land certificates (ownership)	0.462
Percentage of HHs reporting land degradation by climate related extremes during past 10 years	0.752
Land Vulnerability	0.607

For cooking, 100% of HHs were depending on forest-based energy (firewood) and on average every HH spends 201 (SD 32) minutes per week to fetch firewood. Since all HHs in the study community were completely depended on forest-based energy sources for cooking, this has caused huge demand for firewood from the nearby forest. All of HHs were using traditional cooking stoves and improved stoves were yet to be introduced. Use of inefficient traditional

stoves has caused extra demand for firewood. Similarly, use of traditional stoves was seen to be associated with several health problems such as acute respiratory infections (ARIs).

Majority of the respondents were dissatisfied with community forestry for having strict regulations and restricting their access to the forest for firewood. More than 95% of respondents reported that firewood is becoming scarce or less accessible in recent years. Respondents blamed the strict regulations of community forest that has limited the access of people to the forest based products (Table 9). This has caused every HH, to spend on average more than 200 minutes per week to fetch firewood for weekly consumption, which, according to respondents is much longer amount of time compared to 10 years ago.

However, majority of HHs (79%) approved that community forest was effective in terms of forest conservation and water source preservation. Some dissatisfactions regarding illegal smuggling of forest products and elite capture of community forest users group were also heard from some respondents. But this could not be confirmed, as most of the respondents were not willing to give their opinions regarding these issues.

Figure 9: Forest Vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Percentage of HHs using only forest-based energy for cooking purpose	1
Average time to fetch firewood	0.45
Percentage of HHs reporting that firewood is being scarce now in comparison to 10 years back	0.962
Percentage of HHs using traditional cooking stoves	1
Forest Vulnerability	0.853

The study community was observed to be stable in terms of water supply. The village had various water sources and different ways to collect water from the sources. Around 38.6% of HHs said they collect water directly from river, tube wells, and underground sources. 16.28% reported that they experience problems regarding daily water supply throughout the year. However, accessibility, regularity and quality of water was seen to be huge concern. Basic piped-system was installed by the district development authority, which supplied water for

HHs through several public taps. More than 60 percent of the HHs said that they get water from these public taps. Water from these taps was being used for all kinds of HH uses including drinking, cooking and irrigation. However some of the taps were seen to be dry or with very little water flow. According to the respondents, this was mainly because of poor quality pipes used for supplying the water that suffers damages and breakage along the way.

No serious concerns were reported regarding water conflicts as less than 5% of HHs reported that they have heard of conflicts over water in community over past year. This can be accredited to the socio-economic and cultural homogeneity and strong social ties of the community.

Table 10: Water vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Percentage of HHs reporting they have heard any conflict over water in the community	0.05
Percentage of HHs that collect water directly from river, streams and ponds	0.386
Percentage of HHs that do not have daily water supply throughout year	0.163
Average time to nearest water source	0.394
Water Vulnerability	0.248

An average HH would require 169.25 (SD 36.25) minutes to reach the nearest water source. According to the respondents, unreliable public tap water system and long distance to reach the water source, in future could result into a serious crisis. Also, the quality of drinking water in river, streams and public taps can be a concern as any form of water treatment practice was non-existing. However, none of the respondents expressed the need to filter or boil water before consumption. This makes HHs of the study community vulnerable to water-borne diseases in future and its ramifications would be seen in other livelihood outcomes. Nationally, of huge concern remains the vulnerability to climate induced disasters.

Respondents were found to be conscious of environmental changes occurring in their area as most of them reported that the temperature has increased and the rainfall pattern has changed compared to the 30 years ago. More than 62% of the respondent said that they have experienced

change in climate and it has affected many aspects of their livelihood. A 53 years old male respondent said, “We are aware that it is getting hotter every year during hot seasons and too cold during winter, and either we are getting not enough rain or too much rainfall.” However, about 40% also reported that either they are not aware or they have not felt any difference in climate. A 32 years old female respondent said, “Life has been easier now a days compared to past. We are no longer living in a forest, we have our own homes. Some years it is colder or hotter than usual, but I do not think it has changed very much”.

The meteorological data between 1966-2012 from the closest weather station at Manahari River provided by the Department of Hydrology and Meteorology showed high level of deviations from long term mean month in minimum and maximum temperature. The mean precipitation was also found to be highly unstable from 1970-2012. Around 20% of HHs reported that at least one member of in their HH has been severely injured or killed by any of climate related disasters. Floods in Manahari River and landslides over hills were frequent climate related disasters occurring every year at the study community.

Table 11: Climate variability and Natural disasters vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Mean standard deviation of daily mean average maximum temperature by month	0.705
Mean standard deviation of daily mean average minimum temperature by month	0.594
Mean standard deviation of daily precipitation by month	0.283
Percentage of HHs reporting injury or death of a family member due to climate related disaster	0.20
Climate variability and Natural disasters vulnerability	0.445

Livelihood vulnerability in terms of Human capital

The study community did not have a health post, hospital or a dispensary for basic health treatments. Lack of health care facilities can be seen as the major factor that makes the study community vulnerable in terms of Health. It was found that, in average it takes around 106.5 (SD 28) minutes from the HHs to travel to the nearest health post, which is situated in Manahari Bazaar. Lack of proper roads, difficult hilly terrains has made it difficult to access the health

facilities. The health post situated in Manahari can only provide basic health treatment and people have to go to district hospital at Hetauda municipality in case of emergency.

The nearest public hospital was Makwanpur district hospital located at Hetauda municipality, which is 32 kilometers across a difficulty topography. In any case, the health services provided by public hospitals are not satisfactory as they still struggle to provide affordable and sufficient facilities for low income and poor HHs. About 13.75% of the respondents had reported that at least one member in their family had been chronically ill in part six months. Diarrhea, tuberculosis, acute respiratory infections (ARIs), abscess, typhoid and gastritis were biggest health problem reported by the respondents. It seems very important that the study community should have its own health post with at least a health assistant and medicines for frequent health related problems. On 19 July 2013, Makwanpur district was declared as a defecation free district, which means each HHs have access to some kind of toilet. However, quality and use of the toilets are questionable as the quality of the facilities was poor and unhygienic at most of the places. The limited access to sufficient water was seen as the key reason for poor sanitation in the first place.

Table 12: Human Health Vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Average time to nearest health center	0.183
Percentage of HHs reported at least one chronically ill member	0.137
Percentage of HHs with family member who is disabled	0.237
Human Health Vulnerability	0.185

About 35% of respondents reported that they visit dhami-jhakri (traditional witch doctors) before visiting health care centres. Regarding this as a respondent, also a teacher at local school said, “It seems very necessary to be aware that local people are superstitious and blindly-belief traditional practices. However, use of traditional herbal medicines should be promoted and health professions and authorities should work together to train local dhami-jhakri, as it seems impractical to expect to replace traditional practices with modern health systems immediately.”

About 23.7% of the respondent reported that at least one member of their family were physically or mentally challenged in some way. It was observed that most HHs with members

with disability were unable to provide basic health treatment making disable members more vulnerable and unproductive part of the community.

The formal education level for the study community was poor. It was found that, about 45.47% of the people had never been to school (Table 13). About, 37.74% have been to primary school, 16.7% have completed secondary education. Despite the fact that none of the members of visited HHs had been to university, the numbers of enrolment at local lower secondary schools was increasing. Most of the respondents were willing to send their children to school, irrespective of gender, which can be seen as a positive development. However, in reality sons were more preferred than the daughters when parents send their children to school. Women in Nepalese society have to leave their family and go to live with Man’s family after marriage. This was the major reason most of the respondent pointed for not investing in daughter’s education. A female respondent said, “Daughters are guests in our house. They eventually have to leave and go to their real home one and live with their man and his family. But a son is a soul of a family, he is the one taking care of us when we are old. Thus, it’s clear that we should invest on son’s education than daughters”. The evidence that 50% of respondents reported that none of their family members had received any kind of vocational training makes it very crucial to provide more people with income generating vocational trainings. Local NGOs and government should work together to provide such training to local people.

Table 13: Knowledge and skills vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Percentage of population that have never been to school	0.454
Percentage of HHs not having TV at home	0.92
Percentage of HHs not having radio set at home	0.66
Percentage of HHs where a family member has not taken any kind of vocational training	0.5
Knowledge and skills vulnerability	0.633

The study community also had poor access to the information provided by public communication and mass media as less than 8% of the visited HHs had a TV, and only 34% of respondents have a radio. Considering these indicators vulnerability index was estimated to be 0.409 in terms of Human Capital.

Livelihood vulnerability in terms of physical capital

About 86% of HHs did not own bicycles or any other means of transportation. The study community also lacked a proper road that connects to the highway, although national East-West highway is not far from them. It takes an average of 48 minutes' walk to reach the nearest public road/transportation from an average HHs. The absence of proper road facility can be seen as major contributor to other aspects of livelihood vulnerable. Loss of lives and injuries due to falling down from hills were also heard from several respondents. According to most of the respondents, proper connection to road and transportation facilities could offer range of alternatives and opportunities for them to secure their livelihood as well as cope and adapt with socio-environmental stressors. Since, the study community is situated not very far from the national highway, it seems possible to connect the area to the highway with proper road. However, the difficult terrain of the hills could make it expensive and it would require collective efforts from all stakeholders to force the local development authorities to allocate budgets for road construction at the study community. A respondent, also a member of local NGO said, "We just need a good road here and nothing else. Everything will be easier. We can reach Manahari Bazaar and Hetauda will not be that far. We can sell our things and do much more. Life would be so different".

Table 14: Transport Vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Average time to reach nearest vehicle station	0.28
Percentage of HHs not having bicycle	0.86
Transportation Vulnerability	0.57

The study community did not have any health care centres even for basic health treatments and issues regarding health infrastructures have already been presented in human capital section of this chapter. According to the respondents, a better road connection and public transportations can also solve the problem with the access to health care facilities for local people. There was one lower secondary school (up to 7th grade) in the village and students have to travel an average of 48 minutes to reach nearest school. During rainy season it would be impossible for students from ward 8 to travel longer distance and most of them simply choose to drop out from school during due to the floods in Manahari River. The only way to cross the river during

flooding season is the bridge that is in national highway in Manahari Bazaar. According to the respondents, a suspension bridge over Manahari River could solve this problem. Respondents also wished that the school at study community be upgraded to secondary level so that students can get opportunity to complete their school level education at their own village.

Other basic physical infrastructures such as daily drinking water supply-system, communication systems and mass media were observed to be poor at the study community. A staff of local NGO MDI said, “Collective efforts from all the stakeholders, especially from the public institutions and the people of the study community is required to develop sustainable physical infrastructures that would help local HHs in all aspects of their livelihood.” Livelihood vulnerability in terms of physical capital was estimated to be 0.44.

Livelihood vulnerability in terms of financial capital. The livelihood of HHs at the study community was composed with diverse form of agricultural activities contributing to various income-generating sources. HHs were most commonly involved in growing urad bean, maize, banana and Amriso (a broom-grass). Some HHs also were planting seasonal rice and vegetables. Farming systems were observed to be very conventional involving hard manual work and very less agricultural inputs. Traditional slash and burn practice were still practice although most of the respondents denied that being practiced by their HH. This could be because local GO/NGO had persuaded them against slash and burn practices. Conversely, there has been a substantial reduction in slash and burn practice compared to past 10 years and this could be verified through multiple sources, though there are no available quantitative data regarding this. Inverse of average land holding and inverse of livelihood diversification were 0.685 and 0.62, respectively.

Table 15: Asset vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Inverse of Average land holding index	0.685
Inverse of average livelihood diversification index	0.62
Asset Vulnerability	0.652

Rice plantation was limited only to the lower lands closer to the Manahari River where irrigation was easier. Fishing project were also introduced by some of the HHs with the help of local NGO Manahari Development Institute (MDI) closer to Manahari River.

Banana and Amriso were newly introduced cash crops that many HHs were producing and according to the respondents this has been very important crop for in income generation. It was found that the nearest market at Manahari bazaar and Hetauda municipality had huge demands for banana and Amriso and the study community has huge potential for production of those commodity. If proper training and motivation are provided to local people with regards to commercial production of banana and Amriso, it can produce immediate win-win situation, both to the consumers at nearby markets. This could help reduce monetary vulnerability of the HHs. The monetary vulnerability of study community was estimated to be very high. Majority of the HHs had debt (76.25%) and only one third of the HHs had any form of future savings (30.1%). Most of debts were loan or burrowed monetary help from relatives and neighbours. Each year during festival season (mostly Dashain festival) most of the HHs burrowed money to celebrate with new clothes and good foods for all family members. A male respondent said, “We all want to eat at least one good meal a year and a pair of nice cloth once a year. During Dashain (popular Hindu festival), we burrow money or do whatever possible to bring a little bit of joy in all members of family. But this costs a lot for us and takes long time to pay it off.”

During the fieldwork, I also observed that farmers were being attracted towards growing cannabis than traditional crops due to its increasing demands in nearby towns, immediate and high monetary benefits. However, the local farmers growing cannabis were paid low prices compared to the illegal market value of cannabis by the traders. Moreover, farmers growing cannabis were also facing high level of risk from authorities, and often end up with charges of criminal offence by the police. Police raids and confiscations on cannabis farms are frequently heard around the study community.

Table 16: Financial vulnerability

Subcomponents (indicators)	Vulnerability Index (VI)
Percentage of HHs who have debt	0.762
Percentage of HHs that do not have any savings	0.301
Finance vulnerability (H)	0.531

Chapter IV

Discussion

There are sufficient details to suggest that HHs at the study community are vulnerable in terms of socio-environmental stressors. Poor infrastructures, limited access to basic public services such as education and healthcare, restricted access to the forest based natural resources and inadequate knowledge and skills on income generating activities are major factors contributing to vulnerable livelihood. Frequent floods in Manahari River and landslides over the hills have added additional environmental stress to their livelihood. However, these climatic events are not new phenomenon in geography of mid-hill Nepal and there are no sufficient evidence to claim that these events are being driven by on-going climate change. Concerns regarding changing climate patterns such as temperature increase and change in precipitation level were heard. However, no convincing pictures or data were observed or found to suggest that climatic factors alone were the cause of vulnerability to overall livelihood strategies and outcomes of the studied HHs.

Due to the patriarchal social structure, the female-headed HHs were more vulnerable compared to male-headed HHs. Since I have had a-priori presumption that female-headed HHs are more vulnerable and chosen it as one of the indicators of livelihood vulnerability, this might have been the reason for higher LVI score for female-headed HHs. I observed that both genders have equally suffered due to their expected gender roles and the major concern lies behind the overall poor livelihood outcomes of the HHs than in unequal gender role within the Chepang community. I suggest both genders as a victim of patriarchal social system in Chapang community. The expected gender role demands male member of a HH to work hard on farms or often migrate to nearby towns as a cheap labour force, which involve high level of physical risks and mental stress in order to sustain their family. Similarly, subordinated role has restricted freedom of female members in all ways of life such as forced marriage, child marriage, the opportunity of young girls for education and domestic violence were observed during the field work.

As most of my respondents have illustrated, poverty lies at the centre of vulnerability context of their HH. Limited access, inefficient and unsustainable exploitation of resource base as well as underutilization of resources due to lack of necessary knowledge and skills can be seen as major causes of poverty. Marginalization and ignorance within both political and economic institutional

spheres of the country should be associated to the historical causes behind the poor livelihood outcomes of ethnic Chepang communities. People at the study community invest most of their time to meet basic necessities of life such as fetching drinking water, collecting firewood for cooking purposes and travelling to school, health centre, government offices, nearest road and market. The studied community was resourceful, full of opportunities and hardworking people. However, due to the lack of efficient transforming institutional structures, resources were mostly under-utilized and livelihood outcomes were found to be poor.

Livelihood components identified in this study were strongly interlinked with each other and often had mutually reinforcing effects. For example, poor access to adequate and safe drinking water has produced health problems or proper access to road/transportation would facilitate people's access to schools or health centres. As most of my respondents had illustrated, construction of a proper road to connect their village with national East-West highway at Manahari Bazaar could substantially improve their livelihood. Proper road connection would help local people to participate into the market as producers of agricultural products of growing demands such as banana, *amriso*, urad beans and milk. This could help strengthen their financial capital, which could be reinvested to enhance other livelihood components such as proper housing, toilets or children's education.

HHs were found to be most vulnerable in terms of financial capital. One major reason could be the use of few components and indicators under financial capital. Only two components and four indicators were used to estimate financial vulnerability index. However, my data on presumed indicators for financial capital show significantly higher level of vulnerability. Most of the HHs had debt and very few HHs had future savings. Similarly, livelihoods of HHs were dependent upon few sources of income. People were engaged in farming of small diversity of crops such as urad beans, banana, maize and *amriso* with traditional and low input agricultural techniques. Animal keeping were limited at subsistent level for most of the HHs. Relatively small average land holding without proper land certificate together with very few alternative source of income have contributed for high level of financial insecurity among the HHs at the study community.

Moderate to high level of vulnerability has been estimated in terms of natural capital. Issues associated with land ownership, land degradation due to erosion, high level of dependency on firewood, restricted access to the forest based resources due to strict regulations, poor management

of water resources and unstable climate patterns were major factors that has contributed to the natural vulnerability.

Although HHs were found to be affluent in terms of social network and interactions with their neighbours, their limited access to government offices and public services, low level of involvement in social and political organizations, relatively bigger family size and large number of female headed HHs has made them vulnerable in terms of social capital.

However, average family size has been decreasing over the years and most of the respondents attributed this to the increased financial costs for supporting a bigger family. Other potential reasons for decreasing family size could be the increased mobility of people, increased access to the radio and activities of local NGOs in favour of family planning or easy access to the contraceptives. It can be argued that bigger family size could benefit a rural HH with increased number of labour for income generation. However, the opportunities for income generating activities were limited for the studied HHs. Thus, a larger family was considered more vulnerable compared to smaller family size and it was well supported by respondent's perspectives. Similarly, current decreasing trends in family size would have positive influence on reducing social vulnerability in future.

Large percentages of HHs at the study community were dependent on traditional witch doctors (*Dhami-Jhakri*) for treatments and their access to the health centres and facilities were limited by long travelling distance and economic costs associated with it. A great improvement has been done in terms of people access to toilet in whole Makwanpur district, as it has been declared an open-defecation free district and all HHs have installed some kind of toilet facility. More improvements can be done in terms of quality and use of toilets at the studied HHs. Provision of sufficient water seems essential for good sanitation.

Although most of my respondents asserted that construction of proper road can substantially reduce their livelihood vulnerability, I argue that construction of a road alone would not be sufficient prerequisite for sustainable livelihood outcomes at the study community. Provision of efficient technology and skills in agriculture is equally essential to reduce the dependency on subsistence farming. Rightful access and sustainable exploitation of natural resources are important aspects of sustainable livelihood. Similarly, physical infrastructures such as irrigation

systems, suspension bridge over Manahari River and electricity supplies are necessary factors for enhanced connectivity, sustainable growth and overall development of the study community. Despite of moderate level of livelihood vulnerability, respondents at the study community seemed content about their overall life situation compared to their past. According to them, living standards have improved in past ten years and many of the respondents seemed very optimistic about the future. However, general dissatisfaction over public authorities for ignoring their basic concerns was prevalent among local people.

Conclusion

Uses of quantitative indices in vulnerability study provide an overview of vulnerability level. A contextual interpretation of the indices combined with the perspectives and narratives of local people is needed to have a complete understanding of livelihood vulnerability. The use of indices without proper presentation of narratives can be misleading for readers.

LVI results showed that, the studied HHs were most vulnerable in terms of financial capital followed by social, natural, human, and physical capitals. However, overall livelihood vulnerability of the study community was shaped by range of interacting socio-environmental stressors. Limited access to the forest based natural resources, inefficient and unsustainable exploitation of water and land resource, poor infrastructures, limited access to basic public services such as education and healthcare, absence of efficient transforming institutional structures, inadequate technology, knowledge and skills on income generating activities are major factors that has contributed to vulnerable livelihood of the study community.

LVI scores suggested that female-headed HHs were slightly more vulnerable compared to male-headed HHs. However, my conclusion is that both genders have equally suffered due to their expected gender roles and the major concern lies behind the overall poor livelihood outcomes of the HHs than in unequal gender role with in the Chepang community. Nevertheless, gender equality can potentially benefit the community by creating opportunities for better livelihood outcomes, as it will involve women into broader socio-economic and political aspects of the community.

Frequent floods in Manahari River and landslides over the hills during monsoon season have produced environmental stress on livelihood of HHs. However, these climatic events are not new phenomenon in geography of mid-hill Nepal and I found no sufficient evidence to claim that these events are being driven by on-going climate change.

Concerns regarding changing climate patterns such as temperature increase and change in precipitation level were heard from respondents. However, no significant evidence were observed or found to suggest that climatic factors alone were responsible for the vulnerability of overall livelihood strategies and outcomes of the studied HHs. Instead, based on my study, I conclude that environmental stressors such as climate should be considered as one of the interlinked factors, which interacts together with multiple socio-economic and cultural stressors within the given context to produce livelihood vulnerability, in case of my study community.

Most of my respondents stressed that construction of proper road can substantially reduce their livelihood vulnerability. However, I conclude that construction of a road alone would not be sufficient prerequisite for sustainable livelihood outcomes. Provision of efficient technology and skills in agriculture, reduced dependency on subsistence farming, rightful access and sustainable exploitation of natural resources, physical infrastructures such as irrigation systems, suspension bridge over Manahari River and electricity supplies are necessary factors for enhanced connectivity, sustainable growth and over all development of the community.

Livelihood components identified in this study were strongly interlinked with each other and often had mutually reinforcing effects. I conclude that livelihood vulnerability is multifaceted challenge manifested in various forms and shaped by various interacting socio-environmental stressors within the given socio-environmental context of the households (HHs) in a community rather than shaped by one single factor or component.

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Appendix

Questionnaire for Household Survey

HH number:

Name..... Age..... Sex..... of the respondent

Major occupation of the HH: Agricultural..... Non-agricultural.....

1. Social capital

A. Demography

i. HH information: age and formal education (school years) of HH members

<13 and 60<	Education	13-60	Education

ii. Has head of HH attended formal school? Yes: No:

If yes, what is the education level of head of this HH?..... (School years)

iii. Is the HH female headed? Yes: No:

iv. Does the HH have orphan children below 13 years? Yes: No:

B. Livelihood strategy

i. Is your family dependent solely on agriculture as a source of income?

Yes: No:

ii. If YES, what are different incomes generating agricultural activities that your family is involved in?

iii. If NO, what are other income generating activities that your family is involved in?

iv. Does any member of your family have gone to city or foreign country to work?

C. Social Relationship

i. In the past month, did relatives or friends or neighbours help you and your family (e.g., Get medical care or medicines, Sell animal products or other goods produced by family, Take care of children, worked in field)?

Yes: No:

If yes what kind of help? -----

ii. In the past month, did you and your family helped any relatives or friends or neighbours with (e.g., Get medical care or medicines, Sell animal products or other goods produced by family, Take care of children, worked in field)?

Yes: No:

If yes what kind of help? -----

iii. In the past month, did you and your family receive monetary help from your relatives, neighbour or friends?

Yes: No:

iv. In the past month, did you and your family give monetary help to your relatives, neighbour or friends?

Yes: No:

iii. Has anyone from your family gone to any government office for any assistance during the past year?
 Yes: _____ No: _____

iv. Did you vote in constituent assembly election last week? Yes: _____ No: _____

v. Are any of your family members affiliated with any CBO/NGO in local area? Yes: _____ No: _____

2. Human Capital

A. Health

i. How long does it take to reach nearest health facility from your house, if any? minutes

ii. Is anybody in your family chronically ill or disabled? Yes: _____ No: _____

iii. Has anyone in your family been suffered by TB, AIDS, Cholera, Malaria other communicable diseases in the past six months? Please specify? Yes: _____ No: _____

iv. Has anyone in your family has died due to the climate related disasters (flood, coldness, landslides, hunger, avalanches) in the past 10 years? Yes: _____ No: _____

If Yes, which type of disaster?

B. Food and Nutrition

i. Does your family get sufficient food for the whole year? Yes: _____ No: _____

ii. How many types of cereal crops does your family grow in a same plot of land in a year?

iii. Does any member of your family suffer from any kind of nutrient deficiency?

C. Media/Information and Skills

i. Do you have access to?

Media	Own (Yes/No)	Coverage (Yes/No)
TV		
Radio set		
News paper		
Telephone/mobile phone		

ii. Is there any member in your family who has taken any kind of vocational training? Specify

Yes: _____ No: _____

3. Natural Capital

A. Land

i. Productivity

Type of crops	Productivity Per Unit Land (kattha)

ii. In comparison to 10 years' time, has the productivity of your land (crops) degraded? (due to climatic changes and extreme climate events). What's your opinion about it?

Yes: _____ No: _____

B. Forest

i. What sources of energy do you use for cooking purpose in your house?

- Firewood

- Kerosene
- LP Gas
- Alternative (electricity, Solar)

ii. Do you collect your firewood from the forest? Yes: No:

ii. How much time do you spend to collect the firewood?

iii. How is the availability of firewood comparing to 10 years back?

- More than before:
- Less than before:
- Same as before:

iv. What kind of a stove you use to cook food?

Traditional: Improved: Kerosene stove: LP Gas stove:

C. Water

i. Is the water available in this village sufficient for HH purpose? Yes: No:

ii. Do you have clean/safe water for HH use? Yes: No:

iii. During the past 10 years, has there been any conflict related with the water in your community?
Yes: No:

iv. How much time it takes to reach the water source?

v. Do you have water storage at home? Yes: No:

If yes how much?

How many days can you use the stored water?

D. Climate (From meteorological department)

i. Mean standard deviation of monthly average maximum temperature by month

ii. Mean standard deviation of monthly average minimum temperature by month

iii. Mean standard deviation of monthly average precipitation

E. Human wildlife conflicts

i. Have you faced any conflicts with wildlife? Yes: No:

ii. If yes, what type of conflict?

iii. What is the cause behind the issue?

4. Financial Capital

A. Assets

i. How much land does you and your family own (in Acres)? What type of land (agriculture purpose, forest etc.)?

ii. Do you own any livestock? Yes: No:

If yes, what kind of livestock do you have?

How many?

iii. Type of the house:

Material used to build the walls (mud, wood or concrete)	Roofing material (straw/ metal)
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iv. Do you have any means of transportation, if yes please specify? Yes: No:

B. Finance

ii. Do you have any debt? Yes: No:

iv. Do you have savings? Yes: No:

v. Annual income of the HHs.....

5. Physical Capital

i. Do you have electricity (solar) in your house? Yes: No:

ii. How long does it take to reach the nearest public transportation?

iii. Is there a school available nearby? And if yes, how long does it take to reach the school?

Yes: No:



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