

# Chapter I

## Introduction

### 1.1 Background of the Study

Climate change refers to the variation in the Earth's global climate or in regional climates over time. It is change in the statistical distribution of weather patterns when that change lasts for an extended period of time usually decades or longer. UNFCCC (2001) defines this as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere". Climate change refers to a statistically significant variation in either the mean state of climate or variability, persisting for an extended period typically decade or longer. Climate change may be due to natural process or external forcing or to persistent anthropogenic change in composition of atmosphere (UNFCC 2005: cited in Pielke and Sarawitz 2005: 266p).

Climate change has become one of the global problems which has dragged the attention of scientists, leaders and stakeholder as well as it has been affecting all of us in different sectors. Nepal too is not untouched with the impact of climate change since Nepal's maximum temperature was found to be increasing at a greater rate ( $0.05^{\circ}\text{C}/\text{year}$ ) than the minimum temperature ( $0.03^{\circ}\text{C}/\text{year}$ ) (DHM 2015 A.D) at a significantly higher rate compared to the global average of  $0.740\text{C}$ , recorded in twentieth century. In addition to increase in extreme temperature, weather has been observed changing in recent years. Because of the extreme temperature there has been change in weather conditions. Number of monsoon days has been shortening, with early onset and late withdrawal, and the intensity of monsoon rain has shown increasing trend (Gurung and Bhandari 2009A.D). Likewise, livelihood of third world's people has been changing and threatening from climate change.

Similarly, climate change brings out wide-ranging effects on the environment, and on socioeconomic and related sectors, including water resources, agriculture, food security, human health, terrestrial ecosystems and biodiversity. Changes in rainfall pattern are likely to lead to severe water shortages and flooding. Melting of glacier can cause flooding

and soil erosion. In this sense, developing countries are most vulnerable to the impacts of climate change. Nepal is one of the most vulnerable countries affected from Climate change (UNFCCC, 2007 A.D).

The climate change has obviously impacted the people have dependency on the natural resources for their livelihood. In this connection, Devkota (2014) says, "Climate change is gradually becoming a major concern to mankind but most of the people, who are most vulnerable, are not aware of the real consequences of the global warming. It is recognized as a major threat to the communities in the rural areas who are more dependent on the natural resources. Especially in developing countries, the impacts are more severe, but also those living in high risk areas in developed countries are greatly impacted. Temperature in Nepal is increasing at a high rate in recent years similar to the phenomenon observed" (Devkota, 2014: 255).

Due to climate change there are decreasing numbers of rainy days, but higher intensity rainfall events are increasing. According to a recent study, Nepal's temperature is rising by 0.41°C per decade (Shrestha et.al 2000 A.D). The impacts of these changes are more damaging to the livelihoods of those who depend on forest, land river, ponds and biodiversity for food, shelter, and income. Poor people whose livelihoods are nature based, have experienced adverse impacts of climate change and are struggling to cope with it.

Poor people and small farmers are more vulnerable to climatic extremes as well as gradual changes in climate than the rich because they have less protection, less reserves, fewer alternatives and lower adaptive capacity and because they are relies more on primary production which affect their health and livelihood and undermines growth opportunities crucial for poverty reduction)IPCC,.(2001

Change in climatic has put additional strees to the livelihood of the people in Nepal especially indigenous people. Their livelihoods depend on natural resources that are directly affected by climate change, and they often inhabit economically and politically marginal areas in diverse, but fragile ecosystems (Salick and Byg 2007). The idea of climate change among local indigenous people is bound up with thier experiences, in a

particular locality,,of variation over time possibly measured in decades .The impact of climate change can be much greater for indigenous communities living in the more remote and ecologically fragile zones and relying directly on their immediate environments for ) subsistence livelihood UNFCCA 2007 ,(D

Nepal is rich in terms of socio-cultural characteristics. It is the single land of different groups and section of people (Bista 2030). There are 125 jat jati and 123 languages are spoken throughout the country ( Nepal Parichaye ). Asdiwasi Janajati Uttan Rastriya Pratisthan 2058 B.S has listed 59 groups as indigenous people. Majhi is one of them. There is no universal definition of indigenous people. Generally indigenous people are defined as having historical ties to a particular territory, and their cultural or historical distinctiveness from other populations. Majhis of study are living in Baglung since long time. They regard themselves as indigenous people. They have historical continuity to the place, distinct social system language culture and beliefs.

Traditionally accepted occupation of Majhis is fishing and rowing boats (Bista 2030). The area of the Majhi habitation is Baglung, Syangja, Gulmi, Chitwan, Nawalparasi, Gorkha, Tanahun etc ( Gyaneshwor ). It is mostly on the banks of the rivers that those people live and go through their daily activities. They are from the liquor drinking group and also touchable caste (Gautam and Thapa 1994).

Majhi is economically and socially backward people and living their own fundamental cultures and community (Bista 2030). Majhis are dispersed into 65 districts of hill and Terai of Nepal. Boating, fishing, gold panning and living on fishing are the traditional way of life of the Majhi people of all places. They have their own traditional cultural norms and values, customs, language, social norms and values, dress etc. According to Population Census (2011) total number of Majhi people are 72,614 that is 0.32% where, 36,367 are males and 36,247 are females.

Fishing, boating and gold panning are the main income sources of Majhi. That is why they are called as fisherman or ferrymen. But these days they have changed and transformed their professions like other people of Nepal and gradually Majhis have chosen other professions as their livelihood i.e. agriculture labor, civil services, manson carpentry, going aboard, and various technical and non-technical sectors. There might be

various reasons behind the change in the occupation among them climate changes and degradation on the natural resources might be one of the major reason behind the adaptation of new means of livelihoods among the Majhi community which research aims to deal with.

Since the potential impacts of climate change on the livelihoods system of indigenous communities, occupational shifts, and adaptation mechanisms of indigenous people are less understood, this study attempts to assess the vulnerability of indigenous Majhi community to climate change, its impacts on livelihood, and their perception as well as adaptation strategies.

## **1.2 Statement of the problem**

Climate change is emerging as a serious issue throughout the globe. Nepal too is not untouched with the problems brought by climate change. For example, the average temperature has increased consistently and continuously, at a rate of  $0.05^{\circ}\text{C}/\text{year}$  from 1971 onward. Similarly, the maximum temperature increased by  $0.06^{\circ}\text{C}$  and minimum temperature increased by  $0.03^{\circ}\text{C}/\text{year}$  between 1976 to 2005. It shows the projected mean annual temperature anomaly for Nepal where the temperature and precipitation were gradually increased and it was estimated to rise in the coming future (DHM 2015).

Likewise, the seasonal variation is commonly observed all over the country as rainfall occurs due do the south-west monsoon which lasts from June to September. The humid monsoon air coming from the Bay of Bengal is forced to rise as it meets the high hills and mountains in Nepal. The rate of increase in temperature is less in the lower altitude than that in the high altitude. According to the NCVST the climate of Nepal is influenced by the Himalayan ranges and the South Asian monsoon. The result analysis from showed that altitude affects annual temperature and precipitation patterns. Up to about 1500 m, annual rainfall increases with altitude; thereafter, annual rainfall decreases with increasing altitude. The mean precipitation in Nepal is increasing annually by 13 mm, while the number of rainy days is decreasing by 0.8 days/year. High increase in summer river flow provides further evidence that high summer temperatures are leading to fast glacier melt/retreat. A study of monsoon rainfall from period of 1971 to 2005 shows that there is linear increasing trend of about 2.08 mm/year with a large inter-annual variation.

There is also increase in the number of flood days in certain rivers in Nepal. The projections show an increase in the number of hot days and nights, with similar increases in the number of heavy rainfall events during the monsoon period. Likewise, for Western Nepal, the study identifies similar patterns of changing temperature and precipitation which shows the positive effects in country wide as well as Western Nepal (Devkota, 2014).

The impact of climate change has been seen more on the community whose livelihood is depended on the natural resources (NCVST 2009). Climate risks including natural hazards such as floods and droughts affect the poor people's agriculture based subsistence livelihood. Changing climate mainly temperature and precipitation and the number of rainy days show a positive relationship with flood and extreme events where it damaged the physical infrastructures, loss of agricultural production and land. Weather related events such as erratic rainfall, longer drought periods, landslides and floods are increasing in terms of both magnitude as well as frequency. As anticipated changes to the timing of the monsoon and expected adverse effects of climate change begin to be felt on a wider scale and in a variety of ways (including increasingly frequent disaster events, more extreme storms and prolonged droughts, and an increasingly variable water supply), massive pressures will be levied on ecosystems, from water bodies to forests and agricultural lands, further limiting agricultural productivity in the region (Bartlett et, al. 2010).

Likewise, the impacts of climate change such as unpredictable weathering patterns, loss of biodiversity, water scarcity, spread of tropical diseases, malaria, dengue, decreases food productivity, and increased intensity and frequency of landslide and flooding are increasing in Nepal. These various impacts threaten people's livelihood, biodiversity conservation, safety, security and the national economy. Thus, climate change has been already happening across the country with varying degree of impacts. Evidence of its impact is visible in vegetation, hydrology, and rising temperature affecting the normal productivity and availability of ecosystem services. Majhi, the indigenous people of Hill side, are on the front lines to bear the brunt of these changes. Majhi is one of the most endangered ethnic communities of Nepal. They are vulnerable in terms of socio-economic status with rampant poverty, low education and low living status. Majhis

are mostly living at the riverside and near the jungle. Since the livelihood diversity of Majhi is directly dependent on nature and natural resources climate change has direct impact on their livelihood. It is seen that their livelihood pattern are changing in these recent years. Thus, it is important to understand the level of impact on their livelihood due to the climate change and their coping strategies to adapt in the changing climate. Based on these assumption, this study seek to answer the following research questions:

1. How Majhi People perceive the climate change?
2. What kind of effects of climate change are seen on their livelihood?
3. How Majhi people are responding to the changes?

### **1.3 Rational of Study**

Climate change is emerging issue in the world, which is one of the greatest threats to environment conservation and living security. Increasing emission of greenhouse gases into atmosphere, human intervention to environment are further compounding this problem. Although the contribution of underdeveloped countries in climate change is minute, they are most vulnerable to climate change impact. Nepal's contribution to global greenhouse gas emission is only 0.025%(K.C Tanka,2015). It is among the most vulnerable countries to climate change.

With the change in temperature there is increasing number of natural hazards. In this regard, climate change is most prominent issue in Nepal. As indigenous people have lived in the respective places of centuries adapting to the climate, this study assessed the problem faced by the people in study area. The emerging issue of the climate change, its impacts on biodiversity and livelihood, indigenous Majhis understanding and adaptation to climate change is the main focus of this study.

Since boating, fishing, gold panning and agriculture related activities are the main occupation of Majhi people they are the most prone ethnic communities of Nepal. So this study will provide a way to look at the impact of climate change on Majhi community and their changing occupation and living strategy to cope with the situation. Majhis are one of the endangered ethnic groups and least known of Nepal's indigenous people. The global biosphere, including that of the Majhi is deteriorating rapidly through rapid population

growth; degradation of ecosystem, pollution of air and water, soil erosion, etc. because of these problems, there is also a threat to biodiversity and cultural diversity, there should be proper measure to conserve biodiversity, which ultimately will also contribute substantially to the livelihood of the people. They have been using their knowledge and skills to use and maintain the resources and to cope with the natural calamities. But with changing climate, the local knowledge developed over centuries may not help to address rapidly emerging challenges. They will need time to get accustomed to new context. Their indigenous knowledge and skill they have learnt from their ancestors to tackle the changes are limited to the regular phenomenon. Adapting to climate change has been a primary concern of development. But how indigenous people would adapt to the emerging problem cannot be assessed unless we have a clear understanding of the situation. Climate change is global but its impact is always at local level, and hence local level case studies are vital both for policy formulation and adaptation, and blend local peoples knowledge on present.

#### **1.4 Objectives**

The general objective of the study is to assess the perception of climate change and the changing strategies of livelihood due to climate change.

##### Specific Objectives

1. To describe and analyze the perception of Majhis on climate change.
2. To analyze the changing nature of occupation and livelihood among the Majhi people  
Due to climate change.
3. To explore the coping mechanisms adopted by Majhi people to sustain their livelihoods.

#### **1.5 Organization of the study.**

The whole study is managed under eight different chapters. The first chapter shows the introduction of the study where it tries to establish the background and the rational of the research. In addition it asserts the objectives of the study. The second chapter is detail inclusion of literature review related to the research. Likewise, the third chapter is about the research methodology. Chapter four consists of description of the

study area. The chapter describes the physical location and the people of the place. In chapter five Majhi peoples' perception on climate change is presented in detail. Moreover, their opinions are analyzed on the basis of factual data from Department of Hydrology and Meteorology. Status of the climate change and the changing livelihood pattern of Majhis' is presented in chapter six. Chapter seven explores the coping and adaptive mechanisms followed by the Majhi community. The last chapter eight contains the conclusion of the study.



## **Chapter II**

### **Literature Review**

This chapter summarizes the views and finding on climate change, vulnerabilities and its impact on indigenous communities especially Majhi people. Traditional and changing trend of livelihood due to climate change is the primary concern of review. Likewise, literature pertaining to climate change, vulnerabilities and indigenously and communally developed adaptation strategies in Nepal and across the globe were reviewed.

#### **2.1 Introduction of Climate Change**

Climate change is a burning issue in the world. Different scholars and organizations have defined climate change differently: according to Wikipedia the free encyclopedia “climate change is any long-term change in the statistics of weather over periods of the time that range from decades to millions of years”. It can express itself as a change in the mean weather conditions, or in any other part of the statistical distribution of weather. Climate change may occur in specific region, or across the whole earth. The term climate change is often used interchangeably with the term global warming but according to the National Academy of Sciences the phrase 'climate change' is growing in preferred use to 'global warming' because it helps to convey meaning of other terms related to climate change in addition to rising temperatures. Climate change refers to any significant change in measures of climate (such as temperature, precipitation or wind) lasting for an extended period, decade or longer (IPCC, 2007).

Likewise, regarding the climate change, Sapkota (2064) mentions as “Sudden and unexpected change in weather or season is known as climate change.” Climate change occurs from different causes physical as well as human influences on nature. Global warming causes change in climate factors and affects ecosystem (ecological processes and functions) and biophysical systems. Global average temperature has warmed and cooled many times in the twentieth century and is likely to rise constantly in the future mainly due to an increased concentration of Green House Gas (GHG) in the atmosphere. Without GHGs, the earth surface temperature was raised by 0.740 and 0.180 (1.33± 6.0F)

during 20<sup>th</sup> century and scientists estimated that it could increase as much as 6.40C average in the 21th century (UNFCCC, 2007).

Concentration of GHGs in atmosphere determines the temperature on earth. If concentration of GHGs becomes low temperature of earth become less and if increased it results raising temperature on earth. GHGs forms layer on atmosphere which allows entering sun light and heat on earth through atmosphere. The earth absorbs some of the heat gained from sun and reflects some fragment of heat on atmosphere. If the GHGs layer becomes thin the heat passes from atmosphere and the temperature on earth becomes low, otherwise the GHGs layer obstruct the passing process of heat and again reflect the heat to the earth which causes increasing temperature on earth.

## **2.2 Climate Change as a Social Issue**

Many anthropologists and sociologists have studied about the climate change and its impact on society and examined human-environment relationship. Among them are Mary Douglas, Ben Orlove, Margaret Mead, Ctrate, Rayner, Adger, Kelly, Chambers, Convey, and so on. People's perception regarding climatic changes has been frequently reported in different studies and media during the past few years. "The floods are coming more severely, more frequently. Not only is the rainfall far heavier these days than anyone has ever experienced, it is also coming at different times of the year" (Vidal, 2006).

Likewise, Poudel (2009) has researched and found the pattern of climate change in Nepal. According to him, local community people as well as experts opine that impact of climate change is directly seen in different geographical and socio-economical sphere of people. These people regard the following as climate change.

- Different rainfall pattern, flooding and landslides
- Overall decrease in annual rainfall in arid and semi-arid regions of the Annapurna range
- Decreasing water levels
- Bare mountains where there used to be huge amount of snow.

- Increasing tendency of extreme showers and storms in summer leading to severer floods and soil erosion
- Increasing disasters, such as heat waves, droughts, dust storms, and thunderstorms
- Decrease in crop growths
- Increase in mosquitoes and insects

Loss of water sources is one of the greatest concerns among rural populations. Not only laymen but also experts working in the field of climate change opine that several thousand springs and canals have already dried up in Nepal forcing people to migrate (Poudel, 2009).

Since there is a direct impact of climate change upon the agricultural productions and pattern of livelihood occupations of rural community the issue of climate change and its impact upon the livelihood of local community is central issue of discussion among sociologists and anthropologists.

### **2.3 Climate Change in the Global Context**

As discussed above, climate change is posing a serious threat in the global context. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007) revealed that global warming is mostly due to man-made emissions of greenhouse gases (mostly CO<sub>2</sub>). These Global green house gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs and SF<sub>6</sub>) emissions have grown since industrial time with increase of 70% between 1970s and 2004.

IPCC synthesis report (2007) stated that there has been an unprecedented warming trend during the 20th century. The average temperature of the earth's surface has risen by 0.74°C since the late 1800s and the current average global surface temperature of 15°C is nearly 0.6°C higher than it was 100 years ago. A further increase of 1.5-6°C is projected from the period to 2100. The report also stated that Temperature rises beyond 2°C are likely to result in reduced crop yields in most tropical, sub-tropical, and mid-latitude regions and some ecosystems will be irreversibly damaged or lost. It will contribute to result in much more flooding in low-lying areas with decline in food production, an increase in disease, and the extinction of plants, animals, and entire ecosystems In

addition to increases in temperature, global warming results in more extreme weather patterns: more rain, longer dry spells, stronger and more violent storms, more fires, and the spread of tropical diseases. As climate change pushes the world towards more extreme weather, more and more people will be exposed to recurrent disasters during their lives.

Kjorven, (2008) stated that the global temperature has increased by  $0.3^{\circ}\text{C}$  to  $0.30^{\circ}\text{C}$  since the last 19<sup>th</sup> century and by  $0.2^{\circ}\text{C}$  to  $0.3^{\circ}\text{C}$  over the last 40 years (1960-2000) with the indication of more increase in the global temperature in coming days making earth's sustainability more vulnerable.

Keeping these reviews into the consideration, it is clear that climate change is a global issue. It has been affecting the entire world during these last decades. Thus, there are numerous studies about the climate change and its impact throughout the world.

#### **2.4 Climate Change in the Nepalese Context**

Though, Nepal's contribution for causing climate change is negligibly small, Nepal too is not untouched with the problem of climate change. According to GFDL (2011), "Nepal's varied topography and social vulnerability make the country particularly susceptible to geological and climate-related disasters. A general lack of effective response mechanisms and strategies for dealing with natural disasters exacerbates this vulnerability. An increase in soil erosion, landslides, flash floods, and droughts has been reported in recent years across the country, with increased intensity and impact on the lives and livelihoods of the Nepalese."

According to United States, only four percent of the world's population is responsible for 22% of the green house gas emissions. Nepal has less than 0.04% of the world's population and it is responsible for about 0.25% of annual GHG emissions (Rai and Gurung, 2005). Nepal's vulnerability to damage from climate change, however, is large. Temperature is likely to increase more in high mountain areas than elsewhere. Glaciers and snowfields will reduce and may even disappear, reducing Nepal's dry season river water source. This will impact irrigation and drinking water supply and as well as the

reliability of hydroelectricity. Global climate change will also likely shift monsoon rainfall patterns in ways that threatens Nepal's current agricultural practices, as well as threaten infrastructure. Changing temperature and moisture pattern will threaten biodiversity, especially in mountain areas where migration of species is physically restricted (GoN, 2011).

Likewise, according to the study carried out by Metrological Department of Nepal, there is increasing phenomenon of melting of glacier and Glacier Lake may cause outburst and increases flooding. According to the report 0.120C in Himalaya, 0.030C in Hill and 0.060C in Terai temperature is increasing annually (Sapkota, 2064 B.S).

Similarly, Shrestha (2011 A.D) made study on Maximum temperature trends in the Himalaya and its vicinity and found that all-Nepal maximum temperature increased by 1.80 °C between 1975 and 2006 A.D, with high-altitude area showing an annual increase of 0.120 °C during the dry season and lower altitude areas experiencing a rise of 0.060 °C between 1971, 1991 and 1994 A.D. Days and nights are becoming warmer and cool days and cool nights are becoming less frequent.

NAPA report (2010 A.D) revealed that higher increments in temperature are projected over western and central Nepal than over eastern Nepal for the years 2030, 2060, and 2090 A.D. Projections for overall precipitation are mixed. Annual average summer precipitation is predicted to increase 15-20% in the Mid-hills and the Tarai. It is expected that in Western Nepal winter precipitation will not experience any change but that in Eastern Nepal it will increase 5-10%. The climate change brings even the natural disasters. Being the hilly country full of Himalayas, Nepal is under the threat of natural disaster caused by climate change. It already observed increase in dry period, intense rainfall, flood, landslides, forest fires, glacial retreats and GLOF threats (Shrestha, 2011 A.D).

There are various studies regarding climate change and its threat to high Himalayas. Regmi et al (2010 A.D) have conducted country Case study and found that the temperature in the Himalayas is increasing at a faster rate, which is resulting serious impacts on the glacial lakes-the sources of water for Nepal. Many glaciers are retreating

at a faster rate and rapidly melting glaciers means more seasonal variation in river flow resulting more floods and droughts in the country. Nepal has a complex, mountainous landscape, floods and landslides have become more frequent and severe. The high dependence on natural resources for livelihood and inadequate resources to cope with climate change are other reasons. These factors collectively contribute to result the vulnerable situation of the rural and excluded people.

Likewise, Shrestha (2011 A.D) mentioned that Nepal average temperature rose at a rate of 0.03-0.06°C per annum, with a higher rate in the mountains than in the lowlands between 1977 and 1994 A.D. Climate change is contemporary issue for Nepal. The following impact will be seen from climate change

1. Increase in temperature causes the spread of tropical insect mosquitoes, flies and other diseases in upper part that will cause epidemics.
2. The pasture land of Himalayas will be cover of bushes that lead to scarcity of pasture land and negative impacts on livestock rearing.
3. Scarcity of water, poverty, decrease in agricultural productivity, effects negatively on sustainable tourism development.

Similarly, strange climate is being observed in Himalayan area of Nepal due to global climate change. In this connection, Dahal (2008 A.D) has studied the reverse character of climate in Manang and Mustang. According to him, opposite character of the climate is seen in some topographical areas of Manang and Mustang. Rainfall pattern is changing, the area where minimum rainfall occurred during same season last year's maximum rainfall occurred this year and vice versa. 17ml of rainfall was recorded on May at Mustang in 2008 A.D. Three fold quantity of rainfall (53.5 ml) is recorded in the same period this year. In the same period, in Manang last year 356.6 ml of rainfall was recorded this year only 7ml was recorded. Dramatic change in temperature also recorded in these districts during that season. 40C temperature rise is recorded in Manang in one year. Because of increase in rainfall and decrease in snow fall traditional mud house

structure is being damaged, local dwellers of Mustang have started to house roof with corrugated sheet (Dahal, 2008 A.D).

Likewise, Lemos *et al.*, (2007 A.D) found that Nepal's major natural resources, biodiversity and water are at the forefront of climate vulnerability. Response to climate change in Nepal is growing gradually. Action to reduce human contribution to the changing climate are slowly happening but they so far seem too few and too limited to make difference to climate change.

Similarly, Karki, (2007 A.D) concluded that Developing countries are more vulnerable to the effects of climate change due to its high dependence on climate-sensitive sectors like glaciers, agriculture and forestry, and its low financial adaptive capacity. Although Nepal is responsible for only about 0.025% of total annual greenhouse gas emissions of the world, it is experiencing the increasing trends and the associated effects of climate change.

Climate change has proper impact upon the livelihood of Nepalese community. In this connection, Garg *et al.*, (2007 A.D) revealed that over two million Nepalese people depend on climate sensitive sectors like agriculture and forestry for their livelihood. Thus, basically minority communities have been facing the challenges brought by the climate change in Nepalese context.

The major river systems of Asia are sourced from Himalayan headwaters and the subsistence agriculture practised by 90% of the economically active population of Nepal is highly water dependent (Chalise, 2002 A.D). Landsliding and many other geohazards associated with the Himalayan environment are also precipitation driven (e.g. Gerrard and Gardner, 2000 A.D)

## **2.5 Vulnerability and its Assessment**

The IPCC (2007 A.D) defines the concept of vulnerability as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character,

magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity

Brook (2003) classifies vulnerability as bio-physical vulnerability and social vulnerability. social vulnerability exists within a system independently from external hazards and is therefore not a function of the frequency and severity of a given type of hazard but of factors which are incorporated within a human system, for example poverty and inequality, marginalization, literacy, food entitlement, health and so forth . Biophysical vulnerability is interpreted as the amount of damage experienced by a system caused by the impacts of a specific type of hazard and is therefore, in contrast to social vulnerability, a function of the frequency and severity of given types of hazards.

## **2.6 Livelihood and Livelihood Assets**

Livelihood refers to a means of supporting one's existence, especially financially or vocationally. Rakodi (2002 A.D) defines that “a livelihood comprises the capabilities, assets and activities required for a means of living”. The coping and resiliency capacity against any shocks and stresses and ability to maintain or enhance capabilities and assets without undermining natural resource base are determinants of sustainability of livelihood.

Sustainable Livelihood Framework (DFID, 1999 A.D) identifies five major livelihood assets (i.e. human, financial, social, physical and natural) essential for sustaining the livelihood sustainably in a given structure and process context. These livelihood assets of the people are affected by shocks and stresses which are not in control of them. The shocks, trends and seasonality are regarded as exposure of people's livelihood to climatic hazards and gradual shifting pattern of temperature and rainfall for this study.

The livelihood assets as defined by DFID (1999 A.D) covers different aspects such as Human, financial, social, physical, and natural capital. Human capital refers to “skills, knowledge, ability to labor and good health” which are essential for taking on different livelihood strategies to meet livelihood goals. Likewise, financial capital



includes flows as well as stock and can contribute to consumption as well as production. Similarly, Social capital are social resources drawn for achieving livelihood objectives and developed through networks and connectedness, membership to formalized group and relationships, trust, reciprocity and exchanges. Whereas the basic infrastructures, tools and production goods used for supporting livelihood are referred as physical capital (DFID, 1999; Koeberlain, 2003 A.D). The physical assets include house, land, livestock or access to health facilities, roads, irrigation, market and other infrastructures. Moreover, natural capitals are natural resource stock as well as flows from which people derive various services. These resources can be tangible as well as intangible (DFID, 1999 A.D).

Tol and Yohe (2002 A.D) have regarded natural resources and their distribution across population as an important indicator of adaptive capacity.

## **2.7 Coping and Adaptive Strategies to Adverse Climatic Impacts**

Coping is a way of responding to an experienced impact with a shorter-term vision for example, one season, and adaptation is the process of adjusting to change that is both experienced and expected which is longer term. Coping mechanisms are the actual responses to crisis on livelihood systems in the face of unwelcome situations, and are considered as short-term responses that develop into adaptive strategies through times. It is the process or outcome of a process that leads to a reduction in harm or risk of harm, or realization of benefits associated with climate variability and climate change. The Oxford English Dictionary defines coping as “the action or process of overcoming a problem or difficulty” or “managing or enduring a stressful situation or condition”, and adapting as “rendering suitable, modifying”. The UNDP calls it a process by which strategies to moderate, cope with and take advantage of the consequences of climatic events are enhanced, developed, and implemented.

Similarly, climate adaptation refers to the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damage, to take advantage of opportunities, or to cope with the consequences. Adaptive strategies are the strategies in which a region or a sector responds to changes in their livelihood through

either autonomous or planned adaptation (Campbell, as quoted in Biere 2008). It is a response to global warming and climate change, that seeks to reduce the vulnerability of social and biological systems to relatively sudden change and thus offset the effects of global warming. Even if emissions are stabilized relatively soon, global warming and its effects will last many years, and adaptation will be necessary to the resulting changes in climate.

These previous research have focused on the impact of climate change in global and Nepalese context. Some of them even focused on the impact of climate change in some specific minority communities. This research is focused on the Majhi community in order to understand their vulnerable position and new livelihood strategies due to climate change.

## **2.8 Majhis, Climate Change and Changing Livelihood.**

Nepal is multi-cultural, multi-ethnic, multi-lingual, and multi-religious country. But the researches on different tribes began only after 1950 A.D. After the establishment of democracy in Nepal several foreign and Nepalese scholars have conducted researches on different tribes of Nepal. Though, they are very few researches focusing only on Majhis there are various views, researches regarding Majhi people and community.

Majhis are one of the indigenous people of Nepal (Bista 1967). They resemble to Bote, Darai, Danuhar, Tharu, Dhimal, Satar, in terms of physical structure and culture. Majhis are introvert in nature they normally do not go far from the home. Their livelihood mainly depend on rowing boat and fishing (Bista 2030). According to Nepali Brihat Sabdakosh (1983), Makjis has been defined as a man who rows boat along the river bank. It is also expressed Bote as equivalent.

Generally the inhabitant in hill are called as Majhi and of Inner Terai as Bote and Kushar. D.B. Bista (1967) is the first and pioneering one who made an attempt to draw an ethnographic map of the majority of different ethnic groups. He has mentioned in his book 'Majhi' is actually a term used by the people for those people called 'Bote' in the Terai. They are also occasionally referred to a Kushar. All are identical Majhi, Bote and Kushar. They speak one language and follow the same pattern of life. He further writes

that Majhis are almost entirely fisherman or ferrymen on the rivers, where they use small dugout canoes for transport. Regarding the division of sir names Bista has mentioned that there are five types Sundhuwa, Kachhare, Thar Bote, Kushar Bote and Mushar Bote.

Similarly, Gautam, Rajesh and A. K. Thapa Magar in the *Tribal Ethnography of Nepal* (1994) have also provided some important information on the Majhi people of Nepal. According to them Majhis regards themselves as descendents of son of Ram, Kush. That is the reason they also call themselves as Kushar. Likewise, Nagendra Sharma(2052) has mentioned about the cultural tradition of Majhis. He has also mentioned about the rites and rituals, occupation, clothing and ornaments of Majhis.

Most of the studies conducted on Majhi are based on their socio-economic status, tradition, life cycle, rituals, demography and livelihood. Majhis are still limited and resided at the separate place. They live on hand to mouth condition because they do not have much land to cultivate. They catch fish for their nutrients. Various study clearly suggests the scarcity of land among them. Some works concerning the ethnographic study of different ethnic groups existing in different parts of Nepal have been conducting after opening to department of Sociology/Anthropology in Tribhuvan University. But this does not mean that there was not any work in this field prior to the opening of the department.

There exists still a great deal of confusion as to the true identity of the Botes and Majhis have been mistakenly identified as the same and one. This hasty conclusion will be unjust. On the other hand proper understanding of Botes is almost impossible without proper understanding of the Majhis (Subba, 1989). But some other scholars regard them as same Bista is one of them. According to them the difference is on the place of residence. In this context some scholars argues that the descendents of Kush are known as Kusher Majhi and that of Lav are known as Bote. These Botes take tree as Lav. In this context, it would not be otherwise to say that as being form the same descendents they can be called as Bote Majhi.

Similarly, Bhojraj Thapaliya, (2045 BS) states that Bote and Majhi are same. He says that Bote are courageous people because they can fight with crocodile and other big and

dangerous wild animals. On the basis of physical structure Majhis are supposed as Mongolians. He has studied on change of socio economic condition of Bote and Majhi People.

The Book entitled "People of Nepal" declares that there is equality of Majhi, Bote and Darai regarding their physical structure, language and cultural norms and values. Botes like to be called Kushar because of their ancestor is the Kush (Son of Ram). The book also throws some light on the tradition of marriage and death rituals of Majhi. Bhimsen is considered as great deity of Majhi. My study on the Majhi community of Baglung also supports this statement.

From the above studies by Bista, Sharma, Gutam etc we can say that Majhis livelihood has direct relation with natural resources. Their use of rivers for fishing, boating, use of land for agriculture, forest wood for fuel and livestock etc make them directly dependent on nature. As various previous studies showed climate change has various effects on the lives of people. Majhis dependency on nature made them more vulnerable to climate change. Because climate change has its effects more on the people whose livelihood are mostly dependent on natural resources (Aryal, S et, al. 2014).

The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014) found that communities who live in marginal lands and whose livelihoods are highly dependent on natural resources are among the most vulnerable to climate change.. Many indigenous and traditional peoples who have been pushed to the least fertile and most fragile lands as a consequence of historical, social, political and economic exclusion are among those who are at greatest risk. In living off the land and gaining knowledge through their relationship with the land, indigenous peoples have been observing the effects of global warming first-hand for several decades and have been developing coping strategies. They have observed changes in temperature, changes in the instances, amounts and qualities of rain and snow, and changes in seasons.

The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014) Part II pointed out that on a global scale indigenous peoples with limited adaptive capacity as a result of their dependency on natural resources and their limited information

access should be specifically considered in climate change research and policy making processes as they are expected to be disproportionately affected by climate change impacts including health risks, sea level rise, environmental hazards. In Part III it is again pointed out that vulnerability to climate change differs considerably across socio-economic groups and that indigenous communities who are already affected by other stresses are considered as being specifically vulnerable. If we take this reference too we can say that Majhis as being indigenous people are most vulnerable to climatic effect. In this light we can argue that changing livelihood strategies of Majhis discussed in Bista's "People of Nepal" are partly because of climate change too

## Chapter III

### Research Methodology

#### 3.1 Rationale of Selecting the Study Area

Climate change is burning issue in the global scenario. The literature review under the title 'Climate Change and Indigenous People' clearly states that indigenous people are more vulnerable to the climatic effects because of their direct dependence on nature. Majhis are one of the indigenous people living in different parts of the country. Baglung district is also one of the proper dwelling place of the tribal group. Their traditional occupation like boating, fishing and gold panning are changing due to various reasons. Climate change is one of the factor in the change. Long time ago as their profession was boating they used to be called as Botes but now the profession exists no more. As per the change in the profession in the long run they are now called as Majhis. Along with this there are lots of other changes in their livelihood pattern. Thus, to study about the Majhis perception on climate change, changing livelihood, and adaption strategies I have selected Amalachaur VDC, of Baglung as its study areas since the area is proper habitat of this minority community. The VDC is situated in the south-east of Baglung district.

Figure No: 1 Location of Baglung in the Map of Nepal

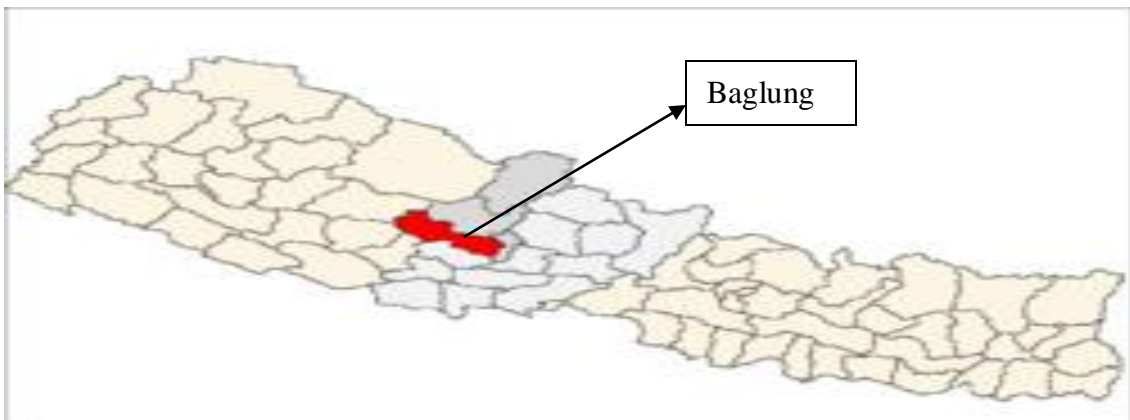
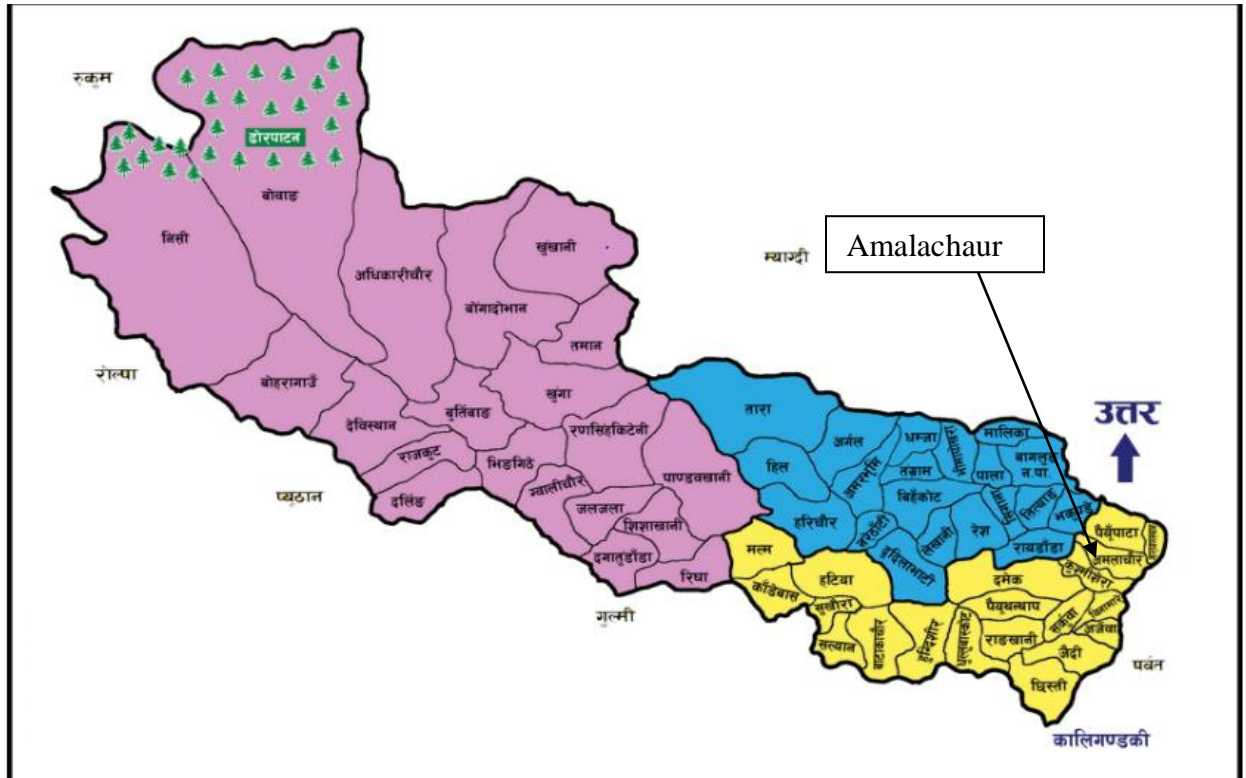


Figure No: 2 Location of Amalchaur in the Map of Baglung



### 3.2 Research Design

This research has incorporate descriptive as well as exploratory research design. The study is descriptive because it will describe the perception of Majhi people on climate change. Exploratory since it explores the relation between climate change and livelihood.

Moreover, it tries to explore the adaptive strategies followed by the people. The method of research designs is mainly collection of primary data through household survey and indepth interview based on the questionnaire. Likewise, collection of secondary data from journals, books, newspaper articles, research report, expert consultation and internet surfing. The collected data will be analyzed and results, discussion and conclusion will be compiled to form a report.

### **3.3 Nature and Sources of Data**

As for the need of the study, primary as well as secondary data are collected by applying various techniques. Primary data are collected via household surveys and indepth interview about their perception on climate change and their traditional as well as changing livelihood patterns. Moreover their newly followed adaptive strategies against climate change are also collected. Secondary data of climate change and impact on livelihoods are adopted from other researches journals, books, newspaper articles and other published and unpublished documents.

### **3.4 Study Population**

There are 20 households of Majhi with 140 population. Owing to the fact that it is a micro study, 40 persons mainly elderly Majhis who have long experience of climate change as well as their changing livelihood pattern and adaption issues are taken to study. Due to the nature of the study mostly I have chosen the elderly members of the community assuming that they are the witness of the ongoing change and have information and experience about changing climatic pattern of their locality throughout their lifespan.

### **3.5 Data Collection Techniques/ Instruments**

Household survey and in-depth interview are conducted for primary data collection. Literature review and secondary data related to climate change and its impact on the livelihood of vulnerable group are collected both from primary and secondary sources.

#### **3.5.1 Primary Data Collection**

##### **In-depth Interview**

In-depth interview based on the questionnaire is my chief source of collecting data. Local Majhis perception on climate change and the changing livelihood patterns as well as adaptive strategies are collected through checklist. For this I have prepared a detailed checklist which can gain the details necessary information related to my study. Owing to the fact that my research needs the understanding and experience of elderly people who have experienced several changed in climate as well as have knowledge on the livelihood pattern and the gradual change mostly I have selected elderly people. In



addition to know the changed view and adaptive strategies some educated middle aged persons are also chose. I have individually met and interviewed them to collect the necessary information.

### **Household Survey:**

This technique will be employed to collect the general information from the households. The data concerning on land use, production, occupation status, agricultural situation, livestock, changing livelihood, and some demographic data are collected. The familiarity to the subject in question will be determined on the basic of their experience and knowledge about climate change and other socio-economic aspects. Furthermore, this technique helped in rapport building. All the 20 household heads were interviewed and inquired about their perception on climate change, livelihood pattern and change in livelihood strategies due to climate change.

### **3.5.2 Secondary Data Collection**

Data related with climate change pattern in national and global scenario are collected from various published and unpublished materials. Likewise, the data of the climate change, temperature, pattern of rainfalls all are derived from the department of hydrology and metrology. Likewise, previous researches related with the research topic are collected from various published and unpublished books, journals, articles and dissertations. Similarly, the project reports made by the organizations like UNFCC, DHM, IPCC and ICIMOD too are regarded as the secondary sources of data.

### **3.6 Presentation and Data Analysis**

The qualitative and quantitative information are collected through in-depth interview. Likewise the secondary data collected from various sources. All available data are analyzed graphically in Microsoft Excel 2007 and charts, bar diagrams etc.

### **3.7 Limitation of the Study**

- The following limitations have been realized in this study.

- This study is confined only in Majhi communities of Amalachaur VDC, ward no. 9 of Baglung district therefore, the perceptions, findings and recommendations may not truly to other parts of Majhi.
- The detail physical vulnerability and impact assessment based on engineering tools was beyond the scope of study.
- The results of this study may be non-conclusive but are simply a small building block and insight into the Majhi community's perception on climate change and their changing livelihood strategies.

## Chapter IV

### Description of the Study Area

#### 4.1 General Background of Baglung District

This research is based on the case study of Amalchaur V.D.C of Baglung district. Now the district is a part of province no 4 under the federal system. The district covers an area of 1,784 km<sup>2</sup> and has a population (2011) of 268,613. Baglung is surrounded by Parbat, Myagdi, Rukum, Rolpa, Pyuthan and Gulmi districts. It has 59 Village Development Committees and one Municipality i.e Baglung Municipality. Baglung Bazar is district headquarter of the district which is situated on the bank of the holy river kaligandaki. Having many rivers and suspension bridges Baglung is also known as the district of suspension bridges. It is a hilly district, most of the population settled in the sides of the rivers. Fertile planes situated in the either sides of the rivers are used for farming. Hinduism and Buddhism are the major religions having Muslims and Christians in minor number. Rice, Corn, Millet, Wheat and Potato are the major crops of Baglung. It is also rich in herbal plants. Lots of mines were found but yet to be used. Baglung is rich in culture as it is the habitat of lots of cast and ethnic communities. The census 2011 has recorded the cast and ethnic group of Baglung which is presented in Annex III.

The table in Annex III shows that Majhis are one of the minority groups of Baglung district. The population of Majhi in Baglung district is 193 in which the number of male is 82 and of female is 111. They are marginalized in many ways. Their living condition is very poor. Some of the Majhi of Baglung live near the Baglung Bazar above the Kaligandaki river whereas majority of Majhis live in Sarangi of Amalchaur VDC, my study area. In the past the same Majhis were used to be called as Botes. But now they are known as Majhis. Regarding their real identity elderly Majhis says that they are Botes but the new generation perceive the term Bote in derogatory sense and wanted to be called as Majhis. The local government also recognized them as Majhis. Their surname in their citizenship card is also Majhi.

#### 4.2 Study Site: Amalachaur V.D.C

Amalachaur is located at an altitude of 1100 metres and covers an area of 35 hectares, which lies on the western bank of the Kaligandaki river. It is about 5km from Baglung Bazar or one hour walk from Kushma, the district headquarter of Parbat. The economy of the VDC mainly lies on agriculture. Main crops are paddy, wheat, millet, corn etc. Apart from this people of this village are largely involved in governmental jobs. The VDC is also not untouched from foreign job trend.

Brahmin, Kshetri, Gayak, Magar, Damai, Kami, Sarki, Majhi etc. are the main cast/ethnic groups of this VDC. The total population of the VDC is 6702 among them 3250 are female whereas 3452 are male. Majhi of my case study live in Sarangi village, which is on the eastern part of Amalachaur V.D.C.

My study is based on the Majhis living in Sarangi, Amalachaur. Majhis are the minority group even in the village. They are living in the village from a long time. They are the real indigenous people of the place. It is known from the survey that they were rich in land possession in the past but are in very poor now. Most of the Majhis are uneducated. They have very low status in the society. The following picture depicts the poor condition of Majhis.

Figure no. 3 House of Majhi people.



## **Chapter V**

### **Majhis' Perception on Climate Change**

One of the main objective of the research is to understand and describe the Majhi people's perception on climate change. Perception is individual peoples understanding. It is direct knowledge of and individual groups of their environment in the course of their practical action (Gibson 1979, as quoted in Ingold). So this chapter presents, describes and analyses local Majhis understanding and experience of climate change. Regarding the importance of understanding local people's perception Journal of Geography and Regional Planning (2008) quotes that the perspectives of the indigenous people, the way they think and behave in relation to climate change, as well as their values and aspirations have a significant role to play in addressing climate change (Doss and Morris 2001). For the convenience people's perceptions on climate change is presented based on some parameters like precipitation, temperature, humidity and due, and other climate related risk and disasters.

#### **5.1 Perception on climatic parameter:**

Majhi people as most of them are uneducated hardly ever heard the term climate change. Only 3 Majhis namely Suresh majhi, Sandeep Majhi, Prem Majhi who are students heard the term and know little about it. Apart from them all other respondents don't know what exactly climate change is? They could not identify any direct impact on their livelihood, thus I have asked their perception and impact based on some climatic trendline like temperature, wind, rainfall ect. Then they explained it in those climatic parameters such as temperature, precipitation, wind, mist and dew pattern and natural disaster. People have felt climate change and responded climate change in various ways as increase in temperature, unpredictable monsoon, increase in weeds in fields, change in potatoes cultivation time, and natural disasters. Most of them tend to recall the natural environment in the past and express their grievance on the change.

##### **5.1.1 Precipitation**

The most general way of expressing about climate change seemed to point about the changed precipitation pattern. Most of the respondents sharing their experience told that

rain fall pattern became unpredictable. They said that the rain fall has decreased in amount and it has also displaced in time.

Chakara Bahadur Majhi of 70 is the eldest person of the community expressed his experience on change in beginning of season's time and precipitation as:

"All seasons used to begin in their exact time in the past. where is that time now? All changed. In the past rainy season used to start in the months of Jestha. We used to sow paddy in the second week of Jestha but the rainfall has changed now the rainy season starts on the second week of Ashad-one month later. Ashad second in the past is the time all our fields used to be all green. But see now we haven't finished ploughing fields and sowing paddy. Now we can predict monsoon in any month it can downpour. Two years ago rain downpoured in Manshir and destroyed the paddy crops. In the past there used to be Shrawani *jhari*(continuous rainfall). where has it gone now? It became so unpredictable that *jhari* can occur in Manshir what to say! In the past in rainy session we could not go anywhere crossing the rivers but now in Ashad also there is no water to sow paddy, I am the live witness."

Figure no 4. Chakra B Bote Majhi expressing his perception on climate change.



Listening the conversation Matuli Majhi of 61 years added

When we want water there is no waterfall but it comes to destroy the ripen crops. The temperature is also high in these days. Mosquitoes are also growing rapidly. Rainfall is not like in the past. In the past it certainly used to rain in Bhadra 1, and Poush 1 but now it is uncertain. Because of the lack of water in time our crops are now growing well. In addition new kinds of unnecessary weeds grow. Nothing grows what to eat? how can we survive?

Suresh Majhi of 18 who is who is SLC graduate knows little about the past rainfall but he says that now it is hard to sow paddy in time because of the lack of water. He knows little about climate change and says that this is all happening because of the increase in temperature because of the emission of green house gases.

All the respondents opined that the rainfall pattern has changed and rainfall is decreasing in comparison to the past. The average yearly and monthly precipitation records taken by the Department of Hydrology and Meteorology also shows that there is significant variation in the timing, frequency and amount of rainfall, that supports the perception of the respondents.

The rainfall of Baglung in different years as recorded by Baglung station is presented below. The station is situated as follows:

Latitude(deg/min): 2816,

Longitude(deg/min): 8336,

Elevation(m): 0984

Table no: 2 Rainfall of Baglung in mm different years as recorded by Baglung station

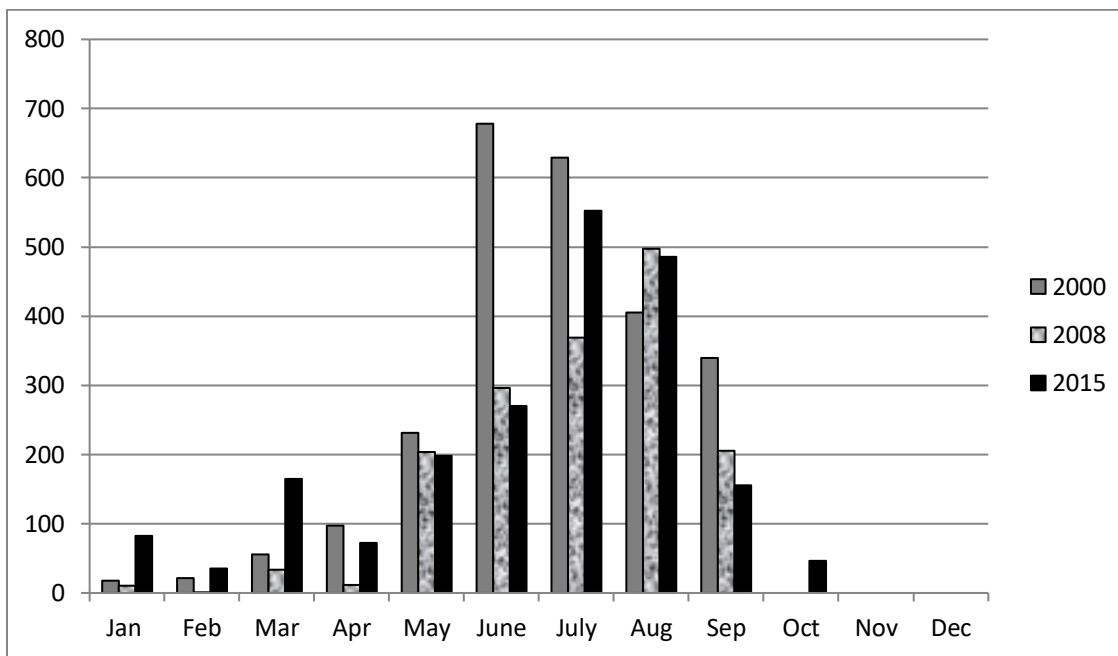
Year/ Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2000	17.8	21.3	55.7	97.1	231.2	677.8	629.3	405.7	339.6	0.0	0.0	0.0
2008	10.5	0.3	33.6	11.6	203.7	296.3	369.0	497.4	205.4	0.0	0.0	0.0
2015	82.6	34.9	164.4	72.1	197.8	270.6	552.2	485.9	155.8	46.1	0.0	0.0



(Source: Department of Hydrology and Metereology, Nagpokhari, Ktm)

The data can be presented in bar diagram as follow:

Figure no: 5 Bar diagram of Comparative study of rainfall of in the years 2000, 2008 and 2015



Baglung station of Department of Hydrology and Meteorology is one of the nearest station from Amalachaur VDC. It has recorded the rainfall pattern since long time. Above is the data of precipitation recorded by the station. For the analysis of variation in the rainfall I have taken the data of 15 years that is since 2000 to till 2015. For convenience I have presented and data of three representative years. The above data shows that the precipitation pattern is changing over time. The above comparative study of the rainfall clearly show that in the past in 2000AD heavy rainfall used to start in the month of June but the rainfall starting time has been gradually changing. Even in the year 2008 the heavy rainfall time shifted to July. In 2015 the heavy rainfall started in the month o July. June/July is the month of rice plantation. The change in rain pattern has directly affected the plantation time. Moreover, data also shows that rain is increased a bit in the moths of January, Feb, and Apr months but decreased in other months. Only 4 months in a year the rainfall of 2015 increased in comparison to the past on the other hand other 8 months rainfall has decreased. From this we can say that in average the rainfall is decreasing.



Another nearest precipitation recording centre of Amalachaur VDC is Rankhani station.

The station is located as follow:

Latitude(deg/min): 2809

Longitude(deg/min): 8334

Elevation(m): 1740

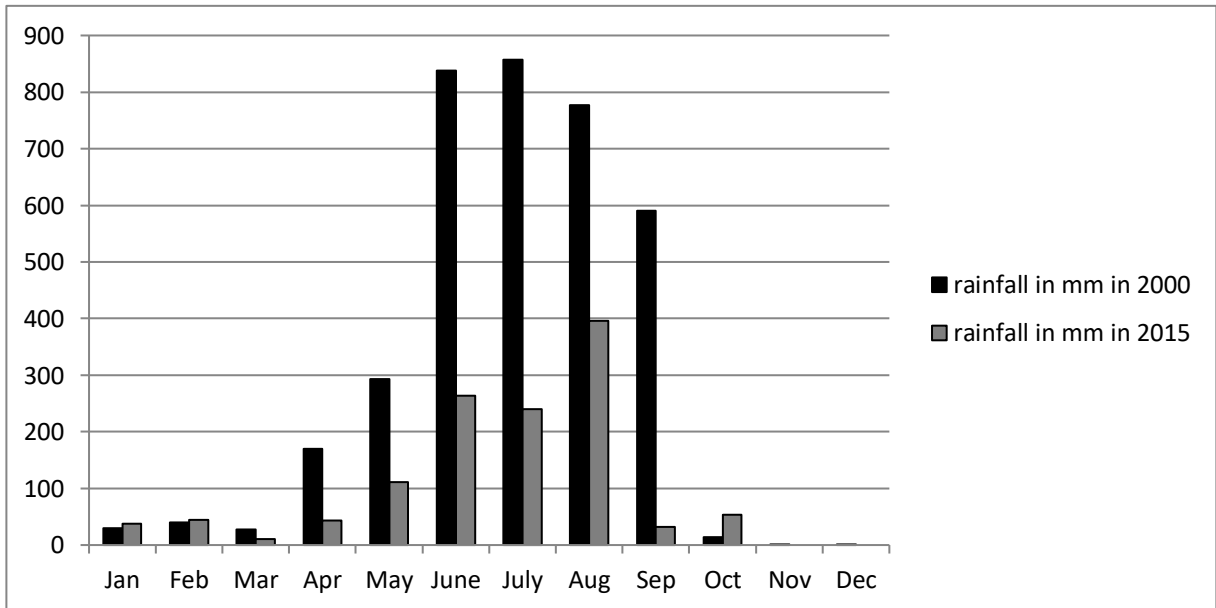
The precipitation pattern recorded by the station in different years is presented below.

Table no: 2 Precipitation pattern of different years as recorded by the Rankhani station.

Year/ Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2000	30.2	39.8	27.2	169.8	292.6	837.5	857.0	777.3	590.0	14.4	0.6	0.8
2008	14.9	5.3	46.7	147.2	192.1	640.6	516.2	789.0	360.8	51.3	0.0	6.2
2015	37.2	44.5	10.1	43.2	110.7	264.2	240.2	396.5	32.4	53.7	0.0	0.0

The above data can be presented in bar diagram as follow:

Figure no: 6 Bar diagram showing the rainfall in 2000, 2015 as recorded by Rankhani Station



The data presented in the above bar diagram as recorded by Rankhani station clearly shows the decreasing rainfall. The diagram is crystal clear to claim that in amount of rainfall is less in the time of paddy plantation. In addition lack of rainfall in the month of Oct, Nov, and Dec hindering the growth of winter crops.

These data recorded by the Department of Hydrology and Meteorology also verifies the perception of the local Majhis perception and the difficulties faced by the Majhis in recent years.

### 5.1.2 Temperature

Temperature is another significant means to perceive the change in climate. Most of the Majhi people when asked about the climate change they replied in response to temperature. Most of the elderly respondents noticed a significant change in the temperature. they viewed that days are becoming warmer in comparison to the past. Some of them argued lack of water in the *Kuwa* (a small source of pure water) is because of increase in the temperature. Karna Bahadur Majhi of 59 argued said that "there used to be white snow covering the nearby eyesight hills till late winter. But now only mt. Dhaulagiri is seen covered with snow."

One of the elderly Majhi, Hari B. Majhi of 62 viewed climate change mainly in terms of increase in temperature.

Figure no 7. Hari B Majhi sharing his experience on increasing temperature.



Now a days the temperature is very high. We have to wear bulky clothe almost all over the year but now it is very hot eve to wear thin cloths. The winter nights used to be very cold, they are cold now also but not like in the past. Now a days sun also rises early. Because of the hot temperature crops and vegetable also grows less. Dust covers the sky because the hot. Now a days mosquitoes are also increasing. In most of the vegetable corps are various unheard diseses, Now a days in you plan potatoes there will occure *dadelo* (a kind of disese in potatoes which causes dry and burned leaves).

But one thing he confuses even in this type of dryness too there are more trees on the hill than in the past. His son Hemanta Majhi explain that "that is-in the past people used to leave their cattle all over the jungle and they used to destroy all the sapling. But now people are deliberately conserving the jungle."

Manrupa Majhi of 67 years old agrues that many things have changed and life is becoming more and more difficult. She said

Figure no: 8 Manrupa Majhi expressing her opinion on climate change.



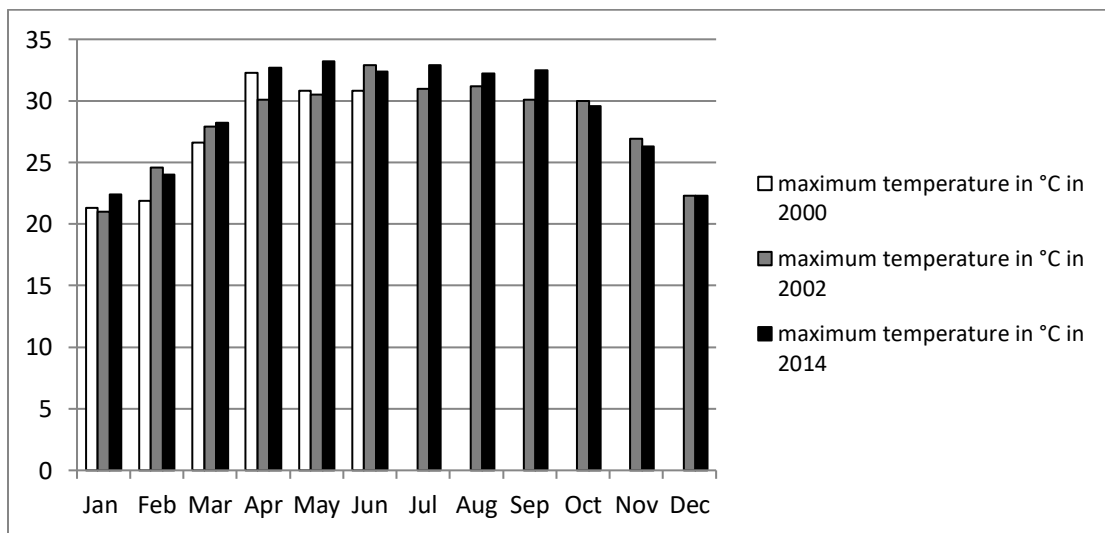
"Now the crop growth is one third less than in the past. In the past the same field used to yield seven *Muri* but now only three *Muri*. In the

past our 8 member family used to sustain on the field. Can we now? How? if we can why the sons has to go abroad?... In the past they used to do fishing in Kaligandaki river and even in Dhape khola but now there are very less fishes. The rainfall also erratic, flood in the monsoon has taken my fields.

Other respondents also have similar kind of opinion regarding climatic regime. Almost all agreed that the temperature is increasing and the crop yielding is not like in the past.

Temperature related data of Baglung station are not available in full extent so I have tried to analyze the data recorded by the Kusma station which is nearest station from the village. Kushma is only one hour walk from the village thus the data can correctly represent the temperature of the village. The temperature of different years as recorded by the Kushma station of Department of Hydrology and Meteorology is presented below.

Figure no: 9 Bar diagram showing the temperature's comparative data of 2000, 2002 and 2014 of Kushma station



Source: Department of Hydrology and Metereology, Nagpokhari, Ktm.

The temperature related data of 2015 is not available even in DHM thus I have tried to analyze the available data up to 2014. Only first six months data of 2000AD is available and the data of 2001 is not available thus I have compared the available data of 2000 and the data of 2002 to the data of 2014. Here, the above data clearly exhibits the increasing

trend of temperature in the recent years. According to the data the temperature of January 2000 is 21.4 degree Celsius, and that of 2014 January is 22.4 degree Celsius. Likewise, the temperature of May 2000 is 30.9 whereas the temperature of the same month of 2014 is 33.2. Similarly, the temperature of April and May of 2002 is 30.1 and 30.5 respectively whereas the temperature of these month of 2014 is 32.7 and 33.2 respectively. In addition other months temperature of 2014 is also high in comparison to the past year. The data presented in the bar diagram is crystal clear to show the increment of temperature in the study area. This data also verifies the respondents' opinion on temperature. This in increment in temperature has various negative effects in the livelihood of the people.

### 5.1.3 Mist and Dews

Mist, dew and humidity are also another important component of the climatic regime. They also contribute to form the climatic condition. During group discussion and even in the personal interview few respondents raised the issue of mist and dew. Elderly Majhi have the experience that mist and dew helps to make the soil moisture and lightly wet which can make the fields fertile. Further it makes the plant survive even in the dry season. Only few elderly Majhi has noticed the significant change in dew pattern. In this context Karna Bahadur Majhi of 59 explained:

Figure no: 10 Karna B. Majhi specifying his experience on changed trend of mist and dew.



"Till a decade back there used to be sufficient dew to moisture the soil. During winter season in the months beginning from Mangshir to Falgun there used to be dense mist all over the field. In the month of Mangshir and Poush the dense dew used to exist till late morning till 10 am in the morning. That used help in the growth of winter crops even in the absence of water. But now a days there is no such dew. So the winter vegetable and other crops like mustard, wheat grow healthy in the absence of water."

Likewise, Jamuna Majhi opines that

" till 5, 6 years ago the khet and bari used to be white because of the prevalence of the dew. It used to be so thick as if snow has fallen at night. Dew fall in these winter too but it is very less, not as in the past."

Ram Bahadur Majhi, Ram Majhi, Kamala Majhi and others have also noticed the change in the dew pattern and opined similarly. Unlike other elements discussed earlier dew and mist pattern change is less noticed by the people. Only 65% of the elderly people well noticed the change. Other Majhis seemed less careful about dew and mist. About 25% respondents do not found any kind of difference whereas 10% have not clear cut idea about it. Whoever engaged in agriculture keenly are found well familiar with this pattern.

## **5. 2 Perception on Climatic Risk and Disaster.**

The natural disasters causes significant damages in the socio-economic assets of the community. The damage and loss is mainly loss of agricultural land, destruction of habitat, and damage of the crops. These kinds of effects makes the poor indigenous community poorer and makes their lives even more miserable. For the rural people agriculture and livestock are the major livelihood options. Landslide, soil erosion, erratic rainfall and prolonged drought days are threatening the agricultural system. So these climatic risks and disasters in the life of people are the most natural forms that community people perceive as climate change.



For Majhis climatic risk and disaster are even more serious matters of grievance. Majhis are the indigenous people directly relying on nature i.e rivers, sand, soil, forest etc. Their traditional occupation is boating, fishing and searching for gold in the river banks. Climatic fluctuations, thus directly affected them to say intensely displaced them from their occupation. As Crate argues local people classify and understand the climate related disaster according to the hazards that affect the existing human environmental relationship to the socio-cultural environment( Crate 2009). Most Majhis responded climate change with the climatic disasters. They have list of miserable incidents where flood and landside have swept away their limited fields. Their fields covered with sand, concrete and stones. Crops destroyed by erratic downpour of rain and hailstorms. The Majhi community together has the experience that the frequency of the climatic risk and disasters has increased.

Guma Majhi who is 49 years old expressed her perception on climate change in relation to climatic distaters. She said

Figure no: 11 Guma Majhi expressing her perception on climate change in relation to climatic distaters.



Increase in flood, landslide and temperature are the climate change. Several people are dying because of land slide and flood that

might be because of climate change. Two years ago (2070) the *Dhape Kholo boulayo* (became large and uncontrolled and swept the *Arjun Khet* leaving no sign. All turned into river bank. This kind of unthikable incidents might be the cause of climate change.

Harka Bahadur Majhi has also similar opinions. He argued

in the past it is thought and having field in at the side of river bank is very good. We could irrigate very easily. Rainfall pattern is also very normal. flood and landslides would not occur that much. People having field near river think themselves very lucky, and proud to irrigate and plough the field in the starting season. I am also one of them. But now because of these natural calamities whoever has field at the riverside can not sleep well in the monsoon season. five years ago(2067) one third of the field was taken by the river and recently while taking the field of Guma next one third was taken. Now I have very little. Despite the of the low irrigation facility, some time I think of hilly fields are better, but the crops face the problem of hailstorm time and again.

Ishwori Majhi and Devi Majhi have also their own understanding of climate change in relation of climatic disasters. Both have very little *Khet* and *Bari*. In the name of field they two small fields( *sana Phota* ) that yields 30 *pathi* and *Bari* gives one *muri kodho*. But snow a days that is also decreasing because of hailstorm, erratic monsoon pattern and problem of monkeys. Interestingly they argues that increasing number of monkeys are also cause of climate change.

**Table no: 3 Number of Respondents Facing different climatic disasters**

Categories of the climatic risk and disaster	Number of the respondents	Percentage
Flood	9	22.5
Douught	27	67.5
Landslide	3	7.5
Hailstorm/ wind	27	67.5
Forest fire	2	5



The above data shows that Majhi respondents are affected from climatic disasters in the agricultural sector. But even more important is the fact that 95% of the Majhis have left their traditional occupation i.e. fishing and searching for gold. Whereas 100% of Majhis have left boating. This data shows the seriousness of the climatic effects facing by Majhis.

To sum up, most Majhis thought they don't know the theoretical aspect and what causes climate change, they felt its effects in their everyday life. In one of my questions, "What do you think why the monsoon, temperature are changing and why the natural disasters are happening?" 67-year-old Manrupa Majhi said, "Mankind are becoming corrupt, they have forgotten religion so God is also becoming merciless to humans. Thus, these kinds of various natural calamities are happening." This is one of the strong evidences that Majhis do not know the cause much but are facing the effects in their life. As most Majhi people perceived, climatic risks and disasters are increasing in recent years. Global and national data also clearly indicate the increase in the frequency of natural disasters in the last few decades. The 2009s great flood in the far-western region, the 2072s landslide in Jure, Sindhupalchowk, yearly floods and large destruction in the Terai region, the 2072s flood in Myagdi, the 2073s nationwide flood and landslide-related incidents are some examples of an increase in climatic disasters. Different analyses revealed that weather/climate (hydro-meteorological) induced disasters are the principal contributors to the present increasing trend of natural disasters (Regmi and Adhikari 2007). People's understanding and experience regarding climatic regimes is important to understand. It can provide easy access to conduct awareness programs and implement adaptive strategies pertaining to local practices and indigenous knowledge.

The respondents' perception on climatic patterns can be summarized and analyzed through the table (Annex IV). The above table shows the respondents' perception on climatic patterns like temperature, rainfall, mist, and dew and natural disasters over 15 years. Among the total 40 respondents, 70% (n = 28) are male, whereas 30% (n = 12) are female. Respondents' perception on temperature shows that 75% of respondents opined that temperature is increasing, 15% (n = 6) said that it is constant, and 10% have other kinds of mixed opinions. Likewise, regarding rainfall, 87.5% (n = 35) of the respondents have said that it is decreasing in recent years. In the same way, 12.5% (n = 5) have other kinds of opinions like constant, decreasing, etc. In terms of mist and dew, 65%

(n=26) said that it is decreasing, 25% (n=10) see no difference in the pattern and 10% (n=4) have no idea of it. In addition, I have collected their experience and opinion regarding natural disasters. Among the total respondents 75% (n = 30) opined that natural disasters are increasing where as 15% (n = 6) said that it is constant. As described above their opinions are almost similar to the data collected by DHM over 15 years.

## Chapter VI

### Climate Change and Changing Livelihood Pattern of Majhis

It is well known fact that indigenous people are more prone to the climatic changes. Climate change poses threats and dangers to the survival of indigenous communities worldwide, even though indigenous peoples contribute little to greenhouse emissions. In fact, indigenous peoples are vital in utilization and conservation and may therefore help enhance the resilience of these ecosystems. In addition, indigenous peoples interpret and react to the impacts of climate change in creative ways, drawing on traditional knowledge and other technologies to find solutions which may help society at large to cope with impending changes. This chapter explores and analyses the relationship between climate change and the changing livelihood strategies of the Majhi communities.

#### 6.1 Climate Change and the Status of Traditional Occupation of Majhis.

It has been universally accepted fact that world climate is changing more vigorously at present than any time period in the past putting greater threats to the wellbeing of human beings as well as earth system. Climate change poses differential vulnerability for different communities, sectors and regions. People, whose subsistence livelihood is based on the direct utilization of natural resources are most affected by climate change and have different but accurate perceptions of climate change than those people following modern lifestyles (Aryal S, Maraseni TN, Cockfield G2014). Livelihood refers to their means of securing the basic necessities -food, water, shelter and clothing- of life. Livelihood is defined as a set of activities, involving securing water, food, fodder, medicine, shelter, clothing and the capacity to acquire above necessities working either individually or as a group by using endowments (both human and material) for meeting the requirements of the self and his/her household on a sustainable basis with dignity. A common understanding of livelihoods is given by Chambers and Conway:

A livelihood comprises the capabilities, assets (both natural and social) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stresses and shocks, maintain or enhance its

capabilities and assets, both now and in the future, while not undermining the natural resource base. The activities are usually carried out repeatedly.

To know the impact of climate change on the livelihood it is necessary to understand the traditional ways of occupation. However, there is no cross sectional data to analyze the traditional livelihood strategies of the community. Based on qualitative data generated from the interview and informal talks, efforts are made to sketch their traditional way of earning livelihood.

### **6.1.1 Boating**

The main traditional occupation of Majhis is boating. Their tribal name is also said to be derived from their activities of boating. They used to earn some money from boating. In the case of Majhis of Amalachaur, Sarang only very few elderly Majhis remember their activities of boating. Chakra B Majhi said that some 40 years ago they used to do boating in Kaligandaki river. At that time there were some wooden bridges but in far distance. He remembers, they used to help people cross rivers by taking very little amount of money or food grains. Manrupa Majhi explained, her husband Dal B Majhi used to meke small canoe with the help of logs; do boating; return with some food.

### **6.1.2 Fishing**

Another main traditional occupation of Majhis is fishing. Fishing used to be the main source of income for Majhis. They are practicing it since very long of time. Indeed Majhis are all season fishermen. Majhis have great deal of experience in fishing and have very good knowledge of fishes. They catch fishes in the rivers. They use different fishing techniques according to seasons. Like using nets; using hooks; changing the main course of small rivulet; using sharp sticks and removing water from the small ditches in the river.

But now a days fishing is not like in the past. Indra B. Majhi of 34 said "we are still fishing. But it not like in the past. Now there are not enough fishes. In the past I used to do it professionally whereas now I do it when there is no other labour works."

But these days their traditional income source fishing is totally shifted due to the various reasons i.e. not getting sufficient fish from the river, dam in river, other caste are also

fishing in the same river. It is interesting that researcher found some of the Majhis are very sad because before 20 years when they went the river they collect 30-40 kilograms fishes at a time within a few hours but now they are not getting 2-3 kilograms even they spend whole day.

### **6.1.3 Gold Panning**

Gold panning in the sand is also Majhis typical traditional source of income. Through the use of net and other tribal equipments they search for tiny particle of gold in the sand. They collect such tiny particles and when that becomes bit large in amount they used to sell it in nearby market. Sundar Majhi explained that if they do the job throughout the day they collect 1 *Lal* ( local measurement of gold) which costs 400 rupees.

### **6.1.4 Agricultural Activities**

In the past days the Majhis of Sarangi are very rich in land possession. Apart from the above mentioned typical occupational activities they involve in agricultural and animal husbandry. Those Majhis who used to have enough land, they used to sustain through agriculture. They cultivate different crops and vegetables like paddy, maize, wheat, potatoes, and other vegetables.

Animal husbandry is another livelihood strategy of the Majhis. They have been rearing different kinds of animal since long time. They mainly rear animals for agricultural purpose, for their diet and for income. Traditionally they used to rear oxen, cows, buffalos, goats, hen, duck ect.

## **6.2 Changing Livelihood strategies of Majhi**

climate change has diverse impact on the livelihood of the Majhi community. In the past Majhis' livelihood, as discussed in the past were mainly boating, searching gold traditional way of farming and animal husbandry. But now their livelihood strategy has changed drastically. In the past about 20 years ago most Majhi family 17 out of 20 used to depend on the above mentioned traditional profession. Only three households who don't have active working members used to depend on agriculture only. But now the scenario drastically changed. None of the family solely depend on boating, fishing and searching

gold. Boating has completely vanished. Fishing and searching gold are still in practice but as optional means of income.

There is strong relation between climate change and the change in the occupation of this indigenous community Majhis. Boating was replaced due to various reasons. Unpredictable monsoon is one of them. According to the local Majhis facility of bridge has completely replaced boating. As Karna Bahadur Majhi explained in the months of Baisakh ,jesha, and Ashoj boating became very risky job.the normal river in could become very big unexpectadly might be another pushing factor.

Fishing was very secure job of the Majhis. "Till a decade ago there used to be enough fishes in the rivers. If we go and invest on e whole day we could catch 20 to 25 kg of fishes. But now if we stay whole day long we can have only 5-8 kg." explained Kul Bahadur majhi. In my question why that is happening? he replied-

first of all the water level has decreased. In the past Dhape khola was enough to have 10 kg fishes. But now the water level in the river has decreased in the way that in dry months there would be no water. That has caused the death of small fishes. Flood and landslide in recent years has swept most of the fishes and it seemed that they have changed their habit. Apart from this most people are suing electric currents which has vastly decreased the availability of the fish.

Mangal Majhi added in addition to with what Kul said "now a days other cast and tribal people are also involving in fishing. Anyway the vital cause is of drying of rivers, flood and use of current."

Kamal B. Majhi of 39 works as a laborer in building houses and roads. He explains when he does not have the labor job goes to fishing that is mainly for the family food and if he would be able to catch more he could have some money too. All the 40 respondents have the same arguments regarding the loss of fishing occupation.

Another important source of income is gold panning. Most of the elderly Majhis have the experience of searching gold in the sand. They said it is almost replaced by various reasons. One of the elderly Majhi, Jhamak Majhi said

Now we don't get enough gold. In the past we used to get 2 *Lal* gold but now we could hardly get 1 *lal*. sometimes we have to return empty handed. That is one reason in addition to this now a days people are taking sand using excavators tractors. Sometimes flood and landslide covers the sea cost and with mud that has also made the job difficult. Further, now here are very few elderly people, youths are becoming engaging in other jobs like reasons the job is being replaced.

Moreover, dependence on the traditional way of farming has been changing. The agricultural system is highly dependent on the climatic factors such as rainfall, temperature, humidity, radiation and so on, the intrinsic factors such as soil texture, soil nutrients, soil moisture, and the living organism such as soil microorganism, pest and animals. More than 95% Majhis depend on the traditional cultivation practice that relay on seasonal rain fall. So it is obvious that change in climatic pattern has direct impact on the agriculture of the community. For the analysis of climatic impact on agriculture I have collected the tentative data of food sufficiency that is presented as follow:

**Table 4: Food Sufficiency Status of Households in comparison to past.**

S.N.	Food sufficiency	Food sufficiency status of households	
		Households 15-20years ago	Households Now
1.	12 months or more	2	-
2.	6-11 months	4	2
3.	3-6 months or less	8	6
4.	3 months or less	6	12
5.	Total household	20	20

Source: Field Survey, 2016.

The data is mainly based on the agricultural production and support in the family. Since there is no accurate recorded standard to measure data food sufficiency, the data is based on the reply of the respondents. The data clearly shows that the food sufficiency is decreasing. There might be various reasons behind the insufficiency. The reasons they

explained are decrease in land due to food and other reasons like selling. Drought, lack of rain, increasing diseases etc. According them the food production has increased 5, 6 years ago when they started to use pests and chemical fertilizers but now it is not increasing like in the past. If not we can say the change is solely because of climatic effects the reasons put forwarded by the households gave a space to argue that along with other reasons climatic change has negatively affected the food production.

The respondents have perceived and experienced the adverse climatic effects in various ways. Change in rain pattern, problem of drought and change in cultivation and harvesting calendar are perceived by many. Chakra B. Bote Majhi says that they used to plant paddy in Jestha, but now in the second week of Ashad. Change in the maize plantation time also observed by the respondents. Mangal Majhi argued that they used to plant maize in first week of Falgun but now they plant in last week of Falgun. Along with the change in the planting time there is change in the harvesting time too. Next adversity they observed is loss of productivity of the crops. They have experienced the loss of production in maize, rice, millet etc. "production has half decreased in comparison to past." said Manrupa Majhi. Likewise, Rupa Majhi argued "It is not like in the past. In the past it used to grow much without chemical fertilizers and pests, but now if we don't use them production decreases in vast amount."

Another adverse effect experienced by the respondents is increase in diseases in crops and vegetables. For instance *Papeto* in rice, *Kalo poke* in maize, *Dadelo* and *Kamila* in Potatoes. Moreover, due to the necessity to use chemical fertilizers, pesticides and insecticides the production cost is also increased. Now a days they are using wide variety of genetically modified crops especially on rice, maize and vegetable items. Emergence of unnecessary weeds is another problem faced by the respondents. They have witnessed such weeds especially in rice, millet, and potatoes. "*Nilo Boke*, *Hanuman*, and *Rato jhar* are seen in most of the crops in recent years." said Dil Kumari Majhi. Some other elderly Majhis argued that now they cannot feel all six seasons, only three seasons summer, rainy, and winter seasons can be felt clearly.

Livestock is an inseparable part of agriculture in Majhi community. Apart from that impact on agriculture climate change has impact on livestock also. Livestock plays a



pivotal role in the process of the intensification of Nepalese agriculture. In the hills and mountain it is one of the important adaptive responses of the people to their environment which is generally known as the mountain specification of the livelihoods (Jodha 1992) .

Seventy percent (n=28)of the Majhi respondents argued that there is significant change in the livestock farming, the system has changed. Though they have not directly associated the change with climate change in fact, the reasons of change they explained clearly indicate that the cause is climate change. The causes they pointed are lack of availability of fodder due to the decrease in crop production, water, decrease in forest and lack of access to it, change in climatic parameters, increase in temperature, grazing land decrease, and various diseases to animal. Increasing climatic risks and are also posing serious problem in livestock farming.

On the one hand Majhi people now possess very few land on the other productivity is decreasing. As told by local leader Hari Paudel Majhis used to possess enough land but their land has been decreasing because of flood, land slide like natural calamities and most land is sold by Majhis as they don't have permanent source of income. Ishwori Majhi has the opinion that when fishing and finding gold decreased they engaged themselves in agriculture others dispersed in searching new ways of earning.

Because of the severe impacts seen in the traditional occupation of the Majhis they are changing the livelihood strategies. Now a days Majhis are following different occupation like ploughing the fields, making houses, both as laborer and mansion, becoming driver, engaging in small entrepreneurship, working as a wage labour, making plough, baskets and other craftsmanship etc. Over a decade ago more than 90 percent of Majhi people used to engage in the traditional occupation discussed above now it has changed. Now the Mjhis are found to be engaged in different occupations like mansion, force labor, ploughman, business, driving, and other job. The change in the livelihood can be shown in the following figure.

Table no: 5 Respondents engaging in different occupation.

Livelihood strategy	Number of respondents	Percentage
Mansion	3	7.5
Wage labour	10	25
Ploughman	8	20
Craftmanship	4	10
Poultry	2	5
Driving	2	5
Government and other job	4	10
Others	7	17.5
<b>Total</b>	<b>40</b>	<b>100</b>

source: field survey 2016

The above data shows drastic change in the livelihood strategy of the Majhi people. Though above mentioned Majhi respondents also engage in agriculture and fishing in one way or other that is not their main source of livelihood.

The whole discussion is evident enough to claim that Majhis livelihood strategies are changing in recent years and among other reasons climate change is one of the vital factors behind the changes.

## **Chapter VII**

### **Coping Mechanism and Adaptive Strategies of Majhis**

The chapter deals with the present coping mechanisms and adaptive strategies followed by the Majhis. Moreover, the difficulties in the path of adaption are also discussed.

#### **7.1 Coping and Adaptive strategies followed by the Majhis**

Generally coping and adaptations are used interchangeably in the context of climate change and disaster management. However, there is a slight difference between these notions. Coping is an action or process of overcoming a problem or difficulty. It is a way of managing or enduring a stressful situation or condition. In the context of climate change it is an instant or short term response to the climatic adverse effects or hazards. Whereas, Adaptation to the climate change is about taking deliberate and considered actions to avoid, manage or reduce the consequences of extreme climate and to take advantage of the opportunities that such changes may generate. Adaptation is an ongoing process of adjusting to changes, with no end point. This means that defining successful adaptation is more about the sustainability of processes and the principles of fairness and equity than it is about measuring outcomes at any given point in time (Hurlimann et al. 2014). Successful adaptation is therefore a matter of “socially and environmentally sustainable development pathways, including both social justice and environmental integrity” (Eriksen et al. 2011:8). NCCARF regards it as consisting of actions undertaken to reduce the adverse consequences of climate change, as well as to harness any beneficial opportunities. The IPCC defines adaptation as the, “adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.”

An important distinction between coping and adaptation that is made in the new Intergovernmental Panel on Climate Change special report on extreme events and

disaster risks. It quotes Lisa Schipper, an SEI-US senior scientist and co-lead author of the relevant chapter in the IPCC report. Coping is a way of responding to an experienced impact with a shorter-term vision (for example, one season), and adaptation is the process of adjusting to change (both experienced and expected), which is longer term (for example, over a decade or longer).

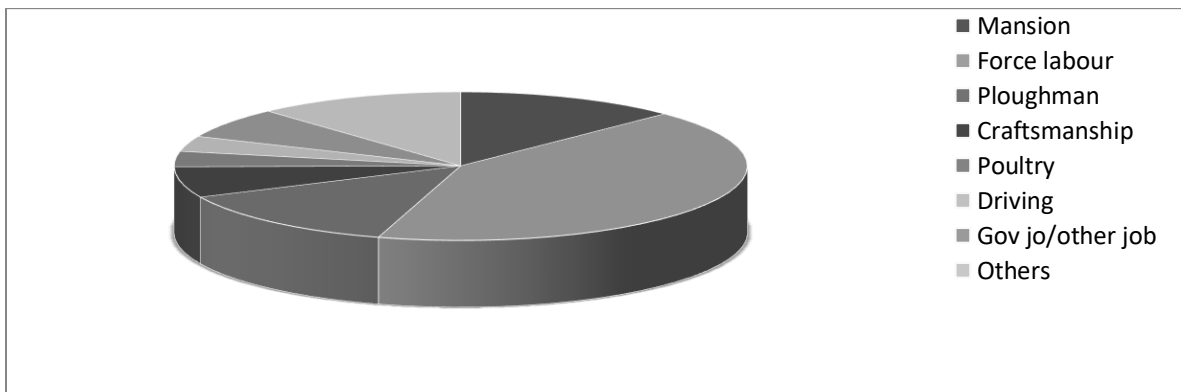
The practical difference between coping and adapting is that coping strategies of today are likely to undermine opportunities for adaptation in the future, through unplanned and unstrategic use of resources, including social networks.

When the traditional occupation and way of farming faced severe climatic effects and could not support the family Majhis have tried to cope and adapt to the situation in several ways. The coping and adaptive mechanisms followed by the Majhi community are presented below.

### 7.1.1 Diversification of the Income Source

From the field study it is clearly seen that the people have already experiencing the consequences of impact of climate change in their traditional way of occupation and farming. As they face the adverse effects they have started adapting some coping and adaptive strategies. Now a days Majhis are involving in different occupations among 40 respondents 7.5% are mansion, 25% are laborer, 20% are ploughman, 10% are involving in craftsmanship, 5% are poultry, 5% are drivers, 10% are drivers, and rest 17.5% are engaging in other jobs like farming. Income diversification of Majhis through engagement in those various occupation is presented through pie chart below.

Figure no: 12 Pie chart showing the respondents engagement in different occupation.



As the past occupation and farming alone could not support the living most Majhis followed different occupations mentioned above. Thus, Income diversification has emerged as a central adaptation strategy of Majhis. People with diverse income source have appeared more resilient than those with fewer income sources. Some local intervention and initiatives in resilient path are explored as following:

### **7.1.2 Agriculture and Livestock**

Adaptation in the agricultural field entails larger advantages. Agricultural adaptation include adjustments in planting and harvesting dates, change in tillage practices, crop varieties, species and rotations, fertilizer, herbicide and pesticide application, improvements in irrigating efficiency and instillation of new irrigation facilities (Parry and Carter, 1990, Reilly 1996 in O'Neil, MacKellar and Lutz, 2007). Majhis are the indigenous people mainly depending on the natural resources. As their traditional occupation like boating, fishing and traditional way of farming was threatened by the adverse climate change they deliberately or unknowingly coping and adapting to it. As the monsoon pattern changed they have changed the time of planting and harvesting. So they did in the case of drought. Especially they have changed the time of rice and maize. Moreover, as the old crops gradually failed to yield more production they have changed the type of seeds.

One of the adaptation strategy is changing the cropping variety. As the past crop variety failed to yield more like in the past. Now they are using new crops variety. For example the past variety of paddy are *Anadi*, *Guduro*, *Aanpjhutte*, *Ashami*, *Gauriya* ect . But now they have started to use genetically modified variety of crops like Masino Guduro, Bhatte Dhan, Kali Dhan, Jarneli, Jetho Budo, Marsi Dhan, etc. Likewise, new variety of maize like Murali Makai, Bikasi Thulo Makai etc are cultivated. In this way they have selecting the crops that suits to their land and environment. Majhis have also started to grow some cash crops like mustard, lentils and beans. Now they are using different types of insecticides and pesticides against the diseases and chemical fertilizers for more productions.

Livestock is another income generating and adaptive strategy followed by the Majhi community. Now a days they are found attracting towards livestock holding. Livestock possession of the household is as follows:

Table: 6. Livestock holding by the households.

Types of livestock	Number Household
Cow	5
Buffalo	11
Goat	17
Pig	-
Poultry	2
Hen	18
Duck	15

In terms of livestock Majhis used to rear cows and buffalos for agriculture and milk purpose. Now they are Hybrid types of cows and buffalos that could give more milk which they can use in home and can earn some money by selling the additional. Now they are attracted to the other domestic animals like chicken, duck, goat etc. Two of the Majhi are conducting poultry form. Goats and hens are the additional source of income to the community now.

Figure no. Goats as livestock in Majhi Community.



### 7.1.3 Commercialization of the traditional Craftsmanship

Some of the Majhis have the some traditional craftsmanship. In the past they were using them for limited purpose for their home and for neighbors. But now they are commercilizing the skill. Mainly Majhis are found to make Halo(plough), Doko(basket), Theki, Dali, ect. They make it by locally available bamboos. Apart from this female members are found making Chakati and Gundri( mat made of hey). They are now selling these products in the nearby market and making money.

Figure no.14. Chakara B. Bote Majhi making plough.



#### **7.1.4 Wage Labor and other Employment.**

Wage labor and other employment became one of the chief adaptation strategy of the Majhi people. The unskilled manpower as well as skilled manpower are also found engaging in various jobs. I have already mentioned the respondents engagement in earlier chapter. Some of the Majhis are working as mansion, and laborer in construction site, house building, road construction like activities. Some are ploughman, some others are drivers. some are engaged in government jobs. Remittance is also one of the source of income of the Majhis. Very few people are engaging in government jobs. Because of the

low status and lack of education they are not able to go the first world countries, however, India is the easiest foreign destination for them.

### **7.1.5 Social Networks**

Social networks in rural area play crucial role to climate change adaptation. According to Ensor and Berger social networks are the glue between many of the elements of adaptation. They draw attention to the relationship between actors and can be visualized as a web of connection that link diverse individuals and institutions either directly or via other actor (Ensor and Berger, 2009:27).

Though Majhis social network is not strong together they respond to any climatic and other disasters. Majhis of Sarangi are very cooperative in each other. Other community cast and ethnic group also help them in the adaptation to climate change. For example Betes are also members of local dairy cooperative and they are also making money. With the collaboration of other community they have managed to fetch water from the local Dhape khola and irrigating in dry seasons too. Moreover, they are working together with society to cultivate genetically modified and hybrid types of crops.

### **7.2 Constraints to Coping and Adaptive Strategies**

Constraints to coping and adaptive strategies refers the barriers and limits that hinders peoples attempt to cope and adapt to climate change. The concepts of barriers and limits to adaptation became widely used after their inclusion in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report chapter on adaptation (Adger et al. 2007). Subsequent research justified a chapter titled “Adaptation Opportunities, Constraints, and Limits” in the IPCC Fifth Assessment Report (Klein et al. 2014). The IPCC provides a systematic typology of barriers (called constraints), including knowledge, awareness, and technology; the physical environment; biological tolerances; economic factors; financial factors; human resources; social and cultural factors; and governance and institutional processes (Klein et al. 2014).

Better adaption need good plan, resource, knowledge skill and community effort. But the adaptive strategies followed by the Majhi community are very limited. Majhis people are



socially and economically backward. Most of them uneducated. Majhis are less familiar with the larger adaptive mechanisms. In this context Klein and his colleagues argue it may be only through changes of large magnitude that the social processes that impede or limit adaptation or the shared meanings of what is at risk can be changed (Klein et al. 2014). Lack of access to the government and other sectors, their traditional way of life, illiteracy, available land structure etc are seen as constraints to coping and adaptive strategies.

### **7.2.1 Low status and Illiteracy of Majhis**

Economic and social resourcefulness and education has many things to do with the adaptation mechanisms. Having resourceful enhances the adaptive capacity. provides various ways to adapt in changing climate. But Majhis having been low in status and literacy. On the one hand they cannot establish commercial farming ways, on the other hand they cannot have good jobs because of illiteracy. Lack of knowledge to the modern farming hindering them to adopt properly. Most of the Majhis are poor and landless. They are working on others land taking them in lease or Adhiya that is also one of the cause they are not active enough to incorporate new and modern way of farming. They think that whether or not they work hard to fertilize the land one day they have to return the field to the owners.

### **7.2.2 The Land and Landscape**

Low fertility of the land in high hill is another constraints to Majhis. On the one hand they have very little land on the other the productivity of the land is not like that of plain land. Being located at the hill the land is more prone to landslide and soil erosion. It also faces mist and dew problem in winter season. Some other land is at the side of the river which is more vulnerable in monsoon season. Small field (*sana sana phota*) next problem which prohibits the use of modern techniques and tools like tractor in addition small fields cannot be ploughed to the corners which decreases the production.

### **7.2.3 Ignorance of the Modern Adaptive Strategies.**

Majhis are not familiar with the newly emerged coping and adaptive strategies. Lack and education and low social status pulled them back in taking advantage of the modern technology. Commercializing homemade product, capitalizing their labor, modern and diverse use of farming, and livestock, modernizing their traditional skill and knowledge are not in practice.

### **7.2.3 Weak Social Networks and Influence.**

The Majhis of this study are minority groups marginalized from mainstream backward in each aspect. Due to low influencing capacity they have very less adaptive choices. Local elites capture most opportunities provided either in job or in other agriculture related projects. Government sector adaptive programs are out of reach to these people. Majhis are neglected in the trainings and programs provided by the government.

## **Chapter VIII**

### **Conclusion**

Climate change is growing as a serious global problem. Thus, it has drawn ever more attention from the media, academics, organizations and politicians throughout the world. It is affecting the world in rapid speed. Indigenous people, directly depending on nature are among the worst affected but are rarely mentioned and cared. Majhis of Nepal are one of them. The close relationship of these indigenous peoples with their natural environments makes them especially sensitive to the effects of climate change. The effects are bad enough on them. Increasing temperature, unpredictable precipitation patten, prolonged drought, worst flood, landslides, new plagues of diseases etc are posing more serious threat to the livelihood of these indigenous people. Though Majhis are the worst affected, they are less talked and concerned group of Nepal. They have got no help coping with its effects and have to fight harder for mitigating and adapting to climate change, for their survival. My study focused on the Majhis' perception, impact on their lives, their coping and adaptive strategies and constrains on adaptation to climate change.

The study is based on the Majhis of Baglung, Amalachaur VDC. Majhis as they dirctly depended on natural environment. First of all study presents the perception of the Majhis on climate. Majhi People are mostly uneducated and backwarded in socio-economical aspects. They could not directly perceive the climate change They are not familiar with the term climate change. So attempts have made to know their perception through some climatic trendlines. Based on the climatic parameters like precipitation, temperature, wind, mist and dew, natural disasters their opinion is collected. It shows that they have felt climate change in their life. Change in seasons, increasing temperature, decreasing rainfall, unpredictable monsoon, drought, other natural disasters like flood, land slide etc are the changes they have perceived in terms of climate change and it is similar with the national records of the climate change. Secondly, the study analyzed the changing livelihood strategy of fueled by the climate change. Their livelihood strategy is in transition because of climate change. Their main traditional occupation is boating, fishing, and gold panning. Great shift is seen in this livelihood strategy changing to agricultural and non agricultural one. Among various factors influencing this shift

Climate change is vital one. Several impacts of climate change on agriculture and on over all livelihood are on surface. It has made their hard life even harder. It is found that Majhi though directly unaware of the climate change, responding it in their spontaneous ways.

Among the limited coping and adaptive strategies against climate change that Majhis have adopted diversification of income sources, modified agricultural and livestock farming, force labor and employment, commercialization of the local products, foreign employment are major ones. Despite these attempts to adopt to climatic hazards there are several constraints to adaptation. Majhis possess very limited land, and are uneducated these things are major barriers to their adaptive capacity. In addition landscape, low status, weak social networks, inability to modernize the indigenous skill, and traditional life style are some other constraints on the path to the adaptation.

Marginalized and minor Majhi peoples' efforts to adopt with the climate change are not sufficient. These deprived people should be empowered through education and other projects. Majhis indigenous knowledge and skill should be given modern touch through different programs. Majhis traditional livelihood skills like fishing should be brought to commercial profession by encouraging and finding to start fish farms and so on. Government should play active role to uplift their socio economic status and enhance their capacity to adapt to climate change. For this Majhis capacity building as well as employment oriented programs should be launched. Government by developing a strategy to finance mitigation and adaptation at local level, should directly involve the communities in their own strategic planning. Furthermore, the involvement of NGOs, INGOs and local bodies is important to foster peoples' awareness and enhance their adaptive capacity.

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## Annex I

### I. General information of respondent

1. Name:-
2. Sex: Male  Female  Third Gender
3. Age.....
4. Family System: Single  Joint
5. Number of Members in the household (Who shares the same kitchen).....
6. Level of Education  
Illiterate  Literate  Up to SLC  Up to Intermediate   
Graduation and Above
7. Occupation (Source of Income for Household)
  - 7.1 Traditional occupation:.....
  - 7.2 New occupation.....
8. If fishing/boating / gold panning.
  - 8.1 Does this occupation enough for your survival?  
Yes  No
  - 8.2. In case of change in the occupation: Why do you changed the occupation?  
.....  
.....  
.....

### II perception on climate change

9. Do you know what climate change is?  
Yes  No 
  - 9.1 If yes, what are the reasons of climate change?  
.....  
.....
10. Do you find any changes in the following during last 15/20years?

Climatic parameters	Yes	No	Same	Don't Know	If Yes		
					Incr	Dec	Any Other
Temperature							
Rainfall							
Mist and dew							
Floods							
Drought							
Jhari							
Hailstorm							
Soil Erosion							
Any other							

11 Have you noticed any change/shift in the raining pattern? If yes, please specify the shift.

.....

**III. Climatic impact and changing livelihood**

12. what kind of land you have?

Khet ..... Bari..... Both.....any other.....

13. What are the crops you grow throughout the year?

1. ....2 .....3.....4.....5.....6.....

14. What is the condition of food production? is it increasing or decreasing?

.....

15. Why is it increasing or decreasing

.....

16. Do you find any kind of new diseases in the crops recently? If yes, what are they?

.....

17. Do you face food shortage?

every year

sometime

never

18. Do you find any unnecessary growth of weeds in the field? if yes, mention please.

.....

19. Is there any variation on food sufficiency over past 15 years? If yes mention the following.

19.1 Food Sufficiency in the past and now

S.N.	Food sufficiency	Food sufficiency status of households	
		Households 15-20years ago	Households Now
1.	12 months or more		
2.	6-11 months		
3.	3-6 months or less		
4.	3 months or less		
5.	Total household		

**III Coping and adaptive strategies related questions.**

20. What are your new source of income?

.....

21. Have you shifted growing seasons of any crops? Yes  No

21.1 If yes please fill the box

Crop	Old growing seasons	New growing seasons	Reasons
Paddy			
Maize			
Wheat			
Millet			
Mustard			
Any other			

22. Has there been increase in pest and diseases in agricultural crops and livestock?

Yes  No

22.1 If yes then please give the following information

Agricultural crop/livestock	diseases/pest

23 .Have you changed any crop variety. If yes please specify.

.....

....

24. Do you have any livestock? Yes  No

24.1 If yes livestock holding

Types	Number
Cow	

Buffalo	
Goat	
Pig	
Poultry	
Any others	

25. Are you adopting modern way of farming?

Yes  No

26. If yes, what are you doing? If no what preventing you to do so?

.....

27. Have taken any training regarding modern farming and livestock?

Yes  No

28. If yes, what kind of training you have taken?

.....

29. How is your position/ influence in the society?

.....

## Annex II

### Janajatis of Nepal

Region	Janajatis
The Himalayas	Bhote, Sharpa, Thakali, Dolpa, Lhomi, Lhopa, Larke, Siyar, Mugali, Barhagaule, Manange, Thadam, Marphali, Thintan, Tanbe, Baiunga, Tarkegala, Chimton, Syantan, Chhaintan and Byasi
The Hilly	Chepong, Gurung, Jirel, Lepecha, Newar, Magar, Rai, Sunuwar, Tamang, Damai, Hyau, Chaantyal, Pahari, Bhujel, Dhurel, Surel, Kusunda, Free, Limbu, Kush, Badia, Bankaria, Hyolim and Baray
The Terai	Bote, Danuwar, Kumal, Darai, Majhi, Raji, Raute, Dhanuk, Dhimal, Gangai, Jhangad, Kisan, Kushubadia, Meche, Rajbansi, satar, Tajpuria and Tharu

*Source: Janajati Development Board, 2064 BS.*



### Annex III

#### Caste and ethnic groups of Baglung.

S.N	Caste /ethnic group	Total	Male	Female
1	Magar	75310	33164	42146
2	Brahman- Hill	52483	23059	29424
3	Chhetree	50249	21798	28451
4	Kami	42891	18769	24122
5	Sarki	14918	6542	8376
6	Damai/Dholi	12612	5378	7234
7	Chhantyal/Chhantel	4029	1810	2219
8	Thakuri	3798	1665	2133
9	Newar	2880	1340	1540
10	Gurung	1845	860	985
11	Kumal	1630	744	886
12	Dashnami/Sanyasi	1180	497	683
13	Gharti/Bhujel	849	375	474
14	Musalman	742	376	366
15	Tamang	704	356	366
16	Thakali	587	272	315
17	Kayastha	299	131	168
18	Gaine	209	105	104
19	Majhi	193	82	111
20	Tharu	171	134	37
21	Rai	117	67	50
22	Badi	77	35	42
23	Teli	51	35	16
24	Limbu	43	26	17
25	Sonar	43	22	21
26	Yadav	31	23	8
27	Hajam/Thakur	30	19	11
28	Sunwar	27	9	18
29	Kanu	23	23	0
30	Kathbaniyan	21	14	7
31	Haluwai	20	10	10
32	Koiri/Kushwaha	16	8	8
33	Ghale	15	5	10
34	Kurmi	14	9	5
35	Brahman- Terai	14	9	5
36	Others	154	64	90
37	Dalit Others	169	89	80
38	Terai Others	92	40	52
39	Undefined Others	65	26	39
40	Foreigner	12	7	5
41	Total	268613	117997	150616

Source: Population Monograph (2014)

## Annex IV

**List of respondents and their perception on climate change.**

S.N	Name of Respondents	Age	Sex	Occupatoin	Perception on Climatic Parameters			
					Tempera ture	Rainfall	Mist /dew	Natural disasters
1	Chakra B. Bote Majhi	70	M	Craft/Farmer	+	-	-	+
2	Matuli Majhi	61	F	Farmer	+	-*	-	+
3	Suresh Majhi	18	M	Gov job	+	-	#	+
4	Hari B.Majhi	62	M	Crft/farmer	+	_	_	+
5	Manrupa majhi	67	F	Housewife	+	-	-	+
6	Karna B Majhi	59	M	Craft/farmer	+	_	_	+
7	Jamuna Majhi	56	F	Farmer	+	_	-	+
8	Ram B Majhi	59	M	Mansion	+	_	_	_
9	Kamala Majhi	58	F	Housewife	*	-	-	+
10	Guma Majhi	49	F	Labor	+	_*	*	+
11	Harka B Bote	61	M	Craft	+	_	_	+
12	Ishwori Majhi	47	F	Farmer	+	_	-	=
13	Devi Majhi	38	F	Farmerr/Labor	+	-	#	*
14	Indra B. Majhi	45	M	Plougman	=	_	=	+
15	Sundar B.Majhi	47	M	Ploughman	=	_	=	-
16	Kul B Majhi	56	M	Mansion	+	_	-	=
17	Mangal Majhi	52	M	Ploughman	*	_	-	+
18	Kamal B. Majhi	39	M	Labor	+	_	=	+
19	Jhamak Majhi	58	M	Labor	+	_	-	+
20	Rupa majhi	49	F	Farmer	+	_	=	=
21	Dil Kumari Majhi	31	F	Labor	*	_	=	+
22	Gorakh Majhi	48	M	Poultry	+	-	-	+

23	Kedar Majhi	45	M	Poultry	+	-*	-	+
24	Sandeep Majhi	21	M	Office job	+	+	#	+
25	Surendra Majhi	30	M	Job	+*	-	=	+
26	Tek B. Majhi	47	M	Driver	+	=	-	=
27	Lakshman Majhi	51	M	Ploughman	=	-	=	+
28	Som B Majhi	59	M	Ploughman	+	-	-	-
29	Tul B Majhi	62	M	Labor/Farmer	+	-	-	+
30	Dil B Majhi	34	M	Driver	=	-	=	=
31	Gharti Majhi	62	M	Farmer/Labor	+	-	-	+
32	Gyanu Majhi	28	M	Driver	+	-	=	+
33	Bimala Majhi	47	F	Labor	+	-	-	+
34	Hima Majhi	37	F	Labor	+	-	-	=
35	Khem Majhi	51	M	Ploughman	+	-	-	+
36	Rekha Majhi	42	F	Labor	=	-	=	+
37	Sete Majhi	53	M	Ploughman	+	-	-	+
38	Raju Majhi	45	M	Office job	=	-	-	+
39	Manoj Majhi	52	M	Ploughman	+	-	-	+
40	Rana B Majhi	61	M	Mansion	+	-	-	+

+ Increased

- Decreased

= Stationary

-\* Decreased and uncertain

+\*Increased and uncertain

\* Uncertain

# No idea

Source: Field Survey, 2016.

**THANK YOU!**