

CLIMATE CHANGE, TOURISM AND LIVELIHOOD: A CASE STUDY OF MANASLU REGION OF NEPAL

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ABSTRACT

This study assesses climate change impact on tourism dependent livelihoods of the mountain community. This review study tries to find out the major climatic variables and climate change extremes that impact to the livelihood of mountain community. The people of study area feel that the fluctuation of climatic variables and extremes is occurring and their experience on the warming and precipitation coincides with authorized meteorological data which depicts that the mean annual temperature is increasing and average annual precipitation is decreasing. This study found that all types of livelihood assets are affected by climate change, climate change extremes and induced disasters on tourism based livelihood in mountain region. The impacts of climate change are loss of biodiversity, decrease in local resources and increase in climatic hazards, destruct the infrastructures were observed. The climatic hazards damage off-farm based livelihood like disturb the tourism activities and other business, detachment of the supply channel, employments, local handicraft industries and impact to the off-farm and farm based livelihoods assets which are the lifeline of the people of this area.

Keywords: Adaptation, climate, disaster, livelihoods, tourism, variables

INTRODUCTION

The report of Department of Hydrology and Meteorology shows that the maximum temperature increasing trend in High Mountain is 0.0680C/year but in Terai is 0.021^oC and minimum temperature trend of High Mountain is -0.005^oC and in Terai is 0.015^oC (DHM, 2017). The impact of the climate change in tourism is visibly found in the Himalayan region but it is difficult to determine the real impact of the climate change in tourism (Nepal, 2011; KC, 2017). The change in climatic variables in high mountain region is faster than plain region. Report of DHM also shows that climate change extreme in High Mountain also increasing. Due to low adaptive capacity, the least developed countries are more vulnerable from climate change induced events. Due to the change in climatic variables and extremes, increase in the frequency and intensity of

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climatic hazards in high mountain region is significant (DHM, 2017). The tourism, resources, destinations and activities are already exposed to the climate change and induced extremes in Nepal. Being the least developed country; Nepal is highly sensitive to climatic hazards and has low adaptive capacity so the tourism activities, destination and business are vulnerable to the climate change that directly and indirectly interlinked to livelihood assets of people. The tourism provides a unique opportunity to experience the way of life of tourism dependent community and individuals. The issues of the climate change need to address for the sustainable development. Most of the tourism activities are based on the natural resources like rivers; biodiversity, landscape, and snow cover Mountain, and undisturbed cultural heritage that also embedded with the nature. The climate change and tourism sectors are interrelated to each other. A small change in climatic variables also brings severe implications to mountain tourism activities. Each tourism activity directly and indirectly interlinks with livelihood of the mountain community through generation of employment opportunities to skilled and unskilled labours and flow of the capital to low income people.

Nepal is the hot spot for alpine and mountain tourism in Himalayan region but scientific research on alpine and mountain tourism is limited. This study try to identify change in climatic variables, frequency and intensity of climate change induced hazards and the adverse impact of climate change in tourism based livelihood. Due to the lack of research on climate change and its impact on different sectors of tourism and activities could not say the exact value of impacts. In Nepalese context, the research on climate change and its impact on non-farm based livelihood like tourism industry is not found. So, this study will be helpful to reduce some of the impacts of the climate change. The major problems created by the climate change in the field of tourism industry are: What are major climatic variables and climatic extremes impact to the tourism based livelihood? How the climate change creates the severe problems in livelihood of the mountain people and their employment created by tourism? How climate change affect tourism dependent livelihood in the context of Himalayan region of Nepal. To find out major critical climatic and climate change induced hazards and impact of the climate change in tourism based livelihood in mountain are the objectives of this study. This report comprises introduction, literature review, and methodology, analysis of the data from primary and secondary source. Report is summarized in the conclusion on the basis of analysis of primary and secondary data.

GLOBAL CONTEXT

The IPCC report concludes that “warming of the climate system is unequivocal, and since 1950s, many of the observed change are unprecedented over decades to millennia. The atmosphere has warmed, the amount of snow and ice have decreased, and the concentrations of greenhouse gases have increased (IPCC, 2013)”. If emissions continue to rise at the current rate, impacts by the end of this century are projected to include a global average temperature 2.6-4.8 degrees Celsius (°C) higher than present, and sea levels 0.45-0.82 meters higher than present. The scenario of the climatic variables is that the changes will continue under a range of possible green house gas emission scenarios over 21st century (IPCC, 2014).

Addressing the issue of climate change is important for sustainable development and that may influence in every options of livelihood. Hamilton and his colleagues argued that climate is an important factor in the destination choice of tourists and shifts flow of international tourist towards higher altitudes and latitudes and the climatic effects on High Mountain are very specific; climate change is likely to trigger the rates and intensity of natural hazards (Hamilton *et al.*, 2005).

Impact of climate change on global economy is negligible in 2010 while climate change may alters GDP by -0.3% to +0.5% till 2050 and may lead to negligible global loss. The main losers will be Western Europe, energy exporting countries, Caribbean and The Mediterranean. Caribbean will be too hot and less pleasant for tourist. Tropical nations will be less popular due to global warming and unpleasant weather. Energy exporting countries will lose a lot due to fall in energy demand. There will be positive impact of climate change in tourism in Eastern Europe, North America, Japan, Australasia and Russia while there will be neutral effects on China and India (Berrittella *et al.*, 2006). Up to 2030, there would be negative effects of higher temperatures in the Mediterranean region, France, Italy and Austria but there will be positive impacts in Switzerland. Climate change causes more problems and burden to the poorer countries who are taking tourism as a main driver of development. Also, Canada, New Zealand and USA will be benefited from climate change (Ehmer and Heymann, 2008).

Moore (2011) had assessed the impacts of climate change on tourism from economic perspectives in Barbados. Climate change policies may reduce tourism mobility in few areas of the country. Recent policies of United Kingdom has increased price of flights to Barbados which may affect tourism in Barbados. Scott (2012) observed that climate change shifts travel patterns, increases

tourism cost in temperate regions and decreases tourism costs in warmer region. Climate change had also shifted tourism from Northern part of Europe to Mediterranean and the Caribbean, North America to the Caribbean.

Climate change enhances product innovation and tourism rearrangements in tourism sector. Rapid melting of glacier and permafrost in alpine region will have negative impact on tourism sector associated with climate change phenomena. Local tourism stakeholders had a great role in implementing climate change adaptation measures for adapting toward adverse changing scenario (Wyss *et al.*, 2014).

NEPALESE CONTEXT

Nepal is rich in biodiversity, cultural diversity, geographical and ecological variation and these are the major attractions of the tourism in Nepal. The climate change induced extremes are responsible destruction of quality of tourism resources and disturbance of tourism activities in the destination. The study area is situated in major tourism destination and people from this area are depending on tourism for their livelihood. The study assumption is that change in trend of climatic variables, and pattern of climatic events in destination severely influences to the tourism and livelihood assets of tourism dependent people. The disaster report of MoHA in 2015 mention the human casualty by avalanche in different places of Himalayan region i.e. November 1995 killed 43 people including some foreign trekkers at Khumbu and Kanchanjungha areas. In 2 January 1999 A.D. 5 people were swept away by the avalanche which occurred in Chunchet Village Development Committee Ward No. 8 of Gorkha district. In the year 2005 A.D. 21 people, in 2009 A.D. 2 people, in 2012 A.D. 7 people, in 2013 A.D. 104 people and in 2014 A.D. 91 people were killed by avalanche and Hudhud snow-storm (MoHA, 2015).

Climatic characteristics that impact tourism livelihood in Nepal include temperature, precipitation (rain and snow), clouds, fog, wind and humidity. The increasing temperature trend, especially at higher altitudes which are experiencing warmer winters, has resulted in lower snowfall in these areas (Dahal, 2007). The impact of climate change in both mountaineering activities, as well as the aesthetic quality of tourism destinations (Bhandari, 2014). The visibility is important to conduct the tourism activities but at present days clouds and fog can severely reduce visibility. This has repercussions on the aviation sector, which is an important part of Nepal's tourism industry, as many rural airports are not equipped with radar technology and require clear visibility to operate (Nyaupane and Chhetri, 2009). Low visibility also means that tourists are unable to view the landscape and its attractions thereby

decreasing the quality of their tourism experience (Nyaupane and Chhetri, 2009). Climate change induced disasters, especially as a result of extreme weather events, impact tourism both directly and indirectly (Lama, 2010). Due to heavy rainfall, landslides and floods restricts access to and from tourism destinations by destroying or blocking roads, trails, bridges and airports.

In Lower Mustang of Nepal, people perceived warm and dry winter, decrease in water availability and draught as a result of climate change. It has promoted tourism by reducing barrier for trekking tourism in winter season but has increased the loss of natural scenic beauty of the place. Natural scenic beauty of mountains was reduced due to less snowfall in winter with thin cover of snow. Hotel owners were affected badly due to water scarcity in Muktinath, Kagbeni, Puthang, Marpha and Lete. Decrease in sources of drinking water in the existing spring had increased burden of bringing water from the new source (Lama, 2010).

Subedi and Chapagain (2011) observed decrease in number of tourists from 2002 to 2006 in Manang valley of Nepal. Tourists in Annapurna, Everest and Langtang region has decreased drastically from about 100,000 in 2001 to 67,000 in 2006. It might be due to political instability, climate change impacts and other reasons in the country. After 2007, the number of trekkers in Upper Manang had increased and reached more than 14,192 in 2007. Rayamajhi (2012) observed that 69% of the tourism stakeholders perceived changes in the tourism season but 49% perceived impact of climate change in their work. About 63% tourist had increased in the region despite the change in climate and shift in tourism seasons. About 83% lodge owners and guides believed that climate change would have an impact on tourism. Rise in temperature had not caused any discomfort to the tourist but instable rainfall pattern had caused discomfort to the tourists. Increased intensity of rainfall, landslides, floods and other natural disasters may affect flow of tourist in the future.

In Manaslu Conservation Area of Gorkha, there was increase in annual maximum temperature and mean temperature by 0.10 and 0.02°C/year, decrease in annual minimum temperature by 0.06°C/year and increase in average annual rainfall by 3.19 mm/year. About 93% people have perceived change in climate, 36% people perceived the most significant impact of climate change on rainfall and water supply and 82% people perceived unfavourable weather change (K.C. & Thapa Parajuli, 2014a).

From the people perception, 96.10% respondents felt that number of tourist was increasing in Manaslu Conservation Area. People felt the increasing trend as a result of climate change and tourism promotional activities. In the long

term, climate changes will have more severe adverse impact on tourism affecting their livelihood. All the key informants felt that the climate change had positive significant impact on tourism currently but in long run, increase in temperature, change in rainfall pattern and water availability and unfavourable weather change might cause adverse impact on tourism in the future. (K.C. & Thapa Parajuli, 2014a).

In October 2014, more than 32 people were killed by sudden snowstorm in Annapurna Conservation Area of western Nepal. Hundreds of trekkers were trapped at more than 5000m altitude from sea level in Thorong La Pass area. Tourists were rescued with the help of helicopters and soldiers in the area. Many tourists were trapped by similar weather change phenomena in Manaslu Conservation Area in same time as reported by the authorities. Appropriate early warning system in the region would minimize the impact of disaster in the region (Burke & Walker, 2014). In April 2015, devastating earthquake in Nepal had caused snow avalanches in Mt. Everest region at about 7000m altitude from mean sea level. More than 17 people had died and 61 were injured. More than 100 mountaineers were safe in Camp 1 and 2. It was the second incidence in 2 years period as 16 Sherpas were killed in an avalanches and icefall last year (2014) in Mt. Everest region (Beaumont, 2015). At the same time in 2015, devastating earthquake causes avalanches in Langtang region. It buried 116 houses, killed 308 people (176 local residents, 80 foreigners, and 10 army personnel) (Callaghan and Thapa, 2015).

Climate change had reduced the barrier of snow in winter season and had increased the number of tourists in short term. In the long term, it will have adverse impacts on tourism. Increase in temperature will cause rapid melting of snow and ice in the mountains and destruction of flora and fauna. Visitors will select alternative tourism location and better destination for trekking and mountaineering. Tourists will be de-motivated to travel due to the adverse climate change phenomena in Nepal. Also impact on tourism industry might affect the livelihood pattern of the local people who depend on tourism for survival. It is necessary to apply mitigation and adaptation strategies to combat climate change. To decrease the death of tourists from unfavourable weather phenomena, early warning system should be installed in trekking and mountaineering route of Nepal. Apart from these, rescue Centre for tourists should be established in different trekking routes of Nepal.

OBJECTIVES

- The broader objective of this study is to assess the climate change impacts on tourism based livelihood of mountain community. The specific objectives are:
- To find out the major climatic variables and climate change extremes that impact on livelihood of mountain community.
- To identify change in climatic variables, frequency and intensity of climate change induced hazards and the adverse impact of climate change in tourism based livelihood.
- To find out major critical climatic and climate change induced hazards and impact of the climate change in tourism based livelihood in mountain community.

METHODOLOGY

With the help of local language and location guide in field level for study make comfortable to collect data and conduct field work regularly and individual interaction, community consultation, and checklist, survey was conducted. The descriptive research approach and survey research design was used in this study. The duration of fieldwork for this study is two times: in spring season and autumn season. The duration of the whole study was one year march 2015 to march 2016. This study is focus on both science and community experiences and perception of the local peoples, activities operators, and other tourism stakeholders in field and central level. The science based data from the DHM and community experience from field work and analyses and co-relate to each other.

The activities conducted in study area were community consultation, key informants interview with local people, tourism entrepreneurs, trekking and mountain guides was conducted to listing climatic and climate change induced hazards and its impact to their livelihood. The primary data gather from field work like key informant interview with semi-structure questionnaire, community consultation and participatory observation in research site. The secondary data was taken from the publication of different government, non-government institutions and DHM. The sampling tools used for this study are random, purposive, and accidental to collect information.

STUDY AREA

The study location is Lho and Samagaun of Trans-Himalayan North Gorkha the western region of Nepal and the tourism is the main source of livelihood. The study location is the prominent for adventurous and cultural tourism, and has rich in the biological and cultural diversity. This study area falls under the world famous trekking route Manaslu circuit and Manaslu Conservation Area (MCA). High Himalayan range is the main asset of the mountain tourism which consists of Mt. Manaslu in the southern part of the study area which is the 8th highest peak of the world. The unique topography with great diversity of vegetation, coniferous forest and snow covered mountainous scenic beauty.

The shifting in the vegetative belt and the tree line is shifted 1.3-3.4 meter per decade (NAST, 2010) in Manaslu region that directly impact on the alpine ecosystem and biodiversity which is linked to the tourism and people's livelihoods.

Manaslu Conservation Area can be categorized into three geographical areas based upon natural setting and ethnicity: i) Nubri Valley in the northwestern part encompassing Sama, Lho and Prok VDCs; ii) Kutang in the middle portion formed by Bihi VDC; and iii) Tsum Valley in the eastern part which includes Chumchet and Chhekampa VDCs. The MCA is rich in biodiversity having inhabitant of about 2000 species of plants, 33 mammals, 110 birds, 3 reptiles, and 11 butterflies in 11 types of forest have been reported from this area (NTNC, 2012), and also reported that MCA is the prime habitat of the elusive snow leopard, grey wolf, musk deer, blue sheep and the Himalayan Thar.

CONCEPTUAL FRAMEWORK

Climate change has multidimensional impact to the human system. The local community have own autonomous indigenous knowledge system that knowledge could not change without the intervention of the nature. So, while the climatic variable change their pattern that enforce to change the autonomous knowledge system of the local community. That change is people's perceptions, values, knowledge and responses. The conceptual framework for this study is given below in the flow chart. The flow chart is based on perception of peoples of study area.

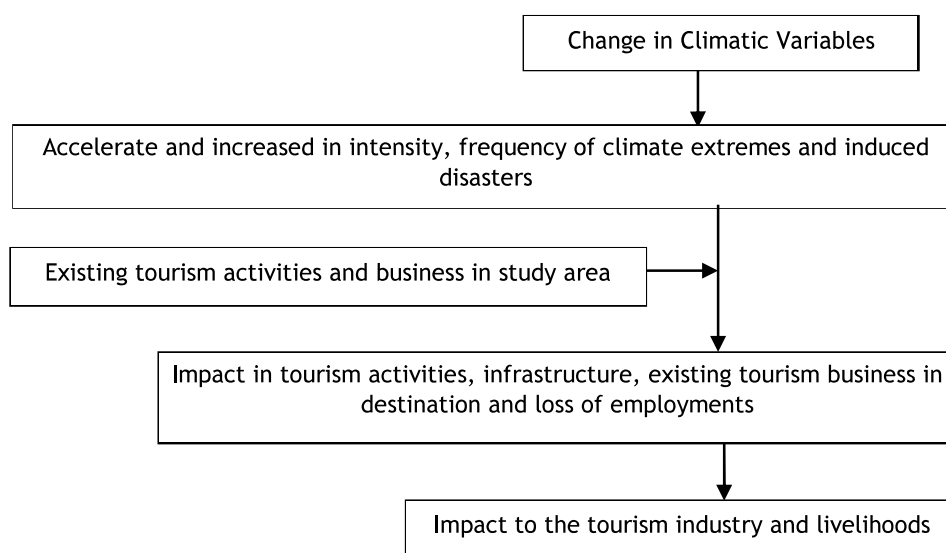


Fig . Conceptual framework

SAMPLING AND DATA COLLECTION

The Data Sources

The primary sources of data from field survey, participant observation for perception, knowledge, values and response collection from local peoples, Interaction with tourists, local people and entrepreneurs in field level and experts and stakeholders was done. The community consultation was conduct in field level; key informant interview was conducted with local peoples, local entrepreneurs, local traditional and religious leaders, old age peoples in the field level, and expert from the different sectors.

The Secondary Data was collected from the government authority and their publications like Ministry of Culture, Tourism and Civil Aviation, Ministry of Science, Technology and Environment, NPC, NAPA, NGO/INGO like publications of ICIMOD, NTNC, and related websites. The climatic data was collected from the DHM and analyzed the trend of temperature in high altitude.

Data Collection Tools

Key informant Interview with semi-structure checklist for major climatic variables, climatic extremes, climate induced disasters, listing the sectors of mountain tourism are affected by climate change and impact of climatic extremes in tourism business and livelihood. There were 80 informants were participate in interview and participatory discussion and more than 100 person participated in community consultation. The community consultation was

conducted with local people, and local tourism entrepreneurs in village. Discussion was conducted with the researcher, professionals and development practitioners to collect the data about impacts of climate change in tourism. The sampling tools used for this study are random, purposive and accidental sampling used to collect information. This study focus on the qualitative method for data collection and analysis as well as quantitative methods also used to analyze variables. The descriptive qualitative methods are used to analyze the available data from different sources.

RESULTS AND DISCUSSION

THE CLIMATIC VARIABLES

Maximum and minimum temperature

The climatic data from the department of hydrology and meteorology shows that the maximum temperature trends of Manaslu conservation area is increasing. It shows that summer was going to be hotter than the previous. The changing pattern of maximum and minimum temperature of study area is given in graph 1 and 2. The temperature trend of 22 years from 1988 to 2010 in Langtang area (this place is similar height to Manaslu area and represent high altitude in Nepal) represent the overall changing pattern of temperature. From this graph we can say that there is increase in maximum and minimum temperature during 22 years. This data give clear message that the trend of temperature rising continuous but unexpected in different years. During 22 years maximum temperature increase in Langtangkhola (Similar elevation with Manaslu region) maximum temp increase from 7.6 °C to 12 °C (4.4°C increased) and minimum temperature -1.7 °C to 0.2 °C (1.9 °C increased). The DHM recorded the data of temperature present on the graphical of Langtang Khola:

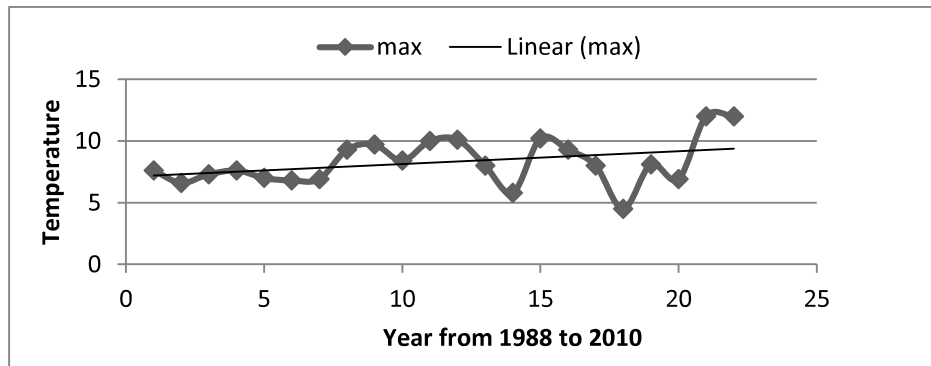


Figure 4: Maximum Temperature recorded from Langtangkhola

Source: (DHM, 2015)

The increasing trend of maximum and minimum temperature accelerate the rate of ice melting, shift the snow line in the Himalayan region, change the

ecosystem services of the mountain ecosystem that change contribute to increase the natural hazards in mountain region also increase the operation cost of tourism entrepreneurs.

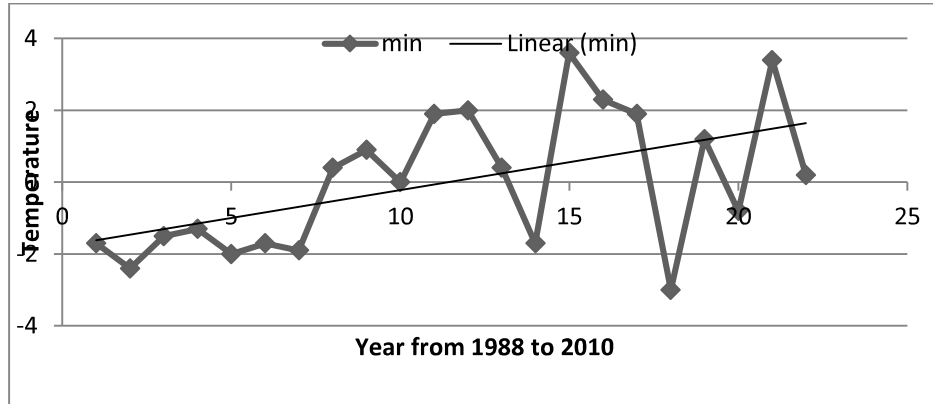


Figure 5: Minimum Temperature Recorded from Langtangkhola
Source: (DHM, 2015)

The graph represents the maximum minimum temperature trend of Langtangkhola. The altitude of Langtangkhola and the Manaslu region is similar. The temperature is main climatic variables that affect to every sector of the livelihoods.

i) The Rainfall Trend of Study Area

The rainfall pattern of Samdo of Samagaun is decreasing order and the fluctuation of the rainfall pattern is unexpected.

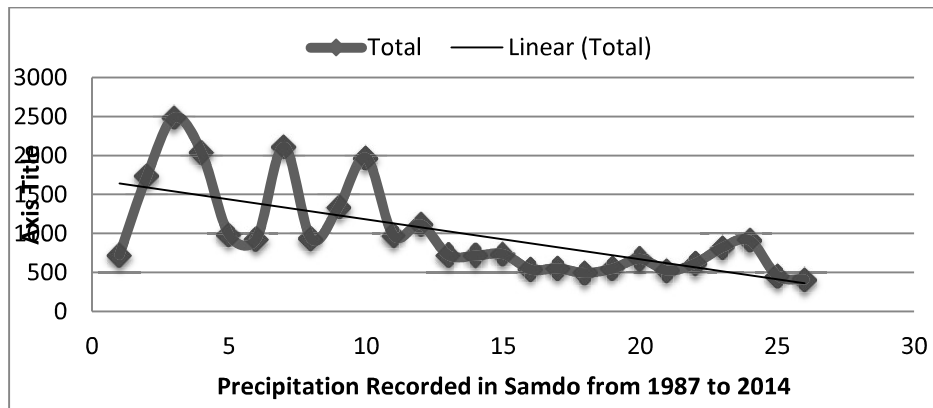


Figure 6: Precipitation Recorded In Samdo
Source: (DHM, 2015)

This graph 3 represents the precipitation trend in research site from 1987 to 2014. This shows that the available data from DHM the precipitation trend is decreasing order during 27 years. The decreasing of the rainfall impact to

agricultural production, increasing the ice melting rate but occurrence of the sudden heavy snow falls causes of disturbance in tourism seasons. The decreasing trend of the precipitation accelerate long drought, availability of the drinking water in trekking route and destination.

The Vulnerability Index of Gorkha

The vulnerability condition of the Gorkha district mapping by Government of Nepal is given below:

Table 2: Vulnerability Index of Gorkha

Types of Vulnerability	Very high	High	Moderate	Low	Very low
Combined Vulnerability Index	--	0.733	--	--	--
GLOF-Vulnerability Index	9.37	---	--	--	--
Draught Vulnerability Index	--	--	0.403	--	--
Landslide Vulnerability Index	--	0.701	--	--	--
Ecological Vulnerability Index	--	--	0.216	--	--
Rainfall/Temperature Vulnerability Index	--	--	--	0.267	--
Combined Adaptation Capacity Index	--	--	--	0.358	--
Infrastructure Adaptation Capacity Index	--	0.068	--	--	--
Technology Adaptation Capacity Index	--	0.044	--	--	--
Combined Risk Exposure Index	--	0.643	--	--	--
Combined Sensitive Index	--	--	0.236	--	--

Source: (Ministry of Environment, 2010)

The climate change vulnerability index prepared by MoPE shows that Gorkha falls under very, high and moderate categories. The adaptive capacity of this location is low so the climate change sensitivity of the location is high.

A. People’s experience and perception on climatic variables and hazards and livelihood

The perception of the local peoples and the data of DHM is coincide to each other. So we can say that the climatic variables of the Manaslu region are changed. Most common climatic variables in the context of Nepal are temperature, precipitation, snowfall, wind, fog/mist, etc. In study area, most of respondents are familiar with same kind of climatic variables. The

community consultation, key informant interview and individual interaction in study area found that they feel that there is rapid change in the climatic phenomena in recent years and have experienced drastic change in the entire phenomena of nature and pattern of climate. Unpredictable climatic variables have directly changed entire livelihood assets of mountain people. The experience of local people expressed that the preplanned activities were cancelled by tourists. Local peoples and tourism entrepreneurs said that seasonal shift in precipitation and snowfall has created obstacle for the infrastructure development in this belt. According to the informants increase and change in frequency and magnitude of climatic variables are most responsible for climate induced disaster which can be easily observed in the mountain area by informants and local tourism entrepreneurs. Long gap of consecutive precipitation has brought drought decreasing pasture land in the mountain region. There are 80 peoples are participated in survey and their experience about the climatic variables is given below:

Table 3: People's Experience about Climatic Variables

Respondent's Perception	Yes	No	I don't Know
Change in Climatic Variables (Temperature and Precipitation)	74	2	4
Change in Pattern of Snowfall	77	3	0
Change in Rate of Melting Ice	76	2	2
Change in Month of Precipitation	78	2	0
Change in Month and Altitude of Fog	74	2	4
Change in Nature of Precipitation	76	2	2
Change in Nature of Snow fall	74	2	4
Loss of livelihood assets	75	1	4

Source: Field Survey 2015

The trekking guides, trekkers and mountain climbing guides said that the high snowfall triggers avalanches, which causes loss of lives and property alongside damage roads and trails in surrounding areas. The local hotel entrepreneurs of the Samdo of Samagaun said that increase of hotness in summer season and appearance of flies. The appearance of flies that may cause of higher chances of increased vector borne disease and other health related problems, which also have negative impacts on service industry in Tourism. Seasonal dry weather can lead to the exposures to fire hazards, which threaten the endangered wildlife and affect wildlife-based tourism. The respondents from

the research site the tourism practitioners, local people, guides, prioritized the major climatic hazards that impact to the tourism business in season.

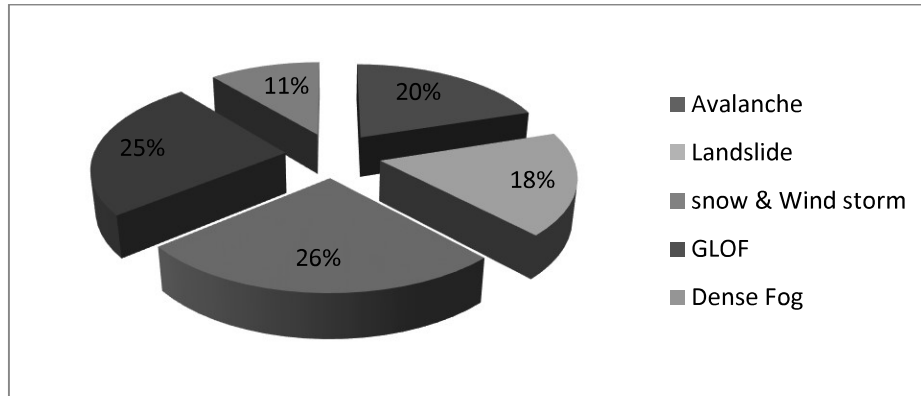


Figure 7: Prioritization of Climatic Hazards

Source: Field survey 2015

Frequency of unpredictable climatic variables like storm and snowfall has directly affected to the visitor, peoples and entrepreneurs. The major climatic hazards are avalanches, landslide, heavy snowfall, snow storm, GLOF, floods and dense fog reported by respondents. The disasters due to the variation in the climatic phenomena are commonly known as climate induced disasters. The consultation with local people found that, it has been turning intense and frequent in mountain region. The adverse impact of such climate induced disaster can be seen in multiple aspects of local livelihoods along with national tourism. Such climate induced disasters are recorded frequently with high magnitude in these few years. Thus changing climatic variables are the most responsible factors for intense and frequent disaster. Respondents from the research sites shared their experiences many human casualties are seen in recent years of experience affected by climate change induced disasters like snow storm, avalanche, and landslides in High Mountain. Avalanches, unseasonal heavy snowfall and storm are destroying the mountaineering tourism these days. The northern part of Nepal is covered with high mountains i.e. Himalayas where avalanche is very common and sometimes it claims the life of human being as well. Camp management and expedition has turned in to the most risky profession and tourism activity. Annually, there has been great loss of property and human casualties in the mountain tourism events. Due to rise in temperature that increase the melting rate of ice in high altitude has also cause difficulty to climbing industry. Similar effect in the agriculture is also unavoidable. Agricultural land, livestock, herbs are being ruined by the

climate induced disasters. The disaster report of MoHA in 2015 mention the human casualty by avalanche in different places of Himalayan region i.e. November 1995 killed 43 people including some foreign trekkers at Khumbu and Kanchanjungha areas. In 2 January 1999 A.D. 5 people were swept away by the avalanche which occurred in Chunchet Village Development Committee Ward No. 8 of Gorkha district. In the year 2005 A.D. 21 people, in 2009 A.D. 2 people, in 2012 A.D. 7 people, in 2013 A.D. 104 people and in 2014 A.D. 91 people were killed by avalanche and Hudhud snow-storm (MoHA 2015). Similarly; In the year 2013 a total number of 460 people were killed by various disasters and in the year 2014 a total number of 487 people were killed by different disasters in the whole country. The number of affected families in the year 2014 is 39,812 while in 2013 only 2,697 families were affected. Likewise, large number of animals were killed in the year 2014 (5,282 animals) than in 2013 (1,535 animals). In the same way, the economic loss also was more in the year 2014 (16,753.7 million rupees) than in the year 2013 (2,057.0 million rupees). (MoHA 2015).

Thus climate induced disasters are being increased in their frequency and magnitude turning entire physical and biological environment down to the lowest quality and quantity. 90% local peoples stated that in community consultation there are possibility of GLOF disasters in the Himalayan regions are being reported, which has negative impacts on the travel and tourism business based livelihood. Moreover, higher demand of the fuel woods are needed which increase the cost at higher elevation, which has direct impact on the trekking and expedition tourism. The landslides, avalanche and snowstorm are major disaster to mountain tourism, and climate change can further exacerbate the situation. These disasters destroy the infrastructure causing blockage of roads, blocked the trekking route, climbing route, detached the supply system in the settlement of mountain, swiping away the cultivated fields, and pollute water resources, which has negative implication for travel and tourism based business and livelihood.

There are evidences that water level is decreasing and snow covered areas are also decreasing said by respondents, which can have high impacts in tourism in Nepal such as: less snow in the Himalayas decreased the aesthetic beauty of Himalayas, which negatively affects the tourism sector. In addition to the aesthetic beauty, less snow also affects the Himalayan climbers and alpine trekkers. There are two types of the livelihood option for the mountain peoples. The on-farm and the off-farm livelihood options both are important for the Nepalese mountain people. The on-farm livelihood options are agricultural and livestock production and off-farm base livelihoods like service industry, production industries, business, employment etc.

The changed climatic variables are the most responsible factors for climate induced disasters in mountain region. The overall liability is there in the human performance used for livelihoods management. It may create as a turning point for the better life. Most visible impact can be seen in crop farming, animal husbandry, local resources based industries, tourist facilities management and adventure activities. These aspects of livelihoods are being deteriorated by the impact of climate change in current scenario. The climate induced disasters are the main cause of road and trekking route blockage. It has negative implication in the livelihoods activities like blocked the supply channel, trade, infrastructure construction, market, porters and guides who are directly involved in the tourism industry for the basic need of livelihoods. Basic facilities management for the tourists like management of hotels, tea houses, small traders, craft producers, water supply management system are completely collapsed by the climate induced disaster in mountain tourism.

Peoples experience on change in the climate change extremes and tourism products and its impact to the livelihoods.

Table 4: People's Perception on Change in Hazards and Tourism Product

	Increased	Decreased	don't know
Impact of Climate Change in Cultural heritage	64	13	3
Impact of Climate Change in Biodiversity	66	12	2
Occurrence of Natural Disasters	72	2	6
Effect of Natural Disaster in Tourism Business	75	0	5
GLOF	72	0	8
Change in the Local Resource Based Industries	2	74	2
Change in basic resource for livelihood	6	65	9
Climate Change in Local Product	2	73	3

Source: Field survey 2015

The climbing guide and local peoples accept that the increasing rate of ice-melting due to increment in the temperature is one of the visible effects of climate change. The mountain guide said that increase rate of Ice-melting due to increment in the temperature is one of the visible effect of climate change. Increased rate of unpredictable precipitation, snow fall and fog in the higher altitude is another changed climatic variable bringing natural disasters. Shifting

snowline has shown impact of climate change in environment. Unseasonal storm is another torture for the mountain tourism. Long drought has direct effect in the crop production and livestock management. While considering these circumstances, we can easily conclude about the impact of climate change in mountain tourism has resulted in a negative direction. The local tourism entrepreneurs, trekking and mountain guide indicate that many tourists are returning back from the Larky Pass due to intense snowfall during tourism season of 2013.

It is obvious that there is impact of climate change in livelihoods of local peoples and most of the respondents accept the facts have been experienced in recent decade. The changed climatic variables are the most responsible factors for distracting local people in the mountain region from their regular pattern of life. The overall burden is there in human performance in livelihoods management. To sum up, climate change has direct impact in the livelihoods of people dependent on local resources and indigenous practices. Most of the respondents have believed that there is negative impact of climate change on the livelihoods activities. Most visible impact can be seen in farming strategies, animal husbandry, and local resources based industries like wool threading, butter gathering, honey hunting, tea houses, hotel, guide and making of handicrafts. These aspects of livelihoods are being deteriorated by the impact of climate change in climate change.

The local peoples said that the dramatic change in availability of water resource in mountain bringing the water scarcity and huge flood and landslide eroding heritages of tourism and other livelihoods related features. The local peoples and trekking guides said that frequency of unpredictable blow of storm and snowfall has directly affected the existence of flora and fauna. The preventive measures for the safety of the unavoidable circumstances after disaster are on most demand before any type of tourism activities.

The climatic hazards in destination affect tourism resources, business, and activities. The respondents feel that the changing climatic variables are the most responsible factors for intense and frequent disaster that has brought displacement of traditional settlements and structures of local ethnic groups. Local peoples reported that many human casualties are seen in the recent years of experience affected by the concentrated storm, hailstones and flash rain in mountain region. Unseasonal precipitation and snowfall has created obstacle for infrastructure development in this belt. Long gap of consecutive precipitation has brought drought decreasing pasture land and unproductive agricultural environment in the mountain region. There is more concern on rise in temperature, unpredictable snow, rain, hailstones, and storm deteriorating

the structure of cultural heritage as well. People are discouraged to use traditional costumes as there is increase in temperature. All assets of livelihoods are facing undesirable impact from change in climatic phenomena. The climate change impact to the physical and natural system which directly and indirectly link to the livelihood.

CONCLUSION

Climate change impact on the Tourism has always been significant aspect of issue and discussion worldwide, which is also a burning issue in the context of Nepal. This knowledge product helps to know how the climate change and its impact to the tourism resources, activities, and business. Participatory tools for assessing climate change were used like community consultation, interview, and observation for qualitative and quantitative data collection from the field. To assess the information, literature were reviewed from different journal articles, published books, government policies, meteorological and hydrological data and other published as well as unpublished thesis articles. The perception and experience of local peoples on climate change coincides with the local meteorological data which depicts that the mean annual temperature is increasing and average annual precipitation is decreasing. The study found that science based analysis of DHM, the vulnerability index of MoPE and the peoples experience from the local peoples is coincide to each other. So, the climate change is occurred and that also impact to the human and natural system of study area.

On the basis of this study we conclude that the trend of climatic variable like temperature, and precipitation is changed and the frequency and intensity of climate change extremes and induced hazards are change now and those changes have potentiality to severely impact/effect in tourism industry. The impact of climate change, and associated extremes and hazards in destination and activities play role to decreased attraction of destination, impact on recreational activities, detached market linkage, loss of employments due to disaster, increase the exploitation of natural resources, loss of biodiversity, decrease water availability in destination create problems in tourism industry. The climate change impact is to off farm based livelihood and all livelihood assets in mountain region. The climatic variables associated extremes are responsible to destruction of the livelihood assets based on the tourism activities that generate the employment, business and create the market for the local products that destruct supply channel from other places.

The study revealed that most important climatic variables responsible for climatic events are temperature, precipitation, fog reported by respondent.

The change in the climatic variable and associated events impact to the tourism related activities and products. This study also summarized severe impact in tourism industry. Altogether the climate change induced disaster impact to ecotourism, adventurous tourism, detached the supply channel for destination and ultimately it effect to the livelihoods of dependent peoples and national economy. The finding of the study from field and literature the climate change affect to livelihood of dependent people i.e. local knowledge based product, employments tourist guide and trekking guide, entrepreneurs and other business, the local climbing and expedition technology, local organic agro-products, herbal product for treatment, the folklore and dance, traditional nature conservation system etc. Finally, the climate change impact to the off-farm based livelihood like entrepreneurs, business, employments, production of handicraft and agriculture, natural and cultural heritage etc. this is also national economy.

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