

Climate Change and its Impact on Tourism Based Livelihood in High Mountain of Nepal

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Abstract

The climate change is the major issue of the development planning in recent world. This paper focuses on the people's understanding and experience about the climate change, its impact on tourism dependent livelihoods of the mountain community. Participatory survey design, interview, community consultation, FGD, were conducted in the field. The literature review and hydrological and meteorological data from secondary source were collected for analysis. The people of research area feel that the fluctuation of climatic variables and extremes is occurring now and they are familiar with that change in climatic variables and associated disaster. 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. People from High mountain region said that the impact of climate change in tourism based livelihood was experienced. All types of livelihood assets are affected by climate change in mountain region. The change in frequency and intensity of climatic variables and climate change induced hazards was observed and that retard in tourism business and tourism activities in local area.

Key words: Livelihoods, Climate, Variables, Disaster, Adaptation, Tourism

1. Introduction

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). Due to low adaptive capacity, the least developed countries are more vulnerable from climate change induced events (Patt et al., 2010). The tourism destination and activities are already exposed to the climate change induced extremes in Nepal (Nepal, 2011). Tourism provides a unique opportunity to experience the way of life of tourism dependent community and individuals. The climate change may be major subject of development planning and that may influence in every sectors of development and livelihoods. Most of the tourism activities are based on the natural resources like rivers, biodiversity, landscape, snow Cover Mountain, and undisturbed cultural diversity that also embedded with the nature. The natural resources are exposed to the climate change and highly sensitive to the changing climatic variables and extremes. The impacts of climate change in natural and cultural heritages have directly impaired the tourism industry of Nepal (KC, 2017). The climate change and tourism sectors are interrelated to each other. A small change in climatic variables also brings severe

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implications to mountain tourism activities. Each tourism activity directly and indirectly interlinks with livelihood of the mountain community that creates the employment to skilled and unskilled labours and flow of the capital to low income people. There is limited study and research have been done on change in climatic variable and climate change induced disasters and tourism based livelihood in mountain tourism activities. Few research and study found based on the perception survey relate to the climate change issues but could not relate with climatic variables and climate change induced disaster that impact to the tourism based livelihood. Previous research could not link with the livelihood option based tourism activities impacted by change in pattern, frequency and intensity of climatic variables and climate change induced disasters. Previous research correlates with only flow of tourist and climate change but this research differs by relating on change in climatic variables and climate change induced disaster with livelihood options. This research tries to identify major climatic variables and climate change induced hazards and the adverse impact in tourism based livelihood. So the research questions are: What are major climatic variables and climatic extremes impact to the tourism based livelihood? How does the climate change create the severe problems in livelihood of the mountain people? How does the climate change affect tourism dependent livelihood in the context of Himalayan region of Nepal?

The research assumption is that change in trend of climatic variables, and pattern of climatic events in destination severely influences to the tourism and tourism dependent livelihoods in Himalayan region. The tourism related activities are the major alternative option for livelihood and a small change in the trend, intensity, frequency and pattern in climatic variables and climate change induced disaster affect severely in livelihood. The previous research shows that tourism is the major alternative livelihood option and it depends on the natural resources and climatic condition. The previous research could not address how the changing climate impacts to the livelihood of people. So this research is unique and differs from the other research and study.

The rest of the paper is structured as follows: section 2 deals with literature review related to climate change impact in High Mountain tourism based livelihood, section 3 is related to the methodology used, section 4 shows discussion and finally section 5 concludes the study.

2. Literature Review

Globally Climate change is one of the most serious threats and has been an issue of international concern for the decades (Devkota and Phuyal, 2015). The Intergovernmental Panel for Climate Change (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, 2014). 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 greenhouse gas emission scenarios over 21st century (IPCC, 2014). IPCC also reported that IPCC estimates economic impact of climate change vary in their coverage of subsets of economic sectors and depend on a large number of assumptions, many of which are disputable, and many estimates do not account for catastrophic changes, tipping points, and many other factors. With these recognized limitations, the incomplete estimates of global annual economic losses for additional temperature increases of ~2°C are between 0.2 and 2.0% of income (IPCC, 2014). IPCC also recognized that the tourism and recreation are major economic sectors impacted by climate change (IPCC, 2014).

Kruk (2009) argued that tourism is a vehicle for economic development, given its potential to earn foreign exchange, create employment, reduce income and employment disparities, and strengthen linkages among economic sectors, control outmigration of local youths and help to alleviate poverty. Nepal is rich in biodiversity, cultural diversity, geographical variation and ecological diversity and these are the major attractions of the tourism in Nepal (Dhakal, 2015). The climate change induced events are responsible for disturbance to quality of tourism resources like biodiversity, scenic view of mountain, water related activities and other adventurous tourism activities in Nepal (KC, 2017). It is evident that the changing climate will have adverse impact on tourism in Nepal because both share a close relationship in which the changing climate directly affects the tourism. It increases the stress on the environment and brings more risks than opportunities for economies based on tourism like that of Nepal (KC, 2017). The climate change may be major subject of development planning and that may influence in every options of livelihood assets.

The national Climate change impact survey 2016, has shown that the climatic variables have caused increased frequency of disasters including flash floods, incidence of climate induced disaster are increasing and becoming unpredictable, pushing more than 1.9 million people to high vulnerability and exposing additional 10 million people to the risks of climate induced disasters (CBS, 2016). The key sectors that are affected or have potential to be affected by climate induced disasters in Nepal include agriculture, health, water and energy use, infrastructures, biodiversity, ecosystem services, and tourism (CBS, 2016). Increases in such natural disasters and rise in temperature have caused decrease in tourists flow in Nepal (KC, 2017). 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, David & Richard, 2005).

There are several challenges created by climate change induced disasters in tourism like destruction and increase cost of infrastructure construction, loss of biodiversity, infestation of the insect and pest which harm to the health and damage to agricultural production, increase in cost of tourism operation and management, decrease the ecosystem services in the destination. The climate change induced hazards create challenges to protect the historical, archeological, cultural and natural heritage. The climate change induced disasters directly and indirectly impact to the recreational tourism, effect in the indigenous knowledge system of the local cultural practices, and that linked to the people's livelihoods in the alpine region (Neupane & Chhetri, 2009). ICIMOD reported that the Himalayan region is facing frequent natural hazards, degradation, of resources, malnutrition or food insecurity because economically utilizable resources and livelihoods options for additional income generation at the local level are limited, outmigration of the mountain area has become a major livelihoods strategy for mountain people (ICIMOD, 2010). The tourism may be major employment sectors for the mountain person that gives various livelihoods opportunities to the peoples. The rich natural beauty and cultural heritage of the mountain can be developed into tourism assets to benefit mountain communities. Being labor intensive and requiring relatively low levels of capital and land investment, it can yield significant benefits to remote and rural mountain areas where traditional livelihoods are declining or disappearing due to environmental degradation and adverse climate change situation and few alternative development opportunities exist (Kruk, 2009).

3. Methodology and tools

The criteria for the selection of the research site were based on the major destination of the mountain tourism and other criteria was dependency of the livelihood in tourism based

activities. The study period of this study was one year and field visit was conducted two times in major tourism season. The community consultation in field level i.e., key informants interview with local people, tourism entrepreneurs, trekking and mountain guides was conducted listing climatic variables and climate change induced hazards that impact to their livelihood. The primary data were gathered from field work like key informants interview with semi-structure questionnaire, community consultation, and participatory observation in research site. The secondary data were taken from the publications of different government, non-government institutions and DHM. The sampling tools used for this research are random, purposive, and accidental to collect information. The descriptive qualitative methods are used to analyze the available data from different sources. The qualitative data from the field and science based data about the change in climatic variables are used for this analysis.

4. Discussion

4.1 The Study Area

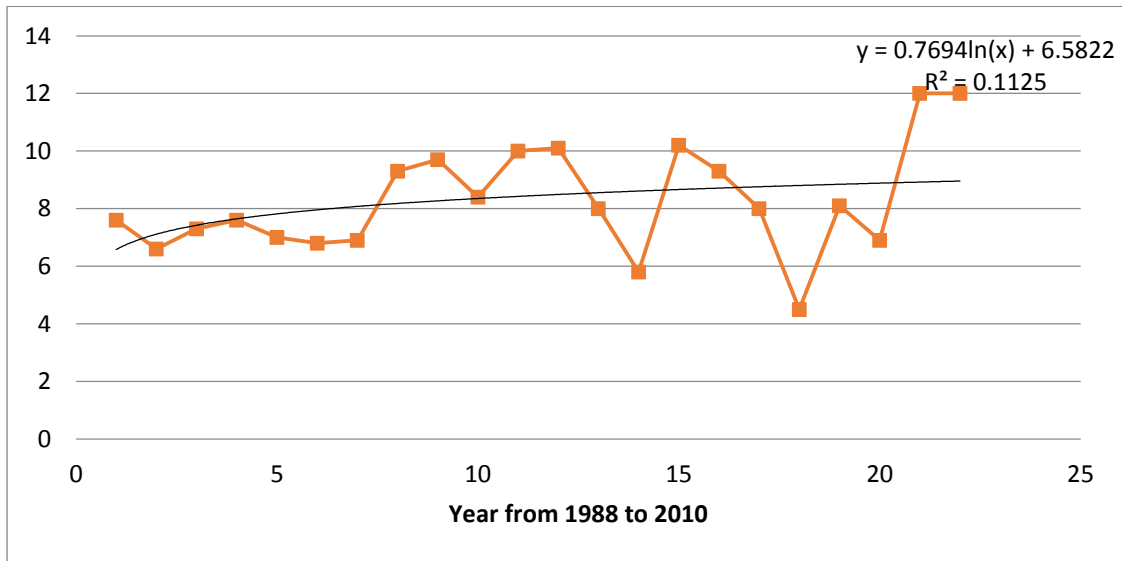
The tourism is the main source of livelihoods in Lho, SamaGaun of the Gorkha. The research location is Lho and Samagaun of Trans-Himalayan North Gorkha, the western region of Nepal. The research location is the prominent for adventurous and cultural tourism, and has rich biological and cultural diversity. This research area falls under the world famous trekking route Manaslu circuit. The Manaslu Conservation Area (MCA) under national trust for nature conservation also initiates and runs the different conservation based development with the local participatory approach in this area. The MCA is rich in biodiversity having inhabitant of about 2000 species of plants, 33 species of mammals, 110 birds, 3 reptiles, and 11 butterflies in 11 types of forest have been reported from this area and also reported that MCA is the prime habitat of the elusive snow leopard, grey wolf, musk deer, blue sheep and the Himalayan Thar (Bhujju et al., 2007). The traditional culture and archaeological resources are also main attraction for tourism. The unique topography with great diversity of vegetation, coniferous forest and snow covered mountains are scenic beauty. Mountain tourism is based on cultural aspect of the society and adventure activities like mountaineering in the Himalayan series available at the highest altitude of the world. High Himalayan range is the main asset of the mountain tourism which consists of highest peak of the world Mount Everest. There is Mt. Manaslu in the southern part of the study area which is the 8th highest peak of the world.

4.2 The Climatic Variables

i) Maximum and minimum temperature

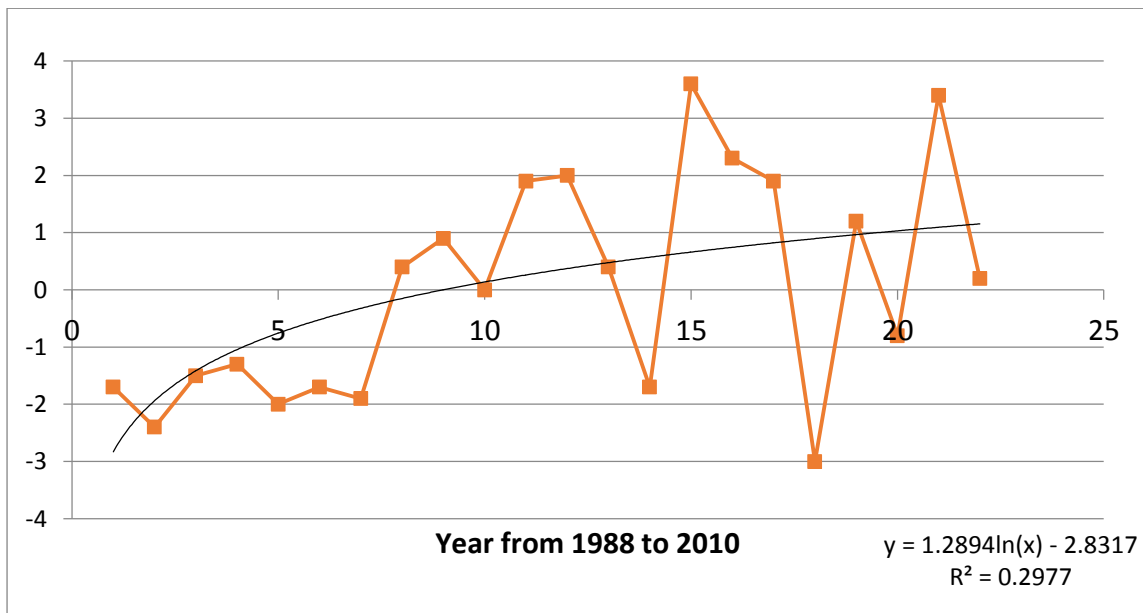
The temperature trends of Manaslu conservation area are in decreasing order. It shows that summer is going to be hotter and winter is going to be cooler. The maximum and minimum temperature of the study area is given in graph 1 and 2. The temperature trend of 22 years from 1988 to 2010 in Langtang area (this place has similar height like Manaslu area) represents 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 increases in Langtang from 7.6 °C to 12 °C (4.4°C increased) and minimum temperature increases from -1.7 °C to 0.2 °C (1.9 °C increased). The geographical location of Langtang and Lho and Samagaun is situated in alpine region. The Langtang is the famous alpine tourism destination and near to the capital city Kathmandu. The Department of Hydrology and Meteorology recorded the data about change in the temperature of Langtang Khola:

Figure 1: Maximum Temperature recorded from Langtangkhola



Source: (DHM, 2015)

Figure 2: Minimum Temperature Recorded from Langtangkhola



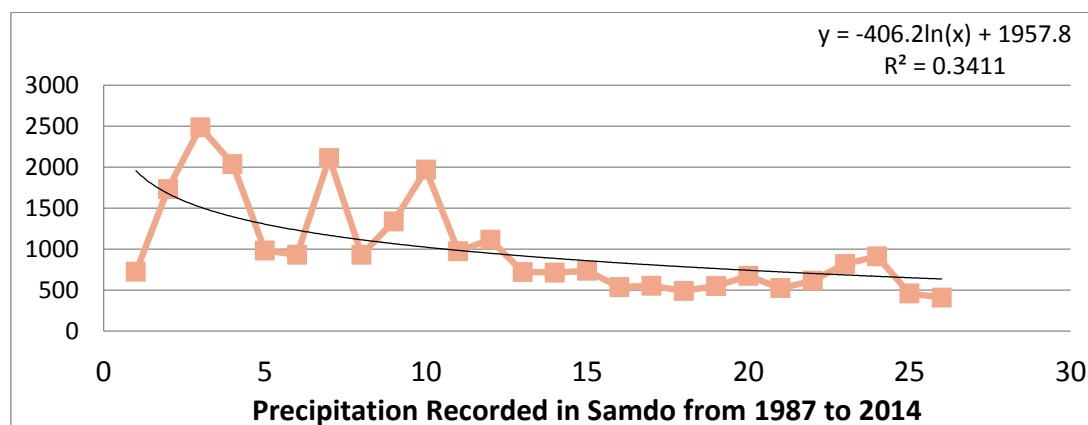
Source: (DHM, 2015)

The graph represents the maximum and minimum temperature trend of Langtang. The altitude of Langtangkhola is 3920 m and the Samdo is 3650, the base of the Larkey pass of famous trekking route Manaslu circuit. The temperature is main climatic variables that affect to every sector of the livelihoods.

ii) The Rainfall Trend of Study Area

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

Figure 3: 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 in decreasing order during 27 years. The decreasing of the rainfall impacts to agricultural production, increasing the ice melting rate but occurrence of the sudden heavy snow falls causes disturbance in tourism seasons.

4.3 People’s perception on climatic variables, hazards and livelihood

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 preplanned activities have to be cancelled by tourists. Local people and tourism entrepreneurs said that seasonal shift in precipitation and snowfall has created obstacle for the infrastructure development in this belt. Increased frequency and magnitude of climatic variables are most responsible for climate induced disaster which can be easily observed in the mountain area. Long gap of consecutive precipitation has brought drought decreasing pasture land in the mountain region. There are 80 people participating in key informant interviews and their experience about the climatic variables is given below in table 1:

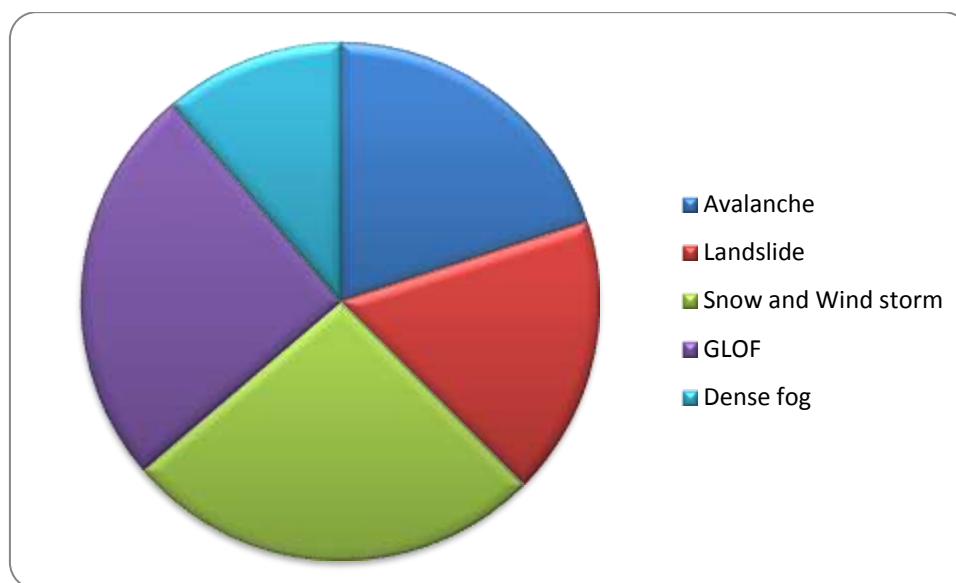
Table 1: People's Experience about Climatic Variables

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

Source: Field work 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 that create favorable environment for houseflies and mosquitoes. The appearance of flies that may cause 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 4: Prioritization of Climatic Hazards



Source: Field survey 2015

Frequency of unpredictable climatic variables like storm and snowfall has directly affected to the visitor, people and entrepreneurs. The major climatic hazards are avalanches, landslide, heavy snowfall, snow storm, GLOF, floods and dense fog reported by respondents. 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 that 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 have 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 increases the melting rate of ice in high altitude has also causes difficulty to climbing industry. Similar effect in the agriculture is also unavoidable. Agricultural land, livestock, herbs are being ruined by the climate induced disasters. It is one of the main causes of degradation of mountain life style of the people.

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 people 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 disasters 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. This also increases the cost for the emergency preparedness and insurance premiums, which also can have indirect linkage with tourism.

A wide range of environmental resources that are critical attractions for tourism in many destinations are sensitive to climate variability, such as wildlife and biodiversity, water levels and quality, and snow conditions and glacier extent. There are evidences that water availability and snow covered areas are decreasing which can have high impacts in operation of tourism entrepreneurship and activities said by people. In addition to the aesthetic beauty, less snow also affects the Himalayan climbers and alpine trekkers.

4.4 The Livelihoods and the Climate change Hazards

The climate change severely impact to the livelihood assets that reported by the respondent. The prioritization of the tourism based livelihood assets impacted by the climate change by respondents is as follows:

1. The natural asset of livelihoods like, biodiversity, landscape, snow cover, peaks, area Adventurous activities and Ecotourism activities,
2. Physical assets of livelihoods of Tourism related Infrastructure like hotel, tea houses, trekking route, transportation, supply channel and other structures
3. The social/cultural assets of livelihoods Cities and Urban Centre tourism and cultural Tourism dependent people
4. The financial assets of livelihoods related to the tourism are loss of employment, increase in operation cost, loss of property,
5. Human assets of livelihoods are loss of life,

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 tourism sector is one of the important off farm base livelihoods in Nepal. The record reveals that trekking business, hotels, and travel agencies are major sub-sectors within the tourism sector in generating employment. For example, trekking business has had generated 50,000 persons job in 2014 followed by 26,808 persons job by standard hotels and about 25,238 persons job by travel agencies (MoCTCA, 2015). Moreover, travel and tourism has had generated 497,500 jobs directly in 2017 contributing 3.2 % of total employment in the country (WTTC, 2017). Similarly, it was estimated that the direct contribution of the travel and tourism sector to GDP was NRs 99.8bn (4.0% of GDP) in 2017 which is expected to grow by 3.8% per annum reaching to NRs 152.4bn (4.2% of GDP) by 2028 (WTTC, 2017).

It is obvious there is impact of climate change in livelihoods as three fourth of the respondents accept the facts and figure that have been experienced in recent decade. The changed climatic variables are the most responsible factors for climate induced disasters in mountain region. The disaster is there to ruin the physical and natural assets of the environment. 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.

Table 2: People's Perception on Change in Hazards and Tourism Product

Impacts	Increased	Decreased	don't know
Impact of Climate Change in Cultural heritage	64	13	3
Negative impact of Climate Change in Biodiversity	66	12	2
Change in Natural Disasters	72	2	6
Effect of Natural Disaster in Tourism	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 people accept that the increasing rate of ice-melting due to increment in the temperature is one of the visible effects of climate change as depicted in table 2. 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.

The perception survey was conducted in local area and the local people of research site on the change in frequency, intensity and pattern of climatic variables and climate change induced disaster participated by 75 people including tourist and guide visited in local area, and local people.

Unseasonal snow storm is another torture for the mountain tourism. The change, frequency and intensity of the natural disaster and change in the time and pattern of the climatic variables directly impact to tourism resources and activities. The above table 3 shows that the pattern and time of the climatic variables in change and the frequency, intensity and pattern of climate change induced disasters are changed. This phenomena are directly and indirectly interrelated with the tourism business and tourism based livelihood. 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.

Table 3: People Perception on Climate Change in Study Area

Change in the month of precipitation	Yes 93%	No 2%	Don't know 0%
Change in month and altitude of fog	Yes 93%	No 3%	Don't know 5%
Change in temperature	Increase 100%	0	0
Change in Pattern of snowfall	Yes 98%	NO 2%	0
Change in Pattern, frequency and pattern of natural disaster	Increase 91%	Decrease 2%	Don't know 7%
Change in Pattern, frequency and pattern of Snow fall	Decrease 93%	Increase 2%	Don't know 5%
Change in Pattern, frequency and pattern of precipitation	Increase 96%	Decrease 2%	Don't know 2%

Source: Field Survey, 2015

The recorded data from Himalayan rescue association show that the climate change induced disaster like avalanche and snow storm cause the casualty of the tourist and tourism operators in adventurous tourism sector places of Nepal. The raw data recorded by the Himalayan rescue association show that there were casualty in mountain region due to the avalanche and huge snow fall that directly affect to tourist and expedition. The recorded disasters in Manaslu and Annapurna region impact to the tourism activities in research location which has direct link to the livelihood of the local people and employee in tourism. The disaster report of MoHA in 2015 mentioned that avalanche of November 1995 killed 43 people including some foreign trekkers at Khumbu and Kanchanjungha areas. In 2nd 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 manaslu region, due to huge avalanche, 21 people in 2005 A.D., 2 people in 2009 A.D., 9 people in 2012 A.D., 7 people in 2013 A.D., 104 people in 2014 A.D. were killed and in 2012 A.D. 2 dead bodies were not found (MoHA, 2015). The loss and damage from the climate change induced disasters in Himalayan region of Nepal shows that human casualty and loss of tourism assets increased. Due to those climate change induced disasters while considering these circumstances, we can easily conclude about the impact of climate change in mountain tourism has resulted in a negative direction. It is obvious that there is impact of climate change in livelihoods of local people 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 disaster is there to disintegrate the physical and natural assets of the livelihood. 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.

Buddhist monasteries, biodiversity, snowcapped mountain, other features of landscapes and local lifestyle are major heritages of the mountain region. The local people said that the dramatic change in availability of water resource in mountain brings the water scarcity and

huge flood and landslide eroding heritages of tourism and other livelihoods related features. The local people and trekking guides said that frequency of unpredictable blow of storm and snowfall have 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 tourism destinations are situated in different eco-regions and the tourism activities depend on resources and climatic conditions. Weather condition in season determines the tourism flow in destination. 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 have brought displacement of traditional settlements and structures of local ethnic groups. Local people 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 have 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 like:

- Biological effects to flora and Fauna, ecosystem services etc.
- Physical effects to snow, water availability, Trails, Bridges, Transportation, communication, health, supply channel, tourism infrastructure and tourism activities etc.
- Economic and Social Effects to quality of Services, increase cost of operation, loss of property, loss of employments,
- Cultural and architecture effects – deteriorate Tourism Attractions of cultural assets, destruct the cultural sites,
- Direct effects by temperature, rainfall, heavy snowfall and storm, etc.

Those all effects of climate change in tourism link to the livelihoods of tourism destination.

5. Conclusion

Climate change impact and adaptation towards the change on the Tourism Dependent Livelihoods has always been significant aspect of issue and discussion worldwide, which is also a burning issue in the context of country Nepal. Participatory tools for assessing climate change were used like community consultation, interview, and observation for qualitative data and science based data from DHM were collected. To assess the information, literature were reviewed from different journal articles, published books, government policies, meteorological and hydrological data and other unpublished thesis work and articles.

Having the limitation of data in the climate change and its impact in tourism sectors in Nepalese context, this research can add the important knowledge materials for the tourism planner, businessman, researcher, academician and practitioner. Several studies reported that climatic and climate change induced hazards like extreme temperature and rainfall, landslides, floods, avalanche, heavy snow-fall, storm, dense fog impact/effect to tourism sectors. The mountainous region of Nepal is the major destination for adventurous and ecotourism activities. The impact of climate change and associated natural disasters in

destination 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 to all livelihoods assets in mountain region. Basically the off farm based livelihood depends on tourism in this 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.

The study reveals that most important climatic variables responsible for climatic events are temperature, precipitation, fog reported by respondent. The perception and experience of local people on climate change coincide with the local meteorological data which depict that the mean annual temperature is increasing and average annual precipitation is decreasing. The change in the climatic variable and associated events impact to the tourism related activities and products. This research also concludes that through these change there are severe impact in tourism industry. Altogether the climate change induced disasters impact to ecotourism, adventurous tourism, detached the supply channel for destination and ultimately it affects to the livelihoods of dependent people and national economy. The findings of the research from field and literature show that the climate change affects to livelihoods of dependent people i.e. local knowledge based product, employments of 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 impacts to the off-farm based livelihood like entrepreneurs, business, employments, production of handicraft and agriculture, natural and cultural heritage etc. This also affects national economy directly and indirectly.

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Note: Views and opinions expressed in this article are the personal views of author.