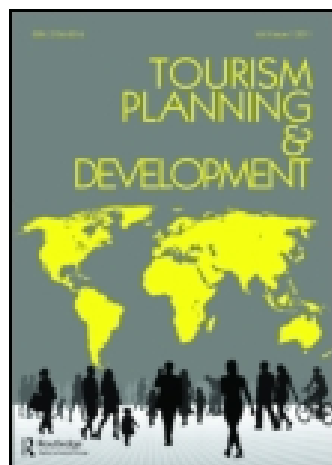


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### Climate Change and Its Impact on Tourism in the Manaslu Conservation Area, Nepal

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# Climate Change and Its Impact on Tourism in the Manaslu Conservation Area, Nepal

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**ABSTRACT** *The Hindukush Himalayan region including Nepal, a country reliant on tourism, is particularly sensitive to climate change. However, there are considerable gaps in research regarding tourism and climate change in Nepal. The present research assesses the impact of climate change on tourism in the Manaslu Conservation Area of Nepal. Seventy-six households were interviewed followed by three focus group discussions and five key informant interviews. The empirical data collected at the site are complemented by secondary information on climate and tourism. Local people perceived that temperature and rainfall have been increasing in the study site as a result of climate change. In response to gradually warming temperature and decreasing snowfall, there seems an urgent need for tourism promotional activities in the study area. This would spread the tourist base and increase foreign tourist expenditure in Nepal.*

## Introduction of Climate Change and Tourism in the Global and National Scenarios

The global climate is changing, affecting various aspects of human life (Epstein & Mills, 2005). Changes in the last 50 years have been dramatic (Intergovernmental Panel on Climate Change [IPCC], 2001, 2007) and scientists attribute the change to human-induced factors (IPCC, 2001, 2007; Ishaya & Abaje, 2008). On an average, the global temperature rose by 0.75°C over the last hundred years (1906–2005), with more than half of this rise, 0.44°C, in the last 25 years (IPCC, 2007). The effects of climate change are not felt evenly across the world (Stern, 2007). For example, the Hindukush Himalayan region is one of the most climate-sensitive regions (Shrestha, Wake, Mayewski, & Dibb, 1999). Eastern Nepal and Eastern Tibet show relatively greater warming trends (greater than 0.02°C per year) (Shrestha & Devkota, 2010). The number of extreme precipitation events and severe storms has increased (Anup, Bhandari, Joshi, & Aryal, 2013; Piya, Maharjan, & Joshi, 2012). As the Stern Review (2007) argues, it is the poorest countries and people who will suffer earliest and the most.

The United Nation World Trade Organization (UNWTO) suggests that tourism is a primary source of foreign exchange earnings in 46 out of 50 of the world's least developed countries (Ramasamy & Swamy, 2012; UNWTO, 2007). The World Travel and Tourism Council (WTTC, 2010) estimates that tourism contributes 9.2% of global gross domestic product (GDP) and forecasts that this will continue to grow at over 4% per annum

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during the next ten years to account for 9.4% of GDP. In Nepal, trekking and mountaineering are creating opportunities for enterprise generation throughout the tourism value chain particularly in the operation of tea houses and lodges along the trails (Sherpa, 2006), which has a direct impact on livelihoods (Adhikari & Fischer, 2011; Farooq, Khan, Ullah, & Shahid, 2012).

### Climate Change and its Impact on Tourism

Climate and tourism have a very close relationship (Burns & Bibbings, 2009; Martin, 2005; Patterson, Bastianoni, & Simpson, 2006; Rayamajhi, 2012) and the tourism and recreation sector is highly influenced by climate (Gomez-Martin, 2005; Skanavis & Sakellari, 2011). Climate is an important factor in the destination choice of tourists (Bigano, Bosello, Roson, & Tol, 2008; Lise & Tol, 2002; Maddison, 2001; Rayamajhi, 2012; Skanavis & Sakellari, 2011). For the global tourism industry, climate change brings risks as well as some opportunities (Sem & Moore, 2009).

More frequent periods of extreme heat will cause discomfort to visitors (Tzu-Ping Lin, Tzu-Ping Lin, & Matzarakis, 2008; Uyarra et al., 2005) and increased risk of illness (Simpson, Gössling, Scott, Hall, & Gladin, 2008). There will be regional and seasonal shifts in tourist flows, resulting in both winners and losers (Braun et al., 1999). Climate change will bring additional burdens especially for the poorer countries, which are putting great hopes on tourism as a driver of development (Uyarra et al., 2005). Climate change is a threat to mountain tourism due to decreased snow security, glacier melt, and more extreme weather events (Burki, Elsasser, & Abegg, 2003).

As a result of climate change, gradually increasing warmer temperature has been removing a barrier for trekking tourism as supported by the study of Lama (2010) in the Mustang Valley of Nepal. Hamilton, Maddison, & Tol (2005) with the help of 14 Global Circulation Model predicted that as a cool country warms, it first attracts more tourists. After the temperature exceeds 14°C, visitors' number will decrease. Warmer countries may have a disadvantage, while cooler countries may have an advantage due to rise in temperature (Bigano et al., 2008; Ramasamy & Swamy, 2012). A lengthened summer season has the potential to expand domestic and international tourism markets and thus increase tourist receipts (Scott, McBoyle, & Schwartzentruber, 2004).

Although the tourism sector is highly influenced by climate, our understanding of how climate variability affects the sector and its potential vulnerability to climate change remains limited (Maddison, 2001; Rayamajhi, 2012; Skanavis & Sakellari, 2011). Until recently, climate change had not garnered substantive attention from the tourism industry and recreation research communities (Gössling & Hall, 2006; Skanavis & Sakellari, 2011; Wall & Badke, 1994). Very few existing studies include the tourism entrepreneur as the basis of study for assessing the impact on livelihood of the people (Moreno & Becken, 2009).

### Studies Related to Climate Change and Tourism in Nepal

Few studies related to climate change and tourism have been conducted in the Annapurna Conservation Area in Western Nepal. The study of Lama (2010) on Lower Mustang shows that the negative impacts of warmer winters are the loss of the natural and esthetic beauty of the place and reduced water availability. From the tourism service and activities viewpoint, water scarcity is affecting the stakeholders operating hotels in villages such as Muktinath, Kagbeni, Puthang, Marpha, and Lete.

The study of Subedi and Chapagain (2011) on Upper Manang shows that the number of tourists visiting the Manang valley had decreased from 2002 to 2006. During those years, the total trekkers in the three major routes, namely Annapurna, Everest, and Langtang, reduced significantly from some 100,000 in 2001 to 67,000 in 2006. The number of trekkers in Upper Manang increased from 9,360 in 2006 to 14,192 in 2007. The main cause for this was the political instability in Nepal.

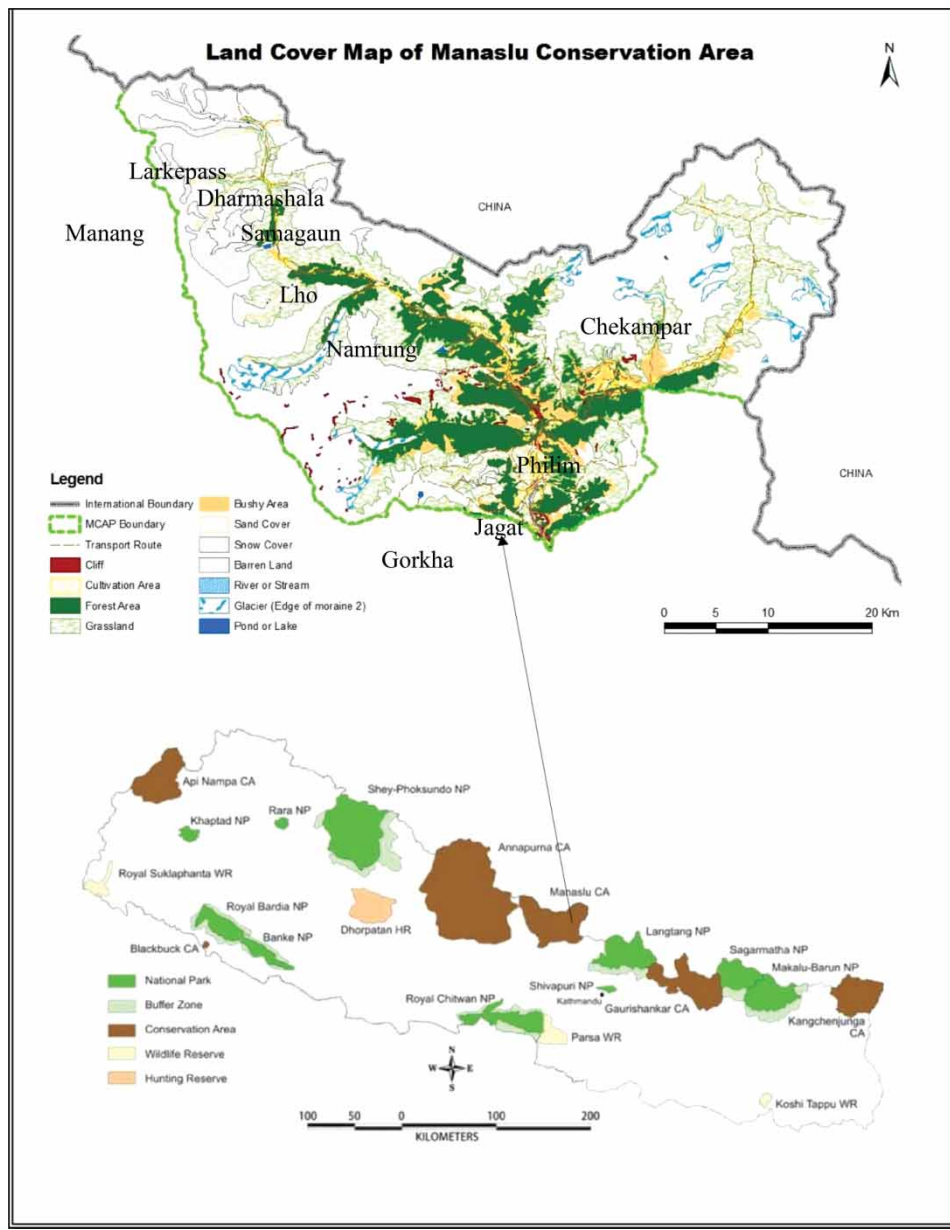
Rayamajhi's study (2012) explores the relationship between tourism and climate change for the stakeholders in the tourism sector, mainly the lodge-owners, guides, and tourists in the Annapurna Trekking Trail. The change in temperature has not been sufficiently significant to cause discomfort to tourists. However, it was found that the erratic rainfall directly hampered the lodge-owners' business. Risk of increased intensity of rainfall, landslides, and floods may prevent tourists from visiting in the future.

Therefore, identifying the impact of climate change on tourism is a contested issue in Nepal. There is no study found in the literature about the impact of climate change on tourism in the Manaslu Conservation Area (MCA) of Nepal, an issue the present paper hopes to address. Analysis of the observed and perceived climate and tourism data is important to see the impact of climate change on tourism. In this context, two questions emerge, which demand empirical answers: What are the observations and perceptions of local people regarding climate change? and Does observed and perceived climate change have an impact on tourism at the local level?

## Study Area

This study was carried out in the trekking route from Machhakhola to Samagaun with particular attention given to Lho and Samagaun village development committee (VDC) in MCA, Nepal, as shown in Figure 1.

MCA lies in the upper region of Gorkha District and is bordered by the Tibet Autonomous Region of China to the north and east, Manang District to the west, and Gorkha District to the south. It covers an area of 1,663 km<sup>2</sup> which was declared a conservation area in December 1998. The elevation of the area ranges from 1,400 m to 8,163 m above sea level. There is unique topography with great diversity of vegetation, coniferous forest, and snow-covered mountainous scenic beauty. Tibetan culture and monasteries attract tourists to enjoy the traditional culture of Shringi Gompa in Bihi and Mu and Rachen Gompas in Chhekampar. Harmony between religion and environmental conservation can be seen as Lamas from monasteries have prohibited the locals from hunting wildlife (National Trust for Nature Conservation [NTNC], 2013). As the area lies in the mountain region of Nepal, trekking and mountaineering tourism had great scope in October–November and March–May to cross the Larke Pass as a form of adventure. Larke Pass is the crossing used to reach Manang in the Annapurna Conservation Area from Gorkha of MCA at an altitude of 5106 m. The area consists of the Manaslu Mountain, a peak of 8,163 m where mountain climbing can be encouraged for tourism promotion (NTNC, 2013). Research exploration activities on biodiversity and glaciers, religious and cultural activities, nature hiking, enjoyment of mountain range scenery, and mountain climbing are generally preferred by the national and international researchers and visitors. There is less infrastructure development and basic services such as availability of safe drinking water supply, electricity, education, and health services. Due to the lack of economic opportunities, people have had to depend on marginal agriculture, animal husbandry, and exploitation of natural resources for survival (NTNC, 2013). Tourism had been one of the sources of income of the local people. Being in such a high altitude, adventure tourism activities such as skiing, hiking, and mountain biking that can be undertaken in the area



**Figure 1.** Map of the study site.  
*Source:* NTNC, (2013).

have, with the right development and promotion, significant potential. But rise in temperature and reduced snow security put the future of this type of tourism in Manaslu Conservation Area at some risk; hence the need for the present investigation.

### Methodology

The field work was carried out between April and May 2012 which was favorable for visiting the local people as they are relatively free from agricultural activities. Primary as well as

secondary information on climate change and tourism was collected for the study. In the beginning, information on tourism-involved and non-involved households were taken from the Manaslu Conservation Area Project (MCAP) office in Philim (the household survey). As the main focus of the study was to get information on climate change and tourism, clustered random sampling was applied for selection of household survey on the basis of their involvement in tourism. About 66% households involved in tourism business were surveyed by using the random number table from the list of households available in the MCAP office in Philim (38 out of 58 households). An equal number of households that were not involved in tourism were surveyed from Lho and Samagaon VDC by using the random table from the list of households available in the MCAP office in Philim to have clear and more detailed information about the relationship between climate change and tourism. Those not involved in tourism might also have observed and experienced the impact of climate change on tourism. A semi-structured questionnaire in Nepali language was used for household survey focusing on their perception toward climate change and impact on tourism. The questionnaire was focused on whether local people had perceived climate change in the form of instable temperature; rainfall and water supply and unfavorable weather change less, moderately, and most significantly; and increases in visitor number. Unstable temperature in this case means increase in temperature of summer and decrease in temperature of winter. Besides the household surveys, three focus group discussions (FGDs) comprising ten people (men and women) were conducted with elderly people and youth in Samagaon and with youth in Lho. As older people had been experiencing climate change since quite a long time and youth have to face the impact for a long time in the future, they were given the opportunity to air their views. To acquire more information on the perception about climate change and tourism, five key informants were interviewed including the local leader, teachers, and leading tourism entrepreneurs as they have been experiencing the climate change and tourism issue. The FGDs and key informant interviews were conducted with the help of a semi-structured checklist in Nepali to have a broader understanding of knowledge on perception related to climate change and tourism. Primary data on climate change and tourism perception collected from field and secondary information of tourists from NTNC and climate data of Department of Hydrology and Meteorology (DHM) were analyzed as follows.

Climate- and visitor-related secondary information was analyzed graphically in Microsoft Excel 2007, while climate change and tourism perception information from household survey was analyzed by entering raw data in Statistical Package for Social Sciences (SPSS) 16 Software. Data from the household survey, focus groups, and key informant interviews were analyzed qualitatively by the description method as shown below.

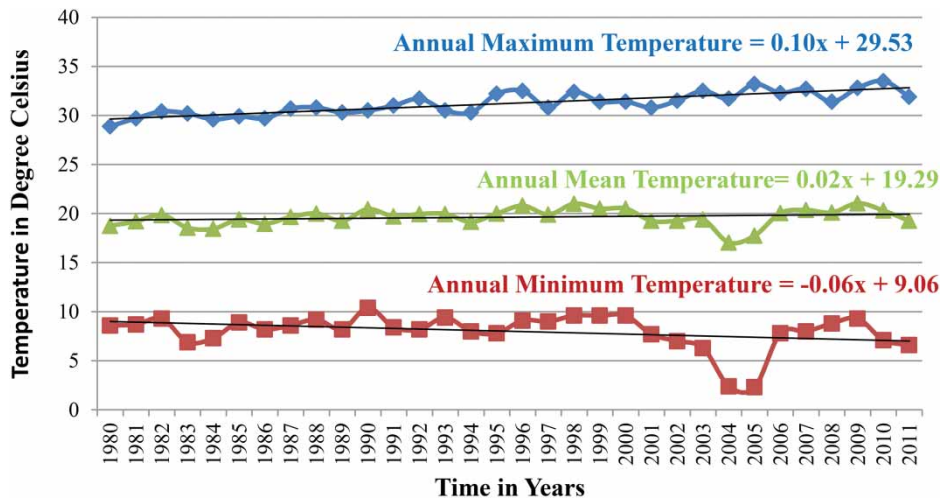
## Results

### *Climate Change and Tourism Observation*

The observed data on climate of the study area, such as temperature, rainfall, and discharge, were available from DHM. The nearest meteorological station for temperature data was located in Gorkha Bazaar. The annual maximum temperature has been increasing at a rate of  $0.10^{\circ}\text{C}/\text{year}$  as the trendline was making a positive slope of 0.10 with the annual time scale starting from  $29.53^{\circ}\text{C}$  as shown in [Figure 2](#).

The annual mean temperature has been increasing at a rate of  $0.02^{\circ}\text{C}/\text{year}$  as the trendline was making a positive slope of 0.02 with the annual time scale starting from  $19.29^{\circ}\text{C}$  and the annual minimum temperature was decreasing at a rate of  $0.06^{\circ}\text{C}/\text{year}$  as the trendline was making a negative slope of  $-0.06$  with the annual time scale starting from  $9.06^{\circ}\text{C}$ .





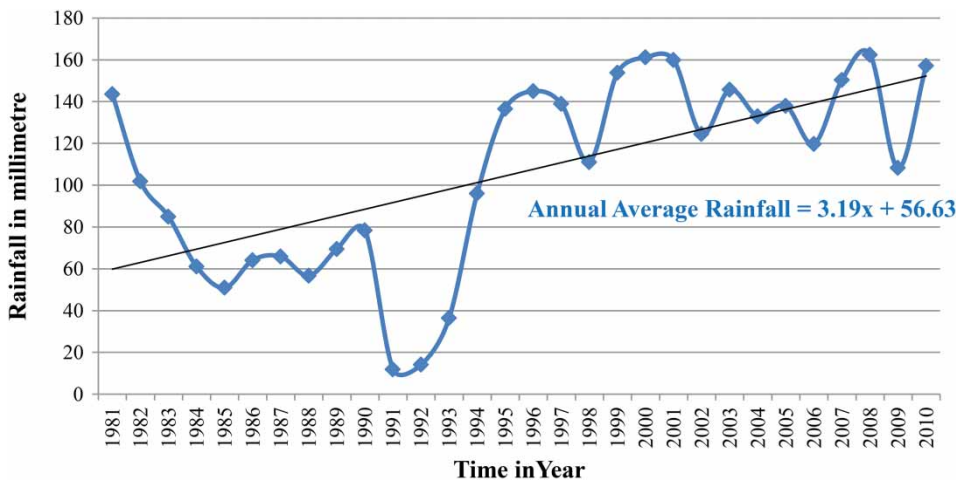
**Figure 2.** Annual maximum, mean, and minimum temperature.

Source: DHM (2012).

The nearest rainfall station is at Jagat, the entry point of MCA. The average annual rainfall has been increasing at 3.19 mm/year as shown in Figure 3. The trendline is making a positive slope of 3.19 with the annual time scale starting from 56.63 mm/year.

Budhi Gandaki River is the main river that starts from the Manaslu Peak and flows throughout the MCA. The discharge data of Budhi Gandaki at Arughat were obtained from the DHM. The analysis of 30 years' data from 1981 to 2010 shows that the annual maximum discharge has been increasing at a rate of 5.52 m<sup>3</sup>/s as the trendline was making a positive slope of 5.52 with the annual time scale starting from 600.7 m<sup>3</sup>/s as shown in Figure 4.

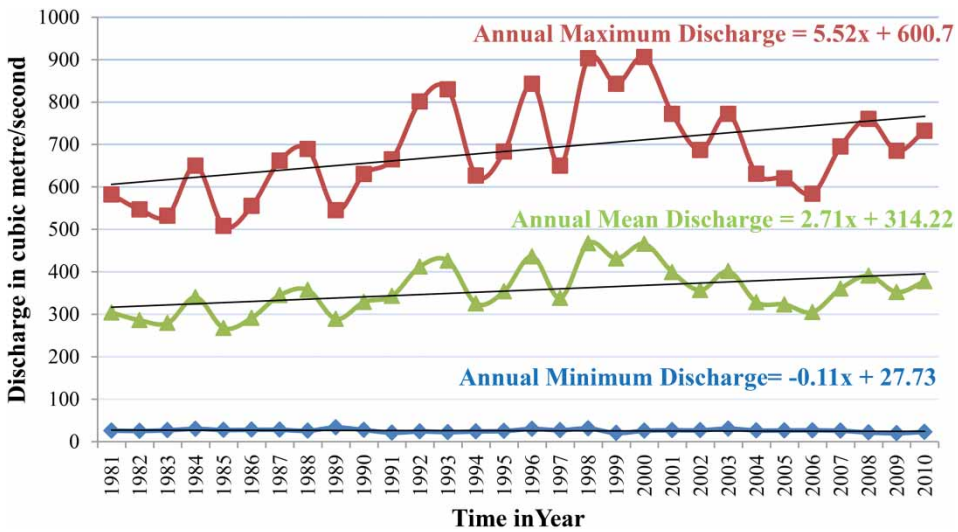
The annual mean discharge has also been increasing at a rate of 2.71 m<sup>3</sup>/s as the trendline was making a positive slope of 2.71 with the annual time scale starting from 314.22 m<sup>3</sup>/s.



**Figure 3.** Average annual rainfall of Jagat.

Source: DHM (2012).





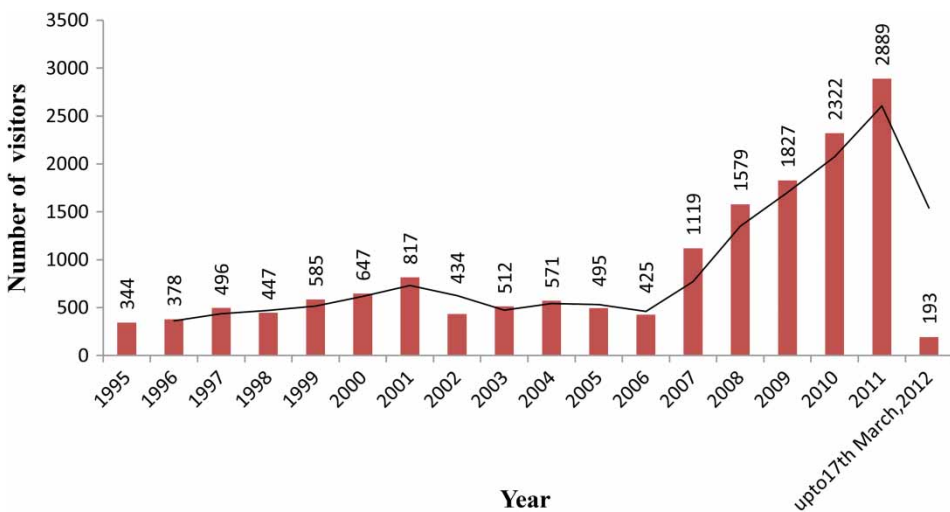
**Figure 4.** Annual maximum, mean, and minimum discharge in Buddhi Gandaki River in Arughat.

Source: DHM (2012).

However, the annual minimum discharge has been decreasing at a rate of  $0.11 \text{ m}^3/\text{s}$  as the trendline was making a positive slope of  $-0.11$  with the annual time scale starting from  $27.73 \text{ m}^3/\text{s}$ .

The observed data of tourists from NTNC show that the number of visitors visiting MCA had increased from 1995 to 2001 but decreased from 2001 to 2006 and again increased from 2007 onwards as shown in Figure 5.

After the establishment of MCAP by NTNC in 1998, visitors increased as there were more facilities available for tourists. Even more tourism-related information is available these days. The MCAP information center played a pivotal role in it.



**Figure 5.** Number of visitors visiting MCA.

Source: NTNC (2013).

**Table 1.** Correlation analysis of number of visitors in MCA in a year with annual average climatic parameters

Independent variables	Correlation coefficients
Dependent variable: Number of visitors in MCA in a year	
Average annual temperature in °C	0.12
Average annual precipitation in mm	0.21

From [Table 1](#), we can see that there is less-significant positive correlation between number of visitors with temperature and rainfall data in MCA in a given year keeping other variables constant (global economy, political instability in Nepal, increase in physical facilities, and promotional activities). The values of correlation coefficient are 0.12 and 0.21 between number of visitors with temperature and rainfall data, respectively. It shows that when the temperature and rainfall of the area increases, number of visitors in MCA also increases. The increase in visitors might be affected by global economy, political instability in Nepal, increase in physical facilities, and promotional activities.

### *Perception on Climate Change and Tourism*

During the household survey, questions on witness of climate change, severity of instable temperature, severity of rainfall and water supply, and severity of unfavorable weather change was asked to the respondents as shown in [Tables 2](#) and [3](#).

Yes/No questions were asked to know their perception regarding climate change in recent years. It can be seen that 93.4% of the respondents experienced climate change condition in MCA. The perception on unstable temperature pattern was received in four significant levels as shown in [Table 3](#) where 69.7% of the respondents felt the most significant impact of unstable temperature. Considerably fewer people (6.6%) saw no significant impact of unstable temperature.

Similarly, respondents were asked about their perception on change in rainfall pattern and water supply, out of which 35.53% felt the most significant impact of climate change on rainfall and water supply.

Regarding perception of unfavorable weather change due to climate change, it can be seen that 81.6% respondents felt that unfavorable weather change is occurring most likely due to climate change. Fewer people saw less significant, moderately significant, and no significant impact of climate change on unfavorable weather change.

The question on increase or decrease in tourist trend was asked to respondents as shown in [Table 2](#). From the people's perception, 96.10% of the respondents felt that the number of tourists was increasing in MCA. 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 impacts on tourism affecting their livelihood.

Participants of FGD felt that climate change was occurring in MCA in recent years. There was an increase in temperature resulting in high snowmelt in the mountains. Increase in

**Table 2.** Climate change and tourism perception of respondents.

Categories	Yes (%)	No (%)
Climate change perception	93.4	6.6
Increase in tourist trend	96.1	3.9

**Table 3.** Climate change perception of respondents.

Climatic variables perception	No significant (%)	Less significant (%)	Moderately significant (%)	Most significant (%)
Severity of unstable temperature	6.6		23.7	69.7
Severity on rainfall and water supply	27.63	19.74	17.11	35.53
Severity on unfavorable weather change	9.2	1.3	7.9	81.6

rainfall frequency and amount in lower altitudes and decrease in snowfall frequency in higher altitudes were seriously felt. Unfavorable weather change phenomena such as untimely snowfall in higher altitudes and untimely rainfall in lower altitudes during April–May were affecting visitors' movement in MCA. This was mainly due to climate change with respect to the view of respondents during the FGD. Almost all respondents during the FGDs felt that number of tourists visiting MCA had increased in the recent years. It was due to the promotion of tourism by providing better facilities, better advertisement, proper management by NTNC, and positive impact of climate change. Due to the adequate representation of the elderly and youth of both genders in the discussion, there was similarity among the observed data with the perception of people. They were observing these changes in the pattern of climate and tourism in the recent years.

Key informants also had a similar view to that of FGD respondents. They all felt that climate change was seen as increase in temperature, increase in rainfall amount and frequency in the lower belt, decrease in snowfall in the upper belt, high melting of snow in the Himalayas, and increase in landslide number and frequency in the lower belt. Increase in tourists visiting MCA in recent years was due to handover of MCA to NTNC and enhancement of local culture and festivals. Less snowfall had also helped tourist to cross the Larke Pass. All the key informants felt that the climate change had positive significant impacts on tourism currently but in the long run, increase in temperature, change in rainfall pattern and water availability, and unfavorable weather change might cause adverse impacts on tourism in the future. Representation of the tourism entrepreneur, local political leader, and educated people in the interview helped in proper verification of information collected from the household survey which was in accordance with observed data of climate change and tourism.

## Discussion

Temperature analysis revealed that annual maximum temperature of the study area was on an increasing trend but annual minimum temperature was on a decreasing trend. It shows that summer was going to be hotter and winter was going to be cooler in the study area. The study of Shrestha et al. (1999) reported an increase of temperature from 0.06°C to 0.12°C per year in most of the middle-mountain and Himalayan regions. There was a high snow-melt in the mountains due to increased temperature compared to the past in MCA similar to the study of Scott (2003) in mountain regions of North America and Moen and Fredman, (2007) in the alpine region of Sweden. Less mountain snow and glacier melt has been decreasing the scenic asset (and tourist expectation) of white snow mountain covering into an uninteresting rocky vista. Chaudhary et al.'s study (2011) on the Kangchenjunga Himalayan region shows that 84.4% of the people felt warmer weather which was much

more than the result of this study in MCA. Similar to Lama's study (2010) on Lower Mustang, people perceived unexpected warm and dry winter in recent times in MCA. According to the view of elderly people, there is less snowfall and less thickness of snow cover in the surrounding area and hill in the winter compared to the past. This small increase in temperature may lead to decreasing numbers of tourists in the area as supported by views of Maddison, (2001) and Gossling and Hall (2006). Rising temperatures due to global warming in the present time would also endanger the snow production in the Manaslu Mountain as supported by Koenig and Abegg (1997). Snow-deficient winters would severely affect the scope of the tourism industry in MCA as explained by Elsasser and Bürki (2002). The study of Jones and Scott (2006) in Canada's National Parks shows that people experience increase in visitors due to a lengthened and improved warm-weather tourism season. This study in MCA was also following a similar pattern in the current time which would work for a few years but would not be sustainable in the long run due to the decrease in scenic beauty of the Himalayas, natural resource, and cultural heritage.

In response to increased rainfall, discharge of the summer season has been increasing, while winter season has been decreasing. The perception of local people towards a change in the rainfall and water supply pattern in MCA was minimal compared to the study of Chaudhary et al. (2011) in the Kangchenjunga Himalayan region. Water shortage might occur as a consequence of climate change which would have impacts on the tourism sector in MCA as supported by the view of Hein, Metzger, and Moreno (2009). Unpredictable rainfall patterns as a result of climate change had resulted in the scarcity of water in MCA and other regions of Nepal as supported by the study of Dahal (2011). Also, greater rainfall in the tourist season would deter tourists in the area in the long run as supported by the study of Maddison (2001) and Gossling and Hall (2006). Camping activity in the high mountain valleys was also affected by water scarcity as a result of climate change in the mountains as supported by the study of Chaudhary et al. (2011) and Dahal (2011). Rain and foggy conditions significantly decrease the quality of the trekking experience in the Himalaya (Neupane & Chhetri, 2009; Rayamajhi, 2012), which would be seen in MCA in the future. These impacts might also be felt seriously by tourism in MCA in the long run.

There was an increasing trend of visitors visiting MCA from observed and perceived data similar to the result of Rayamajhi (2012) in the Annapurna Conservation Area. Despite the change in climate and shift in tourism seasons, the number of tourists has been increasing in recent years. Climate change had shifted international tourists toward the poles and up the mountains (Bigano et al., 2008; Gongmei, Schwartz, & Walsh, 2009). This finding can be relevant in the context of MCA. But tourists might decrease in future as climate effects on tourism have a time horizon of between three and five years (Patterson et al., 2006). Winter sport destinations around the world were already considering the implications of climate change (Scott, McBoyle, Mills, & Minogue, 2006). Currently, very weak positive correlation between climate and tourism shows that tourism sector has benefitted from climate change in MCA. The warm comfortable weather enabled visitors to travel in the winter season and gain easier access to cross the Larke Pass. But negative impacts of climate change can be foreseen in MCA and other mountainous region of Nepal in the future if such phenomena of climate change persist or increase in long run. Operational and maintenance costs would increase substantially under climate change scenarios in MCA in the future as supported by Simpson, Scott, and Trotz (2011). However, past experience in Nepal shows that trekking tourism has declined from 25% to 18% of all tourists visiting Nepal in 2004 (Dhakal, 2005). According to the study of Subedi and Chapagain (2011) in Manang Valley of the Annapurna Region, the number of tourists visiting the Manang

valley decreased from 2002 to 2006 and increased from 2007 which follows the similar pattern in MCA. It was due to the political instability and internal political conflict of Nepal. Hence, tourism is a sector particularly vulnerable to climate change due to its dependence on the environment and climatic conditions.

## Conclusion

Perception of the local people, secondary information, and literature support the fact that climate change is responsible for increases in temperature and rainfall in MCA. Local people also perceive that snowfall frequencies have been decreasing in recent years. Though the long-term historical data on tourist arrival are scarce in the study site, the number of tourists is observed to be increasing in recent years as seen from the available data. It might be due to favorable climatic condition followed by other interventions such as information and awareness of the local people.

From the research, it can be concluded that climate change is experienced by local people in the form of increase in temperature, irregular rainfall pattern, and less snowfall. Visitor numbers have increased in MCA in recent years in spite of the change in climate. Visitors number is increasing due to favorable climate and more information circulation at national and international levels in the current time. Therefore, publicity-related activities in MCA such as Manaslu Visit Year Campaign from Nepal Tourism Board and local cultural festivals from MCAP should be organized at regular interval for the promotion of culture and tourism to adapt to the adverse impact of climate change on tourism which could be experienced in the long term.

## Acknowledgements

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## References

- Adhikari, Y. P., & Fischer, A. (2011). Tourism: Boon for forest conservation, livelihood, and community development in Ghandruk VDC, Western Nepal. *The Initiation*, 4, 35–45.
- Anup, K. C., Bhandari, G., Joshi, G. R., & Aryal, S. (2013). Climate change mitigation potential from carbon sequestration of community forest in mid hill region of Nepal. *International Journal of Environmental Protection*, 3(7), 33–40.
- Bigano, A., Bosello, F., Roson, R., & Tol, R. S. J. (2008). Economy-wide impacts of climate change: A joint analysis for sea level rise and tourism. *Mitigation and Adaptation Strategies for Global Change*, 13(8), 765–791.
- Braun, O. L., Lohmann, M., Maksimovic, O., Meyer, M., Merkovic, A., Messerschmidt, E., & Turner, M. (1999). Potential impact of climate change effects on preferences for tourism destinations. A psychological pilot study. *Climate Research*, 11, 247–254.
- Burki, R., Elsasser, H., & Abegg, B. (2003). *Climate change—Impacts on the tourism industry in mountain areas*. Paper presented at the 1st International Conference on Climate Change and Tourism, Djerba.
- Burns, P., & Bibbings, L. (2009). The end of tourism? Climate change and societal challenges. *21st Century Society. Journal of the Academy of Social Sciences*, 4(1), 31–51.
- Chaudhary, P., Rai, S., Wangdi, S., Mao, A., Rehman, N., Chettri, P., & Bawa, K. S. (2011). Consistency of local perceptions of climate change in the Kangchenjunga Himalaya Landscape. *Current Science*, 101(4), 504–513.
- Dahal, D. S. (2011). *Impact of climate change on livelihood and biodiversity in rural communities, a case study of siddhiganeesh and nepane community forestry user groups of Sindhupalchok District of Nepal*. Kirtipur, Kathmandu: Master, Tribhuvan University.
- Dhakal, D. P. (2005). *Sustainable Rural Tourism for Improved Livelihood of Local Communities* (Policy Paper 4). Singha Durbar, Kathmandu, Nepal: Nepal Tourism Board (NTB).

- DHM. (2012). Climatic Data of Gorkha Station, Department of Hydrology and Meteorology, Ministry of Science, Technology and Environment, Kathmandu, Nepal.
- Elsasser, H., & Bärki, R. (2002). Climate change as a threat to tourism in the Alps. *Climate Research*, 20, 253–257.
- Epstein, P., & Mills, E. (2005). *Climate change futures: Health, ecological and economic dimensions*. Boston, MA: Center for Health and the Global Environment, Harvard Medical School.
- Farooq, S. U., Khan, Z., Ullah, Z., & Shahid, S. M. (2012). The impact of tourism on local livelihood: a case study of Galliyat, District Abbotabad. *European Journal of Scientific Research*, 68(1), 43–52.
- Gomez-Martin, M. B. (2005). Weather, climate and tourism—A geographical perspective. *Annals of Tourism Research*, 32(3), 571–591.
- Gongmei, Y., Schwartz, Z., & Walsh, J. E. (2009). A weather resolving index for assessing the impact of climate change on tourism related climate resources. *Climatic Change*, 95, 551–573. doi:10.1007/s10584-009-9565-7.
- Gossling, S., & Hall, C. M. (2006). Uncertainties in predicting tourist flows under scenarios of climate change. *Climatic Change*, 79, 163–173. doi:10.1007/s10584-006-9081-y.
- Hamilton, J. M., Maddison, D. J., & Tol, R. S. J. (2005). Effects of climate change on international tourism. *Climate Research*, 29, 245–254.
- Hein, L., Metzger, M. J., & Moreno, A. (2009). Potential impacts of climate change on tourism; a case study for Spain. *Current Opinion in Environmental Sustainability* 2009, 1, 170–178. doi:10.1016/j.cosust.2009.10.011.
- IPCC. (2001). *Mitigation, contribution of working group III to the third assessment report of the intergovernmental panel on climate change*. Cambridge, UK: Cambridge University Press.
- IPCC. (2007). *Climate change 2007: The physical science basis summary for policymakers, contribution of working group I (WG1) to the fourth assessment report of the IPCC (Pre-Publication ed.)*. Cambridge, UK: Cambridge University Press.
- Ishaya, S., & Abaje, I. B. (2008). Indigenous people's perception on climate change and adaptation strategies in Jema'a local government area of Kaduna State, Nigeria. *Journal of Geography and Regional Planning*, 1(8), 138–143.
- Jones, B., & Scott, D. (2006). Climate change, seasonality and visitation to Canada's national parks. *Journal of Park and Recreation Administration*, 24, 42–63.
- Koenig, U., & Abegg, B. (1997). Impacts of climate change on winter tourism in the Swiss Alps. *Journal of Sustainable Tourism*, 5(1), 46–58.
- Lama, A. K. (2010). *Vulnerability of nature based tourism to climate change: stakeholders' perceptions of and response to climate change in the lower mustang region of the Annapurna conservation area*. Christchurch, New Zealand: Master of Parks, Recreation and Tourism Management Lincoln University.
- Lise, W., & Tol, R. S. J. (2002). Impact of climate on tourism demand. *Climate Change*, 55(4), 439–449.
- Maddison, D. (2001). In search of warmer climates? The impact of climate change on flows of British tourists. *Climate Change*, 49, 193–208.
- Martin, M. B. G. (2005). Weather, climate and tourism, a geographical perspective. *Annals of Tourism Research*, 32, 571–591.
- Moen, J., & Fredman, P. (2007). Effects of climate change on alpine skiing in Sweden. *Journal of Sustainable Tourism*, 15(4), 418–437. doi:10.2167/jost624.0.
- Moreno, A., & Becken, S. (2009). A climate change vulnerability assessment methodology for coastal tourism. *Journal of Sustainable Tourism*, 17(4), 473–488.
- Neupane, G., & Chhetri, N. (2009). Vulnerability to climate change of nature based tourism in the Nepalese Himalayas. *Tourism Geographies*, 25, 95–124.
- NTNC. (2013). *Manaslu Conservation Area Project*. Retrieved September 15, 2013, from [www.ntnc.org.np/project/manaslu-conservation-area-project](http://www.ntnc.org.np/project/manaslu-conservation-area-project)
- Patterson, T., Bastianoni, S., & Simpson, M. (2006). Tourism and climate change: Two-way street, or vicious/virtuous circle? *Journal of Sustainable Tourism*, 14(4), 339–348. doi:10.2167/jost605.0.
- Piya, L., Maharjan, K. L., & Joshi, N. P. (2012). Perceptions and realities of climate change among the Chepang communities in rural mid-hills of Nepal. *Journal of Contemporary India Studies: Space and Society, Hiroshima University*, 2, 35–50.
- Ramasamy, R., & Swamy, A. (2012). Global warming, climate change and tourism: A review of literature. *Culture Special Issue: Sustainability, Tourism and Environment in The Shift of A Millennium: A Peripheral View*, 6(3), 72–98.
- Rayamajhi, S. (2012). Linkage between tourism and climate change: A study of the perceptions of stakeholders along the Annapurna trekking trail. *Nepal Tourism and Development Review*, 16, 60–75.
- Scott, D. (2003). *Climate change and tourism in the mountain Regions of North America*. Paper presented at the 1st International Conference on Climate Change and Tourism, Djerba, Tunisia.
- Scott, D., McBoyle, G., Mills, B., & Minogue, A. (2006). Climate change and the sustainability of ski-based tourism in Eastern North America. *Journal of Sustainable Tourism*, 14(4), 376–398.

- Scott, D., McBoyle, G., & Schwartzentruber, M. (2004). Climate change and the distribution of climate resources for tourism in North America. *Climate Research*, 27, 105–117.
- Sem, G., & Moore, R. (2009). *The impact of climate change on the development prospects of the least developed countries and small island developing states*. Office of the high representative for the least developed countries, landlocked developing countries and small island developing states (UN-OHRLLS). New York, NY: UN Headquarters.
- Sherpa, Y. (2006). *Mountain tourism: A boon or a bane? Impacts of tourism on Himalayan women*. Kathmandu, Nepal: Federation of Women Entrepreneurs association Of Nepal.
- Shrestha, A. B., & Devkota, L. P. (2010). *Climate change in the Eastern Himalayas: Observed trends and model projections*. Kathmandu, Nepal: International Centre for Integrated Mountain Development (ICIMOD).
- Shrestha, A. B., Wake, C. P., Mayewski, P. A., & Dibb, J. E. (1999). Maximum temperature trends in the Himalaya and its vicinity: An analysis based on temperature records from Nepal for the period 1971–94. *Journal of Climate*, 12, 2775–2787.
- Skanavis, C., & Sakellari, M. (2011). International tourism, domestic tourism and environmental change: Environmental education can find the balance. *Tourismos: An International Multidisciplinary Journal of Tourism*, 6(1), 233–249.
- Simpson, M., Scott, D., & Trotz, U. (2011). *Climate change's impact on the Caribbean's ability to sustain tourism, natural assets, and livelihoods*. Inter-American Development Bank, Environment Safeguard Unit, IDB -TN-238.
- Simpson, M. C., Gössling, S., Scott, D., Hall, C. M., & Gladin, E. (2008). *Climate change adaptation and mitigation in the tourism sector: Frameworks, tools and practices*. (pp. 152). Paris, France: UNEP, University of Oxford, UNWTO, WMO.
- Stern. (2007). *Stern review on the economics of climate change* (Pre-Publication Ed.). Cambridge: Cambridge University Press.
- Subedi, B. P., & Chapagain, P. S. (2011). Tourism development in upper Manang valley of Annapurna region. *Nepal Tourism & Development Review*, 1(1), 56–68.
- Tzu-Ping Lin, T., Tzu-Ping Lin, P., & Matzarakis, A. (2008). Tourism climate and thermal comfort in sun moon lake, Taiwan. *International Journal of Biometeorology*, 52, 281–290.
- UNWTO. (2007). *Tourism will contribute to solutions for global climate change and poverty challenges*. Berlin, Madrid: United Nation World Trade Organisation Press and Communications Department.
- Uyarra, M. C., Cote, I. M., Gill, J. A., Tinch, R. R. T., Viner, D., & Watkinson, A. R. (2005). Island specific preferences of tourists for environmental features: Implications of climate change for tourism dependent states. *Environmental Conservation*, 32(1), 11–19. doi:10.1017/S0376892904001808.
- Wall, G., & Badke, C. (1994). Tourism and climate change: An international perspective. *Journal of Sustainable Tourism*, 2(4), 193–203.
- WTTC. (2010). *Tourism economic research 2010*. London: World Travel and Tourism Council.