

Climate Change Nexus with Timing and Season ability of Tourism- A Way Forward for Long
Term Sustainable Tourism

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Abstract

Mountain-route tourism is regarded as the best way to attract tourists who wish to engage in various activities close to nature. It has been providing business opportunities to the low-income people living in the mountain region and contributing to eradicating poverty. However, climate change happening in recent times has adversely impacted their businesses as there has been a shift in the seasonality, rise of temperature, and changes in other natural phenomena. By conducting interviews among the key stakeholders of the Annapurna region in Nepal, this research aims to develop an understanding of how climate change-induced vulnerabilities are impacting the overall trekking business in the region. First, with the help of empirical data obtained from the Department of Hydrology and Meteorology (DHM), we were able to establish the fact that the rise in temperature in recent times has caused a change in seasonality in the region. Next, we conducted semi-structured interviews with various key stakeholders engaged in the mountain-route tourism business to understand how they perceive the impact of climate change on their businesses.

The findings of the research highlight the fact that micro, small, and medium-sized businesses providing services to tourists who visit the Annapurna region for mountain-route tourism activities face both structural and nonstructural challenges caused by the volatility of climate change. The paper concludes with the recommendation of introducing sustainable and green business practices in the mountain-route tourism business to develop adaptive measures to the vulnerability of climate change.

Introduction

Tourism is regarded as a major, fast-growing contributor to the global economy (Albert et al., 2022; Nepal et al., 2019). According to World Travel and Tourism Council (WTTC), in 2022 the travel and tourism sector contributed 7.6% of global GDP and created 22 million new jobs. In terms of international trade, the tourism sector is often regarded as a source of generating foreign revenue inflow through the provision of services to non-resident-inbound tourists (TFSITS et al., 2010). The WTO definition of tourism regards it as a cross-border movement of consumers (mode 2) that permits workers in remote areas to become service exporters. Tourism provides direct employment opportunities, backward linkages to other sectors, and the entrepreneurial activities of micro, small, and medium-scale enterprises (Albert et al., 2022).

The concept of mountain-route tourism (often simply mentioned as mountain tourism) was initiated in the 18th century when the “Grand Tour” to the European Alps became an essential attraction for English aristocrats (United Nations Environment Programme, 2007). At present, mountain-route tourism has become a key economic activity for the mountain communities that develop themed mountain routes in their locality. Mutana & Mukwada, (2018) defines mountain route tourism as an activity of travelers who enjoy tourism products found along a pre-determined mountainous course of directions. It is often related as one of the most important sources of poverty alleviation for people living in high mountainous regions (Mutana & Mukwada, 2018)

The climate is one of the most important factors for tourists while making their destination choice. In the context of mountain-route tourism, climate change is likely to trigger the rates and intensity of natural hazards (Hamilton, David, & Richard, 2005) such as receding

snow lines, melting glaciers, increased frequency of cloud bursts, floods, and landslides (Sharma, 2012). Rise in temperatures, and erratic and extreme weather events are two main manifestations of climate change. This could adversely impact mountain-route tourism businesses. The climatic variables and climate change-induced disasters severely influence tourism-based economic activities. The natural resources related to mountain tourism are considered highly sensitive to climate extremes events such as changes in temperature, precipitation, weather, and climate (UNWTO & UNEP, 2008). The seasonality, environmental condition, and climate change-induced extremes adversely affect tourism-based economic activities. Therefore, climate change is a salient concern to mountain-route tourism.

Climate change presents very real and lasting challenges when attempting to develop a sustainable tourism base (Marlowe & Burke, 2016). Ecology, economy, and socioeconomic attributes make up the triangle of suitability. These are achieved, in part, through community buy-in and community-based mountain tourism but must be carefully balanced and integrated to keep tourism sustainable (Marlowe & Burke, 2016). Sustainable mountain tourism can be a promising vehicle for economic development and poverty reduction, unlocking opportunities for local economic diversification in poor and marginalized rural areas that lack significant development opportunities (Kruk, 2010). It has the potential to earn foreign exchange, create employment, reduce income & employment disparities, strengthen linkages among economic sectors, control the outmigration of local youths and help to alleviate poverty (Kurk, 2010). Based on our literature review, we found very few researchers that have tried to relate climate change with the micro, small and medium sized enterprises operating in mountain route tourism businesses. Most among them were focused on explaining various aspects of climate change that is happening in mountain regions and tried to relate them with tourism business. However, we

did not find any research that have tried to explain the impact of climate change from small business perspective – what changes they have observed and experienced, how these changes have impacted their businesses, and what have they been trying to do to adopt to those changes.

So, we intended to conduct our research to answer following research questions:

- 1) What are the effects of climate change on the mountain-rout tourism business?
- 2) How has the change in seasonality caused by climate change impacted the flow of tourists?
- 3) What climate adaptive measures have been taken by tourism businesses to mitigate the adverse effects of climate change?

To address the above questions following research objectives were set:

1. To assess the current climate variability and climate change extremes that impact the tourism business.
2. To assess the pattern, frequency, seasonality, and timing of the climatic variables and climate change extremes that impact tourism activities.
3. To recognize the pattern of the flow of tourists in the reason with relation to changes in seasonality.
4. To recommend climate change adaptive measures that could help the mountain route tourism business cope with the impact of climate change and ensure the long-term sustainability of their business.
5. To analyze the perspective of people working in the mountain route tourism industry on the problem of climate change.

To conduct our research, we consider taking mountain route tourism of Nepal. The World Travel and Tourism Council (WTTC) 2022 report indicated that travel and tourism in Nepal generated 1.06 million jobs directly in 2021 contributing 6.9 % of total employment in the country (WTTC, 2022). It was estimated that the direct contribution of the travel and tourism sector to

GDP was NRs 1366.7 Mn (4.30% of GDP) in 2021 which is expected to grow by 3.8% per annum reaching to NRs 152.4bn (4.2% of GDP) by 2028 (WTTC, 2022).

Tourism in Nepal is nature-based and exposed to climate change. Tourism, however, is a climate-sensitive industry because the climate is a key influence on travel planning and the travel experience. Even a small change in the climate and weather pattern will have a direct impact on tourism activities and business in Nepal climatic hazards like floods, landslides, extreme heat, and cool, avalanches, snowstorms, seasonal shifts, endemic in the destinations etc. is directly and indirectly affected to the tourism activities. Due to the change in pattern of climatic variables and climatic extremes shift in the seasonality, the eco-tourism operators of Nepal face severe obstacles from climate change induced disasters in trekking activities. The uncertainty of the climatic variables and extremes also creates unpredictability in the tourism business. There are several questions raised in the tourism industry due to shifts in seasonality. There are following questions need to answer from this study:

By adopting a mixed method approach, this research attempts to fill in the given research void. With the help of the empirical data obtained from DHM, we first presented how the climate change induced rise in temperatures has caused the variation in seasonality. Next, we conducted semi-structured interviews with the various stakeholders (particularly micro-small and medium sized enterprises) of the mountain-route tourism business. We used a qualitative approach of data analysis and presented our findings in the concluding section.

Research Methodology

Data Collection Procedure

Quantitative data collection: Secondary data from various sources were used to make a quantitative analysis.

- a) Reviews of report: the disaster report from (MoHA), the report prepared by donor agencies like DFID, SNV, UNDP etc. Report from Ministry of Culture, tourism and Civil Aviation, Ministry of finance, United Nations World Tourism Organization (UNWTO), World Travel and Tourism Council (WTTC) and other journal articles.
- b) Data from the tourism statistics from Government of Nepal, Ministry of Culture, Tourism and Civil Aviation (MoCTCA) and Department of Immigration)
- c) The climate change trend and scenario Report. The meteorological and hydrological data, and seasonal data from DHM and analyzed it.

2.1 Qualitative data collection: The interviews

To understand the perspective of key stakeholders who are engaged in mountain route tourism business, we conducted semi-structured interviews based on convenient sampling. In the interviews informants were asked about their experience and perception. The interviews lasted between 30-60 minutes and were recorded. The interviewees were business owners of micro, small and medium sized enterprises, trekking guides, travel agents. Also, we conducted stakeholder consultations with professionals from government and private sector associations (NMA, TAAN) to understand the overall business environment. All key informants that were interviewed had working experience of more than 20 years and had provided their services to tourists coming from different part of

world- mostly US, Europe, Asia. The summary of professions and experience of informants is presented in Table1.

Table 1: Summary of informant’s profession and experience within tourism industry in Nepal

Informant	Profession and experience
1	Tea house owner in Annapurna Conservation Area
2	Hotel Owner in Annapurna Conservation Area
3	Trekking agency owner in Kathmandu
4	Mountain trekking guide
5	Employee in Trekking Agencies’ Association of Nepal (TAAN)
6	Former mountain trekking guide, company owner in hospitality sector, trekking agency owner, former employee at Nepal Mountaineering Association (NMA)
7	Mountain trekking guide
8	Mountain trekking guide

Semi-Structured interviews proceeded as follows. First, the informants were asked general questions about their profession and experience. Next, the questions considered interlocutor’s observation on climate change, especially on change in climatic variables, availability in fauna and flora, disease vectors, ice melting, climatic disasters. In the third part questions were asked related to impact of climate change on the business, the impact of change in seasonality in the flow of tourists, and the adaptive measures taken so far by the businesses.

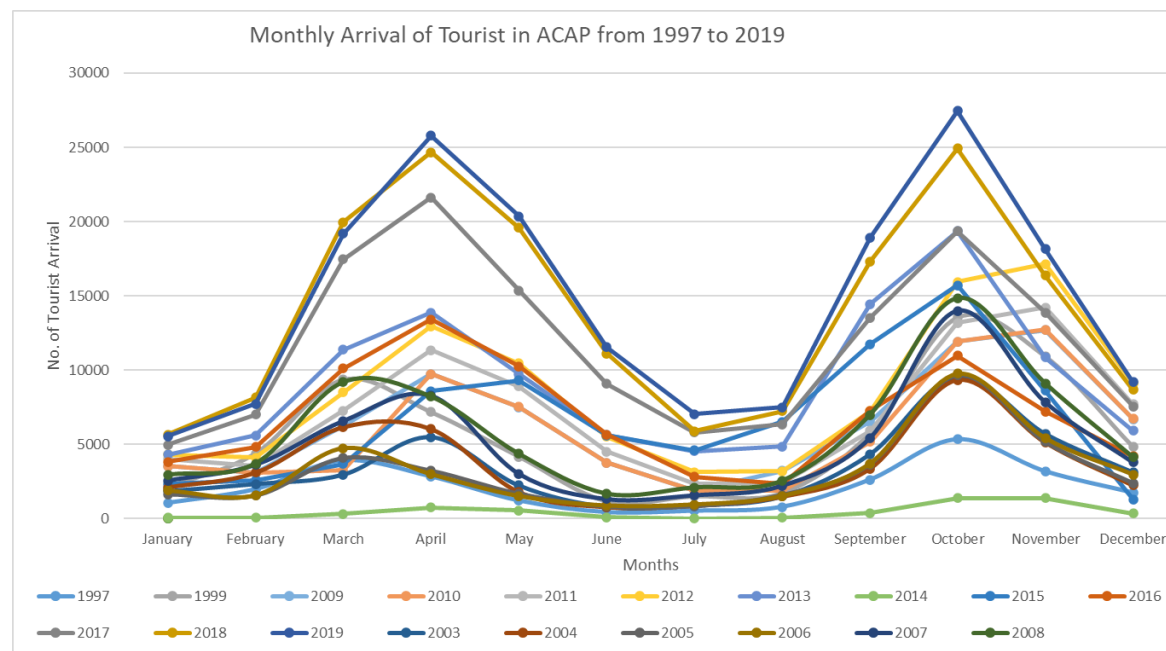
3. Empirical Analysis

3.1 The Monthly arrival of tourists from 1997 to 2019

The flow of the tourist in Annapurna Conservation Area Project (ACAP) region from 1997 to 2019 given in the figure 1 below. The flow of tourist shows that the October is the peak month and followed by April, March, May, September, and November. The analysis of impact of climate change and climate change induced extremes in tourism sectors need to be focus relation of the major tourism

season and climate change extremes. There two major seasons of the tourism in Nepal i.e. Autumn (September, October and November) and spring (March, April and May).

Figure 1: The Monthly Arrival of Tourist from 1997 to 2019



Sources: (MoCTCA, 1997 to 2019)

3.2 The climate change variables and climatic extremes

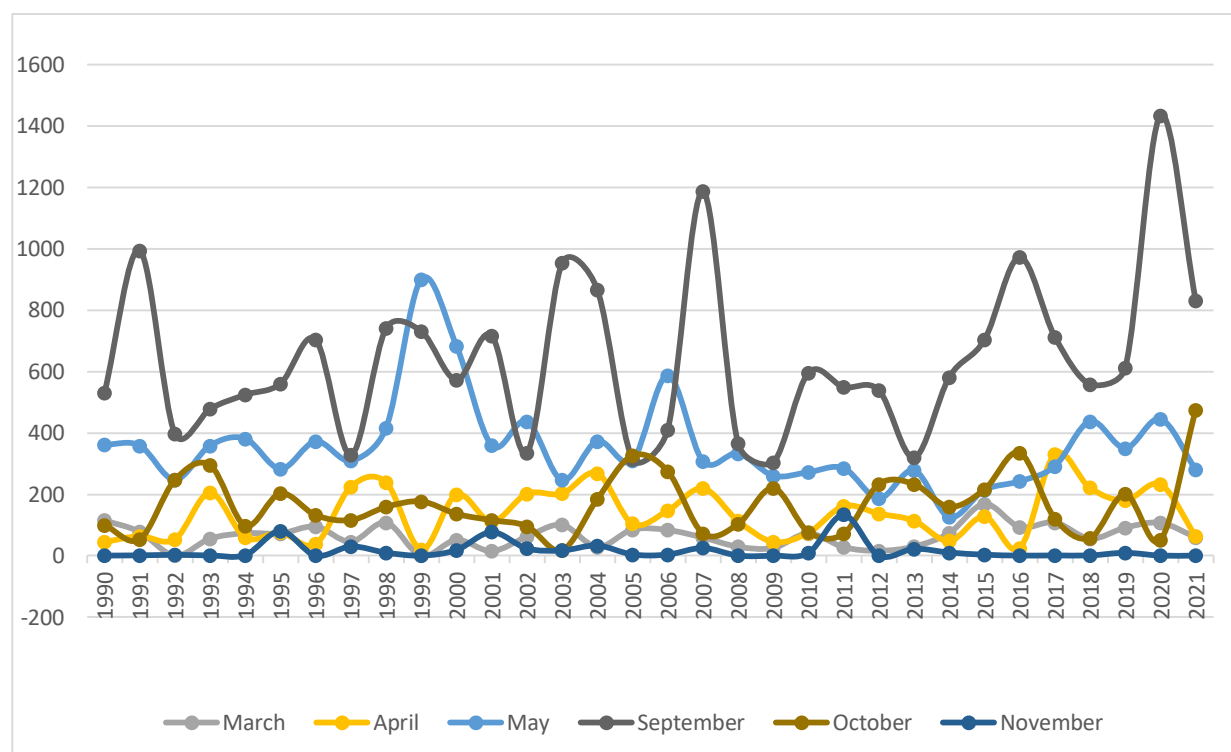
The rainfall and temperature are major climatic variables those causes of climate change extremes. The change in pattern, intensity, frequency, duration of climate change extremes also contributes to change the business of tourism sectors. This chapter analyzed the seasonality and timing of climate change extremes and its nexus with tourism related trade and business.

3.2.1 Rainfall of Nepal and ACAP region

The rainfall trend of kaski recorded in the Pokhara Airport is given below figure 4. It shows that the rainfall pattern in past three decades has been quite fluctuating and have adversely impacted tourism seasons in Nepal. Particularly in the month of September which is regarded as the opening

month for of autom tourism season, we can observe high fluctiation in the reainfall pattern. This shows that tourism season is going to be uncertian in the trekking activities due to change in the rainfall pattern.

Figure 2: Rainfall in major tourism months in Pokhara

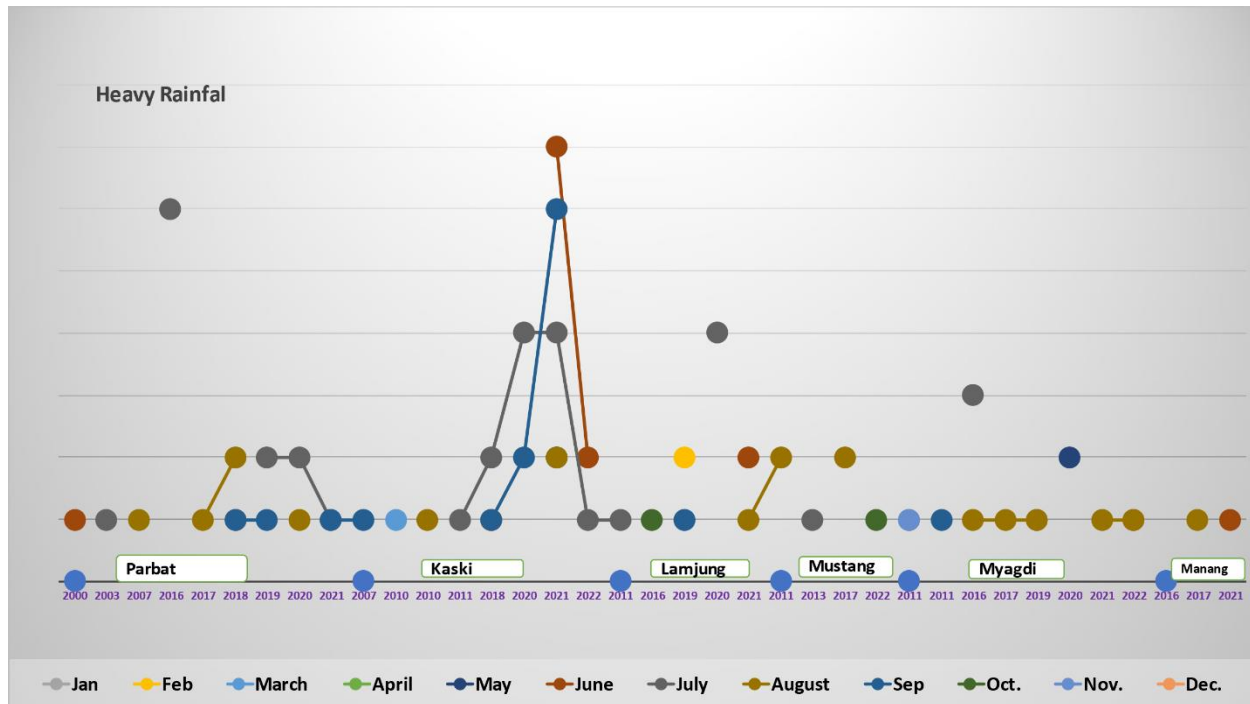


Source: (DHM, 2023)

3.3 The heavy rainfall time and pattern in ACAP region is shifted

The analysis of disaster related data from the Government of Nepal in Disaster Risk Reduction Portal found that the climate change induced disaster is increasing in later year in tourism season in ACAP district. The data available from the year 2000 to 2021 was analyzed and presented in the figure 5 below shows that:

Figure 3: Heavy Rainfall

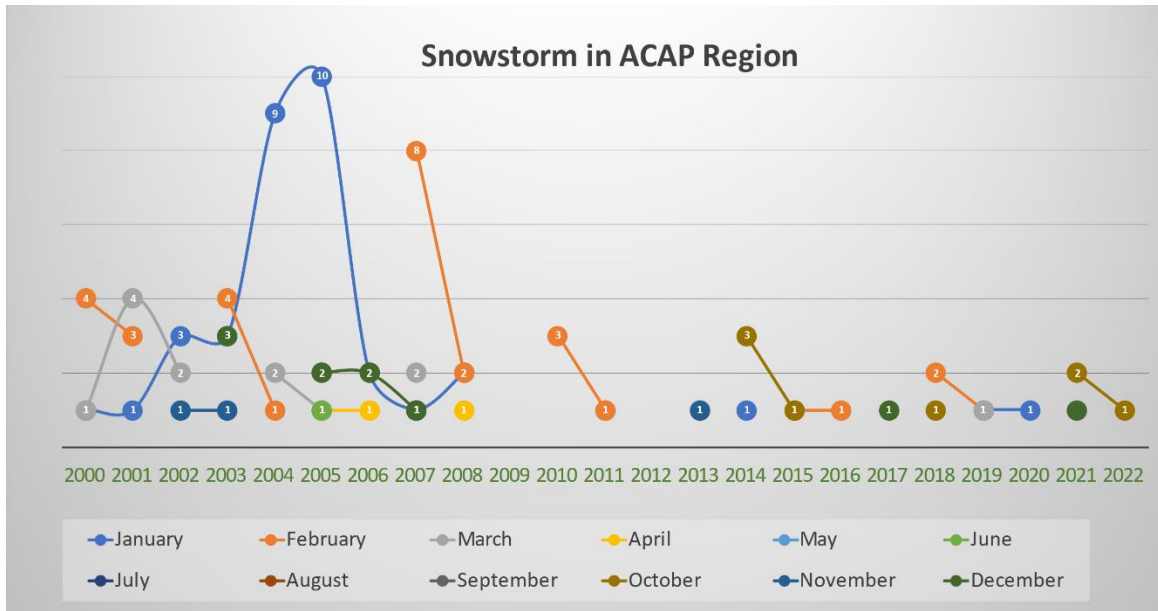


Data source: (GoN, 2023)

3.4 The Snowstorm in ACAP Region

The frequency of Snowstorm in ACAP districts is increasing trend in tourism season like October, March that disturb the adventurous activities like trekking and causes other disasters like Hudhud in ACAP Region. The devastated Hudhud followed by avalanches in 14th October 2014 severely impacted trekking activities in Nepal. An unanticipated blizzard-initiated avalanches killed 43 people, including 21 trekkers on the popular trekking routes belonging to Annapurna and Dhaulagiri region in Manang and Mustang Districts of Nepal (Wang, Fosu, Gillies, & Singh, 2015). There are many occasions of injuries and fatalities resulted from unusually severe snowstorms and avalanches on and around the mountains of Annapurna and Dhaulagiri region. It is also mentioned that the trend of the snowstorm from 1995 to 2015 and the snowstorm followed by

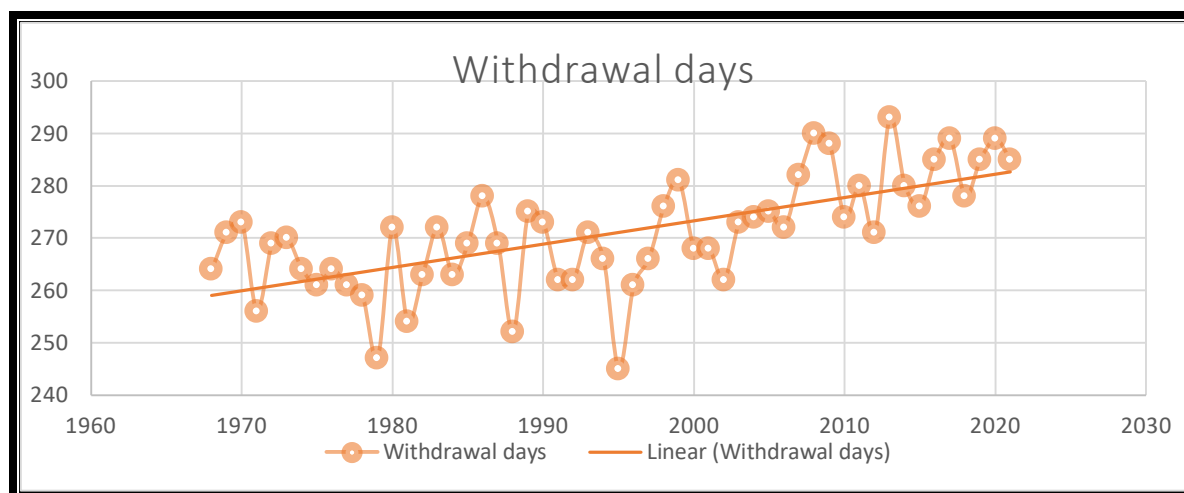
Figure 4: Snowstorm in ACAP Region



Source: (GoN, 2023)

As the time of monsoon withdrawal is shifting towards consecutive months, it is making it difficult for the tourism operator for planning trekking activities. The withdrawal date of the monsoon is 23rd September in Nepal. The figure 7 below shows that the withdrawal period of rainfall has shifted towards October. September/October/November is the main season for the outdoor activities like trekking, hiking, mountaineering, mountain flight, jungle safari, rafting etc. in Nepal. The rainy season has been widening and this has shortened the tourism season. The shift in the withdrawal of the monsoon create difficulties in trekking tourism activities.

Figure 5: Monsoon Withdrawal days



Source: (DHM, Monsoon Onset and Withdraw Information, 2023)

3.6 Temperature Extreme of Nepal

The maximum and minimum temperature increasing trend of overall Nepal is 0.056°C and 0.002°C per year (DHM, 2017). The report from DHM mentions that the maximum temperature increases in all geography and all seasons, but the minimum temperature decreases in high mountain and high Himalayan regions except for monsoon season. The table 2 A and B below shows that the maximum temperature of all districts is increasing and the minimum temperature also increase in Kaski, Lamjung and Parbat and decreasing trend in other district (DHM, 2017).

Table 2 A: Maximum Temperature($^{\circ}\text{C}$) Trend of Selected District of ACAP

Name of Districts		Winter	Pre-monsoon	Monsoon	Post-monsoon	Annual
Kaski	Normal	23.9	34.2	33.5	30.1	30.7
	Trend	0.074	0.06	0.058	0.069	0.067
Lamjung	Normal	13.2	19.9	22.5	18.1	18.8
	Trend	0.078	0.065	0.065	0.071	0.7
Manang	Normal	-0.7	3.1	8.9	3.8	4.2
	Trend	1.118	0.086	0.071	0.09	0.092
Mustang	Normal	0.2	4.3	10.2	4.7	5.3
	Trend	0.092	0.069	0.065	0.08	0.08
Myagdi	Normal	7	12.4	16.7	11.8	12.4
	Trend	0.068	0.052	0.059	0.07	0.065
Parbat	Normal	17.9	25.5	27	23	23.7
	Trend	0.059	0.063	0.057	0.056	0.059

Table 2 B: Minimum Temperature(°C) Trend of Selected District of ACAP

Name of Districts		Winter	Pre-monsoon	Monsoon	Post-monsoon	Annual
Kaski	Normal	10.4	19.7	25.1	17.5	18.8
	Trend	0.022	0.018	0.018	0.006	0.018
Lamjung	Normal	1.7	8.1	13.6	6.9	8.2
	Trend	-0.009	0.007	0.015	0.009	0.008
Manang	Normal	-9.3	-5.4	0.3	-6.2	-4.6
	Trend	-0.05	-0.019	-0.017	-0.03	0.03
Mustang	Normal	-8.9	-4.8	1.9	-5.5	-3.7
	Trend	-0.043	-0.016	0.013	-0.027	-0.014
Myagdi	Normal	-3.4	1.9	8.3	0.9	2.5
	Trend	-0.029	0.015	0.016	-0.014	-0.004
Parbat	Normal	5.2	12.4	18.2	11.1	12.3
	Trend	-0.002	-0.003	0.008	0.008	-0.001

Source: (DHM, 2017)

3.6 The Trend and Scenario of Climate Change Indices

Scenario of the temperature

The overall temperature of Nepal is expected to increase continuously throughout the century (MoFE, 2019). The climate change scenario report of Nepal mention that temperature will increase in all seasons and all geographical regions. The post monsoon season is increasing, and the winter season is getting warmer (MoFE, 2019). The increasing in temperature also influences increase in the ice melting rate, formation of GLOF, insect pest infestation and vector borne disease in high altitude, change in ecotourism hot spot etc.

Table: 3 The scenario of the climate change indices mentions in the climate change scenario of Nepal

Indices	No. of Mean Annual Days in Reference Period	RCP4.5 [2016-2048]		RCP8.5 [2016-2048]	
		%	Days	%	Days
Rainy Days	166.4	-1.8	-3	-0.9	-1.6
CDD	45.3	6	2.7	-1.6	-0.7
CWD	78.1	-4.2	-3.3	3.1	2.5
Warm Days	36.5	64.5	23.9	71.4	26.4
Warm Nights	36.5	81.4	30.5	101	37.8
Cold Days	36.5	-42	-15.4	-55.8	-20.5
Cold Nights	36.5	-40.7	-15	-54.1	-19.9
Warm Spell Duration Index	17.6	110	19.3	157.4	27.6
Cold Spell Duration Index	20.3	-51.8	-10.5	-55.1	-11.2

Source: (MoFE, 2019)

The scenario report in Nepal states that the number of rainy days will decrease but the volume of rainfall will increase, which means the heavy and intense rainfall will occur in the future. The consecutive dry days will increase and wet days decrease, the warm days and warm nights will increase, and the cold days and cold nights will decrease in both scenarios pathways that mean the winter season will also be suitable for tourism activities in all geographical regions of Nepal and the spring and autumn season will be more expensive to operate in future. Extreme climatic events, especially related to temperature, are likely to be more frequent and more severe. As stated, these changes would have a serious impact on different sectors, such as water, energy, biodiversity, tourism, agriculture, and livelihoods (MoFE, 2019). The warm spell will increase, and the cold spell will decrease in future that shows that the increasing in hot days that causes increase the disease pest in the destination in future, ice melting rate is increasing, and GOLF formation rate will increase in Himalayan region (MoFE, 2019).

The Qualitative Analysis

Effects of climate change in mountain route tourism business in Nepal in perception of key informants (and impact on trekking industry)

The key informants during the interviews shared their view on how they perceive climate change and how it impacted their businesses. The analysis of the data from interviews starts with the general impressions of climate change from the perspective of informants. The different climate change variables mentioned by informants, like changes in weather, fauna and flora, avalanches etc. are presented and their effects on mountain route tourism are discussed.

“I can see the difference in the mountain. When I was trekking guide (about 30 years ago)¹, I go to Annapurna the mountain it was completely white and now you can see kinds of barren, you know. No snow there. Black stones, rocky, you know, that I can feel. Also, the glacier part, you know, before you could not even hear the sound, the glacier melt was very slow, but now we can even feel it. (...) So, it seems like that, the temperature increasing the mountain, you can get as a direct impact of a global warming in the mountain.” Interviewee 6

The above-mentioned quote aptly summarizes the research material collected during the qualitative part of the study. All the interviewees reported that they observed significant climate change and its impact in their tourism business, especially in the trekking sector. Like Interviewee 6 said people “feel the change”. Another person, Interviewee 9, who has been a trekking guide for over 20 years, mentioned during the interview that he even checked with his parents and other people, if he is correct about his reflections on climate change and weather anomalies. He also asks them about their opinions about the cause of that situation.

¹ Comment from the authors to show the time perspective

“Temperature going too high, in this moment. I asked with my parents, also other different people, I asked with them.” Interviewee 9

It suggests that this is becoming the topic of more concern in society. People discuss the topic of climate change within family members as it is impacting their businesses and daily life. This is also indicated by the informants' attitude to mention feelings in their interviews, also the behavior and way of speaking during conversations indicated to the researchers that people talk about climate change with anxiousness. People see the impact of climate change and are worrying not only about current situation but also about their future. This repeated approach in different interlocutors' stories is illustrated well in quote form interview with trekking agency owner with over 30 years of experience.

„The climate change impact the tourism very badly. You know, people visit Nepal to see the white mountain, climb the mountain with a full of snow and also to experience and enjoy the nice weather. But every day a lot of problems with the climate changes so you can see the mountain now not full of snow. It is melting and there is less greenery everywhere. So, we are very worried about this, I don't know what our future will be. (...). Because when climate changes, you know, if day by day more and more then, of course, the business effect. When I started my business, I used to have more clients. This clients after the trekking were happier.

Our staffs also happy. Easy to organize everything.” Interviewee 3

In the eyes of the informants, it is quite clear that it is man who is the cause of climate change. However, they emphasize that it is not the fault of people living and working in the Himalayan regions. One can sense a certain sense of injustice in the statements. Tea house owner suggest that mountain regions are affected by metropolitan city and trekking guide suggest the impact of two big, industrialized neighbors of Nepal.

“From this area and Annapurna rural municipality, from this Chhomrong tourism sector, we haven't done anything that causes pollution. Deeds causing pollution come from the

Metropolitan city, from there. Here, we don't even have a vehicle, neither we have place for running vehicles” Interviewee 2

“I think in Nepal not too many factories in our country... vehicles is... (people are) buying more vehicles there but factory line is all is out of country. But not here in Nepal, maybe one percent industries. But out of country or close to a big country. One side India and one side China. There are... There are more changing, they are more factory and close to India, close to China, our country is small and then they doing bad activities, through global warming in Nepal.” Interviewee 9

The interviewees observed several different types of climate change variables. The research material was divided into weather conditions, natural disasters, disease factors and fauna and flora availability. Since the issues overlap in the conversations and it is difficult to distinguish them as separate factors they are discussed together.

Climate change is a vast topic, but due to the climate change in trekking industry, there are several motives that occurred: unpredictability of weather conditions, changes of seasonality changes in temperature, rainfall and snowfall, mist and fog. What was very much underlined in the interviews was the fact that nowadays weather conditions (rainfall, snowfall, extreme heat, and extreme cold) are more unpredictable.

“Actually, at this time, snow, at this time, snow was supposed to stay here even on the hill. This time was supposed to be the time when the snow would completely and heavily cover the mountains as well, until they became fully white. But it is not the case now.” Interviewee 1

“The pattern has changed. The rainfall pattern has changed. Initially August, or early September was the good season for trekking. But now the season has shifted towards”

Interviewee 5

“Happening in winter is we get to. Yeah, unusual freezing cold some week and the summer we got unusual hot. See. Sometimes over 45 days.” Interviewee 4

The timing of snow and water rains have hanged, which causes a lot of uncertainty. The informants said that this year 2023 is the great example. In the mid-March the snow-covered whole Namche Bazar, which normally is unexpected at this time of year. It surprised the tourists and force some of them to change their plans or cancel the trips.

“Like a December January more colder and colder, you know? Compared to before. Everything is not in time, you know. So, changing every year, like every six month, every three month they're changing there. Like a last year, whatever we've seen, they're about the temperature, this year immediately changed. Like, for example, uh Namche Bazaar snow fall in March. But before was not like that in time, uh December and January and between that snow fall. And that is a winter season, mainly in mountain, but this yes, getting changed every year.” Interviewee 7

Not only unpredictability of weather. But also, glaciers and snow melting cause disappointment in tourists, because they don't experience what they expected, especially the white, snowy landscapes.

“For example, Fishtail it used to be covered by this heavy snow masses before. But now in some season you can see the rocky mountain. So people want to see the snow mountain, not, not rocky mountain.” Interviewee 5

But the disappointment of tourists is not the only problem in the tourism industry. Changes of seasonality of the weather are a difficult challenge for people in industry because it is more difficult to plan their business activities. In the past there were two high seasons in September-November period and March-May period. Most of the tourists who came to Nepal and went to high mountains knew what kind of weather they should expect. Nowadays there is a change of seasonality. However, Interviewee 5 underline some positive aspects due to change of seasonality because high mountain regions are not covered with snow tourists can to the

trekking also in months out of standard season. It opens new possibilities, but also complicates planning. Because some people have other gainful jobs in the off-season.

“I mean, regarding this seasonality, previously, the area used to be covered by snow and everything used to become more harder, yeah? And it was not possible, it was not possible to, do trek during the peak winter, yeah? and during January, and February. But now, it's quite norm-, not quite normal, it has become easier. Easier, you can make, you can make it.”

Interviewee 5

“For example, my area there's a uh most of the people are attraction with the tourism sector tourism industry and because the trekking is more major income for the local level, you know. So there are, in the season time, they work in a field and then and in in in a season time they work in the field as a farmer. And then when they start this season, trekking season, then they go to the mount trekking and with the tourist.” Interviewee 7

Informants shed a light in previous quotes on the fact that due to rising temperature the ice and snow are melting. It was mentioned in the interviews that nowadays it is possible to observe black rocks in the high mountain areas, which in the past were covered all year with ice and snow. In the opinion of interviewees there are also more natural disasters like avalanches, flood, landslides, which during rainy season that destroy houses and trails. This causes some problems cause the tourists lose their tracks and accidents are more likely to happen. Also due to the fact that for example avalanche killed many foreigners and also Nepali in the year 2020, it got lot of publicity and causes concern among tourists. Some of them changed plans or shorten the stay.

“Well that time, they cancel the trip and some people shorten the trip. So those people who are already in Kathmandu, so when they heard such big problems and they shorten the trip, so, (okay) for example, in Annapurna basecamp, there was a rain- Avalanche. So people don't go

to the Annapurna base camp. They go to Pokhara, Ghandruk and then come back. Means short. Short stay.” Informant 3

Another observed effect of climate change was less fauna and flora in mountain areas. Mostly the guides put the pressure on those facts during interviews. It is much more difficult to observe rare flowers and plants. Plants such as the famous Nepalese rhododendrons no longer bloom at specific times as they used to. Also, the informants mentioned that about 20 years ago, at the beginning of their careers, it was easier to encounter and observe wild animals. Here attention was paid to the very famous red panda in the Langtang region, which used to be easy to come across while trekking. It is now a huge rarity.

“So conservation area must be very green, a lot of wild animals, you know, insects and butterflies all these things. But uhh if you compare, like, a few years to now, then now you cannot find that much (...) So 20 years before, not like that. The full of forest, very nice and you can smell the flowers. You know, you can see the flowers blooming nice. Wonderful. You know, trees all these things, but now 50 percent less. So they're really affected a lot and the animals also you cannot, you cannot maybe you did not encounter with any animals. So before you, you know, people could encounter with animals like if you go Langtang, that this area popular for the red panda. So now very rare. You cannot encounter with the red panda. You know before they are so many.” Interviewee 3

“Yeah, red panda in the Langtang, they say before, when I was a trekking guide, I could easily see it, you know, but now it is not possible to see, you know.” Interviewee 6

“Less flowering because no more rain.. less flowering, and then the less of the flower view, we see on the mountain. When I started that time more flowering, fix time to rain and then fix time to flowering. In this moment is a flowering time difference and then less flowers we see in the mountains.” Interviewee 9

Interviewees complained also about mists and fogs. Due to them the planes are rescheduled or cancelled, which impact very much tourists plans. They need to change the plans and they

are more disappointed that was mentioned earlier. The difficulties in observing the views due to unfavorable weather contribute to dissatisfaction of clients. One might say that weather in mountain is always difficult to predict, but in the reflections of the interviewees this is a bigger problem in present times. In the past if tourist were coming to mountains in the season, with a very high probability they could expect constant weather conditions and visibility at least in some morning hours.

“ - Well, fog and mist uhh..., you know, helps to cancel the flights. So many people come here for the mountain flight or sight-seeing with the helicopter or fly to the destination before you start the trekking, you know, they have mist, fog, you know like this and the flight cancels. This harm for the business. Umm.. but... this more like hazy.

- And do you see the difference in the past and now?

- Of course, yeah, yeah” Interviewee 3

“- They can't see the green forests, every day foggy and then cloudy everywhere. And then everywhere, foggy, no, good view. And there are also... Tourist, they don't. Like to that situation.

- So they are a bit disappointed?

- Yeah. Yeah. One day tourist say no more tourist come to Nepal. No view so why they come to Nepal.” Interviewee 9

The climate change due to interviewees is also a reason why in the mountains the mosquitos appeared in recent years, which was unusual in the past. Not only the tourists are much more exposed to new risks but the business owners are the ones, who have to take more countermeasures and take on new business risks and costs.

“And also, I forgot to tell you that before in mountain, we could not, we never expect the mosquito in the mountain. Yeah? Now my guide say you need mosquito repellent so I can see in the list of necessary, you know, equipment and gear, equipment thing like such things. They have every agency of putting mosquito repellent which is quite uh unexpected. In mountain, we are not expecting that but now it mosquito is in an over and in mountain and else, last year,

people in Jumla which is very high enough, they got dengue. So dengue is carried by the mosquito which was not. We never expect that in in, that high. Only we think of in south Nepal in Terai, there is mosquito. There is, there is a dengue and malaria but now it is common in mountains as well.” Interviewee 6

Summarizing aforementioned effects of climate change cases different difficulties in tourism industry due to our informants. The most impactful for people operating in trekking sector are the tourist disappointment, change dates, shorten or cancel their trips. Tourists are more often disappointed with their experience and some don't plan to come back in upcoming future. Also the tourists' arrival timing is uncertain as well as the height of tourists flow. So not only it is more difficult to plan the business in long term but also it causes money losses. As Informant 6 brutally and honesty said “we are selling our nature” but the consequences of climate impact the income. As a result, a large group of Nepalese people not only working in a sector of significant importance for the economy, but also their dependent families are forced to live in uncertainty and at a lower standard of living.

“We are selling our nature. We are uh in Nepal. There is no manmade uh attraction. Basically our mountains, our jungle, our rivers, everything is natural, right? So, people come here to enjoy to experience the pure nature. Due to that kinds of thing that has been destroying, so that will definitely uh impact the tourism. (...) Our product what we are selling is decreasing. So that impact our revenue, our income”

Changes in flow of tourists: How has the change in seasonality caused by climate change impacted the flow of tourists in Nepal?

As mentioned above the informants observe the change of seasonality in their industry caused by the climate change. Previously, there were fixed two seasons when tourists came: in spring in March, April and May, and in autumn in September, October, November. This has now changed. Due to the unpredictability of the weather, as mentioned earlier in the Namche Bazaar example, in April in this region the weather should be favorable for trekking. However, the sudden appearance of snow makes trekking impossible. At the same time, on dates when the weather should be unfavorable in winter, there is no snow on the trekking routes and some tourists take advantage of this opportunity. In terms of how seasonality impacted the flow of tourist, it influenced the time of tourists arrivals. In consequence it is more difficult to predict the time of their visits and the number of them. The business income is uncertain and the seasons are not fixed.

“Uhh not normal. If the global warming effect to spring.. Also March also snowing... When I start that time, no... no snowing in the March, April, May, Sorry, March, April, May. Three months is a big season but in this year, it's still snowing, raining a little bit effect and then tourists also come to less tourists visit mountain area.” Interviewee 9

“I mean, regarding this seasonality, previously, the area used to be covered by snow and everything used to become more harder, yeah? And it was not possible, it was not possible to, do trek during the peak winter, during January, and February. But now, it's quite norm, not quite normal, it has become more easier. Easier, you can make, you can make it yeah. (...) And regarding our normal trekking business activity, there are two peak seasons. One is this October is the peak season and April is another peak season. And this two peak seasons are that is uh, that means we have great seasonality. Big seasonality. Visitors only comes to for 3 months for this season, and famous for that season. So, with this, Um with the changes in the climate the peak season in the seasonality can be reduced because we can offer trekking for the wider time period. Wider period. Longer period, not from the end of March. We can even

upper trekking from October to May without discontinue, yeah? Because nowadays people can go to Mount Everest even during January.” Interviewee 5

“ - That’s exactly what it is, everyone is seeing that. Now there is no snow, right? Snow doesn’t fall on time. Now, in the rainy season, rainfall will again destroy. Now again this uhh.. if snow doesn’t fall on time, snow - rainy season gets very unpleasant, heavy rainfall occurs. If snow doesn’t fall now, such happens. (when what happens-) changes are again the same.

- And what that happens, in the flow of tourists...

- Even walking is not possible, how will the flow arrive?

- Yes. There is no flow, right?

-Yes. Walking is not possible and the rain is also too heavy.” Interviewee 1

The research material does not show a direct impact of climate change on the change in the number of tourists. At the same time, the respondents emphasized the negative impact of global pandemic of Covid-19 on the number of tourists and disasters such as well as avalanches or earthquakes. They reported a reduced number of tourists in recent years, which causes them to feel anxious about whether they will have enough resources to live on.

“- Years before Covid before earthquake, you know, our job is really busy everybody, and all the guides, all those get like more than uh 10-20 groups, you know, in a season. But nowadays, two or three groups, Also be very difficult.

- Very hard, very hard.

- Very hard to get them. So, that is a main problem nowadays.

- Very hard to eat Dal bhaat, you know?” Interviewees 7 and 8

“Less tourists come to Nepal sometimes because it's Covid problem” Interviewee 9

Adaptive measures taken by tourism businesses in Nepal to mitigate adverse effects of climate change

The research material shows that businesses operating in the tourism industry take moderate measures to cope with climate change. They make small changes to adapt their businesses. Since there are many consequences of climate change that they are difficult to directly mitigate, like unpredictable weather conditions or sudden natural disasters, it seems like most of the informants are using the “wait and see” strategy. However, a small amount of observed practice is aimed at ad hoc limiting financial losses and low customer satisfaction. The theme clearly mentioned earlier is the difficulty in planning tourist activities due to climate change. The surveyed informants from the industry pointed out that currently they contact their clients much more often and spend with significant amount of time on that activity. During the trekking planning phase, they sensitize clients to unexpected weather fluctuations and how to prepare. They are in touch with customers on an ongoing basis, informing them about the weather conditions updates, they patiently explain the topics of disasters that tourists are concerned about. Especially the owners of travel agencies pointed out that it now takes them much more time. This is also definitely thanks to high development and accessibility of virtual communication options. So more online contact with tourist is being conducted. They do not only inform them about weather conditions, but also encourage to prepare better and also prepare for the possibility of changing plans.

“Yeah, now frequently. Like I'm talking with you I have been talking with my clients also here.

Because people ask you know, small, small question, you know. “We are coming, so how about the weather, you know, this day? How about the flight to Lukla? What's happening in the Annapurna Base Camp? Are there shelters or not, you know? Snowfall- what happened? (...)

Digital development helps a lot to provide the proper information to the clients.” Interviewee 3

In case of bad weather, travel agencies, guides and owners of mountain accommodation try to show you options for spending free time exploring local culture and traditions. So climate changes are one of the reason for more diversification in the offer directed to tourists coming to Nepal. Informants suggested that they were forced to establish or enrich more cultural and food experiences in off-season and during bad weather. In particular, in recent years, the offer related to communing and learning about the culture of the inhabitants of the Himalayan regions has developed.

Thirdly, due to ice melting and temperature change some areas are now accessible to tourists. New tracks were open, so they are more options for tourists to take trips in new areas. However, our interviewee underlined that it is positive impact in short term, in long term he doesn't see it as pro.

“Yeah.. there are uh both cases, yeah? Pros and cons. If we see it positively more, more bypasses have become favorable for trekking and you can reach up to the higher elevation, as the trekkers.(...) But now, it is becoming more easier to reach those areas without any difficulties.” Interviewee 5

In the interviews the informants not only shared their knowledge about the adaptive measures taken by tourism industry in Nepal in terms of climate change. They also shared their views and opinions on what could be done. One of the cases is lack of government initiatives in aforementioned topic. The informants complained that not much in the area of climate change is done by government. In their opinion, there is still a lot of to improve in terms of introducing policies. Trekking guides also shed a light on the fact that the foreign tourists that are coming to trek in Nepali mountains are well educated about climate change and try to protect the

environment. The problem is within the local community. For example, they throw away garbage or burn it and by that they are contaminating the environment. In interlocutors' opinion they should be better educate in this area and it is the responsibility of the government to take the initiative.

"We are very worried about the future. So we need we have been waiting the, the programs from the government. You know, against your climate changes." Interviewee 3

Discussion

This paper attempts to provide an insight into the vulnerability faced by mountain route tourism businesses caused by climate change. By taking a case of mountain trekking businesses operating in Annapurna region in Nepal, this paper presents the challenges faced by micro-small and medium sized businesses caused by the climate change. Mountain route tourism is one of the highest potential sources of foreign currency revenue earning (Mode 2, trade in services) for Nepal which has 8 out of 12 tallest mountains in the world. It is also the only means of employment for some of the poorest people living in the mountain's region. However, the biggest impact of climate is on the mountain region that causes lack of snow in the mountain peaks, uncertainty in climatic conditions leading to risk and vulnerability for tourism businesses. Based on our research, we found that those who are operating mountain route tourism businesses are very anxious about the climate change situation and are finding it very difficult to overcome the adversaries of it. Although they have taken many initiatives to become as environmentally friendly as possible, but they stated the fact that they are the victim of the pollution caused by the big cities and industries not just in Nepal but our neighboring countries. Although through this research we were able to highlight the challenges faced by the mountain route businesses, but perhaps the ways to overcome such challenges through adopting sustainable business practices could be the area of further research.

Practical implications

Currently, social awareness in the surveyed industry about climate change is so high, and the stakeholders themselves are so concerned that this momentum to introduce innovations in the industry should not be missed. Recommendation for government. Even small initiatives might lit passiveness of industry. In the members we saw the readiness of actions but due to the scale and lack of education don't know what to do. Better cooperation between academia, government, local residents of trekking areas and small entrepreneurs in order to develop practices for adapting businesses in the tourism industry to climate change.

At the same time we would like to emphasize the need of appropriate highlighting the topic in the industry of climate change. However, it should be carried out with care for people's moods and emotions, so as not to deepen their anxiety. Phenomena more and more often described in literature passivity and climate depression related to giving up, not seeing the sense in making changes. Development of tourism aimed at raising awareness of climate change using new technologies. Even as simple as life VR goggles in trekking places to give back the high-quality experience for tourists of changes in the environment.

8. Summary and Conclusion

Through the empirical evidence and the semi-structured in-depth interviews conducted among the key stakeholders, this research paper attempts to presents the impact of climate change among the micro-small and medium sized businesses engaged in mountain route tourism business of Nepal. The anomaly in weather pattern in Nepal presents strong evidence that climate change is real, and it is impacting the mountain route tourism business. Climate change induced shift in tourism seasons has created a lot of uncertainty in arrival of tourists in most of the tourist destinations. The interviews with

various stakeholders related to the given business provided important first-hand insights from people working in the same sector reinforcing the same observation.

The findings from the empirical studies provided first-hand information related to various impacts of climate change that we have been observing recently. Some of those impacts are directly related mountain range tourism business such as: (a) less snow in the mountains (b) shift in rainfalls pattern – withdrawal of monsoon has changed from September to October (c) temperature extremes – very hot summer and very cold winter (d) change in weather pattern – irregular occurrence of mist, fogs, snowstorms, heavy rainfall (e) loss of biodiversity, change in agriculture pattern etc.

The findings from the semi-structured in-depth interview provide unique perspective of micro, small and medium-sized enterprises, and other relevant stakeholders regarding the impact of climate change in the mountain route tourism business. As per the information provided by the interviewee, the change in rainfall pattern has changed the tourism seasons. The tourism season (Autum) that used to begin from September now begins in October because there is change in the withdrawal of monsoon. This has shortened the time period of autumn tourism season. Similarly, heavy, and irregular rainfall, snowstorm, avalanches has been quite frequent in recent times, causing damage of infrastructure, tourist routs and even causing fatality and injuries to tourists. The interviewee also mentioned the fact that rise in temperature has also caused increasing cases of diseases and pests among human, animals and agricultural products. This has adversely impacted the local businesses. The unexpected occurrence of fog and mist blocks the view of mountains and restricts tourists from enjoying the natural views. Similarly change in biodiversity has caused the disappearance of many flowers, fauna and made it difficult to sight wild animals in the trekking route. According to the interviewee all these things have added vulnerability to the tourism business and made it less attractive among the local people. Recent case of COVID 19 and the one of the biggest earthquakes (2015) in the region has made the

situation even worst. Although in recent times because of good infrastructures development such as road connectivity and opening of international airport at Pokhara has increased the flow of tourists, but because of complexity and uncertainty caused by climate change it has made mountain route tourism business more difficult now than ever before. The interviewees were very anxious about the given situation and were not able to state any long-term solutions to it.

Few of them did mention some of the adoptive measures taken by them to provide tourist with better holiday experience by providing them with local cultural and food related experiences as an alternative to lack of sightseeing because of bad weather (fog, mist, unexpected rainfalls etc.). They also mentioned that as a proactive measure they also create some alternative trekking routes to ensure that tourists have alternatives if there are any disturbance in the existing routes.

Limitations and future research

The qualitative research was conducted on a limited number of informants. This is a significant limitation because not all-important threads have been identified for sure. However, this study was preliminary, it was used to identify the problem and may be the basis for planning a more advanced project that would require more resources.

Among interviewed informants in conducted research were informants from the trekking industry. Another group of important stakeholders, which are undoubtedly tourists and customers of the services offered, should also be examined. Maybe especially those who have experience from countries with a high awareness of topics related to climate protection. They could be an important source of good practices.

The conducted research is an introduction to further analyses. Among these, there are analyzes of previous initiatives undertaken by various state organizations, public benefit organizations and

completed initiatives. Research on practices introduced by developed countries in the tourism industry in order to protect the environment and adapt the businesses operating in it. In particular, the possibility of adapting these practices to the Nepalese context.

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