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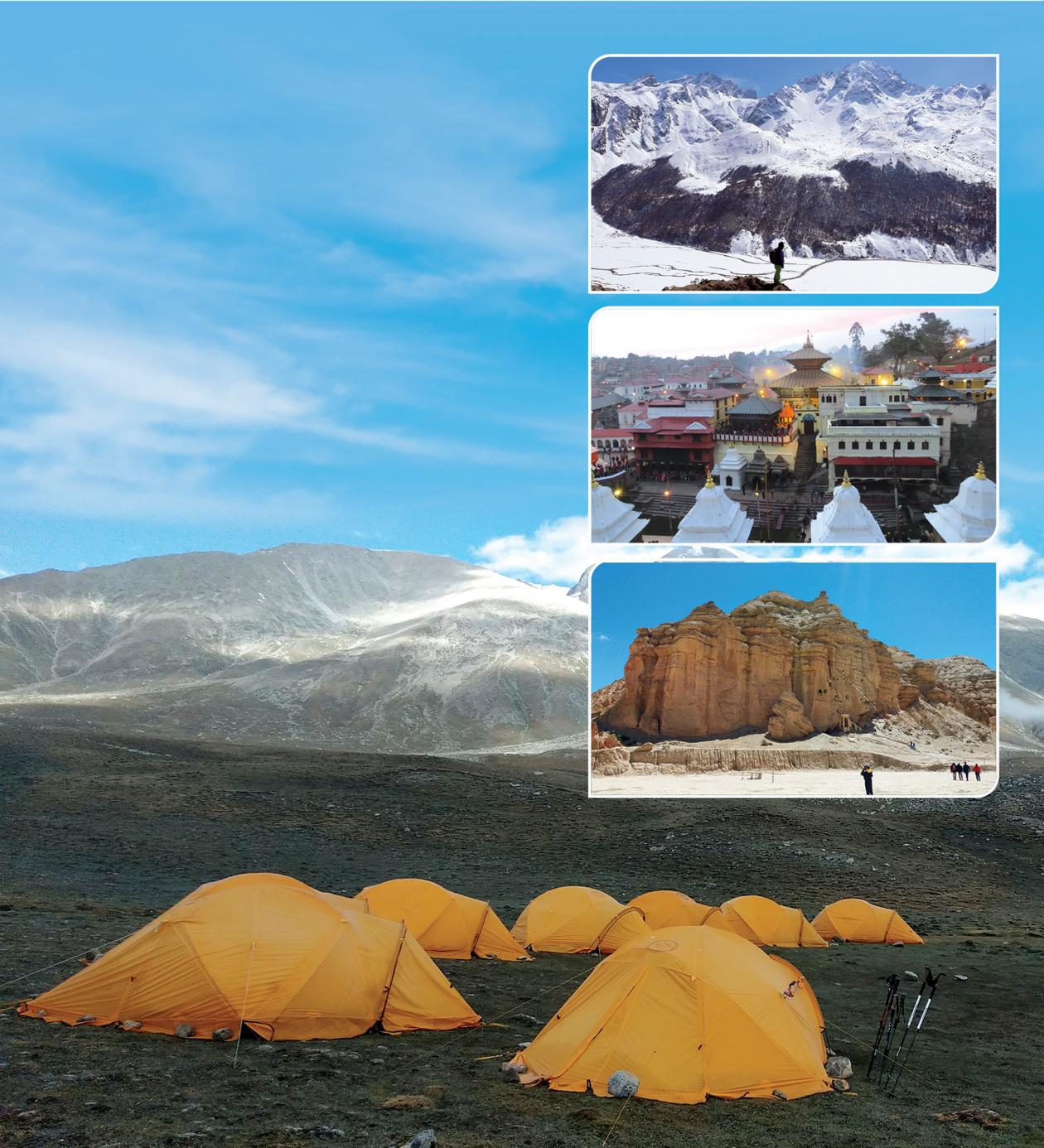
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Editorial

On behalf of the editorial team we'd like to express our sincere gratitude to our valued readers, students, fellow colleagues at the academy and from other affiliated institutions, stakeholders, friends from the tourism sectors, Dean's Office, Faculty of Management, TU, Dept. of Tourism, GON, and the management team of the academy especially the Chairperson Ms. Lakhpa Phuti Sherpa, Executive Director and Campus Chief, Mr. Romnath Gyawali, and Mr. Uttam Babu Bhattarai, Head of the Administration, and all other friends and colleagues without whose active support and inspiration this mammoth task of journal publication would not have been possible.

We'd also like to thank especially to our readers from all walks of tourism academics who have encouraged us to continue the publication of the journal despite encountering serious problems in obtaining relevant and academically worthy papers in adequate number. But the scholars who contributed us with papers have had their faith in our sincere effort and were ready to shoulder the liability of creating some valuable works in Nepalese academia in adventure and tourism sectors.

This second volume is now on your hands for your judicious and critical evaluation. Your active support is awaited in the form of individual paper and overall evaluation of the journal with critical remarks and suggestions for further improvement. We promise that your reviews would be our guidelines for the next publication.

Last but not least, thanks are also due to the technical support team in designing and the overall format of the journal. The supportive administrative staffers of the academy have always been our strength in pouring the energy needed to carry out the task.

Thank you.

Prof. Ramesh Bajracharya, PhD
Chief Editor

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In this respect, the journal entitled 'Journal of Nepal Mountain Academy' was the first volume and now this is 'Journal of Tourism and Himalayan Adventures: *An International Research Journal*', the second volume which is the continued series of the publication.

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Mountain Tourism Development through the Sustainable Livelihood Approach: A Case Study of Dhorpatan Valley, Nepal

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Abstract



Geography of Nepal has largely caused serious constraints to physical development works in mountain regions and consequently

has lagged behind those of lowland areas. Topography challenges available livelihood options, and thereby these areas are often defined by higher poverty rates, lower education levels, limited access to services and increasing out-migration. Therefore, it is essential to identify the baseline assets available for mountain communities in order for them to develop. A tool for assessing livelihood assets is the Sustainable Livelihoods Approach (SLA) which evaluates forms of natural, human, physical, financial, social, cultural and political capital. Tourism can be supported by, as well as potentially augment, these various forms of community assets, but conversely weaknesses in these assets will form a barrier to development. This paper uses the SLA to examine the Dhorpatan valley, a high altitude valley in a mountainous region of western Nepal. Suggestions for future tourism development are identified along with potential challenges.

Keywords: *Dhorpatan, Sustainable, Livelihood, Community, Tourism Development*

Introduction

Nepal, a land linked country situated between the Chinese region of Xizang (Tibet) and India along the Himalayan range, has a population of over 28 million (World Bank, 2014). This nation is understood as a low-income economy. Placed in the 147th position of 189 nations for overall level of socioeconomic development on The United Nations Human Development Index (HDI), Nepal's population survives on incomes below (United Nations Development Programme, 2020). Rapid increases in workforce out-migration are the corollary of these impoverished conditions, as well as the nation's poor resource base and low industrial and services output (Bhattarai, Conway & Shrestha, 2005; Nepal, 2003, 2005). This workforce

drain has impacted rural hill regions of Nepal in particular, changing the demographics and socio-economic fabrics of their communities (cf. Nyaupane, Pretious & Khadka, 2019).

Because of their geography, development in mountain regions has historically lagged behind those of lowland areas. Mair (2006) indicates that the biophysical base of a region often dictates the kind of developments that are available, while these places and their economic histories are considered among national, continental and global economies (Mair, 2006). Accordingly, with the right social, political, economic and administrative processes, a region or nation must find opportunities for advancement with whatever resources it has at its command (Panday, 1999).

Situated in the heart of the Himalayas, eight of the fourteen world-famous mountain peaks over 8000 meters tall are located in Nepal. By no surprise, tourism was embraced as the “saviour” – a core development strategy – since Nepal opened its borders to foreigners in 1951, and its rapid growth has transformed the nation in unprecedented ways (Nepal, 2005). These stories of development and progress align with those of other developing countries as international tourism is said to hold much promise. Mair recognizes this as the “conundrum of tourism” and critiques these development strategies for their sustainability – whereby tourism is often positioned as a “way for communities to survive when there are no other opportunities” (2006: 31).

While we too recognize the potentiality tourism may hold for hill regions in Nepal, it is essential to first identify the baseline assets available for mountain communities in order for them to create and develop a local, sustainable economy. A tool for assessing such assets is the Sustainable Livelihoods Approach (SLA) which evaluates forms of natural, human, physical, financial, social, cultural and political capital. The objective of this paper is to examine the SLA in the Dhorpatan region of western Nepal, specifically the rural communities and villages located in the high-altitude Dhorpatan valley. Prior to this examination we outline the SLA framework, and its application and utility in other regional and tourism studies. After appraising these resources, we extend suggestions for future tourism development in Dhorpatan and identify potential challenges for consideration.

The sustainable livelihood approach

The Sustainable Livelihood Approach (SLA) is an approach to identifying community assets and their development for vulnerable societies (Carter et al., 2015). It emphasizes that “the root of all human development and economic growth is livelihoods – not jobs per se, but the wide, infinitely diverse range of activities people engage in to make their living” (Tao & Wall, 2009: 143). Building upon the original concept of ‘sustainable livelihood’ (SL) as described by Scoones (1998), the SLA is a dynamic lens that highlights “the changes and adjustments people make in their livelihood systems in order to cope under difficult circumstances” (Helmore & Singh, 2001:3). Significantly, this approach stresses that using internal capacities and knowledge systems help the development of rural communities (Chambers, 1986; Lee, 2008).

The SLA model is a useful framework to test the changes wrought by tourism on people’s asset base (Ashley, 2000, as cited in Carter & Carter, 2007). The approach, which aims to reduce poverty in developing countries, makes a systematic evaluation of the variety of assets in a community that might be used and augmented by tourism development (Carter & Carter, 2007), thus the SLA examines a variety of livelihood strategies. Ashley’s (2000) study, for example, offers two perspectives on rural communities using tourism for their livelihood.

Previous tourism developments have tended to focus primarily on the contribution to enhancing local employment and income benefits, often to the exclusion of the major social and environmental changes in livelihoods (cf. Wang, Cater and Low, 2016). Under the SLA, however, the focus is on how to enhance development and the contribution tourism can make, while also reflecting on the broad changes to people's livelihoods consequent to development decisions. The approach is a multi-level one and regarded as dynamic for households, community, region or nation (Cater & Cater, 2007).

Initial work on the SLA identified types of asset or capital central to people's livelihoods including: natural, human, physical, financial and social. Based upon these five capitals, a study by Lee (2005) adopted the SLA in his examination of pick-your-own (PYO) farms in Taiwan to improve farmers' livelihoods strategies and to assess policies and institutional processes. However, in a global tourism context, where local traditions form both the uniqueness and identity of communities, Cater and Cater (2007) identified a further asset. This is cultural capital, consisting of the heritage, customs and traditions, which should be considered in any analysis of the characteristics of local livelihoods. Wang, Cater and Low (2010) added political capital to the sustainable livelihoods approach to further explain governance and administrative structures in community-based tourism development. Political capital identifies elements of power and benefit sharing as issues of concern for community stakeholders. Political capital is a critical form of capital found to be affecting all the other forms of community capital in the sustainable livelihood approach.

Forms of capital

The seven forms of community assets under the SLA can be identified as:

- (a) Natural capital: the natural resource stocks upon which people draw for livelihoods;
- (b) Human capital: the skills, knowledge, ability to labour and good health that are required to pursue different livelihood strategies;
- (c) Physical capital: the basic enabling infrastructure, such as transport, shelter, water, energy and communications;
- (d) Financial capital: the financial resources available to people such as savings, credit and remittances; and
- (e) Social capital: the social resources such as networks, membership of groups and relationships of trust upon which people draw in pursuit of their livelihoods;
- (f) Cultural capital: the heritage, customs, and traditions of the community;
- (g) Political capital: the governance and administrative structures.

These seven forms of capital are highly interdependent, as depicted in figure 1. Pictured are the building blocks of the SLA whereby the financial, social and cultural capital constitutes the community foundation. Physical infrastructure and human skills require the underpinning of the financial, social and cultural capital. The top of the heptagon, the natural capital central to nature-based tourism, relies on sustained and sustainable support from all of these forms of capital. If the natural capital itself is eroded, perhaps by external influences, then the viability of other forms of capital in the community will also be in doubt.

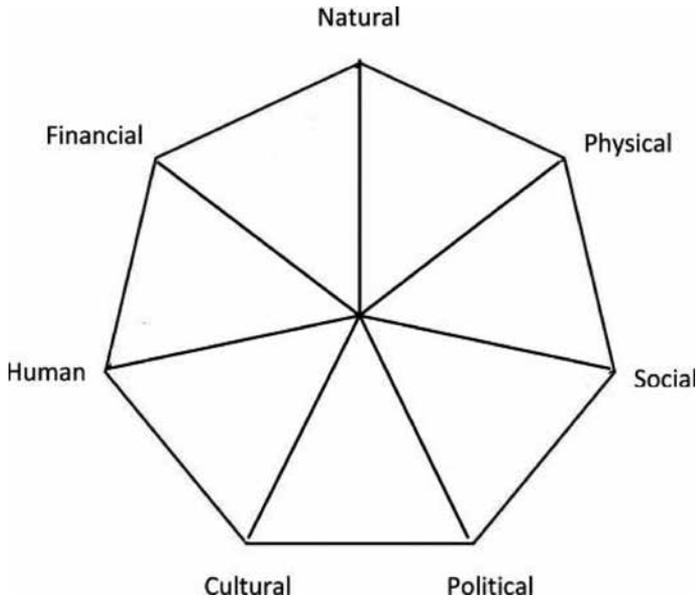


Figure 1: The elements of the sustainable livelihoods approach (Wang, et al., 2016)

Dhorpatan area

The Dhorpatan area is set in the foothills of the Himalayan mountains in western Nepal (see figure 2). Defining the Dhorpatan area is somewhat complicated by a range of administrative structures which overlay one another (see for example Nyaupane et al., 2019). The Dhorpatan valley is part of the Dhorpatan cluster region in Baglung, Gulmi and Pyuthan districts in west

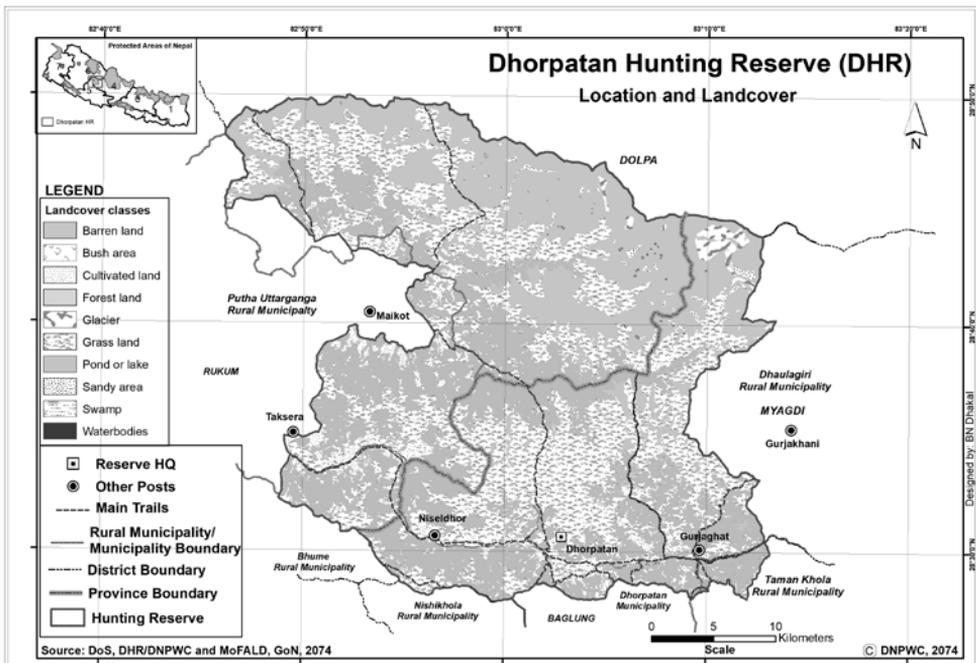


Figure 2: Location and land cover of Dhorpatan Hunting Reserve (DNPWC, 2019)

Nepal which comprises six rural municipalities (local government). It is also home to the Dhorpatan-Madane-Gaumukhi conservation corridor initiated by United Network charity consortium (Pretious, Nyaupane & Khadka, 2018). The Dhorpatan municipality is centred on the town of Burtibang and has nine villages (formally referred to as wards). Dhorpatan is a highly rural, hilly area and the average altitude of farming land is between 2000 to 3000 meters. The economy is heavily reliant on subsistence farming supported by limited trade, remittance from migrant workers and foreign aid. Dhorpatan is also overlapped by the Dhorpatan Hunting Reserve, a protected area administered by the National Trust for Nature Conservation and the only hunting reserve in Nepal. Gazetted in 1983 and formally established in 1987 it covers an area of 1325 km² in the Dhaulagiri Himal of western Nepal in the Rukum East, Myagdi and Baglung districts. The altitude of reserve ranges from 2850 to 5500 meters above sea level (Panthi et al., 2012). Permit fees to enter the hunting reserve are the main indicator of tourism numbers which are low to date (Figure 3), and indeed have declined from the mid-1990s when an average of 200 tourists visited the reserve (Nepal Ministry of Culture, Tourism & Civil Aviation- MOCTCA, 2019). Tourists tend to visit in the two popular tourist seasons of April/May and October/November (figure 4) when the weather is most suitable.

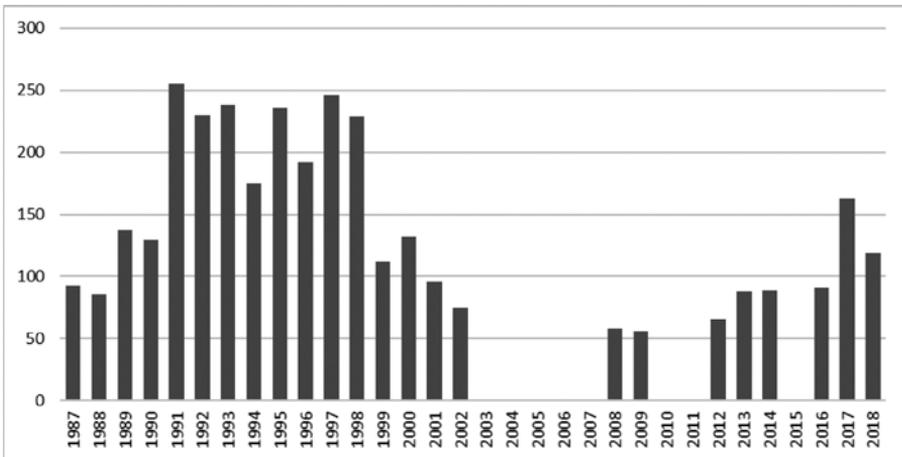


Figure 3: Annual tourist numbers to Dhorpatan Hunting Reserve (MOCTCA, 2019)

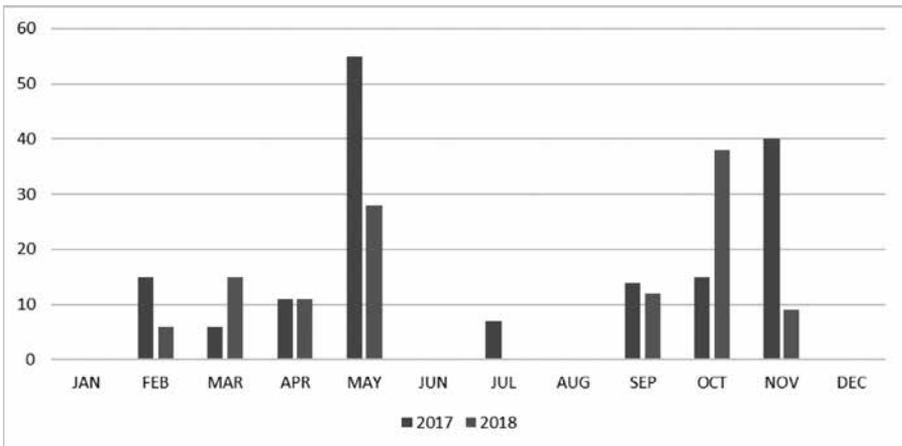


Figure 4: Seasonal number of tourists to Dhorpatan Hunting Reserve Nepal (MOCTCA, 2019)

In 2017, prompted by the non-profit consortium the United Network, the Dhorpatan region introduced the concept ‘Dhorpatan Cluster’ (DC) to establish a regional identity and local approach to conservation and livelihood development (Nyaupane et al., 2019). This cluster is a multi-stakeholder consortium comprising of actors across all three districts in the region. Its focus is on ecology and enterprise, with specific aims to address precarious livelihoods as well as climate change, amidst the changing demographics of rural Nepal.

Integral to the DC are the communities that reside in the Dhorpatan valley – the area with which this paper is primarily concerned. The Dhorpatan valley is a distinct high-altitude valley, defined by the north-flowing Uttarganga River, located some 100km from Baglung and 15km from Burtibang (see figure 5). The valley primarily encompasses former village wards 7, 8 and 9 of the municipality, and has an approximate population of 7000 people. It consists of the following main villages:

- Navi Village (Approximate population 2500, 450 homes)
- Pathathar Village (Approximate population 500, 75 houses, many Tibetan refugees)
- Chhyantung Village (Approximate population 200, 45 houses)
- Bhuji and Vani Villages (Approximate population 175, 37 homes)

The current livelihood activities in these villages are related to agriculture and animal husbandry with a few home stays and small hotel businesses. Additionally, the north flowing Uttarganga river supports small hydropower sites for some villages, and has been recognised as a potential resource for future hydro power development (e.g., National Uttarganga Hydropower Project), and an attraction to be developed for tourism activities. This paper will now explore the community assets in detail.



Figure 5: *Uttarganga River and Dhorpatan valley*

Dhopatan valley livelihood assets

The SLA framework was used to identify baseline assets available to villages within the Dhorpatan valley. To assess and evaluate forms of natural, human, physical, financial, social, cultural and political capital, data and insights were gathered from secondary resources and

first-hand observations. One of the authors has visited the area numerous times and is very familiar with the region and the other two authors conducted a short scoping trip in April 2019 as part of a student field trip. As well as conducting interviews with community members we also held a multi-stakeholder forum to identify challenges in the area. It is important to note that existing research and literature around Dhorpatan valley is scant, making it slightly more challenging to compose a comprehensive picture of its livelihood assets. Our fieldwork was also exploratory at this stage and we do not present individual community members views on assets here. This, of course, highlights opportunities for further research in this region.

Natural capital

Natural Capital is the natural resource stocks upon which people draw for their livelihoods, and is the cornerstone of the SLA approach (Wang, et al., 2016). To a large extent, Dhorpatan's natural capital is governed by its geography as a high-altitude mountain environment. The climate is dictated by this geography, the monsoon season in this area occurs between June and October, but rains may be lighter than areas further south of the mountains, with annual precipitation of <1000 mm (Kandel, 2000). Higher elevations are subject to strong winds throughout the year, and snow usually lasts, even at lower elevations, until early April. During the dry season, the weather is dry and cold, with light snow in midwinter and unpredictable heavier snowstorms into late spring. Because of the surrounding mountains the area receives comparatively less precipitation than other similar areas of the Nepal mid hills.

The Dhorpatan Hunting Reserve is characterized by alpine, sub-alpine and high-temperate vegetation. Common plant species include fir (*Abies spectabilis*), blue pine (*Pinus wallichiana*), birch (*Betula utilis*), rhododendron (*Rhododendron spp.*), hemlock (*Tsuga domusa*), oak (*Quercus semicarpifolia*), juniper (*Juniperus indica*), spruce (*Picea smithiana*), maple (*Acer caesium*), juglans (*Juglans regia*), taxus (*Taxus bacata*) and chirpine (*P. roxburghii*) (Panthi et al., 2012). The reserve supports red panda and also blue sheep (*Pseudois nayaur*), snow leopard (*Panthera uncia*), goral (*Naemorhedus goral*) serow (*Capricornis sumatraensis*), Himalayan tahr (*Hemitragus jemlachicus*), Himalayan black bear (*Ursus thibetanus*), barking deer (*Munticus muntjak*), wild boar (*Sus scrofa*), rhesus macaque (*Macaca radiata*) and wolf (*Canis lupus*) (Panthi et al., 2012).

The hydrology of the valley is dominated by the north-flowing Uttarganga River, which is unusual as most rivers in Nepal flow south. Balanced weather conditions in the region allow for specialized agriculture, livestock and tourism activities. Because of its altitude, current and potential crops differ from those in lower regions and include more temperate species such as potatoes, *Kodo* millet, cardamom, apples and oranges (Nyaupane et al., 2019). Alpine meadows above the tree line are locally known as '*patans*' and are important for both indigenous animals such as the blue sheep but also for livestock grazing. There are concerns with levels of transhumance activity as some livestock grazing originates from many days away. Panthi and colleagues for example note that "habitat overlap between the red panda and livestock potentially poses a major threat to the panda's survival in the DHR" (2012: 701).

Yarsagumba (*Ophiocordyceps sinensis*), a parasitic fungus that develops on dead caterpillars is also present in the region and an important export resource. Endemic to the Himalayas and Tibetan Plateau, it is one of the most valuable medicinal mushrooms in the world (fetching

up to US\$100,000/kg). Yarsagumba is collected in late spring to early summer after snow starts thawing in the alpine and subalpine pastures. There have been concerns as to the sustainability of harvesting of this fungus, with declining yields observed in recent years, leading to an informal licensing and revenue generation system (Thapa et al., 2014).

Human capital

Human capital is based on the skills, knowledge, ability to labour and good health that are important to be able to pursue different livelihood strategies (Carter et al., 2015). Subsistence agriculture is the mainstay of the valley economy, and most of the local community skills are related to farming (figure 6). Education provision is poor within the valley, presently there is only one primary school (with limited subjects taught) and one private boarding school, which is run by the Tibetan refugee community in the Pathathar village (figure 7).

The migration from rural remote areas to towns in the district and larger cities is a common phenomenon, supported by remittance money; we discuss this issue more in following sections. Currently, one of the greatest challenges to carrying out any entrepreneurial activity is the lack of a skilled workforce (Nyaupane et al., 2019). This is further challenged by the increasing out migration as many young Nepalese go to the Middle East for work (Baruah & Arjal, 2018), which means a shortage of labor capacities for farming and other local livelihoods. The impact of workforce migration is severe in that it changes the demographics and the socioeconomic fabric of rural communities in Nepal (Maharjan et al., 2013; Pant, 2013).



Figure 6: Farming in Dhorpatan valley



Figure 7: School, Pathathar village

Physical capital

As described earlier, physical capital includes infrastructure, which is fundamental to enabling livelihoods and development and includes transport, shelter, water, energy, and communication technologies. The remoteness and terrain of the region leads to significant shortcomings in physical infrastructure in Dhorpatan. Roads into the region are unsurfaced, and the only key access point to the valley is via a steep road from the south that ascends from Burtibang, the nearest town. To the east the road ends at Darbang, several days walk from the valley.

Within the valley itself, there are vehicle tracks on both the north and south sides, although these are in a poor state of repair. There is no fixed link between these two axes, as the river flows along the middle of the valley floor.

Vehicles must therefore ford the river at shallow points which vary according to conditions. There are three fixed foot bridges in the valley (which are also accessible by bicycle or small motorbike), however one of these lacks ramps to access (See figure 8). A wide number of footpaths link the various settlements in the valley, but these are seemingly neither planned nor well maintained. An airstrip was in use for some years, but this is in a poor state of repair and is currently not used for fixed wing aircraft operations (figure 9). Transport infrastructure has long been recognized as a major challenge in Nepal, as noted by Blaikie in prior notes;



Figure 8: Footbridge, Navi village



Figure 9: Abandoned airstrip, Dhorpatan valley

The failure of motorable road provision, as the major form of infrastructural development funded by external investment, to generate a significant or systematic response in terms of agricultural output or diversification, in a context where processes in the wider political economy were not conducive to a capitalist transformation of agriculture. (Blaikie, 2002:1256)

Energy provision is facilitated by a hydroelectric power scheme which serves the north side of the valley. Excess water from this scheme is fed into a water powered grain mill, a facility built with the support of USAID. There have also been recent developments to explore green energy development in the region, in particular solar energy. Enterprise infrastructure for agriculture is also a key challenge, mainly the lack of modern farming machinery and connections to markets (Nyaupane et al, 2019). This applies to service sectors as well. As mentioned above there are plans for a very large hydropower scheme in the region. This will involve the construction of a 200m high dam to provide a 821MW plant at the cost of US\$1bn (Kathmandu Post, 2019). Construction of access roads and changes to hydrology will undeniably have significant positive and negative impacts in the area, but will also submerge a large portion of the valley itself, hence altering livelihoods dramatically.

Health provision is limited, there is a small maternity post near to the old airport but there are no other significant facilities. Infrastructure is a key issue for the entire region, although there are developments externally that may improve access over time. The mid-hill highway construction is ongoing, although this itself is a barrier to transportation. The north-south Kaligandaki corridor (Nyaupane et al, 2019) is east of the Dhorpatan region and may develop further as well. Internet accessibility is improving in the region, and there is mobile coverage for the valley on certain networks (e.g., Nepal Telecom) (figure 10).



Figure 10: *Mobile coverage in Dhorpatan valley*

The fragility of the built infrastructure in the valley was demonstrated in November 2018 when a large fire damaged 30 houses in Navi village (Kathmandu Post, 2018). Fortunately, many of the residents had migrated to lower levels for the winter and most of the houses were empty. Nevertheless, there was significant damage to property and assets (for example stored grains), an estimated cost of Rs 32.8 million was lost.

All touristic activity will require accommodation infrastructure such as lodges or hotels, which are currently very limited (Nyaupane et al, 2019). As well as a campsite near the park office (figure 11), there is one guesthouse near the site of the old airstrip that is suitable for the trekking market (shared facilities) (figure 12) and some homestays. However, a mountain bike guide from Pokhara noted that their simple level of culinary provision was not suitable for international tourists requiring complex and high energy food for active pursuits. There is scope, in addition to the usual opportunity for trekking to expand into more diverse adventure-based tourism activities such as mountain biking, paragliding, horse riding, snow skiing and bungee jumping. However, these activities require the development of infrastructure, for example trails and shops. Certainly, the agenda of Dhorpatan cluster itself and other developments in the region might push for the improvement of better connected public infrastructure (Nyaupane et al., 2019). Limited infrastructure poses significant challenges not least production and distribution systems to support agricultural markets and trade.



Figure 11: Campsite, Dhorpatan Hunting Reserve



Figure 12: Guesthouse, Dhorpatan Hunting Reserve

Financial capital

Financial capital involves the financial resources available to people such as savings, credit, and remittances, the latter being particularly important in Nepal. There is limited formal financial infrastructure within the valley. Although commercial banks are expanding their branch services, this does not seem to be well developed in the Dhorpatan valley itself. Money may be accessed through remittance, micro-loans and local cooperative banking. For instance, in 2015, the French charity Amis de Dhorpatan was formed to help farmers in the Dhorpatan valley to grow and sell locally farmed potatoes. Local community owned entrepreneurial ventures as well as investment partnerships such as these are created with an intention to “ensure growing returns and an increasing salary to the producers from one year to the other...” (Amis de Dhorpatan, 2020).

Although entrepreneurial activities have substantially increased in recent years it has failed to create sustainable wealth in the community. It is also typical for organizations, whether for-profit or non-profit, to collapse and become bankrupt within years of their founding. Most businesses in the Dhorpatan Cluster region are small grocery retailers connected to the basic trading system in Nepal (Nyaupane et al., 2019). There are limited cottage industries: dairies, livestock and handicrafts, and a few others are providing basic services such as IT and banking.

Currently one third of Nepal’s GDP comes from remittances (money sent back to family/relatives in Nepal) from overseas workers (Shrestha, 2018). This money is usually spent on land and house purchases which lead to the commercialization of land (Sunam & McCarthy, 2016). The consequences of remittance money on subsistence farming are lack of financial support and a shortage of labor-force and it also affects other precarious livelihoods. Similarly, it appears that the Tibetan community within the valley are also supported by remittances from outside (a new temple is under construction from foreign funds).

Social capital

Social capital involves resources such as networks, membership of groups, and relationships of trust upon which people draw in pursuit of their livelihoods (Tao & Wall, 2009). Trust in private business as well as the NGO sector has traditionally been very low in Nepal, thus generally it is a challenge to achieve social, environmental and economic goals despite positive intentions of actors (Nyaupane et al., 2019). At present, NGOs do provide diverse support to the community, including healthcare, education, livelihood, youth empowerment and so forth, while the local government should predominately be responsible for the function of providing services to the public and delivering infrastructure, welfare and other programmes. However, overall there has been a history of poor governance, ownership and running of a multi-stakeholder cluster as well as a lack of local supporting industries and networks. Moreover, none of these organizations (public, private, non-profit) create uniquely local products or services (Nyaupane et al., 2019).

In response, the Dhorpatan Cluster (DC) was created to operate in the GGA of Western Nepal. This multi-stakeholder cluster (e.g., Community, enterprises, NGOs, government units) is a fairly new asset to the valley, and the region at large. Focused on ecology and enterprise, one of the current DC projects underway is the ‘Dhorpatan Mountain bike Development Project’ which supports running of a shop, events and skills development. Additionally, as described earlier, local community owned entrepreneurial ventures as well as international partnerships were initiated to support the region (cf. Amis de Dhorpatan,

2020). Further the Federation of Nepalese Chamber of Commerce and Industry (FNCCI) introduced a 'one village one product' (OVOP) scheme in the region (and broadly in Nepal), which has been partly successful. The commercial farming of cardamom in the southern region of Dhorpatan is one positive but a limited example.

Cultural capital

Local traditions form both the uniqueness and identity of communities, thus cultural capital, consisting of the heritage, customs and traditions should be considered in any analysis local livelihoods assets (Cater & Cater, 2007). Dhorpatan valley has a mix of cultures and castes including Bishwakarma, Magar, Nauthar (Chhetri), Chhantyal, Thakali, Bhotias (Tibetan refugees), and Brahmin. People are dependent on traditional agricultural practices in the southern part of the hunting reserve. In the northern, higher-elevation parts of the reserve; animal husbandry and trans-boundary trade are the major sources of livelihood (Aryal 2008; Aryal & Kreigenhofer, 2009; Aryal et al., 2010).

Religious sites are important in the valley, as described above a new Tibetan Buddhist temple is being constructed in the Pathathar village. At the eastern end of the valley is a Bon temple from an earlier religious sect and there is a Hindu Uttarganga Baraha shrine on the south western slopes of the valley. On the road from Burtibang, just prior to the pass that enters the valley is a religious site located around a small lake (figure 13). This is popular with local pilgrims and visitors who may visit the site for picnics and to escape the summer heat at lower altitudes.



Figure 13: *Hindu religious site on Burtibang-Dhorpatan road.*

Political capital

Political capital suggests that there is an empowering role of resources used by actors for the realization of outcomes that advance actors' perceived interests (Wang, et al., 2016). Political structures are deeply entrenched in Nepal and often form a significant barrier to livelihood

development. As Nyaupane and colleagues highlight “the political cadre culture is prevalent everywhere in cities, towns and rural villages... socio-economic life is segregated, dominated and driven by political affiliation and favor as much as certain regions are known to be the ‘belts’ of certain political parties” (2019: 10). This political structure forms a barrier to development, but at the same time it is important to recognize and work within existing constraints and opportunities frameworks.

Tourism potential in the Dhorpatan valley

Despite these challenges, we believe that the Dhorpatan valley offers significant potential for tourism development. Although the Dhorpatan ‘brand’ is widely recognized, there has been little done to promote tourism in the region to date. There have been a small number of promotions in the form of big festivals (mahotsav) organized by charities or communities. Such festivals originate from the national culture of organizing events to promote places and destinations and bringing people together. In addition there are regular Hindu ritual festivals as well and these may last several days. Whilst such occasional destination festivals have been able to attract visitors from near and far, the impact is almost immediately lost due to their temporary nature. One of the reasons behind such temporariness is that these destinations Dhorpatan (Baglung) and Gaumukhi (Pyuthan) are very remote and challenging to access. Secondly, and related to the first point, these rural destinations are not well connected to other known national destinations, for example the Annapurna Conservation Area (Nyaupane et al., 2019).

As a mainstay of the Nepalese tourism product, trekking tourism offers opportunities for communities of Dhorpatan to develop further (cf. Beedie & Hudson, 2003; Bhattarai, et al, 2005; Nepal, 2003, 2005; Singh, 1980; Singh & Kaur, 1986). Trekking has a long history in the region, principally as an access point to the Dolpo area north of Dhorpatan. Dolpo was mentioned and made popular in the cult book *The Snow Leopard* by Peter Matthiessen (1978), a journalistic account of his attempts to find the animals among the blue sheep herds which are extensive in the region. Matthiessen, however, is less than praising for the Dhorpatan region, visiting in late autumn rains he describes Dhorpatan as “a sort of purgatory” (Matthiessen, 1978: 61). Yet the continued popularity of this adventurous volume amongst trekkers and outdoors people may be a useful opportunity to promote the area, similar to the ways in which books like John Krakauer’s (1997) *Into Thin Air* and James Hilton’s novel *Lost Horizon* (1933) contribute to the tourism imaginaries of other parts of Nepal (Miller, 2017).

Dhorpatan is also part of the lower Great Himalaya Trail (GHT) which is a long-distance trail crossing the entirety of Nepal, west to east. A recent development has been the less-known Guerilla trek in the west, officially launched in 2012, a heritage trail built in the Maoist conflict heartland. This follows the route and location of significant battles in the civil war of the 2000s. Dhorpatan valley was a training ground for Maoist who stormed the town of Beni in 2004, and is part of the trail which leads from Sulichaur (Rana & Bhandari, 2018). Despite the development of these walking products numbers are still small in comparison to the more popular trekking areas of the Annapurna, the Langtang and the Khumbu.

In 2019, our own scoping visit and collaborative explorations with staff from a Pokhara mountain bike company identified potential for mountain bike trails in the region. However, there is currently no local bike hire supplier, with quality equipment closer than Pokhara (at least 8 hours drive). However, it is likely that Dhorptan would also face competition from

much more attractive high-end mountain bike regions. For example, fly-in, fly-out mountain bike tourism is now well developed in lower Mustang, which has the supporting infrastructure that this niche expects.

Although being an internationally known hunting reserve, actual numbers of these niche tourists are very low, approximately 25 per year (DNPWC, 2019). The Department of National Parks and Wildlife Conservation (DNPWC) has allocated 26 blue sheep as an annual quota for hunting in DHR. The quota was never fully utilised in any year between the period of 1980 to 1998, and after this period hunting declined during the civil war. There is still potential for this market with local involvement as Karki and Thapa (2011) note:

Involvement of local people in the management of sport hunting is essential. Therefore, to increase their stake, the Reserve and the outfitters should initiate schemes that provide financial support to the concerned local communities. They should also assist local communities to use funds appropriately both in conservation as well as in income generating activities. (2011:30)

However, it is also important to note that the hunting title in the protected area designation and brand (Dhorpatan Hunting Reserve) is a significant deterrent to international tourism. It would be sensible for the reserve to adopt a conservation nomenclature rather than 'hunting', as this would allow hunting to continue while simultaneously affording other forms of tourism to be developed and marketed.

Whilst Dhorpatan's adventure tourism appeals to foreign tourists, there is perhaps greater potential for domestic tourism in the region. As discussed above, festivals and other products such as concerts, cultural/religious events and sports competitions could be targeted at local youths and tourists (Nyaupane et al., 2019). These, together with heritage trails in the southern region of the cluster, offer rich experiences for local tourism. Many of these may also appeal to international markets, as there is no product that is purely for locals or purely for foreigners, thus they can be blended according to consumer demands.

Finally, there may also be opportunities for agricultural tourism. The Dhorpatan cluster region is rich with good quality high-altitude farming land at between 2000 to 3000 metres, which presents opportunities for specialist crops (such as buckwheat, cardamom and *Kodo* millet), as well as fruits such as oranges and apples. The French charity Amis de Dhorpatan working in the Dhorpatan valley has identified potatoes grown there to have special culinary qualities, with the potential for export (Amis de Dhorpatan, 2020). Finally, agricultural tourism associated with farming and other local professions, is also one of the potential product areas we identified during our 2019 site visit.

Conclusion

It is clear that the Dhorpatan valley faces significant development challenges, whereby local entrepreneurial activities and livelihood options lag behind other parts of Nepal. In part this may be due to remoteness of hill regions themselves and the decade long civil war, but more poignantly is the limited financial, human and political capital as well as the poor state of physical assets that continue to challenge the communities who reside in Dhorpatan valley. However, the 2017 general and local elections in Nepal, and the resurgence of local NGOs and their various projects, signify hope – a sign towards greater economic and social progress in Dhorpatan's future. Moreover, national tourism campaigns (e.g., Visit Nepal 2020 Life Time Experiences) pave the way for both domestic and international tourism to be supported

by, as well as potentially augment the high levels of environmental, social, and cultural capital that already exists in the Dhorpatan area.

While this shiny promise of tourism begins to be touted within the valley, these types of development will require local collaboration, dialogue and some sort of consensus among the various stakeholders in the region (Nyaupane et al., 2019). There is clearly a need to further research the issues faced by residents in the region and provide research that more accurately portrays their individual views on their assets. Ongoing research intends to conduct more detailed work with community stakeholders, such as mapping exercises (Cater, 2012) to identify community aspirations. Furthermore, these stakeholders and communities are urged to conceptualize tourism as part of the solution, not the savior (Mair, 2012). Here, tourism becomes one of the sustainable and alternative livelihoods that may afford local economic activities that can offer opportunities (skilled and well-paid jobs) that enable migrating youths to stay in Nepal, and disrupt increasing out migration trends. This proposition of course needs additional research. Yet our sustainable livelihood approach has, perhaps, played a small part in helping us begin to address such critical sustainability challenges.

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The Development of Sustainable and Responsible Tourism in Nepal

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Abstract



The paper focuses on the sustainable and responsible tourism development in Nepal. It covers generally the historical tourism development and sustainable tourism perspectives with the example of influences in tourism sector through the infrastructural development in rural hilly and Himalaya areas. However, the development is directly related with the livelihood of communities; and the then issues of these communities should be addressed while planning and developing the particular areas; in some cases, the economic benefits come hand in hand with negative environmental and social impacts, these should be minutely examined and

exercised to mitigate. Due to the manipulation and strong intervention, several regions have had to overcome disastrous environmental damage or the loss of their traditions and local culture in the infrastructural development that has directly impact on the growth of the tourism industry. In this regard, the paper has tried to provide some long-term economic operations practices, and the way to developing sustainable tourism development in Nepal on the base of the principles of sustainable tourism with pressures of commercialism of tourism sector. However, it is not the holistic approach for the sustainable development; and it has not covered all aspect of tourism development. Hence, further studies are required to address these all issues.

Keywords: *Sustainable Tourism, Responsible Tourism, Development, Environment, Destinations*

Introduction

This paper examines the history of, and the relationship between Nepal, tourism, sustainable tourism and development. It is important to understand the history of Nepal, tourism and the emergence of sustainable tourism and why there is potentially a developing conflict between those three sectors and 'Nepal'. It is only by understanding the development to date and reconciling it with the issues of the past 30 years that Nepal will be able to plan future tourism strategies that embrace all the interests of the shareholders under the umbrella of sustainable tourism. Nepal is at cross-roads where it now needs to decide whether it wants to become a Disney type destination or whether it wants to focus on quality tourism making sustainable use of its environmental resources and ethic cultures.

Development will take time, especially in a country like Nepal but it has to make a focused start, and that start needs to identify the direction in which this potentially large gross domestic product (GDP) contributor wants to take.

The development of tourism in Nepal

By the mid-1960s tourism was becoming an established source of foreign income for Nepal. Everest and the other 8000 m peaks in Nepal had been climbed and wide spread press coverage of these events was provided by the leading newspapers and magazines of the day. The early tourism pioneers of the like of Boris Lissanevitch, Jimmy Roberts, Jim Edwards and Toni Hagen all contributed to ‘advertising’ Nepal in their own ways. Nepal was beginning to attract visitors from around the world and in greater numbers.

The ‘Hippy Trail’ was a popular access route to Nepal established through the 1950s and into the late 1970s (Purcell, 2019) that offered freedom and enlightenment for travellers with little money but plenty of time. The availability and access to hashish and other drugs through Nepal government owned and licensed hashish shops in Jhochhen Tole (Freak Street) generated a certain lure and reputation among the hippy travellers wishing to visit Nepal (Radeska, 2017). Thousands of hippies, wanting to get as far away as possible from the capitalist societies of the west, sought places of “enlightenment and freedom.” The overland route to Nepal usually started at a European capital, most commonly London and Amsterdam, and continued all the way through Germany, Austria, Hungary, Yugoslavia, Greece, and Turkey and from there to the Middle East. The final destination, Nepal, but sometimes with a prolonged stay in India, and many travellers were going even farther to Thailand and Vietnam. These journeys were usually completed in old ex-military vehicles offering little comfort but cheap and sociable travelling (Radeska, 2017; youtube, 2015).

At that time very few people paid much attention to the environmental, economic or the socio-cultural aspects of developing tourism, only the positive possibility of the potential financial impact could be clearly envisaged by the host nation, the negative impact, if any, was never recognised or considered.

A short history of sustainable tourism

Strictly, and from a historical point of view, some authors (Lane, 2009; Weaver, 2006) consider that the first ideas regarding sustainable tourism belonged to Jost Krippendorf from the University of Bern. In his book, “*The Landscape Eaters*”, after identifying several negative impacts of tourism, he argues for an alternative – soft form of tourism (*sanfter tourismus*).

Since the early 1990s, the concept of sustainable tourism has begun to be used more often in academic circles and, to a lesser extent among tourism entrepreneurs. It is considered that the birth of the concept of sustainable tourism was the publication of the first issue of the Journal of Sustainable Tourism in 1993 (Weaver, 2006; Hunter, 2002; Dodds & Butler, 2009) which included six articles and two articles and a book review.

This new form of practicing tourism involved small companies or entrepreneurs, which aimed to support the community, preserving the environment and protecting local culture. One of the most prominent spokesmen of sustainable tourism, David Weaver, considers that the main difference between the old and the new form of tourism is moving the focus from the wellbeing of the tourist to the wellbeing of the host community (Weaver, 1998).

At that time, the concept had been highly debated, and it was received with hostility by the tourist industry, dissatisfied with putting any limits to growth and in turn considered it an "ivory tower" unrelated to the market. Sustainable tourism was also considered intellectually arrogant, expensive, elitist and useless (Lane, 2009).

This attitude was not only limited to the tourism industry. Governments and local authorities did not take seriously the concept, as the classical model of tourism was bringing them many lucrative benefits. Conventional mass tourism was generating jobs and wealth transfers from developed countries to developing ones. The mass - media did not pay much attention to the concept of sustainable tourism, considering that it is much easier to denigrate than to explain. In academic circles, there were researchers that considered sustainable tourism an impossible dream (Lane, 2009). This was best explained by Wheeler: On one hand, "we have the problems of mass tourism, which is recording steady and uncontrolled growth. And what is our response? small scale, slow and controlled development. It is simply impossible!" (Wheeler, quoted by Miller & Twining-Ward, 2005). Like sustainable development, sustainable tourism has been the central or secondary theme of conferences and international meetings during which experts in the field discussed the concept, but most importantly it caught the world's attention.

The most important institution for the development of sustainable tourism was the United Nations (UN). Since Agenda 21, resulted from the Earth Summit in 1992, tourism began to be considered as a tool for sustainable development: "We support the development of tourism programs that respect the environment and culture, as a strategy for sustainable development of urban and rural communities by decentralizing urban development and reducing disparities between regions (UN, 1992, Chapter 7)

Several UN departments have focused on tourism, in general, and sustainable tourism in particular. In 1999, in New York, the 7th Session of the Commission on Sustainable Development was held. The main topics of discussion were: consumption and production trends, seas and oceans, the development of small island states and sustainable tourism (UN, 1999: 1-2). For tourism, the Commission recognized the importance of this sector for the economies of countries, but draws attention to the impact that tourism activity can have. It also presented a number of challenges ahead for the tourism industry, national governments and the international community. For the tourism industry, the main challenges mentioned in the documents resulting from the meeting were: (a) sustainability is central to the whole range of forms of tourism, not only for niche tourism; (b) applying methods for waste management and other forms of pollution to minimize negative impacts of tourism activity on the environment; (c) involvement of all partners (customers, staff, other local entrepreneurs) in the decision making process and creating partnerships with the local community or the State to ensure the sustainable development of tourism (UN, 1999).

In 2002, the World Tourism Organization (WTO) launched the Sustainable Tourism - Eliminating Poverty (ST-EP) program. This initiative was launched in the context of the Millennium Development Goals (MDG), WTO experts considering that tourism can be an alternative in many regions of the world. With its partners, the ST-EP initiative materialized in many developing countries, through the implementation of projects: tourism legislation, promotion of destinations, creating themed packages, assistance in national parks and protected areas, etc.

The next moment occurred in 2006 with the establishment of the International Task Force on Sustainable Tourism Development, subordinated to the United Nations Environment Programme (UNEP, 2006). The main objectives and outcomes of the task force focused on several areas:

- Policy - recommendations on policies, standards and certification process, international

funding mechanisms;

- Best practices - collection, classification and dissemination of good practices;
- Education - development and dissemination of manuals and e-learning tools, focusing on sustainable tourism;
- Strategies and pilot programs - activities in the field of corporate social responsibility (CSR) framework for national and international development strategies and examples of pilot programs;
- Information, communication and networking - information dissemination, collaboration between web pages, sharing best practices and awareness raising activities.

The latest entry in the history of sustainable tourism took place at the RIO+20 United Nations Conference on Sustainable Development. The final document, entitled “The future we want”, has a chapter for sustainable tourism, where the importance of tourism for sustainable development is recognized and the importance of funding sustainable tourism is emphasized. (UN, 2012: 25). In 2002 the WTO launched the Sustainable – Eliminating Poverty program. In 2006 the International Task Force on Sustainable Tourism was established by the UN which produced a policy which identified five areas on which the Program would focus.

Schyvens (2007) contributed to this paper (R10+20 UN) Conference on Sustainable Development and its final document ‘The Future We Want’. Schyven went onto observe that what was apparent from the history, as presented in the document, was that tourism had received special attention from the international community and numerous projects were trying to implement sustainable tourism in different regions of the world. However, some questions could be raised regarding the results of those projects and the industry's ability to replicate them elsewhere. He believed that some redundant proposals and advice offered by international institutions, with largely the same concepts but lacked the tools of coercion to compel the implementation of these proposals. He made a harsh critique (Schyvens, 2007: 134) "everything the UNWTO makes, except promotion, is just dust in the eyes of public opinion” (Bac, 2012).

The emergence of sustainable tourism in Nepal

Late King Mahendra, who was a strong environmentalist, began to have concerns regarding the developing tourism trend on ill prepared communities, vulnerable eco-systems and fragile mountain environments. In 1982 he established the King Mahendra’s Trust for Nature Conservation which later became known as the National Trust for Nature Conservation (NTNC, 1986). The founder member-secretary, Dr. Hemanta Raj Mishra played a key role in bringing international donors to support the trust with its mission to conserve nature and the natural resources in Nepal while addressing the needs of the local people in a sustainable way (NTNC, 1986). Geographically, the trust’s activities spread from the sub-tropical plains of Chitwan, Bardia and Kanchanpur in the terai to the Annapurna and Manaslu regions of the high Himalaya, including the trans-Himalayan region of Upper Mustang and Manang (NTNC, 2020).

With the death of King Mahendra in 1972 the newly crowned King Birendra took on a more proactive role in developing ‘tourism’ with one of his main goals being to rid Nepal of its ‘freak and drug heaven’ image and to replace it with ‘adventure tourism’. After studying at

Eton (UK) until 1964, he returned to Nepal where he began to explore the country by travelling on foot to the remote parts of the country where he lived on whatever was available in the villages and monasteries (Daily Telegraph, 2001: 23 August). He enjoyed travelling in his youth, and went on trips to Canada, Latin America, Africa, many parts of India, and a number of other Asian countries. He was also an art collector, a supporter of Nepalese crafts people and artists, and learnt to fly helicopters. During these trips he became aware as to how other countries adapted to the impact of tourism (Crossette, 2001: 3 June).

Nepal, on the right lines

Within a very short period of time Nepal established its first Ministry of Tourism, its first National Park and Wildlife Reserve and its first Cultural Zone. This proactive approach gave Jimmy Roberts' new trekking initiative a boost as it began to promote Nepal as an 'adventure tourism' destination. Up to this point tourism in Nepal had more or less developed without proper planning and strategy, but from 1973 all that changed.

The Annapurna Conservation Area Project (ACAP) was established in 1986 to address these rising concerns. It undertook an innovative and successful approach to natural resource and tourism management in the Annapurna region. It practiced a multiple land use method of resource management, combining environmental protection with sustainable community development and tourism management.

The multifaceted problems of ACAP have been addressed through an integrated, community-based conservation and development approach, an experimental model which has been in the vanguard of promoting the concepts of "Conservation Areas" through an "Integrated Conservation and Development Programme" approach in the country and abroad. ACAP was first tested as a pilot programme in the Ghandruk Village Development Committee (VDC) in 1986. After being notified in the Gazette as a "Conservation Area" in 1992, ACAP's programme covered the entire Annapurna area.

Additionally, the ACAP was the first protected area that allowed local resident to live within the boundaries as well as their private properties and maintain their traditional rights and access to the use of natural resources. It was also the first protected area, which refrained from using army assistance to protect the dwindling natural resource base on which the region depends. Instead, it invested whatever financial resources available for community development and social capital building in the region. NTNC receives no regular funding support from the government for the operation of ACAP, but has been granted the right to collect entry fees from visiting trekkers. The focus is on local capacity building, both at the institutional and individual levels, to meet all the conservation and development aspirations of the people (NTNC, 2020). The natural and cultural features of ACAP have made it the most popular trekking destination in the country, drawing more than 60% of Nepal's total number of trekkers (Tourism Concern, 2014: 11 August). Tourism, over the years, has been firmly established as one of the most important and competitive sectors of the local economy. There are over 1,000 lodges, teashops and hundreds of other subsidiary services to cater to the thousands of trekkers, pilgrims and their support staff. All the proceeds from these visitors go towards the socio-economic benefits of the communities in which they are generated.

The soaring number of visitors into the ACAP region has exerted immense pressure on forest resources that are already stressed as a result of the growing local population and whose fuel wood consumption is twice that of the local people. Similarly, litter, particularly the wastes produced by trekkers and hoteliers, is another major concern. It is estimated that an average

trekking group of 15 people generates about 15 Kg of non-biodegradable and non-burnable garbage in 10 days trekking, producing tons of garbage in mountain regions annually. This has on many occasions brought local communities through their Buffer Zones into conflict with the central administration. In the ACAP region this has led to a situation where the local people want to abolish ACAP or at least seriously realign it so as it recognises the limitations the local communities believe it unfairly places on those communities, in part because they feel that the central government does not disseminate the finances gained from the permits and other taxes placed on the tourists. Consequently community-based approaches to decision-making in the management of protected areas are increasingly being implemented in many areas. However, information on the outcome of these approaches for conservation is often lacking. In the study 'effectiveness of community involvement in delivering conservation benefits to the Annapurna Conservation Area, Nepal' the effectiveness of community-based approaches for conservation of biodiversity was examined in Annapurna Conservation Area (ACA) (Nepal) through a combination of ecological assessments and social surveys undertaken both within and out with ACA. Forest basal area and tree species diversity were found to be significantly higher inside ACA than in neighbouring areas outside. The means the density of cut tree stumps was significantly lower inside ACA, associated with a decline in use of fuel wood as an energy source over the past decade. Social surveys also indicated that wild animal populations have increased inside ACA since the inception of community-based conservation. Observations of animal track counts, pellet counts and direct observations of selected species such as barking deer (*Muntiacus muntjak*) and Himalayan thar (*Hemitragus jemlahicus*) indicated higher abundances within ACA. The community-based management has been successful in delivering conservation benefits in ACA, attributable to changing patterns of resource use and behaviour among local communities, increased control of local communities over their local resources, increased conservation awareness among local people resulting from environmental education, and the development and strengthening of local institutions such as Conservation Area Management Committees (CAMC) (Bajracharya et. al., 2005).

Broughton Coburn makes a strong case for change to the established system of management in his article 'It's time to restructure conservation area projects in Nepal' published on 20th November 2019 (Pant, 2019: 20 November, Wednesday)

A 20-year interlude in Nepal's re-structuring and the aftermath

The Maoist insurgency (1996- 2006) in Nepal was a completely new development in Nepal's political history, Nepal had not seen such a radical change in its political structure since the Gorkha expansion of the late 1700s. The new political doctrine had a major socio-economic and political impact on the conditions of Nepal, and in nearly three decades it has become a major political force with the capacity to change the state and the country's socio-economic structure. The Maoist movement and its associated political sectors have a wide range of domestic, regional and international support and along with ideological and material linkages it has been able to completely change the image and status of this once Himalayan Kingdom of Nepal.

In general, the people of Nepal were of a positive mind-set with the new political change and the prospect of a democratic system of governance in 1990. However, the change did not go as planned and eventually civil war broke out in 1996. After almost another ten years of political insurgency and then the intervening political rivalry the new constitution came into effect on the 20th September 2015.

The insurgency inadvertently played a role in facilitating neoliberal modes of rural financialisation in some areas of the country. In seeking to supplant traditional money-lending practices and landlord-tenant relationships, Maoist practices encouraged some people (in districts where parallel states were not effectively established) to travel to those district headquarters to borrow money from banks and other formal lending institutions (Upreti 2006). Since the Maoists came to power after the peace agreement in 2006, market entities especially the banks, contractors, and foreign companies have become more powerful and further mobilized the growing development desire in the insurgency context to deepen rural financialisation, what Paudel (2019) calls a period of 'red neo-liberalism in Nepal'.

With a young population, 42 percent of people in Nepal were under the age of 15 in 1991, the country's population continued to grow rapidly. The Ministry of Population and Environment (MoPE) projected that the population would reach 32 million by 2016, in fact it was only registered as 27.26 million (MoPE, 2016). In light of that increase, the prospects for economic growth and political stability appeared fragile (Population Reference Bureau, 2002: July 26).

In the article based on the study of the 'Rapid Urban Growth in the Kathmandu Valley, Nepal' the researchers concluded that the cityscape changed dramatically between 1989 and 2016. This growth, the largest urbanisation in South Asia, came as a result of rural to urban migration and this 'push factor' was instigated not only by the belief of greater economic and lifestyle benefits but by the pressure brought to bear on rural communities by the civil conflict. It is estimated that over 500,000 rurally based citizens migrated to Kathmandu between 1996 and 2008. The capital city is the hub for all important socio-economic sectors, tourism, finance, industry, education, transportation and healthcare and as such controls the flow of all economic and financial transactions in Nepal (Ishtiaque et. al., 2017).

During the intervening years Kathmandu did not necessarily live up to every migrant's expectations, money and work were scarce and housing lacking. Many migrants saw the possibility of developing some form of tourism. Although they did not necessarily have a background in tourism, they were aware of the increasing opportunities it offered. Money was borrowed, agencies were established and in the fight for survival, many of the previous generations' sustainable development work was side-tracked. The advances Nepal made in sustainable tourism in the 1970s and 1980s were quickly forgotten in the name of commercialism and immediate financial gain. As the highly competitive supply side developed agencies were looking at ways to increase profits while possibly reducing expenditure. Sadly, this philosophy has got out of hand and there is an element of the tourism supply sector that has taken their focus on financial gain too far. This has manifested itself in more recent times in the form of the helicopter rescue insurance scam that came to light in 2017 (Skinner, 2018: 21 September). Many of the big players within the tourism sector have political connections and dubious practices are often spared investigation.

Today, May 2020 and Nepal is in the grip of the Corona virus pandemic. This will undoubtedly have significant consequences for the tourism industry. Reports have already emerged of illegal logging and poaching during the lockdown, long-term pressure on forests and wildlife could increase in the future. Nepal experienced amazing forest resurgence over the last three decades, attributed in part to out-migration, since migrants' households farmed less land and spent remittances on cooking gas, reducing demand for firewood from forests. If an estimated 1 million migrants return home en masse, the consumption of forest resources could increase. Prime Minister Khadga Prasad Sharma Oli has emphasized the need to focus on agriculture

and continue large infrastructure projects already underway. But besides some programs for food aid and debt postponement, initiatives that directly put cash in the hands of struggling citizens are lacking and several cabinet members are embroiled in corruption allegations surrounding health supplies procurement (Gili, 2020).

For at least a decade and more obtrusively in recent years, the problem of corruption has been at the centre of the political agenda in Nepal. It is recognized as one of the chief causes of Nepal's underdevelopment. It is very widespread, has different manifestations, and is practiced at all levels of society. The Nepali bureaucracy, politician, and the business sector are most seriously affected by, and inextricably involved in corruption. This is really a great challenge to the campaign of modern Nepal. The businesspersons, the politicians, government officials, so called academicians and even consumers are responsible for this. It is critical to continue a strong stance against corrupt practices during the response to the COVID-19 pandemic. Anti-corruption procedures and systems of accountability will ensure that development aid is deployed to benefit those who need it the most. A wave of corruption-related incidents linked to the current situation underscores the importance of continuing and strengthening transparency and accountability efforts (Steingrüber, 2020).

This interlude in the tourism industry, like the aftermath of the 2015 earthquake is an ideal opportunity for Nepal to realign its tourism policies and strategies so as to provide a more sustainable future for this potentially long term financially lucrative industry. Sadly, those so focused on making money are already looking at other opportunities and, like the helicopter rescue fraud and the road building spree at present being undertaken in rural Nepal, which is not directly attributed to 'development' but rather financial gain by some people in power. The Nepali government is seeking to build roads to every village in the mountainous nation. But some warn the road boom could have high costs for communities and the environment, especially in areas where traditional livelihoods and trek tourism rely on unspoiled nature (Coburn, 2020: 2 January). The new focus of such people will set Nepal and the tourism industry back yet again.

Are the principles of sustainable tourism now giving way to the pressures of commercialism and maybe development?

It is extremely important that those in charge of developing not just tourism but sustainable tourism fully understand the expectations of trekkers and other visitor sectors that spend time in Nepal. Most visitors expect to see the local wild life, cultural architectures, a pristine environment and local customs and traditions, however this must be managed in such a way to also meet the expectations of the local communities – access to essential services, good communications and the opportunities to generate a liveable income from tourism. After all what is the point of developing tourism if it actually has a negative impact on the local communities and environment?

Although today the tourism' industry contributes only around 7.9% (World Data Atlas, 2018) to the national GDP its potential is far from exhausted. The grass-root operators and mountain communities see the value of tourism as supporting their financial sustainability but, in the vacuum, created by a lack of direction and monitoring from senior levels of administration they are often taking things into their own hands. However, these positive achievements are threatened in some cases by the current political and moral situation. In short, the communities hosting tourists are not getting the benefits that they expected.



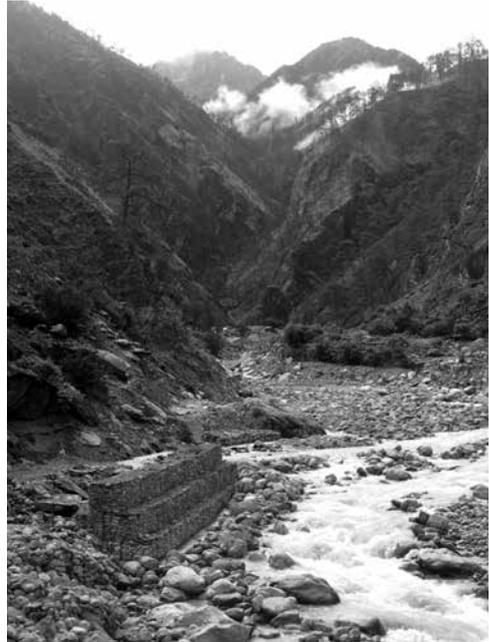
Picture 1: Power tools are driven across fragile eco-systems to break up and destabilise the rock structure. It will take years for these eco-systems to recover, if ever changing the entire eco-system of the valley – Dolpa © Ian Wall

Although systems are in place to manage a positive expansion of the tourism industry the rapid development accompanied by a lack of transparent monitoring by some of the major players of today has also allowed some dubious practices to enter into the industry and in many areas this is having a negative impact on Nepal reaching its sustainable tourism potential. This is especially so with regard to the environment and the impact of tourism on the wild-life.

As part of the major challenges facing any new administration in the mountain tourism sector attention must be given to a balanced approach to promoting the country as a tourist destination, developing infrastructure that opens up new areas for tourism, offers the opportunities for socio-economic development for the local shareholders and above all maintaining an environment in which wild life and eco-systems can live in harmony with both developmental sectors. Many countries have gone head-long into developing tourism that has ultimately caused great and irreversible damage to the environment from which there has been no recovery.



Picture 2: Hydraulic power tools using pressurized air-hoses are used to break up and destabilise the rock structure so that the man-power can remove rubble by hand. These machines require diesel fueled compressors, there is always a lot of spillage and ground contamination which often leaks into water courses or the water courses are ultimately destroyed. The young works are not provided with the appropriate protective clothing and many are seriously injured during the work - Dolpa © Ian Wall



Picture 3: The construction of road bridges changes the water course of rivers and ultimately results in pollution and erosion of the fragile environment and eco-system. The heavy machinery is often not well maintained and as a result suffers from mechanical failure at which time it is often abandoned. If bridges are not properly built, they often get damaged or destroyed during the monsoon, if there is no money for repairing them then the locals will return to their old ways leaving industrial waste in the environment - Dolpa© Ian Wall

The pay-off would be to what extent would an area lose its existing tourism trade from those wanting to visit a remote and so far relatively untouched destination as opposed to any new and different type of tourist who would be attracted to an area just because it is no longer 'remote' but because it has road access?

Whilst recognising that the remote communities need to be more included in mainstream Nepal developers must keep in mind the expectations of all shareholders and the impact on sustainable tourism (UNCRD, 2017: 14 March)

There has been a rapid expansion of rural road development over the last few years. The situation along the Annapurna Circuit has been well aired and verbally documented;



Picture 4: The new road to Lo Manthang linking Nepal's central districts with China has resulted in many vehicles plying the routes, however, once they break down or get involved in an accident they are simply discarded and left to rot where they stop. This pollution of a pristine community will result in fewer tourists visiting the area with the obvious negative effect of less financial income generation opportunities (Lonely Planet collection).

now there is aggressive road development in Dolpa one of the most unique regions in Nepal.



Picture 5: *New road development is often completed without the local communities understanding the full implications as to what they have signed up to. Not only is it easy for people to travel to Kathmandu but it is also easy for maybe the less-desirable element of the population to arrive in the remote villages. Several communities have reported local Gompas and shrines being desecrated and vandalised by unwelcomed visitors – Helambu, Ama Yangri Stupa ©Ian Wall*

Recent reports have highlighted the fact that the new roads would only be used for motor bikes and tractors taking goods to remote villages. But at what point will the first 4 x 4 head into Dolpa? The Helambu is criss-crossed by roads and many villages have had a total change in character, and many locals regret the modernisation that is affecting many remote hill communities (Lama, 2019: 18 October). In some regions conflict has broken out between local people and the contractors (The Himalaya Times, 2019: 26 October). The development of new roads will always impact on the environment and wild life. Over the years the balance might well be addressed but in the short term the negative impact on both the environment and wild life will be compounded by the probable loss of revenue from mountain tourism, the destruction and displacement of the very elements that trekkers visit these areas to witness.

To address these issues the first question that must be asked is ‘what is sustainable tourism?’

According to the UNWTO ‘sustainable tourism’ is the development of guidelines and management practices that are applicable to all forms of tourism in all types of destinations, including mass tourism and the various niche tourism segments (UNWTO, 2005: 11, retrieved). Sustainability principles refer to the environmental, economic, and socio-cultural aspects of tourism development, and a suitable balance that must exist between these three dimensions to guarantee long-term sustainability.

The second question to be asked is ‘Is Nepal’s approach to modern tourism sustainable?’ Data show that the tourism industry contributes 7.9% to the country’s gross domestic product (GDP) and that the actual economic contribution of the sector to the GDP has increased in recent years. It was anticipated that the sector would grow but without any pre-determine indicators, as opposed to recorded data, these advancements are difficult to monitor and the

published 7.9% contribution to the GDP has caused many to ask why? However, the government has now set a bench mark of two million tourists for ‘Visit Nepal Year 2020’, can this be achieved, is it sustainable, what impact will it have on the environment and above all will it be a quality experience for both visitors and the local communities? (Corona virus curtailed tourism in 2020).



Picture 6: Valley sides previously covered in vegetation are stripped thus the strength properties of the top soil are removed leading to greater erosion. This erosion will occur every year often leading to the total collapse of the more exposed sections of the road, many roads in remote regions never get repaired after a major collapse - Dolpa © Ian Wall

However, in the short term there are benefits. This image is of a complete family working on the road construction thus their joint earnings and short-term financial sustainability will have been greatly increased. Development is a necessity; however, it must be balanced with tourism expectations and considerations of all the other elements of sustainable development.



Picture 7: There are however, immediate financial advantages, this is one family who are all employed on the road building project. Many, if not all the laborers are unskilled and often not supervised, serious accidents and rock fall frequently happen – Dolpa - © Ian Wall

Ask any local person in any one of Nepal's tourist destinations, 'Are you getting what you expected from the developing tourism market in your area?' And the answer is nearly always 'NO!' If there is no long-term financial advantage from tourists visiting 'attractions' then tourism is not having a positive impact on that area.

Money taken in the form of business taxes, permit fees, tourism taxes and other related costs paid by the tourists don't always go to the related communities who then feel cheated. Schools, health and income generating activities, issues which local communities regard as being the benefactors of hosting the tourism industry do not always materialise. In economic terms although the country's GDP contribution is growing it has not reached a sufficient level for 'tourism' to be recognised at government level as a major area of income generation that should be heavily, sustainably and appropriately invested in within the near future.



Picture 8: Any new building in remote areas will always require the raw materials being sourced locally as this is often the most cost-effective way. Rock will be quarried locally leaving unsightly scars on the local environment which will take decades to cover over with ground hugging foliage - Khumbu © Ian Wall



Picture 9: All the new lodges built for tourists require open quarrying. The top soil is removed and eco-systems destroyed, erosion quickly wears the land away. Most high-altitude communities do not have killed workmen so these have to be brought on site from lower valleys. Temporary living conditions are not good, people become ill and worse and there are little attention paid to the polluting effects these projects have on the immediate locality-Khumbu© Ian Wall

The local players feel that they are not being supported from the senior administration level sufficiently to create a sustainable economic life style from tourism. While at the senior administration level the financial benefits from tourism are maybe seen as ‘disposable income’ rather than a resource to reinvest in the sustainable tourism industry.



Picture 10: Tourist arrive in fragile eco-systems with little knowledge or consideration for their environment and little realizing what their actions will have on local resources then conflicts often arise - Khumbu© Ian Wall

The environment, flora and fauna are under extreme pressure from tourism. Deforestation to make way for new airports, wider roads, creating productive subsistence agricultural land, developing new road networks, destroying natural water courses, building new lodges or other tourist facilities with little consideration for the delicate balance of the Himalayan environment are all contributing to a less sustainable industry.



Picture 11: Nepal's capital city has not escaped the effects of un-monitored development. The old communal water fountains of the valley are drying up due to the vast reduction of the ground water resource as a result of illegal and erratic, drilling of bore holes, building construction and new road development all within the valley © Ian Wall

Nepal must now consider the infrastructural development on sustainable tourism development

The Nepal government is well aware of the changing weather patterns and its effect on natural productivity and this is nowhere more obvious than in the present-day condition of the high Himalaya, the decreasing ‘permanent’ snow cover and potential reduction in water supply.



Picture 12: *New roads not only scar and weaken the upper hillside but the building of roads often follow existing trekking routes with little consideration for the many trekkers that visit the region and bring with them much needed financial support for the hill communities. This is not what trekkers want to experience and many will be turned off by the road development and look for new unspoilt locations - Helambu © Ian Wall*



Picture 13: *With the new roads pushing deeper into the National Parks serious damage is created to the environment. Roads often contour the hillsides and basically tear a line across the vegetation which supports the upper hillside. In the monsoon, this is highly likely to slip, not only blocking the new road but continuing down the valley sides and possibly forming a dam across the river which will then cause local flooding issues – Manaslu © Ian Wall*



Picture 14: *The same view taken 10 years apart. With the extension of the road deep into the National Park the road head community suffers as a result. With vehicular access materials that were once unavailable get transported in to the remote regions. Many of these materials are packed in plastic sheeting or covered by tarpaulins causing typical road head pollution, discarded tarpaulins building materials and an abundance of plastic waste. Now trekkers leave the jeeps and walk on to less disturbed villages. In a few years' time the road will progress again leaving behind a less that picturesque Himalayan community which will be avoided by those wish an authentic Nepalese experience - Manaslu © Ian Wall*

The development of the tourism industry, in its present form has several major socio-economic and cultural consequences. Not all tourists are travelling from abroad and in Nepal there is a huge upturn in domestic tourism. Tourism may have many different effects on the social and cultural aspects of life in a particular region or area, depending on the cultural and religious strengths of that region. The interaction between tourists and the host community can be one of the factors that may negatively affect a community as tourist may not be sensitive to local customs, traditions and standards. The effects can be both positive and negative on the host communities.

Positive impacts from a well-structured sustainable tourism plan

- Local community can mix with people from diverse backgrounds with different lifestyles which through 'demonstration effect' may lead to the development of improved lifestyles and practices from the tourists' examples.
- There can be an improvement in local life through better local facilities and infrastructure (developed to sustain tourism) which could lead to better education, health care, employment opportunities and income. Tourism related business opportunities can be developed.
- The conservation of local and cultural heritage of an area and rebirth of its crafts, architectural traditions and ancestral heritage to meet client expectations.
- The income generated from permits and fees should be reinvested back into the local communities to strengthen capital development.
- The government would benefit financially from the taxes and other tourism related charges.

Without a good sustainable tourism plan there would be negative effects

- Existing infrastructure may not be able to cope with the greater stress created by influx of tourists.

- Local population's activities and lifestyles may suffer intrusion from tourists leading to resentment towards tourists.
- The local population may copy lifestyles of tourists through the 'demonstration effect' and the result could be a loss to local customs and traditions as well as lower standards of behaviour.
- Increased crime could develop through decline in moral values, leading to greed and jealousy of wealthier visitors.
- Traditional industries may be lost and local goods substituted by imported and mass-produced goods which lack authenticity but appeal to a mass market.
- Tourists may act in an anti-social manner which could cause offence to the local population. Unless sufficient information is provided by the host nation and tourist providers on the standards of behaviour expected in that area, local populations come to resent tourists and act aggressively towards them.
- Language barriers between the tourist and the host community which may create communication problems.

Present day overview

In general, tourism entrepreneurs, at local level do not believe that tourism as delivered in its present form will, in the long term, be sustainable. On the other-side of the coin, the tourists also have expectations, and they pay a relatively high price thinking that their financial contribution to Nepal's GDP will ensure a sustainable outcome. At national level and in general terms visitors have common expectations, to be safe, to have value for money based on their payments for permits and other services. They expect a litter free environment, efficient methods of transport, good customer care provision and exposure to Nepal's unique culture, festivals, architectural and ethnic heritage. There are then specific expectations based on, religious tours, mountain trekking, wild life safaris, bird-watching or adventure tourism, niche activities.

In the context of sustainable tourism development, it must be born in mind that Nepal has only been developing a tourism industry for the last nearly 70 years, for the mountain and remote communities this has been considerably less. As a developing nation it is unfair to expect that Nepal can provide the same standard of service and facilities as more developed tourism destinations, however, it must have a positive vision with pre-determine positive indicators to enable it to move in the right direction.

To understand exactly what is required to create a sustainable tourism sector it is worth considering the World Tourism Organisation's (WTO) definition of sustainable tourism and cross reference that to activities that are being played out in Nepal's tourism industry at the present time.

Sustainable tourism development guidelines and management practices are applicable to all forms of tourism in all types of destinations, including mass tourism and the various niche tourism segments. Sustainability principles refer to the environmental, economic, and socio-cultural aspects of tourism development, and a suitable balance must be established between these three dimensions to guarantee its long-term sustainability.

To develop a truly sustainable tourism industry

There are three key issues that need to be addressed:

1. There must be optimal use made of environmental resources, those that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity.
2. Respect must be given to the socio-cultural authenticity of host communities, conserve their original and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance.
3. Viable, long-term economic operations must be ensured to provide socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and income-earning opportunities and specific services to host communities, and contributing to poverty alleviation.

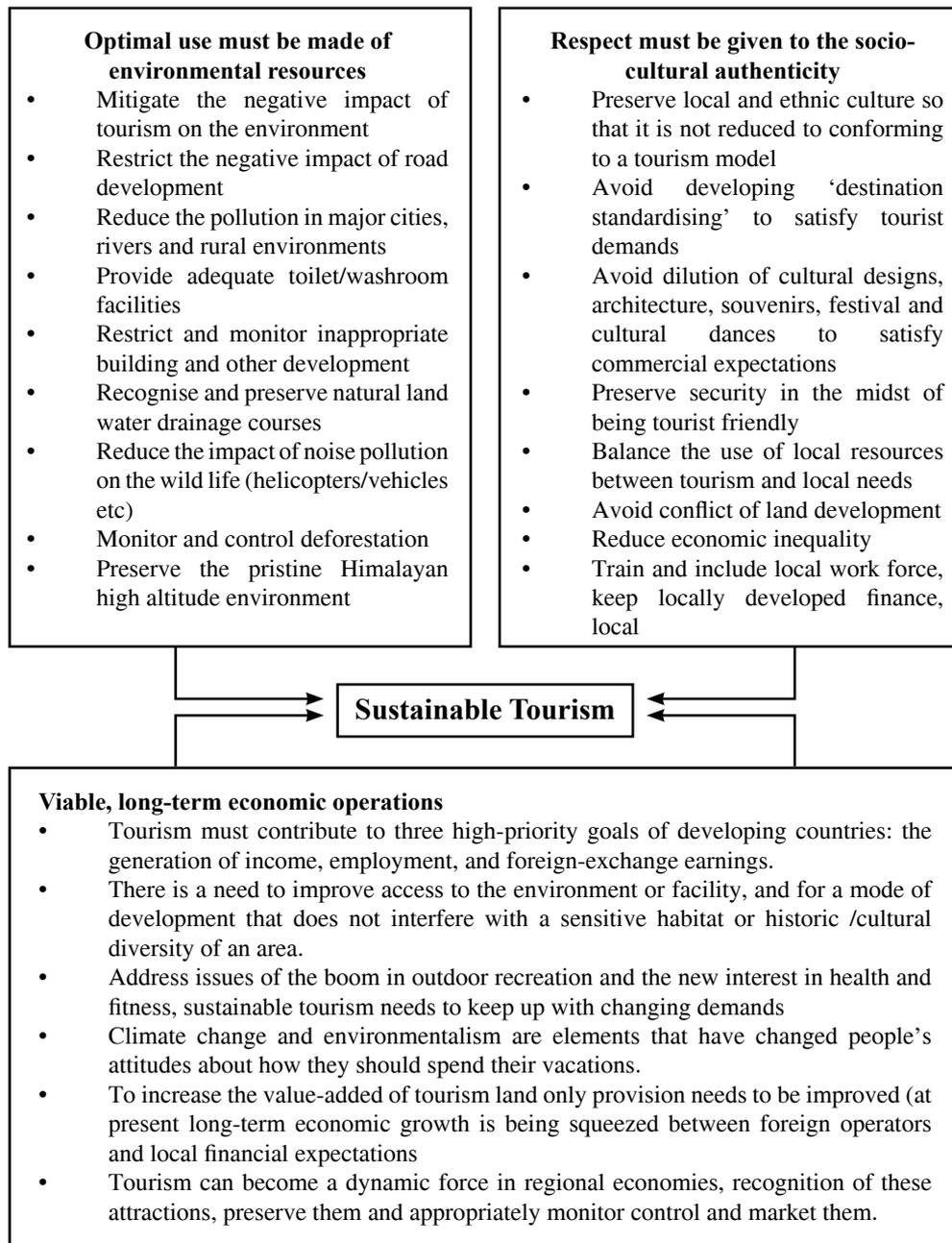
Sustainable tourism development requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building. Achieving sustainable tourism is a continuous process and it requires the constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary. Sustainable tourism should also maintain a high level of tourist satisfaction and ensure a meaningful experience to the tourists, raising their awareness about sustainability issues and promoting sustainable tourism practices amongst them.

It has been suggested by PATA, Nepal chapter that a tourism arrival goal for 2030 could be 5 million tourists. Within the next 10 years is it possible for Nepal to have sufficient infrastructure in place to meet all the criteria for a sustainable tourism industry? Several leading travel writers have already voiced their concerns.

Viable, long-term economic operations

- Tourism must contribute to three high-priority goals of developing countries: the generation of income, employment, and foreign-exchange earnings.
- There is a need to improve access to the environment or facility, and for a mode of development that does not interfere with a sensitive habitat or historic/cultural diversity of an area.
- Address issues of the boom in outdoor recreation and the new interest in health and fitness. Sustainable tourism needs to keep up with changing demands.
- Climate change and environmentalism are elements that have changed people's attitudes about how they should spend their vacations.
- To increase the value-added of tourism land only provision needs to be improved (at present long-term economic growth is being squeezed between foreign operators and local financial expectations).
- Tourism can become a dynamic force in regional economies, recognition of these attractions, preserve them and appropriately monitor control and market them.

The way to developing sustainable tourism



Conclusion

In the beginning, tourists visiting Nepal were ‘adventurers’, they had little idea as to how long their trip would last or even if they would return home. As tourism developed ‘guides’ were simply local people who knew all the local paths and ‘guiding’ was simply a means to try to escape the poverty trap.

During the early 1950s many expeditions arrived in Nepal to climb the 8000 m mountains, soon trekkers followed. Several, now famous foreign entrepreneurs saw a potential to develop tourism and the monarchy of the day supported their initiatives. With the development of the hippy trail the numbers grew. Meanwhile, at the highest level of governance in Nepal concern was growing as to the negative impact so many visitors were having on the fragile mountain environmental and ethnic sectors of the population and steps were taken to minimise collateral damage while at the same time trying to improve socio-economic benefits. Eventually the Annapurna Area Conservation Project grew from little acorns leading to probably the finest and most talked about trekking route in the world at that time.

Up until the early to mid-1990s, tourism was developing as a sustainable and flourishing industry that was contributing a significant amount to Nepal's GDP (12.1% in 1995) % (World Data Atlas, 2018). However, from 1996 to 2015 Nepal went through a period of prolonged political unrest which not only destabilised the development of tourism it also caused the development of Nepal to flounder.

During the term of the insurgency there was a large migration of people from the rural regions of Nepal into the capital city, living was not easy and the financial gains that were anticipated were not readily forthcoming. With the easy of borrowing money and with political support some of the migrants were able to get a foot-hold in tourism.

Throughout the early 2000 period, the commercial competition between agencies developed and some took a short cut to profiteering. Many of the policies for sustainable tourism that had developed in the late 1970s and early 1980s were side-tracked in the name of financial gain, in some quarters greed took over. Many of the political leaders had financial interests in tourism as well as other parts of the national infrastructure, in what we might call a relationship of vested interests. Health, travel, tourism, transport, road building, nothing escaped the eye of those looking to make a profit no matter what the cost.

Rural development is essential to develop an all-inclusive society and the government established a plan of developing road and domestic air flight connectivity. Many of these projects have potential for significant financial gain for interested parties. However, these are not all sustainable projects and there is now a developing clash between rural development and sustainable tourism, the form of tourism that takes into account the various stakeholders from within the environmental, financial, socio-economic, cultural sectors as well as understanding the expectations of tourists visiting Nepal especially those going to the remote regions.

Over the last five years, there have been periods of time when Nepal's tourism sector virtually closed down, in 2015 after the earthquake and Indian blockage and then in 2020 with the corona virus pandemic. These two unfortunate incidences provided breathing space for those in charge of tourism at government level to refine the Adventure Tourism Policy and Strategic Plan for Nepal. However, there seems to be indecision at the top level. Is tourism just an industry that provides the icing on the financial pie for some community leaders or is it to be developed into a high-end industry providing a quality experience back up by a quality service for both domestic and foreign travellers?

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Human Dimensions to Climate Change: Insights from the Case Study in the Nhāson Valley of Nepal Himalaya

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Abstract



The climate change in the Nepal-Himalayan region is not just about increased temperature and subsequent glacier melting. It speaks to broad questions on the relationship between society and the environment, science and knowledge, global and local. The present study analysis supports the understanding and responses of agro-pastoral communities on climate change in Nhāson valley of the southeast Manang District. The stories from local participants were documented and analyzed for their agro-pastoral experience. The communities inhabit in the place engaging in daily activities and accommodate practices to cope with anthropogenic climate change.

The paper is based on nine months ethnographic study (from 2012-2018) undertaken in six settlements that practice agro-pastoralism for livelihood. In addition, quantitative data was also used to supplement local narratives about the changes in environmental phenomena visually in the local real world. The findings depict that the mountain agro-pastoral communities are more aware with the environmental changes associated with climatic variables. The communities' observation is grounded on the lived experience. Moreover, climate surpasses many disciplinary boundaries. Both, qualitative information based on local narratives and quantitative data, offer complementary to address complexities of global climate change.

Keywords: *climate change, scientific, local knowledge, Himalaya, agro-pastoral communities*

Introduction

My writing in reference to the widely cited book 'Wisdom sits in places' (1996) by Keith H. Basso tells us the bound with place are important for the production of knowledge. Such knowledge is an important aspect to understand climate change and its impacts on human life at local level (Ingold & Kurtilla 2001; Cruickshank 2005; Crate 2008; Poudel 2020).

Researches across the Himalayan regions indicates warming at a rate three times higher (0.060C/year) than the average warming of the earth (0.02 0C/year) (Shrestha & Aryal 2011; Shrestha et al., 2012). However, the warming rate is not the same in different altitude zones in Nepal; it is higher in the hills (1500-2500 meter (m) above the sea level (a.s.l.) (0.072 oC/ year) compared to Terai (< 200 m a.s.l.) (0.024 °C/year) and Trans-Himalayas (Jomsom: 2744 m a.s.l.) (0.029 °C/year) (Nayava et al., 2017). As compared to other parts of Nepal, warming rate (annual maximum temperature) was observed to be highest in Manang (0.118 0C/year) (Government of Nepal, 2017). The impacts of increased temperature on the Himalayan natural ecosystems and human communities are noticed and experienced. For

instance, studies depict the biological responses to climate change have manifested the modification of plant communities, shifting of elevation from lower to upper landscape, disappearance of alpine plant taxa (Shrestha, et al., 2012; Brandt, et al., 2013; Minish, et al., 2016). Similarly, precipitation patterns (intensification and distribution) are being shifted, glaciers are melting rapidly, glacial lakes are expanding, new lakes are forming, and events of outburst of glacial lakes have been increased in the Himalayan region due to climate change (Vetaas, 2007; Agrawala, 2008; Shrestha & Aryal, 2011; ICIMOD, 2011; Shrestha, et al., 2012). However, it not only impacts on plant ecosystems, glaciers and permafrost; it also affects all aspects of human life including health, homes, livelihoods, culture and our physical environment (Fiske, et. al., 2014). It also dislocates human-nature relationship (Ingold & Kurttila, 2001; Vedwan & Rhoades, 2001; Strauss & Orlove, et al., 2003; Cruickshank, 2005; Crate, 2008; Crate & Nuttall, et al., 2009; Adger, et al., 2009; Crate, 2011; Poudel, 2012 & 2020; Barnes & Dove, et al., 2015; Crate & Nutall, et al., 2016) which is place specific and cultural specific. However, human dimensions are rarely covered by scientific studies. Thus, agro-pastoral communities of Nhāson, a small valley of Nepal Himalaya, may have been noticing climate change differently which is an important question.

Himalaya is known as the water tower of Asia or third-pole. The existing literature shows that climate change has posed threat to the people and their livelihood and culture in the region (Vadwan & Rhoades, 2001; Byg & Salick, 2009; Pandit, 2017; Poudel, 2020). When I began to talk with the people in the Nhāson valley, I learned that climate change for local villagers is more than increased temperature and melting of glaciers or expanding of glacial lakes as explained by natural scientists and development practitioners. For the agro-pastoralists of the valley, it also means shift in crop landscape and disturbance in seasonal cropping calendar, opportunities to grow new crops and challenges to grow the existing one, loss of meadows for livestock, difficulty in cross-breeding yak with local cows, and threats to their customary laws and indigenous knowledge and practices. I feel that such issues and problems are rarely accounted in the ongoing climate change discourse of the Himalaya, in spite of the fact that this region has remained hot spot of discussions for scholars, development practitioners and even government and non-government organizations (Ministry of Environment, 2010; ICIMOD, 2011; Shrestha et al., 2012; Brandt et al., 2013; Minish et al., 2016; Nayava et al., 2017).

My ethnographic study tells that local agro-pastoralists are neither blind to notice environmental changes nor passive in coping with risks imposed by anthropogenic climate change. Indeed, there is no option beside adaptation with climate change (Adge et al., 2009). They are seeking new strategies like planting new crops, practicing intercropping and planting drought resistance variety of crops to resist with prolonged drought, exchange of seeds, upward shifting of the yak habitats, creating water storage ponds to feed livestock, connecting meadows with piped water systems, searching for new meadows, updating customary laws, and searching new places for cross-breeding yak and cow to cope with the risks created by climate change. Such strategies are effective and rational until encountered limitations. Hence, ongoing global warming and associated climatic and other anthropogenic environmental changes ask newer people how the people in the Himalayas can thrive by giving continuity to agro-pastoralism embedded with their culture and livelihood. Hence, the paper focuses on human dimensions of climate change in the Nepal Himalaya.

Research methods

The study was carried out for nine months of field research at six settlements namely,

Thanchok, Tache, Nache, Unash, Ghyalanchok and Tilche, in the Nhāson valley, located in the central Himalaya of Nepal, between 2012 and 2014. Extended period of residence and research at a community, [what Geertz (1997) termed ‘being there’] helped me to grasp the contextual understandings of climate change from grounded perspectives. I documented oral narratives on the changes in climatic variability (snowfall, rainfall and temperature) and physical landscapes that the people have been noticing in their locality and stored them as a live memory inside their heads. During the fieldwork, I largely paid higher attention to elders than young one because they had lived many years and accumulated wider and absolute knowledge by seeing things, including climate events, changes, and impacts in their everyday life (Roncoli et al., 2009). I hang out with the villagers, especially farmers and herders, while visiting their farmlands, and meadows that helped me to contextualize the issue.

In addition, I had taken some photographs of apple and maize farming when I visited Upper Manang. The photos were used in the discussion with the people of Nhāson. This method gave us a better opportunity to contextualize the higher limit of vegetation landscape that was in the past and how it has been changed since the last three decades and more in the Nhāson valley.

Besides ethnographic methods, I also used meteorological data (temperature) to verify the local narratives. Moreover, I also used topographic maps of the scale of 1:25000 to analyze climate change, particularly vegetation and livestock landscapes.

The setting

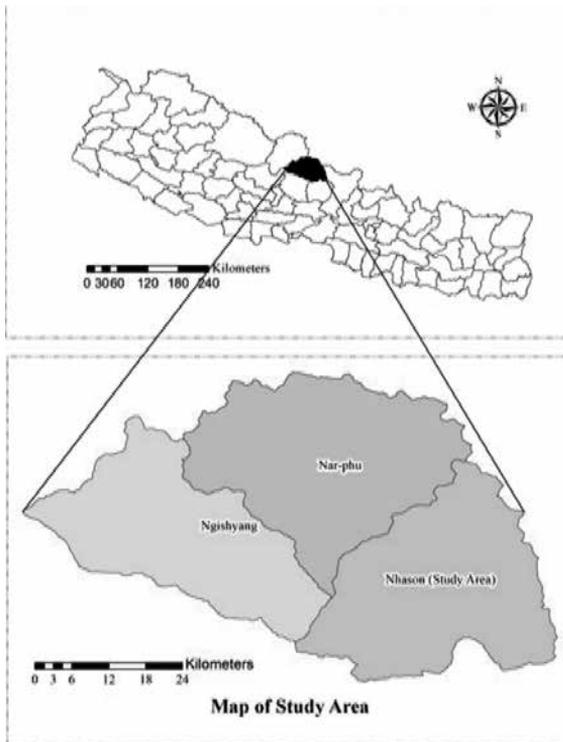


Figure 1: Study Area (Nhāson valley, Manang) is shown in an enlarged form from the recent map of Nepal.

Geographically speaking, the Manang District is located in the central part of Nepal (Figure 1). The district is divided into three micro-ecological zones: Gyasumdo (Nhāson), Nar-Phu and Nisyhang (Gurung, 1976; Spengen, 1987). Nhāson is located in the southeast of the district. It covers a wide vertical zone from 1,645 to 8,125 m a.s.l. (HMG/N, 2000). In 2011, maximum temperature and minimum temperature of the valley (Chame) were 22.30C and -5.80C respectively (DHM, 2011). Annual maximum temperature increment in winter season is 0.1180C (Government of Nepal, 2017).

Gurung was the politically, socially, culturally and economically dominant group of the valley. The valley’s name ‘Nhāson’ is also derived from Gurung words. The term consists of Gurung’s two words ‘nhā’ and ‘son’, meaning ‘villages’

and 'three' correspondingly. Nhāson, therefore, traditionally denotes the three villages, namely Tache, Nache and Tilche. In 2018, there were 16 settlements formed after the arrival of new groups over the last one and half century ago¹, whereas a few settlements were after the expansion of tourism on the corridor of the Annapurna mountain range in the late 1970s and Manaslu in the 21st century. The settlements are located in the Marsyangdi gorge and its tributary the Dudh-Khola in the 'V' shape. The settlements are scattered in different altitudinal ranges i.e., 1,645 to 3,700 m a.s.l. Tal is located in the lowest altitude and Bimthang in the highest.

Agro-pastoral life in the Nhāson valley

Agriculture, animal husbandry and trade/tourism based business are the key three pillars of livelihood (re)shaped by the local environment as well as a wider political-economic processes and state interventions in different time periods. Every household raises livestock of one kind or another, including yak, *cho/choamma* (yak-cow crossbreeds), cow, ox, sheep, goat and horses. These livestock have both cultural and economic values to them. The animal products consumed locally include meat, milk and milk products, dung, wool and draft power. Yak, sheep and goat are for meat. Sheep wool is used as the basic raw material for blankets and clothes. Sometimes, they offer gifts of woolen items to their kin who reside outside the valley. Draft power (ox) is necessary for plowing the field. Crossbreeds are for making cash. They offer the blood to their deities by sacrificing animals (sheep and goat) for the prosperity, good health of household or community members and good productivity. However, animal husbandry is under a threat in the Nhāson valley due to climate change, state policy, international policy (blockade of Nepal and Tibet border), market economy and development intervention (Poudel, 2016). Although, yak herding is rapidly flourishing in the valley when they started eating yak meat.

The main crops grown in the valley are maize (improved and local), naked barley, buckwheat, wheat and potato. They have never grown enough crops for their consumption because of the limited agricultural land, low productivity and short growing season. They would be involved in salt-grain-salt trade with Tibetan people and lowland dwellers until the early 1960s when Tibet was a free state. After Tibet became a part of China, salt-grain-salt trade plummeted rapidly to a halt. Thereafter, they largely relied on lowland dwellers for foods such as imported rice from Lamjung. Once connected by motorway in 2012, they started to export potatoes, main grown crops of the valley.

In the valley, there are three agricultural seasons, namely spring, summer and winter. It is, however, impossible to grow crops in all seasons in a given year due to the short agricultural season. Therefore, they have been practicing rotational cropping practices thrice in two years based on seasons and agricultural lands. For instance, they grow winter crops and summer crops on 'X' field this year and spring crops on 'Y' field, and in alternative years they grow spring crops on 'X' field and winter crops and summer crops on 'Y' field. The rotational growing of crops in different agricultural lands in different seasons is also important to them for the management of their livestock in the winter due to lack of ground grasses to grazing livestock in high pastureland, except fallow-lands.

¹ *The ancestors of Gurung had come and settled down at Nhāson about 150 years ago from Lamjung, an adjacent district of Manang located in southern part, the ancestor of Kami came in the 1st part of 20th century and Lama in the early 20th century from Mustang*

Landscape variation and agro-pastoral systems

In the Nhāson valley, the agricultural landscape is largely located between approximately 1,700 to 3,500 m a.s.l. As other parts of the Himalaya, the crops grown are determined by altitudinal and climatic factors in the valley (see Allen, 1986; Goldstein & Messerschmidt, 1880; Messerschmidt, 1976; Stevens, 1996). The farmers of the valley grow improved maize, buckwheat, wheat, naked barley, latte (quinoa like grain), potatoes, kolo (Himalayan beans), soybean, cauliflower, cabbage, pumpkins, cucumbers, and green-leafy vegetables in 1,700 to 2,500 m a.s.l. However, they grow potato, local variety of maize, buckwheat, naked barley, wheat, cabbage, cauliflower, pumpkins, kolo, green leafy vegetables at the altitude between 2,500 to 3,000 m a.s.l. From 3,000 to 3,500 m a.s.l., they only grow buckwheat, naked barley, potatoes, green-leafy vegetables, cabbages, and cauliflower. The agro-pastoral systems of the study area are summarized in Table 1.

Table 1: Altitudinal distribution and diversification of the agro-pastoral systems of Nhāson

Altitude in meters	Agro-pastoralism systems
4,501 & above	Snow
4,001 -4,500	Pastoralism only
3,501-4,000	Summer only crops production: potato, buckwheat and naked barley, apple*
3,001-3,501	Potato, buckwheat, naked barley, local maize*, apple*, pumpkins*, cauliflower, green leaf-vegetable, and cabbage
2,501- 3,000	Potato, local variety of maize, improved variety of maize*, buckwheat, naked barley, wheat, cabbage, cauliflower, pumpkins, kolo, green leafs vegetables, cucumber*
1,700-2,500	Potato, maize (local and improved varieties), beans, soybean; buckwheat, naked barley, winter wheat*, apple, cabbage, cauliflower, pumpkins, kolo, green leafs, cucumber, tomato*, chilli* tree tomato*

Source: The author's field study, 2012-2018 (*recently growing crops and vegetables).

In the valley, the selection of crops is not only shaped by altitude, but geographical slopes also have important role to determine it. For example, farmers cannot grow wheat in the sun-shadow zone in summer whereas they do in the sunlight zone within the same altitude.

Climate change and its effects on agriculture

Figure 2 shows Annual maximum and minimum temperature trends of the Chame valley. The maximum temperature of the valley has increased (0.0334°C/year), and minimum temperature has decreased (- 0.080°C/year) considerably over the three decades, indicating that temperature extremes are prevailing in the valley.

Like other parts of the Himalaya, vegetation landscape of domestic crops is being changed in the valley along with increment of temperature. Upward shifts of agriculture can be 150-200 meters per degree of warming in the mountain region (Meyer-Abich, 1993). Agro-pastoral communities of the valley have not gone unnoticed to it. They have been experiencing and observing it. At Thanchok (2,682 m a.s.l.), for instance, they could not grow cucumber and improved variety of maize due to cold and less number of hot days until the end of 2007, but today they do it. In reference to the change in the maize landscape over the last few years, Yagya Ghale, (a 58 years old farmer) said:

The weather at Thanchok (2,682 m a.s.l) is not like the past. In the past, summer used to quite cold and short. We (villagers) could only grow local maize, but not *dale* and *bikase* (improved varieties) maize and cucumber at village as the down-settlers (who live upto 2,400 m a.s. l) did. We tried to grow *dale* and *bikase* varieties of maize and cucumber several times but never succeed. Since the last decade and more, we have been experiencing hot days in the summer, and the days are also more. We succeed to grown cucumber in 2007 for the first time and improved variety of maize in 2010 (Y. Ghale, personal communication, November 20, 2012).

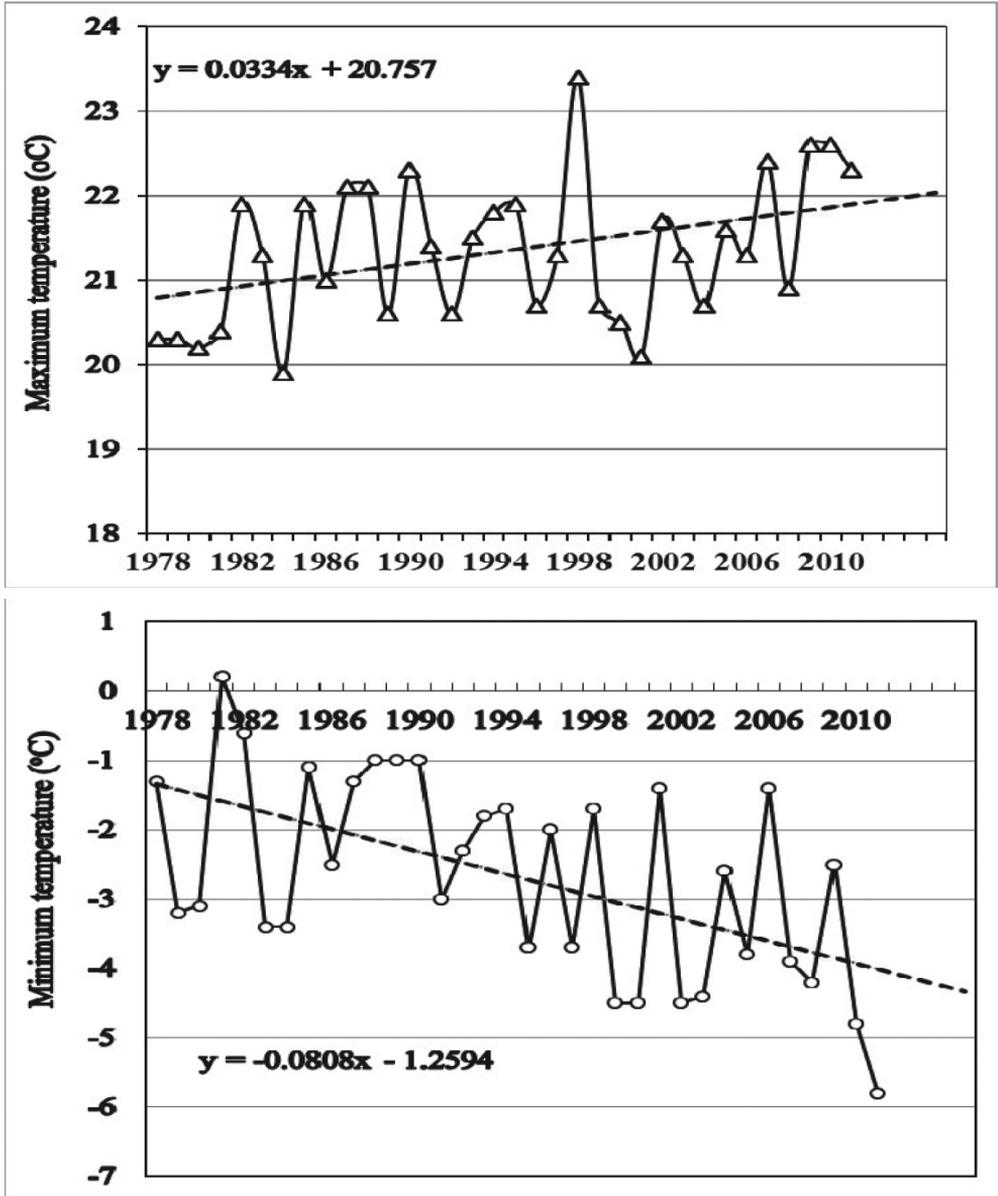


Figure 2 : Annual maximum (upper) and minimum temperature trends at Chame from 1978 to 2011. The broken lines show the temperature trends.

Similarly, chilli, tomato and tree tomato could not grow in 1,700-2,500 m a.s.l. until 2007, but now it becomes possible to grow along with increased temperature. In 2012, when I visited to Upper Manang area, I saw maize filed at Dhikurpokhari (3,240 m a.s.l.) (Figure 3, a) and apple fruits grown at household at Pisang (3,250 m a.s.l.) (Figure 3, b). Growing of maize and good apple yield are recent phenomena for the area. When I showed the pictures to my informants on the screen of my laptop, they could not believe me. The eldest informant, Ratan Ghale (81years old man) stopped me and exclaimed:

What's a good maize farm and apple fruits! When I was young, maize used to grow at Thanchok (2,682 meters) only, and it began to grow at Chame (2,710 meters) very late. Apple fruits also look better than here. They may not be from there, may they?" Apples were only grown in the Nhāson valley. As I recalled my earlier days, it would grow upon Bhratang (2,850 meters) only, and it would be small, hard, and sour. But it looks larger and brighter like what we would grow at our village in the past (R. Ghale, personal communication, November 15, 2012).



(a) Maize farming at Dhikurpokhari (3,240 m a.s.l.)



(b) Apple fruits at Pisang (3,250 m a.s.l.)

Figure 3: Maize (a) and apple (b) farming in the upper Manang area

Ratan Ghale's remark is telling that the place or altitudinal zone which was good for apple is no better now and vice versa (see Figure 4). Indeed, Thanchok was the upper limit of maize cultivation in the Marsyangdi valley until the early 1970s (Gurung, 1980) and began to grow at Talekhu (2,750 m a.s.l.) in the early 1980s (Koirala, 2038 BS). Over the last three and a half decades the landscape of maize has shifted 520 meters upwards i.e., from Thanchok (2,682m a.s.l.) to Dhikurpokhari (3,240 m a.s.l.) along with the increment of temperature.

The interventions government, non-government organizations, the Annapurna Conservation Area Project (ACAP) and private sectors in new technology and methods in agriculture sector definitely create a new environment for growing new crops and fruits in the Nhāson valley as well as Upper Manang but people considered climate change are more responsible for it. Yam Bahadur Gurung, a staff of ACAP, shared his experiences like this:

ACAP trialed vegetable farming in greenhouse tunnel in 1992, but could not success until 1998. New technology is necessary for change, but everything cannot achieve by it. The suitable climate is also essential for it. The decline of snowfall in winter and increased temperature in summer in Manang create new environment to grow green vegetables, primarily tomatoes in plastic tunnel (Y. B. Gurung, personal communication, November 18, 2012).

Climate change is not only producing opportunities to grow new varieties of crops, but also uprooting the traditional crops landscape. For example, the agro-pastoral communities in the valley could no longer grow good quality and quantity of apples over the last one and half decades due to decline of snow which is also reported in other regions of the Himalaya (Vedwan & Rhoades, 2001). Likewise, they have been noticing the decline of buckwheat yield, losing both yield and taste of (*kolo*) Himalayan bean, potato and maize due to climate change.

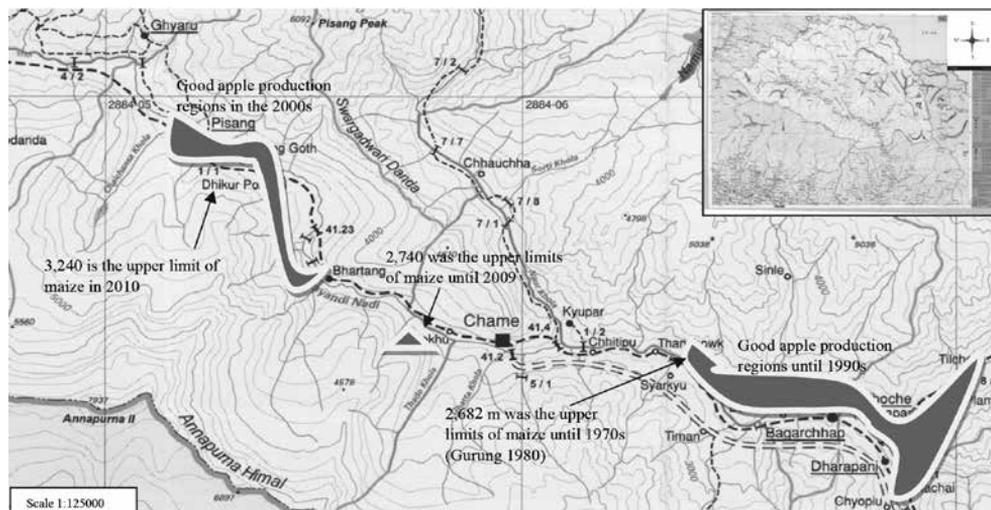


Figure 4: Vegetation landscapes changed in Nhāson over the last 30 years. Source: Poudel, 2016

Landscape variation and pastoral systems

The Nhāson valley covers a wider geographical landscape i.e., from about 1,700 m a.s.l. to 8,000 m a.s.l. This wider vertical landscape favors to raise different types of livestock like yak, *cho/choaama*, cow, goat, sheep and horse. Due to lack of limited agricultural land, they cannot grow enough crop residues as fodder to feed their livestock. Hence, they practice a seasonal movement of livestock. In summer, they move their livestock in high altitude meadows and in winter to villages and their surroundings and the low altitude pasturelands located in lower adjacent districts. The movement of livestock varies according to types of livestock. It is largely shaped by physiological characteristics of animals. For example, yak can only live until 120C (Haynes et al., 2014). Therefore, yak herds remain in high elevation meadows (3,500 m a.s.l.) whereas herds of cow and cho-aama moves in high elevation meadows in summer (from mid-April to mid-May, and from mid-August to mid-October), and middle elevation meadows (around 3,000-3,200 m a.s.l.) and village and its surroundings (from 2,000 to 2,500 m a.s.l.) in winter (mid-October to mid-April). Likewise, sheep and goats move in high elevation meadows in the summer, and the middle elevation meadows and the village and its surroundings in pre-winter (mid-October to mid-December) and low altitude (from 500 to 1500 m a.s.l.) in winter. Since 2016, the traditional practice of grazing livestock in lower altitude (about 500 – 1,700 m a.s.l.) has almost stopped when lowland dwellers started to grow cash crops on their private agricultural lands and community forests. It has brought great challenges for herding, especially sheep and goat. Due to restrictions on grazing on community forests and private land in lowlands, some households sold their livestock and some of them reduced herds' size.

The rotational movement of livestock adapted by the agro-pastoralist communities in the Nhāson valley can preserve ground grasses and crop residues of fallow farmlands. They use it during the pre-winter and winter seasons. Without moving their herds in meadows in different seasons for grazing, they cannot manage their herds in the limitation created by climate.

Climate change and its effects on pastoralism

In the Nhāson valley, the challenges of climate change seem to be on traditional habitat, cross-breeding, access to water resources for feeding on high meadows and access to ground grasses for grazing. In the valley, the local people were observing the changes in the meadows landscape. For instance, in May 2013, I was talking with some herders at the Nache village about climate change and livestock management practices. One of the informants Mangal Bahadur Gurung (68 years old), narrated the climate change that he has been noticing on their meadows like this:

There were a few species of rhododendron and other thorny trees at Kromche pastureland, and most of the lands were covered with grasses. Snow used to cover the land for a longer period in winter. However, the weather and vegetation landscape have been changing a lot since the 1970s. There is very little snowfall in the winter, and now it does not remain on the ground for a long time as it used to. The decrease in snowfall made it possible to grow new vegetation in Kromche grazing land. The rapidly growing and increasing of trees, especially thorny species, have made the grazing space smaller. Moreover, in the past, it was not difficult to count cattle because we could see them by standing in a high place. But now, we rely on the sound of a bell that hangs on the neck of our cattle to know where they are (M. B. Gurung, personal communication, November 18, 2012).

The similar experience was shared by Lal Bahadur Gurung (54 years old), a local forest guard and former herder, from the same valley like this:

I spend my early life (age between 14-24 years) as a shepherd and even today I occasionally make supervision of my sheep and cattle herds. In the summer, our herds would be at Prochha, Timle and Yoba meadows, and even stay there. There was no single tree. Now, 50% of these meadows are covered by shrubs and pine trees. We are missing our meadows (L. B. Gurung, personal communication, November 16, 2012).

The life experiences of herders are telling that the thorny and shrub flora of the lower elevations is slowly making incursions into grazing meadows, and a number of species historically known as quality grasses to their livestock from these habitats could no longer be located. Studies on responses of climate change in the Himalayan region also reported the changes in plant phenology, elevation range shift in plants, upward moves of tree lines, changes in plant communities structures, incursion of low elevation shrub vegetation into the alpine meadows, disappearance of alpine plant taxa (Shrestha et al., 2012; Minish et al., 2016; Pandit, 2017). By 2050 and 2070, it is predicted that about 16 percent and 18 percent of endemic angiosperm species would be likely to lose their habitat (Brandt et al., 2013; Manish et al., 2016). Such vegetation community modification will lead to decline of yak population in the Himalaya and extinction of a unique human culture that have evolved in these highlands over thousands of years (Pandit, 2017; Poudel, 2020).

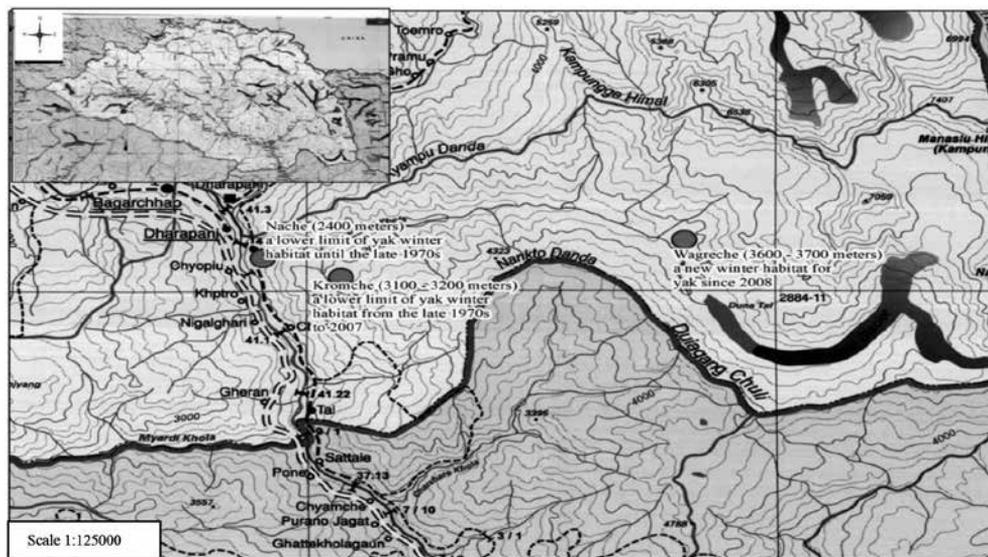


Figure 5: Yak landscapes changed in Nhāson over the last 30 years. Source: Poudel (2020).

The major challenge of climate change (mostly increase in temperature) is in the habitat for livestock, especially yak. Over the last four decades (1978-2020), the annual maximum temperature has increased by about 1.40C (0.0334 0C/ year). Studies reported a closed connection between temperature and physiological character of yak. Physiologically, yak can only live up to 120C. At 130C, yak's respiration rate starts to rise; at 160C, its heart rate and body temperature start to rise, and at 200C, it stops moving, grazing, drinking, or ruminating (Haynes et al., 2014). Hence, the agro-pastoral communities of the Nhāson valley have shifted the habitat of their livestock. For instance, the communities used to keep their yak herds at an altitude of 2,400 m a.s.l. until the 1970s; after that, the same altitude was not found to be suitable for keeping the yaks. After that, they began keeping their yaks at an altitude of 3,100-3,200 m a.s.l. The place was good until 2007; thereafter, this altitude has become no longer climatologically good for keeping the yaks. Then, they have started keeping them at an altitude of 3,600-3,700 m a.s.l. (see Figure 5). With every instance of increased temperature, the communities have shifted the location of their yak herds towards higher altitude in order to cope with the risk.

Global warming is not only dislocating the habitat of yak. It has more impacts on yak and associated culture or tacit knowledge. The Nhāson valley is geographically and climatologically suitable for hybrid production (Poudel, 2016). For household economy, the herders of the valley have been producing hybrids by cross-breeding yak-bulls and cows. It is, however, a complex task. It requires both biological and human dimensions as suggested by Bishop. She writes:

Hybrid should be impossible, however, some species are sufficiently close either due to recent domestication or because of insufficient time or selection pressure for differentiation, that their chromosomes will match up and produce a viable offspring, especially with human assistance in the mating process itself. (Bishop 1998:31)

In my discussion with herders, I found that three components seem essential for hybrid

production. They are: sound knowledge about the local ecological system (such as temperature, geographical location, availability of grasses and water for livestock in pasturelands); animal behavior (mating season of cow and yak); and human resources in the households (Poudel, 2020). This shows a close connection between human and ecological systems for crossbreeding. However, ongoing climate change has threatened the rhythm of the natural system and is breaking the relation between the social and the ecological system. For instance, Kromche (3,100-3,200 m a.s.l), which is a pastureland of the Nache village, was not only a geographical space but also an empirically tested place for cross-breeding between yak-bull and cow. In the beginning of May, the villagers would move their cow-herds upwards to Kromche and reach there by mid-May. They would keep yak-bull and cows together for crossbreeding by separating nak (female yak) and bulls from each herd. It requires more human resources to herd nak and bulls separately. If they did not separate yak from nak and bull from cows, it would be impossible to cross-breed between yak and cows. They would keep yak-bull and cows together from mid-May to mid-July for mating by separating them from their opposite sex. Thereafter, herders would move the yak-bull to a higher altitude because the yak-bull cannot live in high temperature due to its physiological characteristics. In my interviews with the herders of the Nache village, they reported that the place is no longer good for cross-breeding because of increased temperature, which is illustrated by the following case.

In our village, there was a yak-bull raised for cross breeding. One particular winter, a yak bull was left at Kromche (I could not recall the date). In that winter, there was heavy snowfall which continued for several days and it remained on the ground for a long time as frozen ice. The yak-bull could not get anything to eat due to thick layers of snow and it died of hunger, eventually. Today, the event, which was a reality in the past, has become like a fairy tale. The same place where we lost yak-bull due to heavy snowfall in the past is also the place where we lost our six yak-bulls due to low altitude sickness between the years 2000 and 2009 when we kept them for mating with cows for cross-breeding. Today, the villagers hardly move their yak herds down from Wagreche (3,700 m a.s.l) throughout the year (M. Gurung, personal communication, November 24, 2012).

The story, narrated by Meghalal, describes what has been happening to yak in the mountain region over the last few decades due to climate change. Temperature has increased dramatically, and winter snowfall has decreased severely. Scientific data also shows that the maximum temperature increased by about 1.4 0C over the last four decades at the Chame valley. The changes in temperature and snowfall patterns in the Himalayan region are threatening natural ecosystem and livelihood (Pandit, 2017). In the Nhāson valley, the changes in temperature and precipitation have gradually been disturbing the social and ecological systems, that is, declining of moisture in soil, increasing incursions of busy plants on meadows, shortage of grasses and water to feed livestock that badly affected the traditional habitat of yak, seasonal moving cycle of livestock, shrinking of meadows, breeding cycle of livestock, fat in the body of livestock. Indeed it is largely threatening the livelihood. Moreover, it is disturbing indigenous knowledge and practices that were built up through multi-generations of interaction with the local ecological system which is gradually breaking down due to climate change.

Conclusion

The data presented in the text tells us that environmental change associated with variations in

weather and climate has not gone unseen by the agro-pastoral communities who are observing and experiencing change first-hand. As the first eyewitness, agro-pastoral communities' science or knowledge is pragmatic, tacit and grounded rather than theoretical, myopic and satellite. To be a pragmatic, tacit and grounded knowledge, the place and continuous attachment with it are important for the production of knowledge that sits in places' (Basso, 1996). Hence, place and the relation with it; place and the memory with it; places and the oral history attached with it come as a central for discussion on climate change to agro-pastoral communities. However, global warming is gradually dislocating people relation with environment (Crate & Nuttall, 2009) including indigenous knowledge that cannot be transmitted as a set of customary prescription or formulae; it accumulates from a lifetime of experiences traversing and inhabiting well known places and is embodied in tacit knowledge (Ingold & Krutilla, 2000; Cruickshank, 2014). This knowledge is really important to understand climate change and its impacts on human dimensions at local level. Moreover, it can be a vital evidence to complement and enrich scientific understandings. It is, therefore, critical to recognize the value of traditional knowledge or eye witness of local communities on what is happening absolutely in communities and their surroundings. As pragmatic knowledge, indigenous/local knowledge on climate change seems as a system of knowledge that could inform science rather than an object for science as Cruickshank (1998) said.

Community people have a distinct way of telling climate change as scientists do. They see it through the window of crop performance (Vedwan, 2001). Recalling the past crop or grass landscape and comparing it with the present is a method of measuring the changes. People compared the size, color and taste of present fruits, quality of grasses, behavior of animals with the past that they noticed and observed.

The Himalayan communities are less responsible for global warming. Nonetheless, they are highly affected by global warming. The ways of life of the communities are disturbed, uprooted and dislocated from its past realities (Poudel, 2020). Climate change is not only affecting to Himalayan glacier and permafrost as well as the natural ecosystem, but it is also adversely affecting socio-cultural systems. However, there is a wider gap in epistemology and ontology between scientific and local knowledge, natural science and ethno-science to understand climate change (Poudel, 2012). Neither western science nor traditional knowledge is sufficient in isolation to address all the complexities of global climate change (Riedlinger & Berkes, 2001). It is essential to cross-fertilization between western scientific analysis and local understandings (Rhoades et al., 2008). Only with a strong interdisciplinary and transdisciplinary approach that involves the participation of the local people directly affected can we hope to achieve the solutions to address the current issue of climate change.

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Tourism and Transformation: Changing Livelihood Practices of Mountain Dwellers

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Abstract



This article is about major changes in the lives of mountain dwellers brought by tourism. The article focuses on the people of the Khumbu region in general and the Lukla *bazar* in particular. Based on the primary research, the article reveals changing livelihood practices of both the Sherpa and the non-Sherpa people. The article mainly focuses on how traditionally agro-pastoralist Sherpa people transformed their everyday lives into multiple occupations. Tourism development has also supported the in-migration of non-Sherpa people and the out-migration of the Sherpa that not only made both groups dependent on tourism sectors but also ended the Sherpa's monopoly on tourism businesses.

Keywords: *Tourism, Khumbu, Transformation, Sherpa, non-Sherpa*

Background

This article is about changing economic activities of the Sherpa and the non-Sherpa people living in the Everest (Khumbu) region of Nepal. The Khumbu region is one of the most popular destinations for trekkers and mountaineers in Nepal. The lofty mesmerizing snowcapped mountains are a major attraction for tourists. In addition, tourists like and enjoy traditional cultures. The Sherpas' stories of bravery for scaling the mountains and their hospitality towards the guests appeal to tourists from all over the world. The region is popular for adventure tourism. The expedition of Tenzing Norgay Sherpa and Sir Edmund Hillary on the Mt. Everest in 1953 A.D. and construction of Lukla airport in 1964 A.D. made the region popular for the tourists who want to climb the mountains and those who cannot climb but enjoy sight- seeing through trekking.

The number of tourists visiting the region is increasing every year (see table 1). As a result there is a structural change in society, culture, economy and demography. Tourism has transformed the way of living of the people. The in-migration of Sherpa and non-Sherpa people inside the Khumbu region and out-migration of the local Sherpa people has brought the structural changes in the region. The development of tourism sectors lured the people to in-migrate at the Khumbu. The non-Sherpa in-migrants are Tamang, Rai, Newar, Magar, Gurung, Kami, Damai who arrived for Khumbu seeking better opportunities in tourism. The non-Sherpa and even some Sherpa in-migrated to the region from different parts of Solukhumbu and other neighboring district such as Khotang, and Okhaldhunga.

The first section of the paper describes general background, objectives and the research methodology. The second section focuses on facts and figures of tourism growth in the

Khumbu region which is followed by traditional occupation, social- cultural and economic activities of its' inhabitants. The third section of the paper analyzes primary data in comparison with the past which is followed by concluding remarks.

This paper aims to analyze the changes in economic activities among the Sherpa and the non-Sherpa people of the Lukla *bazar* (market) in Nepal. However, the economic transformation of the Sherpa of the Khumbu region has also been discussed in general.

The study is based on field work and primary data. The research was conducted during 2013 to 2016 AD. I made several visits during the period. The census of three hundred eleven households of both the Sherpa and the non-Sherpa were conducted in Lukla- the gateway to the Khumbu region. Lukla was an isolated place until an airstrip was constructed in 1964 AD. It was not the major trekking route to the Khumbu region prior to the construction of the airstrip. But today, Lukla has one of the busiest tourist areas of the Khumbu region. In addition to this, the information has been obtained through semi structured interviews, informal *kurakani* (general conversation such as tea-talk) and observation. However, secondary data have also been analyzed as necessary.

Tourism and development theories

Anthropologists who study tourism sectors have multiple views and findings in regard to the effects of tourism on native economy and culture. Some anthropologists have blamed tourism as bad, destructive to indigenous culture, responsible for culture commoditization and culture commercialization. For example, Greenwood (1989), Harrison (1994), and Shepherd (2002) have found that tourism is bad and destructive.

But, some writers argue tourism is good for cultural revitalization and conservation. Jarvenpa (1994) stated that culture commoditization is very fruitful for enriching the social meaning of the culture. Similarly, Medina (2003) examines how the commoditization of culture for tourism affected traditional practices in a Maya village. She concludes that due to the commoditization of Maya culture and identity, they became able to revitalize the ancient Maya culture. Tourism has revalued, in certain contexts, traditional Maya knowledge that most young people lacked.

During the 1970s and 1980s, anthropologists used two development paradigms to study tourism i.e., Modernization and Dependency (Neo- Marxism) theories (Milne & Ateljevic, 2001). But after 1980s community based approaches became central to many tourism development plans around the world which emphasized local agency, seeing communities and their constituent members playing an active role in determining tourism's outcome (Milne & Ateljevic, 2001). In this paper I review two development theories are used to understand particular theoretical perspectives on tourism.

Modernization theory

Hall (1994) stated that modernization theory primarily focuses on the process of westernization and assumes that developing countries seek to imitate western patterns of production and consumption. Modernization theorists argue that development is a stage of growth or advancement. Claney (1999) states:

Modernization school viewed development as a linear process, with many poor countries simply behind their wealthier counterparts. Developing societies were seen as being 'underdeveloped' in the sense of lacking development. They were viewed,

however, as being in the midst of transforming themselves from traditional to modern; and although modernizing was viewed largely as an endogenous and often cultural process, economic ties between north or West and South were considered beneficial, or the very least benign. (p. 2)

Modernization involves in multiple aspects of society and culture. Huntington (2002) writes that “modernization involves industrialization, urbanization, increasing levels of literacy, education, wealth, and social mobilization, and more complex and diversified occupational structures” (p. 21). If it is so, tourism brings such changes in any tourist destinations: the sooner or the later.

Modernization theorists are interested in explaining the positive changes brought by tourism. Tourism as a means of acculturation brings changes on both guests and hosts. Modernization theorists argued that interaction between the guests and the hosts support the hosts to be acculturated with western life styles. The adoption or imitation of such a lifestyle is always better than the previous one.

Modernization theorists emphasize on the economy or material benefit that tourism brings in the host society. The new economy which is created by tourism would help to raise socio-economic status of the people and development of the country becomes possible. This concept was dominant during the 1950s and the 1960s that stated tourism industry as the ‘smokeless’ business (Sutheeshna, 2008) and focuses on the trickle down approach in economic development. Lanfant (1995) stated that the transformation of the traditional society into the modern society is possible by their incorporation into tourism sectors.

But rapid modernity in the rural and peripheral areas can destroy tourism businesses. The modernization supports to loss the culture and the identity of local people which not only makes the people homogenous but also helps to decrease the number of tourists. The tourists who enjoy authentic culture and ritual of the local people may not visit frequently once the local people are modernized. Rapid modernization may bring changes in the local economy but further deteriorate tourism sectors.

Dependency theory

Inspired by theories of imperialism, colonialism and Marxism, dependency writers generally argued that development was not a linear process but instead more holistic, where wealth and poverty were intimately linked on a global scale (Claney, 1999). Dependency theory is a theory of economic, social and political change which attempts to explain poverty, deprived social conditions and political instability of many poor countries of their dominance by rich and powerless countries. Drawing from Marxists concepts of capitalism, dependency theorists argue that development is an essentially in-equalizing process; while rich countries get richer, the rest inevitably get poorer.

Preister (as cited in Shrestha, 2011) states the condition of dependency could be demonstrated in four ways in reference to tourism: (1) Tourism promotes unequal exchange of surplus values between the local area and the core nations; (2) It represents an economic sector dependent on extra-local forces; (3) It restricts managerial and business opportunities of local residents; and (4) Tourism may reduce existing ownership and employment options because of conflict between these sectors and the tourist sector (p. 14).

Some authors take tourism as a form of imperialism (Lea, 1988; Nash, 1989), but Hall (1994) sees development and underdevelopment as parts of the same global process.

Neo-Marxists are interested in analyzing the unequal power and economic relations brought by tourism development between the developed 'West' and the underdeveloped 'Third World'. The theory assumes that the developed 'West' dominates the undeveloped 'Third World' by exploiting their resources, expanding the market of the multinational companies, and generating hegemony towards them.

Dependency theorists have raised most of the negative issues about tourism. In my view, there are two sides of everything, i.e. good and bad, but dependency theorists always analyze second side of the coin that is bad or negative. It is equally true that tourism brings unequal power relations, destroys culture and identity, and promotes new economic classes in the tourists' destination but it is also true that tourism has helped people overcome poverty and poor education. In addition, in the case of Nepal, tourism has helped preserve many monasteries in Khumbu and Mustang (Shrestha, 2019); the Sherpa of Khumbu are still proud of their culture. They are happy of constructing houses in towns and educating their children in expensive private school at Kathmandu.

History of tourism in the Khumbu region

Khumbu enjoyed their regional political autonomy and self sufficient economy before unification of Nepal (Fisher, 1990). Prior to 1950s, the Khumbu region was dominantly an agro-pastoral community (Kunwar, 1989). Some of the Sherpas traded across the Himalaya with Tibet. But, the Sherpa people had the hardest lives in the region before the growth of tourists and the development of tourism (Basnet, 2020). They farmed only potatoes and buck wheat because of coldness and high altitude and only a few of them had worked in tourism as porters in Sikkim and Darjiling (Stevens 1993; Ortner, 1999). After 1950s, three events were more important for increasing the number of tourists in the region. The first was scaling of Mt. Everest by Tenzing Norgay and Sir Edmund Hillary in 1953, the second was the construction of Tenzing Hillary Airport, Lukla in 1964, and the third was the establishment of the Sagarmatha National Park in 1976. These events have opened the door of opportunities for many Sherpa families in the tourism sectors as porters, Sardars (guides), domestic workers and hotel and lodge owners.

Hotels, lodges and other tourism businesses have regularly increased in the Khumbu region due to the flow of number of tourists. In 1980 the first data was recorded of tourists' arrivals at the region. In that year 5836 tourists visited the region (Ministry of Culture, Tourism and Civil Aviation- MOCTCA, 2013). The number of tourists who visited this region was higher than the population of the Khumbu region. In 1970, the total population of the Khumbu region was 2761 including 274 Tibetans, 84 non-Sherpa Nepali, 2 Europeans and 13 people unknown of origin but the number increases in the year 1982 in which the Sherpa population was 2524, Tibetan 187, non-Sherpa Nepali 339, and 50 unknown origin people. The total population was 3108 along with 8 Europeans (Pawson, Stanford, & Adams, 1984). However, their data excluded the number of tourists visited the region in those years.

Although Tenzing Norgay and Edmund Hillary reached the summit in 1953, the number of tourists increased only after 1964 A. D., when Tenzing Hillary airport at Lukla was constructed. Prior to the 1950s, the Rana prime ministers allowed a small group of American and British mountaineers for survey of Mt. Everest from the Nepalese side; they were the first Westerners to ever pass through the Khumbu village and monasteries to glimpse the south flank of Mt. Everest (Rowell, 1980, c.f. Stevens, 1988). Hornbein (as cited in Stevens, 1988) stated that after 1950 expeditions became a fact of life in the Khumbu region during the pre

monsoon climbing season. The British came to Mt. Everest in 1951 and 1953 and Cho Oyu (8201 m. 6th highest mountain in the world) in 1954, and Swiss came to Mt. Everest in 1952, 1955 and 1956. These mountaineers employed hundreds of high altitude porters, predominantly the Sherpa, who were paid Rs. 7.5 per day. The income was seven times more than any agricultural labour in the region (Fuerer-Haimendorf, 1975). Table 1 shows the trends of tourist arrivals in the Khumbu region.

Table 1: Trends of Tourists Visited the Khumbu region in different years

Year	Tourists visited in Khumbu
1980	5,836
1985	8,347
1990	11,314
1995	14,997
2000	26,683
2005	19,522
2010	32,084
2015	34,412
2018	56,303

Source: Ministry of Culture, Tourism and Civil Aviation, 2019

By 1971, some 1400 trekkers per year were visiting the Khumbu region. The number of tourists increased in 1972-73, reaching 3200 (Stevens, 1988). As the number of tourists increased, the locals also gained an opportunity for seasonal jobs. It has been estimated that 500 men were employed in trekking by 1971 and 70 percent households of Khumjung and Khunde had at least one member involved in trekking and mountaineering (Fuerer-Haimendorf, 1975).

In 2011, the total population of three different VDCs of the Khumbu region (Chaurikharka, Namche, and Khumjung; now Khumbu Pasang Lhamu Rural Municipality) was 7161 (CBS, 2011). The number of tourists was five times more than the number of residents in the region including non-Sherpa residents. The number of tourists increased every year and reached 32,084 in 2010, 34,412 in 2015 and 56,303 in 2018 (MOCTCA, 2019). This number excludes domestic tourists and Nepali trekking employees because the government of Nepal does not keep records for domestic tourists.

The data of tourist arrivals show that the people of the Khumbu region have interacted directly with many visitors from the different parts of the world. These interactions of hosts and guests have multiple effects on the host's communities in the region. The following section of this paper will try to reveal the economic transformation of the Khumbu people in general and the Lukla in particular.

Tourism and transformation in the Khumbu region

The increase of tourists every year has brought a wide range of effects to Khumbu. Trekking and tourism related jobs became very lucrative for the Sherpas after the 1970s. Traditional occupations such as agriculture and trade with Tibet has been gradually replaced by the involvement of Sherpa people in three different sectors of tourism; the first was getting

employed in trekking as porters and other staffs such as assistant guides and guides; the second was their involvement in hotels and lodges business in the trekking trails; and the third was the establishment of trekking agencies as a new business in Kathmandu. This means that the Sherpas were totally submerged into the tourism sectors. As a result tourism influenced their economy, society and culture. The impact of tourism in the region could be seen visibly as Fuerer Haimendorf (as cited in Stevens, 1988) notes:

...inflation of agricultural day- labour wage rates, which along with household member absences on treks, led to changes in the ability of many families to maintain multi elevation transhumant agro-pastoralism; a monetarization of the economy; and a change in the old barter trade of Tibetan salt for lowland grain to a system in which lowlanders hiked up to six days in order to sell grain cash on the Saturday market in Namche, established in 1965. (p. 73)

The market of the Sherpa trekkers is not limited to the Khumbu region. The trekkers even go to Tibet trek during summer season. The Sherpas, especially men, sometimes remained outside of their home for 8 to 9 months in a year. This is how the region introduced rapid socio-economic changes. Most of the Sherpas, who work in tourism, are able to educate their children at the private school of Kathmandu. Some of them are also able to buy either land or houses in the capital city.

Tourism in the Khumbu region may be described in two ways: the first is the involvement of the Sherpas in trekking and expeditions; and the second is the involvement of the Sherpa and non Sherpa in local tourism businesses such as hotel/ lodge, *bhatti* (a small hut selling tea, liquor, *dal bhat* especially for the trekking porters), shop, curio goods and so on. Now, the rich Sherpas of Khumbu do not join trekking as guides and other supportive staffs. They have established their own trekking company at Kathmandu or established the hotels in trekking trails. The Sherpa who are not economically sound and unable to establish their own business work in trekking as guides and other supportive staffs.



Picture 1: Lukla airstrip and some scattered houses in 1964, Photo credit: Peace Corps Photo Collection.



Picture 2: Lukla Bazar in 2020. Photo credit: Solukhumbu, a face book page.

The literature about tourism in Khumbu stated drastic changes and modernity in Khumbu. Pawson, Standard, Adams and Sherpa (1984) state:

...that the impact of tourism and modernization has varied from village to village. Most noticeable have been additions to the district capital, Namche *bazar*, where extensive tourist related construction has taken place. New buildings include at least a dozen tourists lodges, and there were several more under construction in 1982; grocery stores stocking surplus expedition food and luxury items such as beer liquor, toiletries, and film; numerous tea and *chang* (beer) shops; a bank that will change travelers' cheques; and, by 1983, a telegraph office. (p. 244)

The writers have presented the facts of the Namche bazar in the nineties but if one visits the same in 2020 what does one see? I observed that Namche bazar is not less modernized in comparison to Thamel at Kathmandu. The big and compact hotels and lodges, grocery, bharti, banks, police check point, army camp, western music, the pub, and more than this the ideology of the Sherpas prove the transformation of the old Sherpa village into a new, modernized tourism market. The living standard of the people has been changed along with the changes in modes of production. The Sherpas, who travel outside the Khumbu region for trekking, establish tourism business inside or outside the region or visit abroad in sponsors have jet-set lifestyle that snuggled up against village way of life (Adams, 1997).



Picture 3: *Namche Bazar, Solukhumbu, looking northeast in 1966. Photo credit: Peace Corps Photo Collection.*

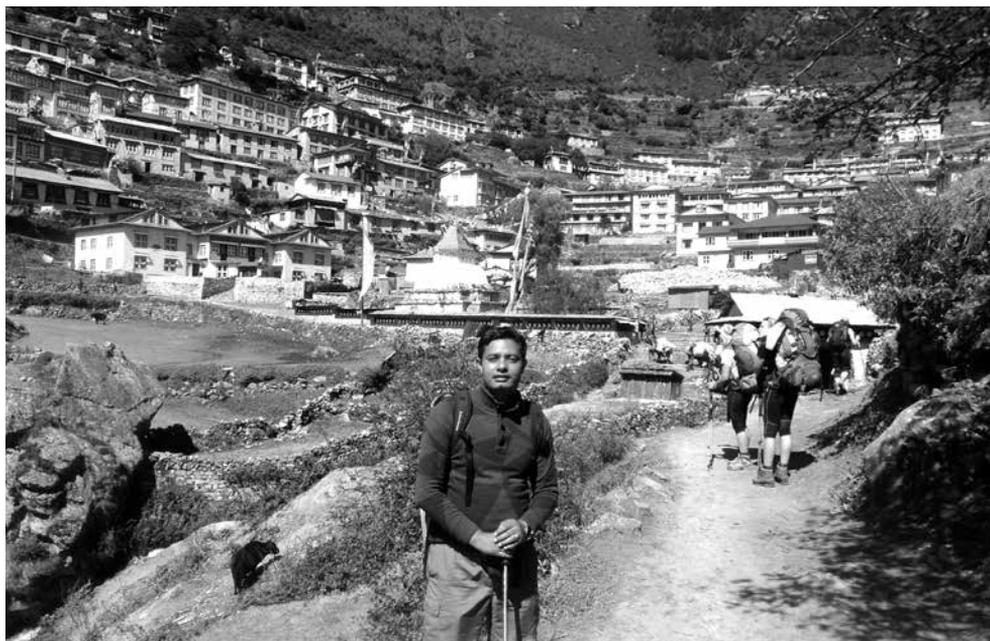
Changes in the economy of Khumbu

The most important changes in the Khumbu region including the people of Lukla can be seen in their economy. Once, agro-pastoralists, the Sherpas have been totally transformed in their overall economy especially their occupation and investment. Fuerer-Haimendorf (1964) has mentioned agriculture, animal husbandry, trade with Tibet and crafts as the major economic activities of the Khumbu people. But today, the economy of the region has been dependent on tourism sector. The tourism has created new occupations which created new forms of economy. Fuerer-Haimendorf (as cited in Bhandari, 1987) stated that “more than half of the families of the villages are involved in tourism as porter, *Sardar* (guide), and hotel keeper. The position of the *Sardar* has been a source of influence and economic power in the area. The *Sardar*, besides his wage, takes a commission on the wages of non-Sherpa porters too”.

Brower (1991) has also to some extent same findings about the economic transformation in the region. As she states:

The traditional Sherpa economy was a three-way dependency on agriculture, animal husbandry, and trade. Today, the picture is somewhat more complicated. This is mostly a result of tourism, which affects almost every household in Khumbu either as a result of direct involvement in the business of tourists (as guides, porters, hotel and shopkeepers, or owners pack- stock) or indirectly as a consequence of the restructuring of the economy initiated by tourism. (p. 55)

Comparing the findings of previous researchers with the present observations, the author can strongly claim that the economy of Sherpas is changing more rapidly than before. The traditional mode of production was based on land and labour rather than cash. The land value was based on agricultural production. But now land has become like a cash crop. The land is commoditized for the construction of big hotels and lodges or running shops and *bhattis*. Land ownership provides the social and economic power to owner. But this is only for those owners who have land on major bazar or on the way of trekking trail. The value of land is not measured by soil fertility and the quantity of crop production. It is valued in relation to tourism market. Now, I will describe ownership of land by different caste and ethnic groups in Lukla *bazar* and some major changes in their occupation and other sectors which are related to their economy.



Picture 4: *Researcher at Namche bazar from the southern side of it in 2016. © Khadga Narayan Shrestha.*

Land ownership

Land is the major source of production in Nepal. It is related to persons or households' pride and prestige. The person who has much land has socio-economic power and prestige. The land at the Lukla *bazar* is expensive because of its market value; not because of its agricultural production. The land which is at the centre of bazar or near from the airport has much expensive than the land at the corner sides. The peripheral land is used for agriculture and animal herding. For example the land below the main bazar is owned by Rai community and they rear pigs and other animals.

Table 2: Land Ownership by Caste and Ethnicity

Caste/ Ethnicity	Land own/Yes	Per cent	Non- ownership/No	Per cent	Total H.H.
Sherpa	67	51.5	63	48.5	130
Tamang	21	31.8	45	68.2	66
Rai	11	20.7	42	79.3	53
Magar	6	40.0	9	60.0	15
Chhetri	1	7.1	13	92.9	14
Dalits	2	16.6	10	83.4	12
Hilly Brahmin	0	0.0	8	100	8
Newar	1	20	4	80	5
Others	0	0.0	8	100	8
Total	109	35	202	65	311

Source: *Field Servey, 2016*

The distribution of land is not equal at Lukla like other parts of the country. The data show that altogether 35 per cent households have land in their names at the Lukla *bazar* (the data do not include land outside of the Lukla *bazar*) but 65 percent households are landless. It shows the pictures of in-migration of the Sherpas and non-Sherpa people in the area.

The ownership differs by their caste and ethnicity. Sixty seven households of the Sherpa people have their own land among 130 the Sherpa households. It means 51.5 percent of the Sherpas have land ownership and the others do not. But among the land holders too, the ratio of land distribution is not equal. There is a wide range of differences among the Sherpas. For example some of the Sherpas own only 3 *Ana* (1 *Ana* = 0.0031 hectare and 16 *Ana* = 1 *ropani*) land which is the lowest quantity where as others have up to 30 *Ropanies*, which is the highest among all households.

Regarding other caste and ethnicity the Tamang has 31.8 percent, Rai 20.7 percent, Magar 40 percent, Chhetri 7.1 percent, Dalits 16.6 percent, Newar 20 percent, hilly Brahmin and others have no land ownership in the Lukla. Among the non –Sherpa people, the Magar holds maximum quantity of land up to 1.5 *Ropanies* and the lowest quantity is 3 *Ana* from Rai community. Similarly 40 per cent Magar households have their own land. It is because some of the Magars are migrated from the neighboring village like *Kharikhola*. Tamang and Rai households possessed much land in comparison to the other non Sherpa households. It is because the Tamang migrated earlier than other people followed by Rai. Even in the Sherpa community 48.5 per cent households do not have their own land in the bazar which proves that these were the migrants' Sherpas.

The land of Lukla was the land of the Sherpa people. If it is so, the questions come to our mind that how did such a land own by the non-Sherpa people? Why did the local Sherpa sell their land? The Sherpas who own the land are they local or migrated from nearby villages? Was tourism responsible for the displacement of the local Sherpas? This paper may answer some of these queries and remaining others may be useful for the further research.

Trekking and tourism related activities have allowed the local Sherpas to abandon agriculture and animal herding. The flow of tourists compelled them to establish hotels, lodges and taking part in trekking as porters at first and gradually they became the guides. The in-migration of the Sherpa and the non-Sherpa people in Lukla gradually plotted the land into different slices. In this regard some of the local Sherpas who did not involve in tourism business started selling their lands plot by plot and displaced like Tharu in Chitwan (Kunwar, 2002), and others became economically weak who sold their land located at the centre of the *bazar*. They lived at the periphery, watching everyday big houses and big business in their sold land. Hence, the ownership of land does not actually measure the economic condition rather the location of the land and their involvement in the tourism businesses that support to measure the material lives of the residents.

Diversity in occupation

The people of Lukla are engaged in different occupations for their livelihood. Some people operate shops, hotels/lodges, and others operate *bhattis* or getting employed in trekking, agriculture, and foreign employment. The statistics shows that the highest per cent people are engaged in trade and trekking tourism. Among 627 people, 28 percent people are engaged in shops and other trades relating to tourism. Similarly, 27.3 percent people are engaged in trekking. However, 20 percent people have been operating hotels and lodges for tourists and

others visitors. The people, who are engaged in agriculture, are only 7.1 percent; and engaged in foreign employment consisted only one percent of the total population.

Table 3: Diversity in occupation by caste and ethnicity

Occupation/ Ethnicity	Sherpa	Tamang	Rai	Magar	Chhetri	Dalits	Hilly Brahmin	Newar	Others	Total	in %
Trade	59	39	25	8	5	22	5	3	10	176	28
Hotel/Bhatti	65	32	14	7	1	0	3	2	1	125	20
Trekking	77	41	29	5	11	3	1	3	1	171	27.3
Employment	27	26	25	8	7	4	3	1	2	103	16.5
Agriculture	27	1	7	4	2	0	2	0	2	45	7.1
Foreign employment	5	0	0	1	0	0	1	0	0	7	1.1
Total	260	139	100	33	26	29	15	9	16	627	100

Source: Field Survey, 2016

Regarding occupational diversities, it is interested to examine peoples' involvement in different occupations on the base of their castes and ethnicities that provide much information on economic diversification and change. The data show that 33.6 percent the Sherpa, within the total population of trade, are involving in trade related business. Respectively, Tamang 22 percent, Rai 14.3 percent, Magar 4.6 percent, Chhetri 2.8 percent, Dalit 12.5 percent, hilly Brahmin 2.8 percent, Newar 1.7 percent and others 5.7 percent. It clearly illustrates the domination of the Sherpas in trade at Lukla.

As it is already stated that 20 percent people, within the total working population, are operating of hotels and *bhattis*; among them the Sherpas are 52 percent in total. . Respectively, Tamang 25.6 percent, Rai 11.2 percent, Magar 5.6 percent, Chhetri 0.8, hilly Brahmin 2.4, Newar 1.6 and others 0.8 percent are working for this types work. It is interesting to note that the Dalits do not have any hotel/lodge and *bhatti* in the *bazar* area, although Buddhists community does not have a principle of touchability and untouchability like caste system in Nepal. The Dalits are mainly engaging in shop-keeping such as ready-made clothing, groceries, tailoring, shoe making, metal work and other tourism related occupations.

Trekking is another main occupation of the Sherpas and the non-Sherpas. In trekking, 27.3 percent people are engaging. Among this, the data show that 45 percent Sherpa are working in trekking tourism. Besides, Tamang, Rai, Magar, Chhetri, Dalits, hilly Brahmin, Newar and other have been involving in this profession 24, 17, 3, 6.4, 1.7, 0.6, 1.7 and 0.6 percent respectively.

In the employment sector except trekking, the Sherpas involvement is fewer than the other non-Sherpa in Lukla. The Sherpa's involvement is only 26.2 percent in other employment sectors; whereas 25.2 percent Tamang, 24.2 percent Rai followed the Sherpas. Magar, Chhetri, Dalits, hilly Brahmin, Newar and others occupied 7.8, 6.8, 4, 2.9, 1 and 1.9 percent respectively.

In comparison to other occupations, agriculture occupies only 7.1 percent. The involvement of the Sherpa is higher than the other non- Sherpa. Among them, 60 percent the Sherpa are

actively working in agriculture, however only 10 percent are claiming as a farmer. Whereas, Tamang 2.2, Rai 15.6, Magar 9, Chhetri 4.4, and hilly Brahmin 4.4 percent are working in agriculture. However, Dalits, Newar and others have not been involving in in sector; it seems that they either have no any agricultural land or they have been working other works. Some people such as Sherpa, Magar, and hilly Brahmin of Lukla *bazar* have gone abroad for foreign employment. Among them 71.4 percent are the Sherpas; Magar, and hilly Brahmin are equal by 14.3 percent. Hence, these data vividly exemplify the occupational diversities among castes and ethnic groups residing in the Lukla *bazar*.

The traditional occupation of the Khumbu people has changed. Ninety two percent people of the study area are engaging in shop keeping, trekking, expeditions, operating hotels and lodges, and employment service. Large expeditions hire dozens of temporary porters to carry food and equipment from Lukla and some trekking porters are also hired. Due to this, people who worked in farming and animal herding are also changing their occupation.

Some people are engaging in multiple occupations simultaneously such as trekking in its season; and in off-season at farm, *bhatti*, shop, and so on. Although money making from trekking sector is not an easy work; people have to travel for many days with dreaming dollars and exchanging their lives into deaths at the high altitudes (Shrestha, 2011; 2018). However, the earnings from trekking and mountaineering are better than farming and animal herding. Mr. Chhetri, a director of trekking company, reveals the earnings of the trekkers and climbers:

The trekking guides earn 2000 to 2500 salaries per day. A trekking staff earns 1500 to 2000 and a porter earns 1200 to 1500 per day. This is the core salary of these people. In addition to these, the tourists give them some amount as tips, generally not less than 10,000 in one trekking but a climber may earn above one million per climbing (C. Khatri, personal communication, November 23, 2013).

The amount they earn per day or per trekking is a good amount and a farmer does not earn that much from farming. The earnings from farming are seasonal; they can harvest either potato or buck wheat in a year. The majority of the jobs in trekking and expeditions are taken by male whereas female are least participating in trekking and engaging in hotels, lodges and *bhattis* and so on.

Most of the hotel owners started their career in trekking as porters; later they got promotion in assistant guides and finally became the *Sardar*. As they earned from trekking and expedition, they invested this amount to another sectors of tourism. “I was employed in trekking, later I bought this hotel. I invested more to make this hotel comfortable for tourists. I also decorated this house both inside and outside” a Sherpa hotel owner at Lukla replied (P. Sherpa, personal communication, October 9, 2016). He is one of the representative characters and there are many other similar cases at Lukla; it is hardly to get anyone without involving in trekking.

In the regards, only a few number of people have changed their profession from farmer to hotel owner. Most of the people had changed their occupation from farmer to trekkers then after hotel, lodge owners. The change in occupation is not limited to the Sherpa; the non Shepa like Newar, Magar, Tamang, Rai and Chhetri have been also changing their occupations. I observed a group of Magar operating 3 hotels at Khumbu in the rented houses. These Magars are from outside of Solukhumbu district, started trekking first, then changed hotels

operating. Some of the people are engaging in multiple occupations like government offices, and their family members operate *bhatti*, small lodge, and grocery. Some other people are doing trekking and their relatives are operating *bhatti* and shop keeping.

Hence, tourism is responsible for changing the occupation of the people in the Khumbu region. However, their occupation is fully dependent on tourists. Arrivals of tourists in each season determine their fate and future. If the number of tourists is high, everybody get economic benefits more or less and if the numbers of tourists decrease then depending people on tourism sector have to face economic crisis as it was in 2015 when the earthquake disaster and Indian blockade both one at a time, and now the pandemic COVID 19 is not less than last one in 2020.

Inflation

The growth and development of tourism in the Khumbu region has encouraged the immigration of new people. A total of 56,303 tourists have visited the region in 2018 (MOCTCA, 2019), which excludes number of Nepali porters, guides and other supportive staff. The increased number of tourist has brought price hikes. The local production of goods is not sufficient to fulfill the demand of tourists, supportive staff and local people. The goods have to be carried either from Kathmandu by air services or from lower parts of Solukhumbu by mule or through the human labour. Hence, the price of goods is highly increasing.

Tourism has brought economic opportunities to many people but it also has created inequalities among them. This inequality has made the lives hard for lower class and local people. Brower (1991: 87) writes:

No everyone in Khumbu is in position to engage in these (tourism) enterprises: some gain at other's expense. Success in finding trekking assignments or employment in expedition tourism is largely a matter of whom you know. Particular clans and village enjoy a disproportionate share of the higher pay and prestige jobs with the more active companies.

The price of imported goods is hiked much than other local productions like potatoes. Rice, maize, wheat, fruits, chicken, mutton, and buff are imported either from lower parts especially by the local traders like Rai, Tamang or from Kathmandu by air services. It is natural to be expensive if the goods are imported from air services. Hence, the price of the goods is much expensive. Stevens (1993:380) states:

The price of rice has increased tremendously, from nine rupees per *Pathi* in 1964 to twenty six rupees ten years later, and thereafter rising more precipitously to thirty five rupees in 1978 and ninety rupees in 1988. In autumn 1990 rice cost ninety to one hundred rupees per *Pathi* depending on its quality. This is more than three times in comparison the price of rice at the lower altitude areas of Solukhumbu or at Kathmandu.

The price of goods shows that life of an ordinary people who are not involved in tourism related businesses is very hard. The people who are able to achieve economic benefits from the tourism can sustain their lives even the prices of goods go up and up (Rogers, 2007) but other people have to compromise on their daily lives and expenditure.

Inflation of the goods made people's life very hard. The porters, farmers, government service holders and other ordinary people are highly undermined. Mrs. Sherpa, a housewife in 2016, told that, "*sabai bastuko bhau badyo* (all things became expensive); we farmers have hard

days. The wage of workers is also increased so that we cannot hire them in domestic works” (M. Sherpa, personal communication, October 10, 2016). The business people of tourists’ route have no problem of inflation because they charge high price to tourists and other domestic visitors such as rice (*daal bhatt*) Rs. 300, tea per glass 50, beer small can 300, Mo. Mo 200 per plate in Lukla *bazar* and prices of goods again go up when we travel higher altitude than this. The main cause of inflation in Lukla is overflow of international tourists and their Nepali staff. The number of tourists is more than the number of local inhabitants which naturally hike the price of goods and services.

Conclusion

The growth and development of tourism has helped to modernize the Khumbu region. Tourists from various parts of the world have made the region a globally known hot spot. Tourism is mostly responsible for not only modernization but also socio-economic and demographic change. Tourism is responsible for in-migration of the non-Sherpas and the out-migration of the many Sherpas. This demographic change has multiple effects on the society, economy, and culture of this region.

Tourism has an effect on the day to day lives of the people. Economic prosperity and the diversification of occupations have not only made people to adjust in jet-set life styles but also changed their values, ideologies and behavior patterns. Tourism has promoted inflation simultaneously in any other tourism destinations too. These cases of Mustang and Annapurna area (Shrestha, 2019) are also similar with this. .

Tourism has also given social and economic opportunities to the Khumbu region but the maximum benefits are taken by big hotels and lodges owners. The non-Sherpa and the local Sherpa are engaging in other occupation rather than operating the hotels and lodges gain the less benefitted. The economically prosperous people are in key decision making process and they have a reputation for power (Hall, 2010). Inflation has made the least earning people’s life terrible which is one of the problems created by tourism.

These facts and figures of tourism of the Khumbu region can be analyzed through different perspectives. Tourism has brought modernization: the end of the hard days of the local Sherpa, replacement of their thatched huts by big cemented buildings, good education, jet setting life styles, and upward economic mobility. Modernization theorists take these changes as a part of development. They take these indicators as good and positive, and encourage other people of the ‘Third World’ to follow them.

Simultaneously, the in-migration of the non-Sherpa, out-migration of the Sherpa, and access of the non-Sherpa to the tourism business may end the Sherpa’s monopoly in the tourism sectors in near future in the Khumbu region.

Rapid transformation in economic structure has led to changes in the modes of production. Such transformation from traditional forms of economy to modern economy has not only made the diverse societies but also helped to create new economic classes. The new economy has made people completely dependent on tourism. In such a situation, if tourism sector is hit with crisis, as in 2015 and the recent crisis of COVID 19 in 2020, people’s everyday lives may grow much harder than before of the Khumbu’s tourism. This is what the dependency theorists warn about. Hence, there is an immediate need to think about tourism sustainability through supportive and supplementary economic activities to make lives better in coming days.

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Last Walk to *Aaryaghat*

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Abstract



The paper focuses on religious aspect of *Aaryaghat* situated on the banks of holy river Bagmati within the periphery and premises of *Pashupatinath* temple. Hindus believe that if the dead person gets the funeral and rituals performed here then the gateway to heaven opens. This final journey is taken as the last walk to *Aaryaghat* and is done with a symbolic religious belief. The *Aaryaghat* of *Pashupatinath* area is a very sacred place where Hindus' cremation process is performed for the purification of the dead and the departed soul. The rituals are related to the Hindu belief of salvation, rebirth and attainment of heaven. After the death, there are various ritual

practices to be done like *Sharadha* annually and such rituals are performed by the kin folks devoutly on the belief of attaining a heavenly place in the realms of trinity Gods. The paper has only focused on the aspect of the last walk concept and the *Aaryaghat* at the *Pashupatinath* through personal observation and secondary literature review.

Keywords: *Aaryaghat, Bramhanal, cremation, salvation, rituals, Bagmati River*

Introduction

The *Pashupatinath* area is believed to be the sacred-most *Dham* (divine abode) of Lord Shiva, also known as *Mahadeva* (Lord of Lords) and popularly revered as *Bholenath* (the pure and innocent Master Lord) who has chosen the area for His *Lila* (divine activities) and resides here with His retinue comprising many sacred *Dakinis* (female deities), *Bhringis* (lower-ranked divine power), *Pisacha* (darker side of divine power) and powerful *Shakta* deities like *Bhairav* and *Nandi*. Shiva-devotees believe most of these divine powers and beings manifest their benevolent power of creations in the form of *prakriti* (nature) and bestow unlimited compassion to all the living beings in the world and particularly to those who reside in this holy place. Hundreds of millions of Hindus, wherever they live, hold this place as the 'once must-be-visited' *Dham* at their hearts. During field observation study visits the author has witnessed the devotees offering prayers devoutly and performing religious acts whole-heartedly. Visibly hundreds of Indian visitors and devotees also flock to this sacred *dham*. Both Nepalese and Indian visitors have expressed that to be a pilgrim at this *Dham* is an ecstatic joy and feel oneself being closer with the *Bholenath*. Their every aspects of life has been intertwined with such religious beliefs and rituals of Hinduism: myths, ideas, values, beliefs, norms and way of living are exemplified in all traditional forms of the religion in everyday life. But at the same time devotees of Buddhism and other religious sects have also been performing many religious rituals which make this *Dham* a cultural mosaic - a unique cultural place of heritage and pilgrimage.

Religious syncretism assimilates into a religious tradition of beliefs. It has a holistic approach encompassing people, natural environment, local belief, spiritualism, philosophy, expression, religious belief, social activities as an integral part (Nyaupane, 2018). The unique aspect of cultural heritage of this area lies in its cultural pluralism since it has multiple layers of histories and cultures associated within this. In the context of cultural heritage, it is important to explore the interconnectedness between the tangible and intangible as well as culturally and naturally formed syncretic aspects of *Pashupatinath* heritages rather than treat them as separate entities.

Various religious groups like Hindu, Kirat, Buddhist, and Jain who are religiously bounded make this statement clear (Koirala, 2051 BS). Every aspect of this holy place i.e. forest, river, grassland, rocks, ponds, open spaces, narrow streets, caves, riverbanks, temples, river, premises, inns, rest houses or crematoria areas etc. are all intricately interlinked with various religious and cultural values and living norms since ancient period of known history.

River Bagmati is regarded as one of the most important cultural heritages because of the water of Bagmati is directly or indirectly associated with the above mentioned cultural values of people. So, this area has become a pilgrimage site where different religious myths, legends, and stories exist and have been flourishing since the ancient historical period till today. Because of this great confluence of rich historical and cultural values it carries celestial religious stories to the social folklores which attract millions of pilgrims with incredible beliefs towards the legend that leads to pilgrimages.

As this area has an unfathomable historical and cultural legacy the belief and devotion has continued not only within one or two generation but has been continuing to present generation; it has been linked to the initial ruling Kirāt Dynasty to recently dethroned Shah Dynasty. A number of literary sources like Gopalraj Vamsawali, Bhasa Vamsawali, Kautilays Arthasastra and other sources mentioned that the Kirāts ruled in Nepal since a long time before the Licchavi Dynasty. Different literary sources mentioned that all together 28-32 kings of this dynasty, who ruled over Nepal for 1200 years. These literary sources claimed that they had developed art, architecture, culture, systematic administrative system, trade, and commerce. However, some scholars have not accepted the existence of Kirāt because of inadequate archaeological sources like inscriptions, coins, arts, architectures, and so on.

Since the Kirāt Dynasty to till date, all these ruling dynasties have built and changed many arts and architectural forms within the *Pashupatinath* premises and the value of shrines have always increased. This is why it is renowned as one of the ancient-most cultural heritage sites, and thus, a world class religious-cultural heritage destination competing to other most renowned Asian sites.

Furthermore, not only the tangible aspect, it is equally enriched by intangibility too. Since birth to death rituals, holy bath, unique procession in *Trishul Jatra* (trident procession) and other like, the *Bala Chaturdashi* (seed scattering rite in Hindu culture for the remembrance of deceased souls), the *Shivaratri* (festival related to the Lord Shiva), and many more important festivals and ritualistic activities and, devoutly believed the gateway to the heavenly abode of Shiva *Dham* have enlivened the local cultural practices which encapsulate the sense of intangible cultural heritage.

Thanks to all those great past efforts to make this area truly a place of devotion where some of the architectural wonders exist proudly, a true treat to the heritage tourists who can enjoy

a lot in this area by engaging in its historicity, legend, master pieces of art-works abundantly scattered, commanding architectures, ancient traditions, rich ethnicities, unique processions and festivals. Thus, this site is also termed as an open air museum where tangible and intangible art and heritage values are visible at once.

Shiva (God of Destruction who destroys evil and demonic forces) is believed to have a presence in some form or another at cremating grounds. The *Aaryaghat* (one of the holiest crematorial places) is believed to be the most sacred funeral ground in the Kathmandu valley. Here at this *ghat* the last walk of a dying or dead person has been taking from very ancient period but no written account of any time reference is found yet. It is located just north of the footbridge and is the site where members of the royal family and other high caste people are cremated, whereas other *ghats* are also used for general people. The *ghat* is composed of a long strip of paved stone and block of stone platforms consist as the steps to the river.

This paper is to explain the religious importance of death ritual at the *Aaryaghat*. It highlights the significance of the *Bramhanal* where holy water comes from the main sanctum of the *Pashupatinath* temple and the water is sprinkled on the dead and dying person which is ritually practiced as the person's last walk before the cremation process.

The paper is prepared based on the interdisciplinary approach. The data have been collected from both primary and secondary sources. It mainly relies on site observation and field visits carried regularly from December 2019 to till date. The secondary information has been collected from books, journals, articles and internet sources. However, individual interview and commutative data are not presented in this paper.

The Kathmandu valley

The religious texts, legends and archaeological investigation mention Kathmandu valley to be a large lake before it was inhabited by man (Gutschow, 2011). The religious text, *Swayambhu Purana* explained the Kathmandu valley as a huge and deep lake called *Nagdaha* (lake of snake). The legend Bodhisatwa Manjusri made this appropriate for the human settlement by drained out the water with his sword at Chovar gorge. The myth is that he then established a city called *Manjupattan*, and made Dharmakar the ruler (Levi, 2005). Since then the valley has been a center of migration the Kirats from northern territory; and the Lichhavis and the Mallas from southern territory. This place is beautified not only for trades, pilgrimages and refugees; but also for permanent settlement by rich dynasties who brought their rich cultured administrative systems, trades, industries and traditions to add the mystic beauty of their land (Slusser, 1998).

Monuments of Nepal are blended significantly in this valley - Kathmandu, Lalitpur and Bhadgaun which represent an epitome of harmony in rural design of typical arts and architectures as the unique and intangible cultural heritage (Nyaupane, 2018). Settlements in the bowl-shaped Kathmandu valley located at an altitude of about 4600 feet above sea level are believed to have started around 723 BCE. The Licchavi (400-750 AD), Malla (1201-1769 AD) and Shah (1769-2006 AD) dynasties were instrumental in developing urban centers, temples, palaces or private and public houses, culture and civilization of Kathmandu valley everywhere the Bagmati and its tributaries (Regmi, 1966).

The history of the valley begins with the accounts preserved in number of chronicles, such as the *Bhashavamshawali* (Yogi, 2013 BS), the *Bhamsavali* (Yogi, 2013 BS), the *Rajvognala Bamsavali* and the *Gopalraj Bamsavali* (Bajcharya & Malla, 1985) which mentioned the

Gopal, the Mahispal, and the Kirat had ruled the valley. The Licchavi period is considered as a beginning of written history of Nepal who were ruling since 5th century in Nepal (Regmi, 2007). In the Licchavi period, hundreds of monuments and art works might be created that have been mentioned in the inscription are not found in these days. However idols and the *Shivalingas* (*Trinity of Hinduism*) are still found in the various places around this valley. Furthermore, some of them are still in existence without any written inscriptions (Koirala, 2051 BS).

Malla rulers replaced the Licchavis and developed this valley as an open air museum (Regmi 2007 BS). This was the period when almost all fine arts, architectures, literatures, music, monuments, ceremonies, rituals, festivals and processions were developed which are showcased by present generation till now (Wright, 1972). The Mallas developed the craft and constructing with bricks and wood to such perfection that whether temples, palaces, the *ashram* and *Matha* (monastic or similar religious establishments in Hinduism, usually more formal and hierarchical to promote and practice Hindu religion), monasteries, private house, inns, *dharamasalas*, *Pati-Patis* are a living example operative management of public infrastructure which is also a place where people gather for several purposes like after natural calamities, processions and festivals, ceremonies, death ritual and cremation process. It is for supporting communities in these extreme to normal events and in addition to their day to day public anchors; *Akhada* - place of practice with facilities for boarding, lodging and training, and a Hindu sect for religious renunciation in teacher-student tradition were built of unique architecture which is the aesthetic value (Korn, 1976). These monuments and structures were constructed to provide the facilities for crematorial activities and to other religious perspectives.

In the Shah Dynasty (1825-2063 BS) most of the monuments, shrine, temples, ghats, and other cultural heritages had been created, developed and preserved. The Rana rulers, in Shah Dynasty period, had emphasized and renovated other numerous monuments and structures like palaces, temples, idols, *ghats* and so on. After the rise of the Rana, they imported and assimilated the style of white stucco places copying the prevalent European neo-classical architectural style (Regmi, 2007) because of their approach and relation with the then British rulers in India and their frequent visits to England and other European countries. Neoclassical architecture is the dramatic use of columns, and a preference for blank walls. The new taste for antique simplicity represented a general reaction to the excesses of the Rococo style. The exterior is built to represent classical perfection and simplicity of form. The Ranas had contributed a large number of architectural constructions in many areas (Tiwari, 2013). For example, several *Devalayas* (small temples related to Lord Shiva) rest house, streets, gates, water wells and so on (Regmi, 1966). Due to the contribution of each dynasties, patrons, artists and common people the Kathmandu valley was enlisted as World Heritage site in 1979. The cultural heritage of the Kathmandu valley is illustrated by seven groups of monuments and buildings which display the full range of historic and artistic achievements for which the Kathmandu valley holds universal outstanding value as well as makes it world famous. Due to the outstanding universal value of art works, architectures and intangible cultural heritages of the Kathmandu valley, UNESCO enlisted seven monumental zones in the world heritage site: three durbar squares, three *Naths* and one *Narayan*: Hanuman Dhoka, Patan and Bhaktapur Durbar Squares; the Stupas of Swayambhunath, Boudhanath and the temples of Pashupatinath and Changu Narayan.

The holiest place: the *Pashupatinath*

The *Pashupatinath* temple is located on the bank of sacred Bagmati River, around 4 kilometers east of the center of the Kathmandu city, particularly in 27° 42" N. latitude and 85° 21" E. longitude. "The area is 1335 m above the sea level and occupies a large physical boundary of approximately 265 hectares wide, abundant with temples, idols, stupas and open spaces" (Tandon, 2053 BS, p. 2). The *Pashupatinath* area expands from River *Manamati* to *Rudramati* where the actual religious site flourished around River Bagmati in between two rivers (Nyaupane, 2018). Remarkably, west of Bagmati is being settled by *Devpatan* (the *Devpatan* is the ancient name of the Pashupati area), the ancient cities and the east is being covered by *Shleshmantak* (playground of the Lord Shiva and Goddess Parvati in the mythology) forest.

Geographically, the *Shleshmantak* and ancient *Devpatan* area rise east and westward slopes down till two rivers the *Manamati* to the *Rudramati* by creating plateaus at both sides. Though, the boundaries of the Pashupati area can be identified at present by east of the *Pashupatinath* up to the *Uttarbahini*, on the west up to the *Dhobikhola*, the *Pingalastahan* in the south and north up to the *Gaurighat*.



Picture 1: The magnificent and panoramic view of Pashupatinath temple and Nasal Chock in front of eastern gate; Photo credit : Tanka Prasad Paudel.

Hence, due to its recognition as one of the greatest pilgrimage sites of Hinduism, it also has been the common cradle of various religions that have contributed to numerous tangible heritages like "pagoda temples, *Shikhar* temples, the *Shivalaya*, *Sattals-Pati*, stupa, *Vihars*, the *Shivalingas*, masterpiece idols, *Ghats*, the *Matha*, water spouts, gates and so on" (Koirala, 2051 BS, p. 271).

Hereby, this site is not only the melting pot of various religions and societies it has been significant to the global mankind and humanity. Thus, all the rituals, beliefs, involvement and activities have created life in those tangible heritages to keep them alive centuries to centuries (UNESCO, 2006).

The sanctity and antiquity of this area is evident from the narration of the religious texts,

Himmatvankhanda and the *Pashupatipuran*. It is claimed that the Lord Shiva himself as his earthbound, enamored by the peaceful environment, the forest, the free flowing Bagmati River, plateaus and natural landscape and decided to stay in this area. It has been beautified by the jungle, hills, gorge, open spaces, small forest, river, flora and fauna, chirping of birds which are all inspirable elements that made a complete whole. In regard to the area, sacredness yogis, ascetics, devotees, pilgrims, common people, scholars, researchers, traders, merchants, visited and made it a center of religious affairs. In the course of time, inscriptions, idols, the *Shivalingas* water spouts, inns and so many tangible cultural heritages were set up making it a hub for social-religious activities (Yogi, 2013). Among such diversified destinations, it has the incredible, incomparable and exceptional importance in the world which can be termed as the focus point of Hinduism. Even the Buddhist, the Sikha and the Jain also have accorded equal importance to Lord Shiva and *Pashupatinath*.

The holy river: Bagmati

The sacred and holy Bagmati River has been worshipped by the millions of devotees. It is originated from Bagdwar on the lap of the Shivapuri hill, crossing through the Sundarijal, the *Pashupatinath*, Chovar and passes hundreds of kilometers of plain terrain to join the Ganga River in northern India. The Kathmandu valley's rivers and streams such as *Vishnumati* (*Keswati*), *Hanumante*, *Manohara*, *Dhobikhola* (*Rudramati*), *Godavari*, *Tukucha* (*Ichumati*), *Nakkhu* (*Pravavati*), *Balkhu* (*Ratnavati*) all join Bagmati river at some point (Baidhya, 2003).

The religious text, *Himvat Khanda* also describes that if anyone bathes in the *Sangamtirtha*/*Aryatirtha* (pilgrimage site) of Bagmati river bank, the devotees obtain the merit of having performed the *Aswamedha Yagya* - ancient Hindu tradition which is one of the most royal rituals of *Sanatan Dharma* (Hindu religion) for achieving spiritual satisfaction, peace and happiness (Yogi, 2013). It is mentioned that if one bathes in this river *Sangamtirtha* (pilgrimage site of the *Pashupatinath*) during the time of solar eclipse or lunar eclipse and then offers donations, performs *Yagya* and ritualistic worships he receives millions times more merit of those pious acts (Yogi, 2013).



Picture 2: The holy River Bagmati, view from Aaryaghat; Photo credit: Tanka Prasad Paudel.

The religious text, *Brihat Samhita* mentions gods dwell where groves are near rivers, mountains and springs. The Lord Shiva and the Goddess Parwati used to come and roam in the *Shleshmantak* forest. Time to time, Lord Shiva and Goddess Parwati get disguised in many forms to roam around this forest where other gods and goddess also become delighted to settle (Baidhay, 2045 BS), slowly and steadily, a large number of devotees and pilgrims started to visit and stay in this place.

Similarly, every dynasty in Nepal has paid high importance to Bagmati River as importance given by various religious texts like *Himaavakhanda*, *Pashpati Puran*, *Swasthani Brata Katha* and so on. As a result Bagmati river bank has been developed with numerous temples, *Matha*, *Aakhada*, *Sattals* (shelter or rest house for spiritual pilgrims), *Patis*, art works of variety of architectures by all ruling dynasties. Hereby, numerous temples, inns, rest house, stupas, *Ghats*, water sprouts, wells, Ponds, *Bihars*, bridges, staircases, *Aakhadas*, *Mathas*, *Dharmasalas* and so on have been consecrated with religious-social and various other purposes (Tandan & Michaels, 2017).

The water from all these sacred monuments and religiously worshipped places mix with Bagmati River emphasizing its sacredness. In the route, Gaurighat to Tilganga there are 65 *Tirtha* (pilgrimage sites) and holy sites which highlight the importance of the river. In regard to its spirituality and holiness, surrounding vicinity is considered to be an auspicious site where Hindus perform all sacraments from birth to death and post-death rituals, prayers to the deceased soul and wishing well-being to the living and the ancestors. This is why Bagmati is considered as the most consecrated river among the Hindus and other sects as well.

The *Aaryaghat* is the main crematory site of the Kathmandu valley and the most sacred one to the Hindus due to the presence of the holy river Bagmati and the Lord *Pashupatinath* in the same place. The eastern gate straightly descends down to the banks of the holy Bagmati River where *Gangamai*, *Birupakshya*, *Mrigasthali*, *Kuruwa Sattal*, *Ghate Baidhya* with *Sattal* and two piers of the *Aaryaghat* are located at the either side.



Picture 3: Two piers of the *Aaryaghat* at the eastern gate of *Pashupatinath* temple on the banks of *Bagmati* River; Photo credit: Tanka Prasad Paudel.

Furthermore south resides the courtyard of *Batleshwori* where the terracotta *Anantadinarayan*, *Panchaganesh*, the office of Pashupati Area Development Trust (PADT) *Mangala Gauri* and numerous *Shivalingas*, the *Shivalaya* and shrines are situated. Moreover, further south of this courtyard another popular *Bhashmeshwor Ghat* is situated. Notably, two ancient bridges with long staircases link to *Ram Mandir* and the fifteen *Shivalayas* from where the pilgrims and foreigners can have glances and do photography at this premises.



Picture 4: The Rana Prime Minister, Jung Bahadur Rana constructed fifteen *Shivalayas* across of the *Bagmati River* at the beneath of *Shleshmantak forest*; Photo source: https://en.wikipedia.org/wiki/Pashupatinath_Temple.

The sanctity is expressed by people not only for holy bath, worships, oblations but people also consider leaving their body on the banks of this river to be a very fortune. It's a belief that no matter how ignorant or sinner is a person, leaving his body on banks of river *Bagmati* cleanses away all his sins and shall be bestowed the abode of the Lord *Shiva*. Moreover, leaving body right on the *Brahmodaya tirtha* of *Triveni* (confluence) or on the *Bramhanal* has different glory. Thus to end one's life in the *Pashupatinath* area at the feet of River *Bagmati* is considered to be extremely glorious than ending life in other sacred spaces (Yogi, 2013 BS).

A cultural heritage destination: the *Aaryaghat*

The *Aaryaghat* exhibits an awe-inspiring feeling at the first sight to any discerning mind. The serene and green environment filled with fine art work of great temples and other monumental works suffice to impress all visitors. The symbolic sculptural art, wood and metal art works, terracotta and stone art, and truly a garden of multi-roofed temples, the most impressive *Shikhar* style *Pashupatinath* temple, traditional rest houses, stupas, monasteries and water spouts with superb art are visible almost everywhere. There are cliffs and caves usage of brick colors in the structures. It is the places where one can see a pure devotion find spiritual consciousness, salvation and a rich living cultural heritage. This whole premise is an open museum where pilgrims find a combination of religion, art, architecture and culture. This is one of the biggest sites for the religious, archaeological, pilgrimage, historical and cultural tourism (Nyaupane, 2019).

People from all over the Indian sub-continent and beyond have frequented to this place for hundreds of years. Those people throughout the time span of hundreds of years, in honor to the place, have created a complex heritage in both ways, tangible and intangible. It has great concentration of tangible heritage such as temples, idols and images, shrines, inscriptions,

inns, rest houses, *ghats*, water spouts, ritual platforms, inscriptions, *Dharmasalas* (traditionally constructed pilgrims house), *Akhadas*, sculptures, traditional streets, stairs, settlements, caves, ponds, and wells that have highly untouched and embraced by intangibility like festivals and processions, rites and rituals, dances, musical performances, oral traditions, religious belief, social harmony and traditional skills. That's why, without linkage of intangibility to tangible one is like a body without life in the eastern culture. So, it has been still proved as the tangible icons which continuously go equally with the intangibility.

Since the ancient time, the ritualistic practice, beliefs, norms and values within the devotees have created deep impressions on the tangible assets. The high degree of patience and passion devotees show in order to pay respect and devotion towards their gods and goddesses is bewildering to a non-Hindu onlooker. The devotees do not care about the extremity of weather, season, day or night, thirst and hunger, rest and sleep (Nyaupane, 2019). This extraordinary craze towards the lord has added the value in such tangible aspects of cultural expression. Hence, such sentimentality and spirituality among devotees show the unspeakable aspects of religious and cultural fervors which create intangibility within tangibility of heritages and traditions.

Deopatan is considered to be a plate of ancient death just like *Kaasi* -pilgrimage site where most of the Hindu worship and perform death ritual like the *Shradha* for the salvation of ancestor- in modern day of Banaras of India. The *Himwathkhanda* mentions that those of Bagmati River will go directly to heaven on the east, north and south side of the temple flows the Bagmati River on the side of which are many religiously famous *Ghats* (Yogi, 2013 BS).

Similarly, around the *Aaryaghat* there are other equally important *ghats* like *Suryaghat* to the northern; and the *Bhasmeshworghat* on the southern side located. These *ghats* are considered very auspicious for cremation of the deceased (Yogi, 2013 BS).



Picture 5: *Bhasmeshworghat* is located on the southern side of the *Aaryaghat*; Photo credit: Tanka Prasad Paudel.

The dying one is to be brought to the banks of the river so that they can spend their last hours in a holy place, let their feet deep in the divine waters and pray for their released souls to reach heaven. Along the riverbank there are a number of inclined stone platforms, called *Ardhajal* (half-water), that are normally submerged in water.

These platforms have a special funerary significance. There are a few shrines at the *Aaryaghat* and the most important among them are the shrines of the *Gangamai* (built in 1848) and the *Virupaksha* (600 AD) situated next to the eastern stairway.



Picture 6: The temple of Gangamai and Virupaksha situated next to the eastern stairway to Pashupatinath in front of the Aaryaghat; Photo credit: Tanka Prasad Paudel.

The *ghat* is the funeral or crematoria site situated on the bank of river, the confluence of river where the last rite specially of Hindus are performed in order to burn the corpse and flow the residual ash into the flowing water. Remarkably, the reason of cremation on the bank of flowing river is done in order to gain life again and again. In Hinduism one who is born in the human form regains six more life under the sinless completion of previous life and gains salvation (Tandan, 2053 BS). Even it is supported by the religious belief, the physical body is exhausted but the spiritual body “*Aatma*” (soul or spirit / a form of an invisible energy which is neither created nor can be destroyed) remains for long run until proper funeral rites are completed. That’s why cremation by burning is essential and even need to perform various rituals till thirteen days (Tandon & Michaels, 2017). Among the first of the death rites is cremation. The word in the Sanskrit and various similar dialects is ‘*Antyesti*’ (refers to the funeral rites for the dead in Hinduism, which involves cremation of the body) which literally means ‘*The Last Sacrifice*’ (Hertzler, 1936). In Hinduism, the human body as the whole universe consists of five elements – Air, water, earth, fire and space and the last sacrifice denotes returning the body to five elements of its origins. On this last sacrifice, the body is kept on the pile of wood and then is burned. The burning is preceded by several death rites performed at the place of death and the place of cremation. Other rituals are followed by cremation.

The purifying last drop of water: the *Bramhanal*

The holy water offered to the *Shivalinga* in main sanctum of the *Pashupatinath* flows down to the *Bramhanal* (the holy water and milk offered to the Lord Shiva flowing to mix in the Bagmati river which is used as the last drop to sprinkle the dead body) which has one that is dead or going to die (Koirala, 2051 BS). Notably, Hinduism believes in rebirth so death is not the final/ultimate destination whereas, the one who is being offered holy water of the *Bramhanal* is believed to be sinless and gets rebirth again and again. Tiwari (2013) has claimed that "the triple confluence *tribeni* perceived by the Hindu at the *Bramhanal* in the *Aaryaghat* where ablutions from the *Pashupatinath* temple, and water of Bagmati and from the forest of *Mrigathali* and numerous temples of the *Pashupatinath* area (p. 62).

The main *Shivalinga*, at the sanctum of the temple is being worshipped by the holy water, milk, the *Keshar* (saffron), the *Chandan* (sandal wood), and sugar and so on. Generally, the *Shivalinga* is washed by cold water in summer and hot water in winter as the holy bath at 4:00 AM early morning every day; whereas in front of the eastern courtyard of the temple complex, water heating is installed.

Notably, after the holy bath the main priest draws the *Shriyantra* (symbolic worshipping method of the universe on the top of the *Shivalinga* at the sanctum of *Pashupatinath*) at the top of the *Linga* and starts worshipping by the *Panchamrit* for the welfare of nation and citizen. Worshipping the *Shriyantra* resembles worshipping of whole universe. Furthermore, worshipping the *Shriyantra* with the *Shakti* (power) is the special practiced in the temple. Hence, the *Shivalinga* is the representation of genitals of the Lord Shiva and the Goddess Parwati which is self-evolved the *Jyotirlinga* (self originated the Lord Shiva in the form of flame).

There are three major parts in the *Shivalinga* and they are the symbols of the Brahma- starting (base) part; the Bishnu - in the middle; and the Maheshwor - in the upper part, the trinity gods which resemblance origin, operation and destruction (Koirala, 2051 BS). This holy bath of the *Shivalinga* is flown to the *Bramhanal* and then to Bagmati River which ultimately connects to sea that vaporizes and spreads all over the universe. Even, it depicts the miniature of three world i.e. neither terrestrial nor celestial world. Moreover, it states about birth to death too.

Hereby, any corpse brought in the *Pashupatinath* area is being placed on the *Bramhanal* in order to offer the holy water as the last drop to the corpse through the process of placing the head to the *Bramhanal* then the corpse gets purified with oil, butter, shawl for funeral rite and being offered by flower, garlands, vermilion powder, incense before proceeding to burning ritual.

The *Bramhanal* is a sloped flat stone where the feet of the body is touch let to the water of holy River Bagmati. The water offered to the main shrine exists and crosses the *Bramhanal* touching the body placed there to Bagmati River. Laying the body at the *Bramhanal* and offering the holy water is considered an act of liberation for making deceased soul free from terrestrial world. Similarly, near to the *Aaryaghat Vatsaladevi* temple courtyard has a small image of the *Yamaraja*, the God of death which has been placed to signify this area as the proper place designated for death rituals (Lamsal, 2033 BS).



Picture 7: *Bramhanal situated next to the Aaryaghat which is horizontal with the sanctum of Pashupatinath temple; Photo credit: Tanka Prasad Paudel.*

Thus, all the bereaved relatives pay last homage at the *Bramhanal* ritual. Most tragic moment is encountered during the procession there where mourning members grieve and bid farewell with tears in their eyes.

The cremation and death ritual

The Hindus have multi-aspects of cremation whereas they mostly practice cremation with help of fire i.e. burning the corpse on the pyre. Notably, the hermits, saints and children are buried. Generally in Hindu tradition, the corpse is washed by black sesame oil and wrapped by white fabric to male and unmarried women, whereas red is used for the married women. Then the toes are tied by thread and red '*Tilak*' (vermilion powder put on forehead) on forehead is marked by the thumb. After that, the corpse is placed on the pyne facing head to north. Thereafter, the friends and relatives, well-wishers round up the corpse and sprinkle water three times and also, flower, vermilion powder are offered to the body. Here the eldest son or the made mourner or a priest takes bath and round the corpse three times. Eventually, the funeral light is lighted at the ear of the corpse and later lit the whole body. In this way, the relatives pour oil and ghee in the fire to let it burn fully. Finally, the corpse gets fully burnt and turns into ash, which is poured to the river (Hutton, 1951).

The secondary rites called *kaaj-kriya* are also performed till thirteen days immediately after the death at first, and then after six months and afterwards every year as '*Shraddha*' (respect and homage offered in the form of prayer and food to the departed souls of parents, or grandparents, or great grandparents) are performed. The changing of '*Janai*' (sacred thread worn by the Brahmin and the Chettri castes) during *Janai Purnima* (the festival of *Janai*) and '*Sorha Shraddha*' (post-death rituals carried out once a year as per the religious text/calendar) before the *Dashain* is also performed nearby *ghats*.

In this context, the Hindu scripture the *Garuda Purana* says, "there is no salvation for a man without a son". The ritual is also held on the death anniversary of the ancestor. The *Shraddha*

is performed only at noon, usually on the bank of a river or lake or at one's own house, all the *Shraddha* is done especially in that the *Tithi* which matches the day of death. It is done on the exact date of death as per the lunar calendar called *Tithi* (lunar calendar based on the moon's rotation around the Earth also is the time taken for the longitudinal angle between the moon and the sun to increase by 12° which is calculated by the priest and performed death ritual on the death day) and again during the *Sorhashraddha* (sixteen lunar day period when the Hindus worship and pay homage to their ancestors, especially through food offerings and long ritualistic performance which falls on the month of Sep-Oct that takes place before the *Dashain*).

Families may also make a pilgrimage to places like *Varanasi*, *Prayag* and *Gaya* of India or *Pashupatinath* in Nepal to perform the *Shraddha*. It is essential that the *Shraddha* is performed by the son—usually the eldest—or male relative of the paternal branch of the family, limited to the preceding three generations (Hutton, 1951).

The *Shraddha* is usually performed bare-chested, as the position of the sacred thread worn by him needs to be changed multiple times during the ceremony (Pandey, 1988). It involves the *Pinda-daan*, (food offering for demised soul) which is an offering to the ancestors of the *Pindas* (cooked rice and barley flour balls mixed with ghee and black sesame seeds), accompanying the release of water from the hand. It is followed by the worship of lord Vishnu in the form of *Kush*, a gold image or the *Shaligram* (the *Shaligram* refers to a fossilized shell used in South Asia as an iconic symbol and reminder of the God Vishnu) valuable stone and the *Yama* (God of death).

Conclusion

Thus *Aaryaghat* stands as a most revered place from all aspects of aesthetics, philosophical, and pragmatics. It offers a state of peaceful and satisfying moment of piety for the pilgrims, a thought of attaining salvation for the death aspirants and presence of one of the richest syncretic state of many yet great religious beliefs for the history, culture, and art scholars. It's the final journey of a person who takes his or her last walk to the *Aaryaghat* with a belief that their soul shall be bestowed to achieve salvation and the ultimate abode would be selected at the Shiv *Dham*.

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Glacial Hazards and Avalanches in High Mountains of Nepal Himalaya

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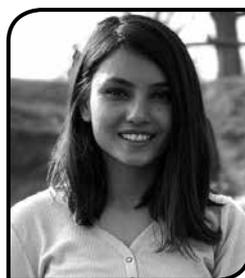
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Abstract



This paper provides a comprehensive overview of the glacial hazards (GHs) and reflects the situations in the Nepal Himalaya.

We discuss on the different GHs with focus on the avalanches (snow, ice, and rock), presenting a nation-wide database on avalanches compiled from literature. We also share the relevant policies in the GHs and lays groundwork for future research on the high-altitude hazards. GHs are prone to high mountains of Nepal, yet it is startling that the area has received the least priority. Almost every year, human casualties and property losses reported due to various disastrous events in the country. We documented 60 avalanche events since the 1920s across the country, ensuing the loss of more than 370 human lives. Almost all high-altitude regions of Nepal are prone to avalanches. Number of avalanche events and casualties were the highest in the Khumbu region of Nepal. In recent years, the avalanche records and casualties are also expanding in other parts of the country, most likely due to increased human activities at high altitude regions and documentation. It is inevitable to analyze the hazards prevalent in the mountains to ensure safe and secure livelihood, trekking, and mountaineering activities. We also underline the urgent research priorities to provide a more systematic understanding of GHs in Nepal.

Keywords: *Mountain Hazards, Avalanche, Snowstorm, GLOFs, Rock fall*

Introduction

Mountains across the globe have been the most interesting places for the trekking and mountaineering adventure tourism (Thakuri & Koirala, 2019; Mu & Nepal, 2016). Further, most mountains serve as the important sources of water as they store water in the form of snow and ice and supply water downstream during the dry periods, but the traveler and

mountain dwellers are usually unsafe and insecure due to various mountain hazards. Mountains present varieties of hazards (Table 1), including glacial hazards. Unlike low lying plain areas, various mountain hazards can be observed in the Nepal Himalaya. The possible mountain hazards are (a) swollen river/increased discharge/river flow – high water levels, (b) avalanches, (c) serac collapse, (d) landslides – downslope movement, (e) debris flow, (f) rock falls, (g) crevasses, (h) extreme weather/storm, (i) high altitude sickness (Acute mountain sickness, High-altitude pulmonary Oedema, High-altitude cerebral oedema); and (j) snow cornices (Corona & Stoffel, 2016; Gruber & Haeberli, 2007; Zingari & Fiebigler, 2002; Richardson & Reynolds, 2000).

The GHs are the processes related to mountain glaciers, ice caps, or ice sheets that threaten lives and properties. High mountains are particularly prone to GHs related to snow, ice and permafrost as these elements exert key controls on mountain slope stability. Two main types of GHs can be observed in high mountains: (1) direct action of ice and/ or snow; this includes events such as avalanches of ice, and snow, glacier outburst floods and glacier advances, and permafrost hazards, and (2) indirect GHs that arise as a secondary consequence of a glacial feature or process and may include catastrophic breaching of moraine dammed lakes, rock avalanche etc. (Hewitt, 2002 & 2009; Richardson & Reynolds, 2000; Bell et al., 1990). The GHs have a direct connection and consequences for human society as they can impact on infrastructure, hydropower, agriculture, and tourism through the loss of lives and properties. Further, these hazards are the potential threats for the mountaineering activities that can destroy the infrastructures, trekking trails, and result in the demise of mountain climbers (Thakuri & Koirala, 2019; McClung, 2016; Mu & Nepal, 2016).

Table 1: Loss of lives in the country by disasters in the last decade (2011-2019) (MoHA, 2020)

Types of Hazards	2011	2012	2013	2014	2015	2016	2017	2018	2019
Avalanche		9	8	16	23		1		8
Cold Wave	41	25	2				1	47	
Earthquake	6	1	0		8962				
Epidemic	9	33	4	12	3	19	10	5	
Fire	25	77	59	67	75	63	63	87	77
Flood	126	52	131	129	0	101	166	17	73
Landslide	110	60	87	113	138	148	70	91	86
Storm (Snow, Wind, Hailstorm)	6	18	3	43	12	2	5	24	42
Thunderbolt	76	118	147	97	103	118	85	75	94
Total	399	393	441	477	9316	451	401	346	380

In this paper, we present different glacial hazards with focus on the avalanches (snow, ice, and rock), We also share the relevant policies in the GHs and lays groundwork for future research on the high-altitude hazards. The paper is based on the analysis of the existing data and published literatures. Data on avalanche hazards were collected from different sources, graphically presented, and documented. Literatures were searched by using some key words, like “glacial hazards”, “avalanche”, “disaster”, “glaciers”, and high-altitude. In this study, literatures published (journal articles, conference proceedings, abstracts, thesis, project reports) up to the end of February 2020 are incorporated.

Glacial hazards

Avalanche hazards

As the peaks of northern part of the country are covered with ice/snow, avalanches are very common in Nepal and claim the life of human and loss of properties (McClung, 2016). An avalanche is a massive slide of snow, ice, rock or debris down a mountainside, caused by the released build-up of snow (Park & Reisinger, 2010) and thus, can appear as a) snow, b) rock, c) ice avalanches, or d) mix of any of these. It is typically caused when material on a slope breaks loose from its surroundings which then quickly collects and carries additional material down the slope. Various kinds of avalanches exist in the mountains, including rock avalanches (which consist of large segments of shattered rock; Deline et al., 2015; Hewitt, 2002 & 2009), ice avalanches (which typically occur in the vicinity of a glacier), and debris avalanches (which contain a variety of unconsolidated materials, such as loose stones and soil) (Birkeland, 2018). Avalanche usually occurs when stress from the pull of gravity and/or applied load exceeds the strength of the snow cover. Although avalanches can occur on any slope given the right conditions, certain times of the year and certain locations are naturally more dangerous than others. Wintertime, particularly from December to April, is when most avalanches tend to happen (NSIDC, 2019). About 90% of all avalanches begin on slopes of 30-45°, and about 98% occur on slopes of 25-50°. Avalanches strike most often on slopes above timberline that face away from prevailing winds (leeward slopes tend to collect snow blowing from the windward sides of ridges).

Landslides and snow avalanches cause major disasters on a global scale every year, and the frequency of their occurrence seems to be on the rise (Nadim et al., 2006). The main reasons for the observed increase in landslide disasters are a greater susceptibility of surface soil to instability and greater vulnerability of the exposed population. Furthermore, traditionally uninhabited areas such as mountains are increasingly used for recreational and transportation purposes, pushing the borders further into hazardous terrain (Nadim et al., 2006). Snow avalanches represent a significant natural hazard to infrastructure and residents in high mountain regions of the world (Brundl et al., 2004; cited in Laxton & Smith, 2009). Tourism destinations are easily impacted by a variety of natural disasters which cause serious damage to the visited regions (Murphy & Bayley, 1989; cited in Park & Reisinger, 2010). The occurrence of natural disasters leads to a decrease in the tourists' arrivals (Park & Reisinger, 2010).

GLOF hazards

ICIMOD (2011) reported 24 glacial lake outburst flood (GLOFs) in Nepal. Further, some other GLOFs events (e.g., Figure 1) have been reported until 2018 from different parts of Nepal (Thakuri & Koirala, 2019). About 28 GLOF events have already been experienced in the Nepal Himalaya causing the loss of lives and properties, originating from the outburst of lakes located in Nepal and the Tibetan part of China.

Many glacial lakes are emerging as potentially dangerous once due to enlargement from the combination of small lakes and melting of the glacier ice (Khadka et al., 2018; Salerno et al., 2016). Even the Tsho Rolpa Glacial Lake located in the eastern Nepal (Figure 2), which was lowered by 3 m water level in 2000 for preventing from the outburst (Rana et al., 2000), is recently emerging as the most dangerous lake threatening downstream population. The lake was 149 hectares in 2000 just after the lake lowering activity, while in 2018; the lake surface area has increased to 160 hectares (increased by about +7%). This lake is prone to frontal

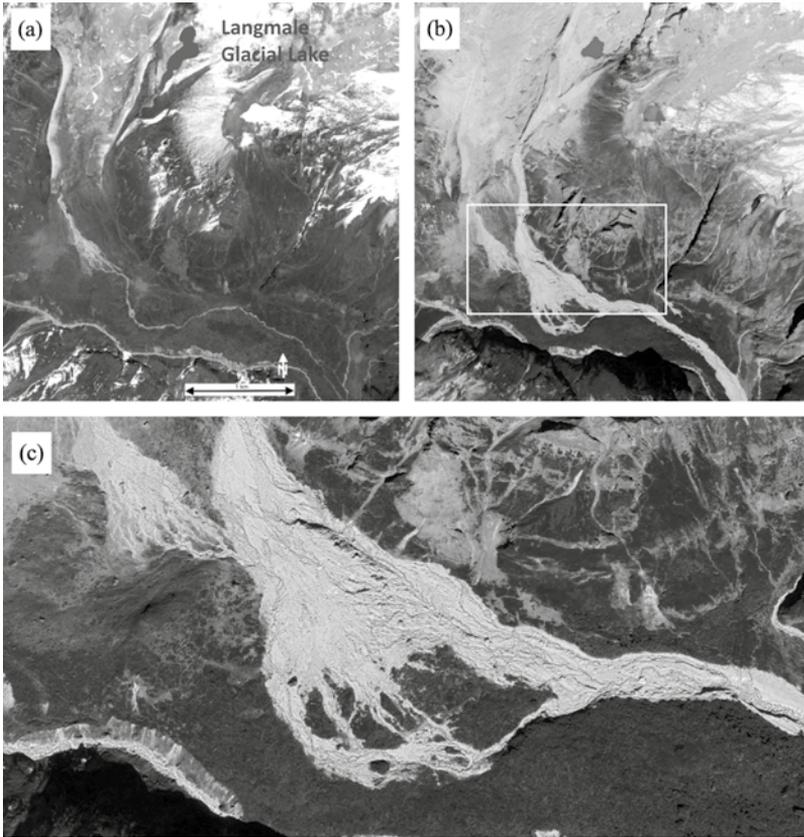


Figure 1: Comparison of satellite imagery before (a) and after (b) the glacial lake outburst flood of the Langmale Glacial Lake in the Barun valley of the eastern Nepal. A focused outwash plain with sediment deposits from the April 20, 2017 GLOFs (Byer et al., 2018) is shown in (c) (Source: GoogleEarth, 2020).

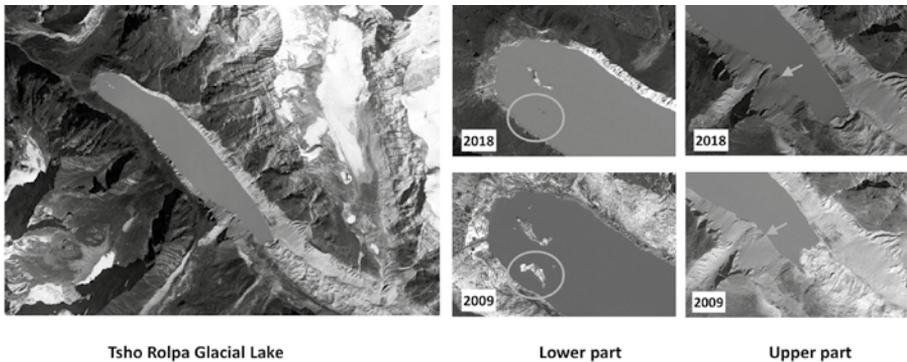


Figure 2: (a) Tsho Rolpa Glacial Lake, (b) Comparison of lower part of the lake, showing that the lake elevation has increased in recent year. Small permanent islands in the middle of the lake are submerged under the water; and (c) The lake is expanding toward the northeast by melting the glacier ice (Source: GoogleEarth, 2020).

moraine dam break. This glacial lake is connected to the glacier ice on one side (eastward). The lake can increase in the size (towards – southeast) further more by melting the glacier ice.

Permafrost hazards

The permafrost is a ground (soil or rock, and included ice and organic material) that remains at or below 0 °C for at least two consecutive years (Van Everdingen, 1998). It is, therefore, called as a permanently frozen ground and is defined exclusively on the basis of temperature irrespective of texture, degree of induration, water content or lithological characteristics. Since permafrost is a thermal state, the determination of the energy balance to the ground is very important for its modelling and prediction of future changes (Chauhan & Thakuri, 2017; Arenson, 2002). Several factors and effects have a major influence on the thermal regime in the ground. Perennially frozen ground is very sensitive to climate change. Due to the retarded response of permafrost to cycles of air temperature, permafrost temperatures have been used to examine past climate changes. Climate change may result in new different ground freezing conditions, thereby influencing the surface velocity and the maximum depth of solifluction processes (Gruber & Haerberli, 2007).

Permafrost hazards relate to infrastructure that is partly or entirely placed in the vicinity or on top of the permafrost- and glacier-affected frozen rock masses or debris. Changes in permafrost and glacier dynamics may derive from atmospheric warming, but as well from human-environment interaction (Gruber & Haerberli, 2007). Mountain infrastructure can be negatively affected by ground-ice degradation induced by the combined effects of construction activity, the structure itself and climate change (Bommer et al., 2010). A widespread loss of permafrost will trigger erosion or subsidence of ice-rich landscapes and in addition, the thawing will have a severe impact on infrastructure due to excessive settlements and exploration, and will result in rapid coastal erosion (Arenson, 2002).

Snow, ice and rock avalanche: Splendid mountains turn into dangerous places

More than 60 avalanches tolling 372 persons death since 1922 has been reported from the

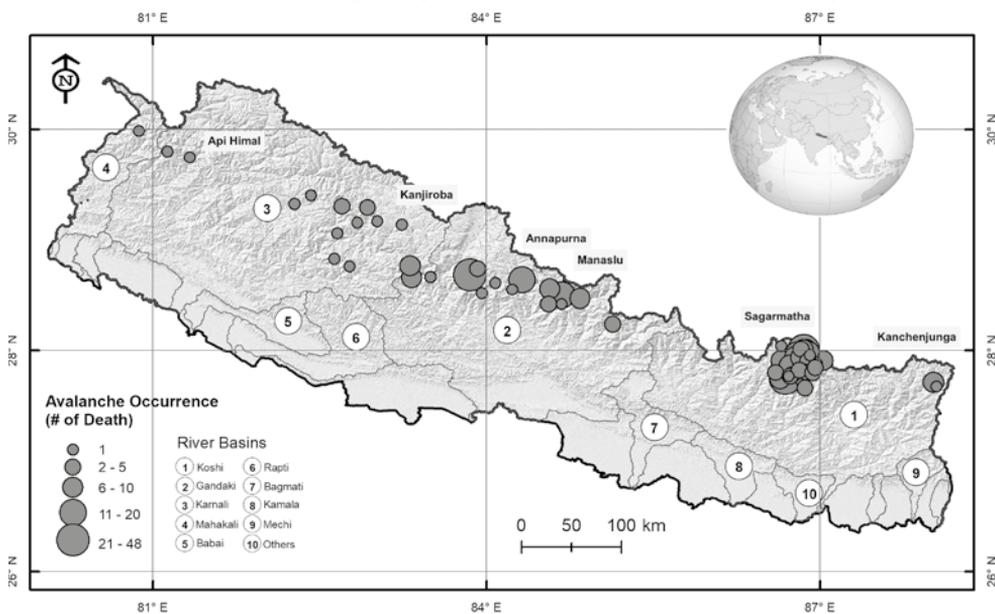


Figure 3: Avalanches recorded in Nepal Himalaya from 1922 to 2020: Showing avalanche prone areas based on the previous avalanche records (Table 2). The Everest region is the most disastrous place for avalanches.

Nepal Himalaya (Figure 3 & Table 2). Almost all the high-altitude regions of Nepal are prone to avalanches (Figure 3). The avalanche records since 1922 show that the number of casualties and the avalanche events are the highest in the Khumbu region compared to other parts of Nepal (Figure 3 & 4). In recent years, the records and the casualties are expanding in other parts of the country which might be due to increased human (tourism) activities and the recording system.

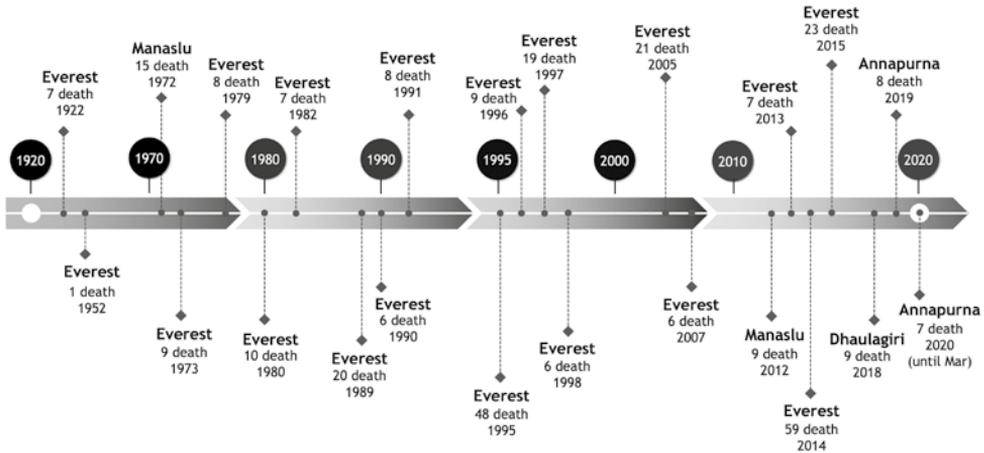


Figure 4: A historic timeline of the major avalanche events in Nepal Himalaya from 1920 to 2020, developed based on different data sources (For further details, referred to Table 2)

Avalanche in Mt. Everest (2014 and 2015) and Langtang valley (2015)

The 18 April 2014 avalanche was the second deadliest disaster in the history of Mt. Everest (8848 m) in Nepal, after the avalanches that struck the southern side of the mountain following year on 25 April, 2015, which were triggered by an earthquake of magnitude 7.8 in Nepal (Figure 5; McClung, 2016). An avalanche occurred in the early morning towards the southern side of Mt. Everest at an elevation of approximately 5800 m, near Everest Base Camp (ABC). Within the Khumbu Icefall, on the route between camp I and camp II, this was the disastrous avalanche that killed 16 men, mostly the Sherpa guides.



Figure 5: Tragedy in the Himalaya: An ice-snow avalanche originating from the steep slope of Mt Everest hit the Khumbu ice fall and Everest base camp in 2014 (Source: B.B Rai/AFP/Getty Images).

On 25 April 2015, a series of avalanches triggered by the earthquake of magnitude 7.8 in Nepal. Climbers at the base camp of the Mt Everest and others on the higher elevations were trapped during the disaster (McClung, 2016). At least 23 people were killed and 61 injured. The avalanche began in the late morning on Mount Pumori (7,161 m), a mountain just a few kilometers west of the Everest, gathering strength as it headed toward the base camp, where climbing expeditions were preparing to make their way to the summit. Furthermore, the earthquake triggered avalanches, landslides, and rock falls in the Langtang valley which caused the loss of more than 350 people's lives and destroyed the village of Langtang (Fujita et al., 2017; Kargel et al., 2016). These casualties are categorized under the Earthquake hazards since it was difficult to discern the direct cause of the avalanches (Table 1) and excluded in Figure 3 and 4.

Avalanche in Annapurna circuit 2014

On 14 October 2014 a snowstorm and series of avalanches occurred on and around Annapurna and Dhaulagiri in the Manang and Mustang Districts of Nepal. Injuries and fatalities resulted in the deaths of at least 43 people of various nationalities, including at least 21 trekkers. The storm arose from the Cyclone Hudhud (NDMA, 2015) and was the worst in a decade with almost 1.8 m of snowfall within 12 hours.



Figure 6: Steep mountain slopes are the potential source of the rock/ice avalanche. (Source: S. Thakuri, 2014)

Table 2: Avalanches occurred in the Nepal Himalaya and human casualties due to avalanche and snowstorm for the year 1922 to February 2020. The years 1995, 2014, and 2015 are the top three years with more deaths due to avalanche and snowstorms. The data is compiled from different literatures.

Year	Incident	Incident description	Total death
1922	Avalanche	British Mount Everest Expedition	7
1952	Avalanche	Swiss expedition, Lhotse Face	1
1970	Avalanche	Ice-fall avalanche in the Khumbu Icefall, during production of “The Man Who Skied Down Everest” between Base Camp and Camp I	6
1972	Avalanche/Snowstorm	South Korean Mountaineering Expedition, Nepalese Sherpa, Koreans and Japanese killed at the 26,658 feet of Mt. Manaslu	15
1973	Avalanche/Snowstorm	S.W. Face	9
1974	Avalanche	French expedition from the West Ridge to Mt. Everest	6
1977	Avalanche	Sisne Himal	1
1978	Avalanche/Snowstorm	Khumbu Icefall	7
1979	Avalanche/Snowstorm	Below North Col, Japanese Alpine Club reconnaissance expedition	8
1980	Avalanche/Snowstorm	7900 m North Face	10
1981	Avalanche/Snowstorm	6900 m W. Cwm	4
1982	Avalanche/Snowstorm	Khumbu Icefall	7
1984	Avalanche	Ice-fall avalanche in the Khumbu Icefall	3
1987	Avalanche/Snowstorm	Everest basecamp	2
1988	Avalanche	Climbers’ camp at 23,625 feet towards Mt. Everest	2
1989	Avalanche/Snowstorm	Polish Climbers on Mt. Everest on a 7200 m W. ridge; and Spanish climbers in Mt. Pumori while traversing Mt Pumori’s exposed slopes	20
1990	Avalanche/Snowstorm	Everest region	6
1991	Avalanche/Snowstorm	Everest region	8
1992	Avalanche/Snowstorm	Khumbu region	2
1994	Avalanche/Snowstorm	Everest region	2
1995	Avalanche/Snowstorm	Intense snowfall generated numerous avalanches throughout the Khumbu region Near Mt. Kanchenjunga base camp	48
1996	Avalanche/Snowstorm	Mount Everest during attempts to descend from the summit, at Lhotse face	9
1997	Avalanche/Snowstorm	Everest region, Everest	19

1998	Avalanche/Snowstorm	Everest region, Everest	6
1999	Avalanche/Snowstorm	Everest region, Everest; Chunchet, Gorkha	6
2005	Avalanche/Snowstorm	Powder-snow avalanche, induced by several hours of heavy snowfall, plowed into a French expedition's base camp	21
2006	Avalanche	Due to a massive serac (ice fall) collapsing at the Khumbu icefall on Mt Everest	3
2007	Avalanche/Snowstorm	Everest region, Everest	6
2009	Avalanche	Khumbu Icefall	2
2010	Avalanche	Big avalanche swept away a leading Sherpa along with his guide, in windy conditions fixing ropes near the summit of Mount Baruntse	2
2012	Avalanche	Avalanche hit camp three of the Manaslu peak, resulting in a flood of snow	9
2013	Avalanche	Everest region, Everest	8
2014	Avalanche/Snowstorm	Snowstorm and series of avalanches occurred on and around Annapurna and Dhaulagiri in the Manang and Mustang districts; Seracs on the western spur of Mount Everest failed, resulting in an ice avalanche	59
2015	Avalanche/Snowstorm	Shaking from the 25 April 2015 earthquake triggered an avalanche from Pumori into Base Camp on Mount Everest	23
2017	Avalanche	11-year-old boy went missing in an avalanche at Chorkhola area in Kaikhe village council, Dolpa while they were going to their animal sheds in Chormara Lek	1
2018	Avalanche/Snowstorm	Heavy snowstorm followed by landslide buried the base camp of Mt. Gurja at 3,500 m on the lap of the south face of Mt Dhaulagiri	9
2019	Avalanche	Avalanche at Annapurna trekking route in Nesyang Rural Municipality of Manang district; Dolpa; Dhading	8
2020 until Mar	Avalanche	Avalanche struck the famous Mount Annapurna circuit climbing route (3230 m) after heavy rains and snow	7

Storms and avalanches of Khumbu and Kanchenjunga Himal (1995)

On November 9 and 10, 1995, a severe storm hit the Nepal Himalaya, triggering several snow and ice avalanches in different parts of the country. As a result, 24 people were killed in a lodge near the village of Pangkha in the Gokyo Valley (Yamada et al., 1996) and 7 other deaths resulted from an avalanche in the Kanchenjunga area of far eastern Nepal (Kattelmann & Yamada, 1995). This storm was the most intense event to occur during the autumn in the recorded past at least 50 years. The autumn season in the Himalaya tends to be quite dry, so this storm seemed extraordinary. Precipitation gauges at lower elevations caught 50 to 200

mm of rain during the storm. Cold temperatures led to snowfall above 3,500 m in the Khumbu region, and snow depths increased rapidly with elevation. About 30-50 cm of snow fell at 3,800 m; 50-100 cm of snow was found at about 4,000 m; and 100-200 cm of snow was deposited above 5,000 m. The intense snowfall generated numerous avalanches throughout the region.

The aforementioned three events are the largest reported storms and avalanches events in Nepal. The events not only hampered the tourism industry of Nepal, but also directly affected the life of the people who were employed only because of tourism.

Triggers and avalanche risks in high mountains

Triggering factors

Avalanches are triggered by either natural forces (e.g., precipitation, wind drifting snow, rapid temperature changes) or human activities. Overloading of snow on the slope, shearing and bonding of snow molecules, vibrations resulting from sound, skiing, earthquake, construction, and explosive blasts etc. trigger the avalanches. According to Schweizer (2003), the triggering of an avalanche can occur as a result of (i) localized rapid near-surface loading by, for example, people or explosives (the latter being called artificial triggering), (ii) gradual uniform loading due to precipitation or other factors, or (iii) a no-loading situation that changes snowpack properties, for example, surface warming (called natural triggering or spontaneous release).

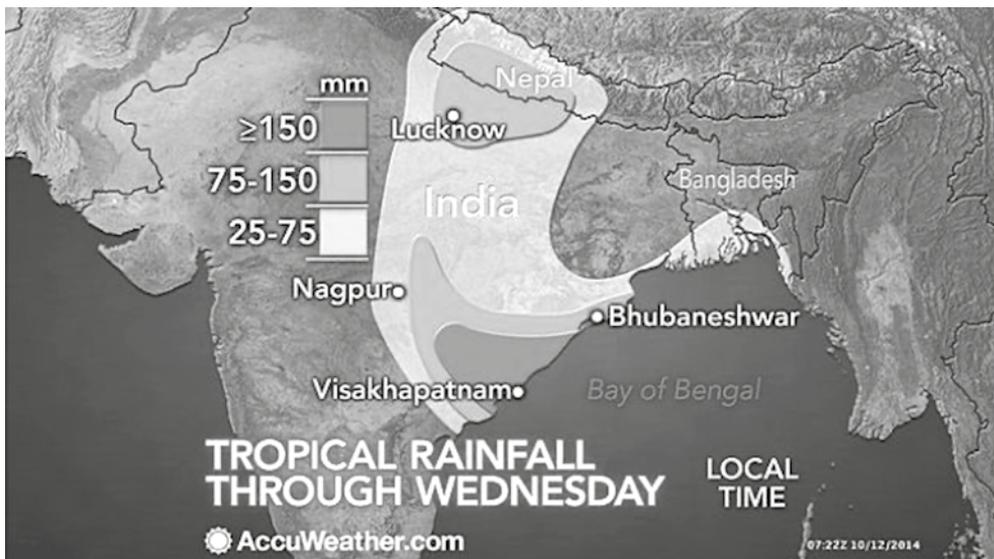


Figure 7: Heavy precipitation (up to 150 mm rain to hit central Nepal; 150 mm rain is nearly equivalent to 3000 mm snow) was predicted in Nepal during the tropical Cyclone Hudhud, begun to form on 6 October 2014 and dissipated on 14 October 2014 (NDMA, 2015) triggered heavy snowstorm in the Annapurna region, killing at least 43 persons (Source: AccuWeather.com).

Complex interactions between the terrain, snowpack, and meteorological conditions lead to avalanche process. The only constant factors for the snow avalanche are the terrain characteristics and slope with an inclination greater than 30° (Corona & Stoffel, 2016). Terrain roughness also influences avalanche formation by hindering the formation of continuous, weak snowpack layers (Schweizer, 2003). The day to day stability of snowpack

is also influenced by the orientation of the slopes with respect to the sun and dominant winds. Most of the factors contributing to snow avalanching are related either to the strength or to the load of snow and its variation over time. In addition to terrain, four essential factors leading to the release of snow avalanches are precipitation (snowfall), wind, temperature, and snowpack stratigraphy (Corona & Stoffel, 2016; Schweizer, 2003). Being the phenomena controlled by climate, snow and ice avalanches are not only expected to be affected by changes in atmospheric conditions, but also by climatic change.

A rock avalanche, sometimes referred to as sturzstrom, is a type of large and fast-moving landslide (Deline et al., 2015). Occurrences of rock avalanches are affected by several factors such as (i) inherent factors (e.g., rock structure, slope form), (ii) preparatory factors (e.g., weathering, climate change), (iii) triggering factors (e.g., earthquake, rainstorm) (Weidinger et al., 2002), and (iv) factors that may affect mobility (e.g., glacier surface) (Pacione, 1999). Permafrost thaw could also trigger the rock avalanche as the freeze-thaw action is conditioned by the temperature fluctuations and volumetric expansion of ice on the slope generally widens existing fractures and prepares for rock failure (Gruber & Haeberli, 2007). Climate change and more extreme weather conditions may also be contributing factors. Earthquakes often trigger avalanches, rock falls and tsunamis (Fujita et al., 2016; Park & Reisinger, 2010). Observations indicate that most natural avalanches are triggered by heavy snowfall (Conway & Wilbour, 1999; Hirashima et al., 2008), a sharp rise in temperature or rainfall (Baggi & Schweizer, 2009; Gauthier et al., 2017) as well as earthquakes (Podolskiy et al., 2010; Pérez-Guillén, et al., 2014; cited in Hao et al., 2018). The 2015 earthquake triggered avalanches in the Mount Everest region and in the Langtang Valley flattened the villages and people were made homeless within less than a minute (Kunwar & Limbu, 2015).

Avalanche risks

Snow, ice, and rock avalanches have frequently been responsible for large disasters in high mountains. Different evidences of avalanche can be observed based on the altitudinal gradient (Zimmermann et al., 1986). Above the snowline, the avalanches occur throughout the year, but especially during and after the summer monsoon. At this region, avalanche can be observed directly. Below the snowline, avalanche occurrences are very rare. Rock avalanche can be observed occasionally at these elevations (Deline et al., 2015).

Nepal is considered as one of the most susceptible countries for the climate risk, according to the Global Climate Risk Index (GCRI), which assesses the impacts of meteorological events in relation to economic losses and human fatalities (Eckstein et al., 2019). The country is in top 20 of all the multi-hazard countries in the world. More than 80% of the population is exposed to the risk of natural hazards (MoHA, 2017), which include water-induced disasters and hydro-meteorological extreme events such as droughts, storms, floods and inundation, landslides, debris flow, soil erosion, avalanches, extreme temperature, and glacier lake outburst floods (GLOFs). The existing mechanisms for developing risk assessments in Nepal are presented in Table 3.

The frequency of avalanches may increase due to the global warming. Nepal Himalaya is experiencing a continuous elevation-dependent warming in the last four decades, i.e., high mountains areas are more rapidly warming compared to the southern lowlands. Maximum air temperature has increased by 0.045 °C/yr and the minimum temperature by 0.009 °C/yr from 1976 to 2015 (Thakuri et al., 2019). Glacial lakes are considered a sensitive indicator of climate change and glacier dynamics (Salerno et al., 2016). In the situation of outburst,

glacial lakes can threaten the downstream communities and have significant socio-ecological consequences. The glacial lakes, mostly located above 4000 m elevation, show heterogeneous rates of expansion in different river basins and by elevation zones, with apparent decadal emergences and disappearances in the Nepal Himalaya. In general, both the number and surface areas of the glacial lakes has increased continuously in the last four decades. Overall, the glacial lakes exhibited ~25% expansion of the surface areas in the last three decades (Khadka et al., 2018). A continued expansion of the glacial lakes is posing the risk of GLOFs threatening the downstream population and infrastructure.

Table 3: Existing mechanisms for developing risk assessments in Nepal (Adopted from UNDRR, 2019)

Assessment Mechanism	Method
Nepal Hazard Risk Assessment (NHRA) 2010	Multi-hazard risk map for Nepal, based on description of the available data, hazard assessment and mapping for earthquakes, floods, droughts, landslides and epidemics at the national level.
Urban Risk Atlas (URA) 2013	The URA was developed based on RADIUS tool for risk analysis. The data input includes base maps, major infrastructure, buildings, critical infrastructure, building typologies and number of people at home when the earthquake occurs as basic for casualty estimations (based on day/night cycle).
Vulnerability and Risk Assessment Framework (VRAF) 2017	VRAF describes a conceptual framework for vulnerability and risk assessment, methodological process for conducting VRAF and provides a set of vulnerable and risk indicators to be accounted for in different sectors, i.e. urban settlement & infrastructure, water resources & energy. This supports the measurement of climate risk to determine climate adaptation priorities and devising climate adaptation strategies.

Policies and legal provisions

The Constitution of Nepal (2015) has identified disaster management as one of the key priorities of all tiers of the government (federal, provincial and local) in the list of the concurrent powers of the federal, provincial and local levels. To meet the vision of the Constitution, a comprehensive Disaster Risk Reduction and Management (DRRM) Act (2017) was endorsed by the Nepal government. Later in 2018, the National Policy on Disaster Risk Reduction 2018 and the National Disaster Risk Reduction Strategic Action Plan (2018-2030) were endorsed, to further strengthen the government's initiatives on DRM (MoHA, 2019; Table 4).

The DRRM Act (2017) focuses on the disaster risk reduction as well as management. The act was developed in the federal context of Nepal and makes provision for the formation of National Disaster Management Council, National Disaster Risk Management Authority, Disaster Management Committees at all three tiers of the government and executive committees at federal and provincial levels. Although this act and its regulations have not focused on the hazard specific disaster, it includes both natural and non-natural disaster. It defines 'natural disaster' as the disaster that is caused due to snowfall, hailstorm, avalanche, GLOF, heavy rainfall, drought, flood, landslide and soil erosion, inundation, storm, cold waves, heat waves, lightning, earthquake, volcano, wild fires and other types of hazards.

Therefore, the act is inclusive of the GHs. Similarly, the act makes provision for declaring any area that has been hit by serious natural disaster as the ‘Disaster Crisis Zone’. This provision is particularly relevant in the context of high mountain areas which are often hit by large, but unprecedented disasters such as landslides, avalanches and GLOFs.

The National Disaster Risk Reduction Policy (2018) mainly aims at reducing significantly the loss and damage of life and property, human health, livelihood and productive resources, physical and social infrastructures, cultural and environmental heritage from natural and human-caused hazards. The policy is aligned with the priority areas of the Sendai Framework for Disaster Risk Reduction (SFDRR). Among 59 SFDRR polices adopted, some of them are directly related in managing high mountain disaster while others are linked indirectly. The policy has put emphasis on providing disaster management information to the general public and stakeholders by developing disaster management information based on Remote Sensing System, Geographic Information System and Open source Technology. It encourages research on disaster risk, mitigation, preparedness, and capacity building on search and rescue, reconstruction and recovery and therefore envisions establishing National Disaster Risk Reduction Research and Training Academy. Although the word ‘avalanche’ has not been mentioned anywhere in the policy document, it aims to continuously monitor glacial lakes and other mountain hazards, and develop and implement forecast-based preparedness and response plan. Much emphasis has been given to the development and implementation of well-functioning early warning system, which is the necessity of high mountain hazards such as heavy snowfall, storms, glacial lake outbursts, and avalanches. The policy encourages the development and use of Web-based systems, Mobile Apps, Short Message Service, Interactive Voice Response, Emergency Telecommunication for the communication of early warning information for effective and timely preparedness and response.

Table 4: Nepal’s legislative frameworks for disaster risk reduction (Adopted from UNDRR, 2019)

Legislation	Purpose	Scope	Responsible Institution
Natural Calamity Relief) Act, 1982 (Amended in 1989; 1992)	First structured disaster policy of Nepal; Legal instrument focusing on disaster response. The Act gave MoHA the responsibility to oversee overall disaster management activities.	National, districts and municipalities	Ministry of Home Affairs
Local Self Governance Act 1999	Delegated administrative power to local authorities on overall local development processes including disaster risk reduction.	Municipalities	Local governance
National Action Plan for Disaster Risk Management 1996	Action plans for pre-disaster and post-disaster phase.	National, districts and municipalities	Ministry of Home Affairs
National Strategy for Disaster Risk Management (NSDRM) 2009	Formulated to set up 29 strategies to transform Nepal’s response- focused disaster management approach to a more comprehensive and proactive risk reduction approach.	National	Ministry of Home Affairs

Nepal's New Constitution 2015	Mentions DRM for the first time under Article 51 and has clearly assigned DRM as a concurrent responsibility for all tiers of government.	National, districts and municipalities	Government of Nepal
Disaster Risk Reduction and Management Act (2017)	Replaces the Natural Calamity (Relief) Act 1982. Sees disaster risk management as a process focusing on different stages of the disaster management cycle.	National	Ministry of Home Affairs
Local Government Operation Act, 2017	Outlines the roles and responsibilities of Urban and Rural Municipalities.	Districts and municipalities	Ministry of Home Affairs
National Disaster Risk Reduction Policy 2018 (Nation DRR Policy)	Serves as the national framework for disaster risk reduction, aligned with the SFDRR, with the vision: Sustainable Development through DRR actions and climate change adaptation.	National	Ministry of Home Affairs
National Disaster Risk Reduction Strategic Action Plan, 2018 - 2030 (NDRRSAP)	Guides priorities of actions towards the concluding years of SFDRR.	National	Ministry of Home Affairs

The National Disaster Risk Reduction Strategic Action Plan (2018-2030) (NDRRSAP) was formulated based on the learnings and challenges of implementing a National Strategy for Disaster Risk Management (2009) to fulfill the commitments made by Nepal as part of the Sendai Framework for Disaster Risk Reduction (2015-2030). The NDRRSAP has identified 4 priority areas and 18 priority actions to be carried out in the short term (by 2020), medium term (by 2025) and long-term (by 2030) basis for disaster risk reduction and management in Nepal. The four priority areas are (i) understanding the disaster risk, (ii) improving disaster risk governance at federal, provincial and local level, (iii) promoting private and public investment for enhancing disaster risk reduction and resilience based on multi-hazard risk knowledge and (iv) improving preparedness for effective response and recovery and build back better. Under the first priority area, NDRRSAP adopts following strategic activities to understand the underlying risk of high mountain hazards such as avalanche and glacial lake outburst flood:

- Establish a real time snow, glacier, and glacial lake observation system;
- Prediction, mapping and scoping of major glacier, avalanche, GLOF affected areas and making that information publicly available;
- Map out the infrastructures, settlement and population (disaggregated) at risk of glacier, avalanche, GLOF in terms of exposure and vulnerability and disseminate the information for public use;
- Prepare glacier, avalanche, GLOF risk sensitive land use plan and make it publicly accessible;

Under other priority areas, the NDRRSAP has emphasized on promoting preparedness, multi hazard early warning system, community-based disaster risk reduction, risk transfer, and

capacity building in search and rescue.

The Local Government Operation Act (2017) has also mandated local governments to take initiatives on DRRM to mainstream in the development, risk reduction and natural resource management. Similarly, the Climate Change Policy of Nepal (2019) aims to reduce the loss of climate-induced disasters to lives and property, health, livelihoods, physical infrastructures and cultural and environmental resources. It aims to enhance and make preparedness and response effective by developing, monitoring, forecasting, and early warning system for disasters including flood, landslide, land erosion, avalanche, drought, lightning, windstorm, heat wave, cold wave, wildfire, fire etc.

The Sendai Framework for Disaster Risk Reduction (2015-2030) is the major international commitments on disaster risk reduction that Nepal has made for managing disaster risk. This was adopted by UN Member States on 18 March 2015 at the Third UN World Conference on Disaster Risk Reduction in Sendai City, Miyagi Prefecture, Japan. The Sendai Framework is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action. The Framework aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years.

Concluding remark

GHs are issues of glacier, snow and ice-covered areas (referred as “cryosphere”) in the northern part of Nepal. The avalanches are triggered by the human activities, earthquake, heavy precipitation and wind and aggravated by the climate change. Climate change can increase the intensity of the hazards, including the increased number of avalanches, rock falls and landslides in the mountain slopes. Due to resource limitations and difficult working environment, limited information is available on the avalanches in the high mountains of Nepal. Yet the risks from these events are growing in many of mountain areas, due to increased populations, infrastructural developments, utility facilities, and even increasing human activities. There are many policies and legislation that are developed for disaster risk reduction and management. Most of them are focused on multi-hazard risk rather than focusing on a single hazard. The existing provisions regarding the high mountain disaster management are focused on understanding the underlying risk of the mountain hazards, developing effective early warning system, and effective warning communication mechanism, capacity building for search and rescue and enhancing the role of local governments for disaster management.

No legislative provision exists for addressing the hazard specific disasters, e.g., avalanche and the high-altitude GHs in the country, but instead exists overarching act and its regulations for both natural and non-natural disaster in the country. A separate policy for addressing the mountain hazards such as avalanche, flashflood and GLOF is required. At the same time, emergency response plan and operating procedure for search and rescue is of immediate need for the large mountain disaster such as the Khumbu avalanche. The visitors and mountaineers visiting in the high mountains need reliable information about the mountain geo-hazards and their associated risks. Satellite-based hazard assessment is an effective technique for certain hazards, e.g., GLOFs, rock fall etc., however field-based in-situ measurements are necessary in most cases. Hazard maps, monitoring of the rock fall events, permafrost conditions, and early information to the mountaineers can aid to make accurate and timely decision.

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Solar ultraviolet (UV) radiation as a potential health hazard in the Himalayas

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Abstract



This paper is an attempt to bring forth situations of UV radiation levels or UV index (UVI) and effects affecting different causes to concerned living beings and on environment in the Himalayas. It has analyzed solar radiation data observed at different locations, covering the elevation range of 2735 meters (m) above sea level (a.s.l.) to 4355 m a.s.l. of the Nepal Himalayas. In addition, existing research

results reported by other researchers on Himalayan UVI and UV guidelines of the World Health Organization (WHO) have been reviewed. The study has identified that mountaineers/climbers are exposed to enhanced high levels of UV radiation due to the coupled effect of the altitude-related increase of UV radiation and the reflection from snow and ice-covered surfaces. Sun protection measures are essential to be applied according to the UVI range/categories associated with existing weather conditions and seasons while out climbing or mountaineering, especially during high-intensity sun hours (09:00–13:30 local time (LT)) in the spring and autumn.

Keywords: *Solar UV radiation, UV Index, Himalayas, health hazard, Sun protection*

Introduction

The sun is the ultimate source of energy for the earth and sunlight is crucial for many processes on the earth, such as heat and production of oxygen through photosynthesis. Different life forms are possible only due to the availability of the right proportion of solar energy at or near the earth's surface. Sunlight (or in scientific terms: solar radiation or electromagnetic radiation) is transmitted in the form of waves with wavelengths in the range of about 0.2 to 2.6 micrometer. The solar spectrum consists of UV rays in the range of 200 to 400 nanometer.

A small amount of UV radiation is beneficial for humans and essential in the production of vitamin D (Holick, 1996; Lehmann, 2005). Also, UV radiation is widely used in industrial processes and in medical practices for a variety of purposes, such as killing bacteria and viruses, phototherapy, sun-tanning, etc. (CCOHS, 1997-2020). Despite being beneficial, prolonged exposure to solar UV radiation may result in sunbite to acute and chronic health

effects on the skin (erythema and cancer), eyes and immune system (WHO, 2002; Moehrle et al., 2003). Regarding the multiple effects on exposed human skin, a well-known mountain guide and climber- Mr. Tshiring Jangbu Sherpa narrates his experiences:

"There are many risks to sunlight. When the sun rays fall on the white snow, its reflection burns the skin of the face and turns it very black, and the evening cold also affects the face. Use of UV cream on the whole face is mandatory. UV cream and protective goggles are thus very much essential for the high mountain trekkers and mountaineers. So I'd like to advise all the mountain aspirants to take precaution to protect toes, nose, hands, ears from the snow-bite and sun-bite."



Tshiring Jangbu Sherpa, (4th times Mt. Everest Summiteer), background of Mt Lhotse, May, 2012

The depletion of the stratospheric (20-25 kilometres a.s.l.) ozone layer leads to an increase in ground-level UV radiation because ozone is an effective absorber of UV radiation. The depletion of the stratospheric ozone due to the release of chlorofluorocarbons and other atmospheric pollutants has been observed for several decades. The changes in the stratospheric ozone and climate over the past forty years have altered the solar UV radiation conditions at the earth's surface (Diffey, 2004; Barnes, 2019). Watanabe et al. (2011) reported that ground-level UV radiation does not return to its previous stage even after recovering stratospheric ozone (part of the ozone recovery was observed in the 1990s compared to the 1980s) due to various interacting processes.

At higher altitudes, a thinner atmosphere filters less UV radiation (Blumthaler et al., 1997; Pfeifer et al., 2006). High elevation areas such as the Himalayas receive more UV radiation mainly due to decreasing amounts of air molecules, aerosols, ozone and clouds in the atmosphere (Schmucki and Philipona, 2002; Sharma et al., 2015). In recent years, there has been growing concern about increasing levels of UV radiation in the sunlight, especially at high altitudes (Barnes, 2019).

In the Himalayan countries, including Nepal, the people reside at around 3000-4000 m a.s.l., and it is of great interest to evaluate irradiances at those altitudes in order to determine the erythemal (erythema: redness of the skin) UV radiation exposure of the inhabitants. In addition, visitors from within the countries and different parts of the world travel and trek to those areas in different seasons for different purposes, such as hiking, trekking, skiing, trade, mountaineering, research, etc. where the degree of UV radiation is almost unknown. Moreover, at high altitude, there is an elevated risk of UV radiation exposure for mountain guides and mountaineers due to the altitude-related increase of UV radiation and the reflection from snow and ice-covered surfaces (McKenzie et al., 1998; Cockell et al., 2001). Painful injuries of snow blindness and retinal burn from intense solar radiation (visible rays and invisible UV rays) reflected by snow or glaciers have been reported by many mountain climbers and recorded as one of the well-known medical emergencies (Moehrle et al., 2003; Isser et al., 2019; Sherpa, 2020). Following is the narrative of a highly experienced Rock and Alpine Guide regarding the effect of sunlight:

“Over the two decades that I've been guiding, I've decided that the greatest enemy to the climber is not the rain, it's not the snow and it's not the wind. Instead, it is the sun. There is nothing more relenting and nothing that will have such dire long term effects as the sun.”



Jason D. Martin, Executive Director, American Alpine Institute, AMGA Certified Rock and Alpine Guide

Very few sporadic and site-specific studies on UV radiation have been carried out in the Himalayas (Singh and Singh, 2004; Pokhrel and Bhattarai, 2011; Sharma et al., 2015). The studies are quite limited and inadequate to make the concerned stakeholders aware. To the best of our knowledge, no studies on UV radiation have been reported from above 2850 m a.s.l. in Nepal Himalayas. The main objective of this study is to present the results of solar UV radiation level or UVI (i.e. a measure of the intensity of UV radiation) at high altitude sites of the Nepal Himalayas. The global solar radiation data observed at the high altitude

meteorological stations were used to calculate the UVI for the respective locations. Additionally, existing research results reported by other researchers on Himalayan UVI and UV guidelines of the WHO will be reviewed to complement the present study.

Materials and methods

Study area

Solar radiation data were collected from high altitude meteorological stations that cover an elevation range of 2735 m a.s.l. to 4355 m a.s.l. in the southern slope of Nepal Himalayas. The stations are scattered and extended approximately 450 km from east to west of the Nepal Himalayas. The details of the study area are given in Table 1.

Table 1: High-altitude (in descending order) meteorological stations in the Nepal Himalayas.

Sites (Name of station)	Latitude (N)	Longitude (E)	Altitude (m a.s.l.)
Khumbu (Dingboche) (DHM)	27° 53' 40"	86° 50' 40"	4355
Makalu (Sipton-La) (DHM)	27° 40' 00"	87° 13' 00"	3980
Langtang (Kyangjing) (DHM)	28° 13' 00"	85° 37' 00"	3920
Khumbu (Syangboche) (GEN-AWS)	27° 48' 36"	86° 43' 12"	3833
Annapurna: Machapuchhare (Fish-tail) - Base Camp (DHM)	28° 32' 00"	83° 57' 00"	3470
Kanjiroba – Hurikot (DHM)	29° 07' 00"	82° 36' 00"	2735

Data

In this study, global solar radiation (direct plus diffused radiation) data from the stations were collected (DHM, 1993-1994; Adhikary, 2012), sorted out and analyzed. Absolute extreme values of instantaneous global solar radiation data recorded once a month (monthly maximum) around local noon (± 1 hour) under clear-sky conditions in Makalu, Khumbu (Dingboche), Langtang, Annapurna and Kanjiroba were selected from the data set covered the period from January 1993 to December 1994. The monthly maximum data were used to calculate monthly maximum UVI and then maximum seasonal average UVI for clear-sky conditions. The data were extracted from the two-year data set in order to calculate maximum possible UVI around local noon under clear-sky conditions at the high altitude meteorological stations.

Similarly, the 30-minute averaged global solar radiation (under all existing weather conditions) data recorded at Syangboche (Khumbu) Glaciological Expedition in Nepal (GEN) - Automatic Weather Station (AWS) for the period from June 1996 to May 1997 (Ueno et al., 1996 & 2001) were processed to obtain monthly mean hourly values. The hourly solar radiation data were then used to calculate diurnal (06:00–18:00 LT) hourly UVI. The purpose of the GEN-AWS data is to illustrate diurnal patterns of UVI that may typically represent the Khumbu region and serve as a reference for other regions of Nepal Himalayas as well. The summer, autumn, winter and spring seasons correspond to the months of June-August, September-November, December-February, and March-May, respectively. The instrumentation details are given in Ueno et al. (1996), Ueno et al. (2001), and Adhikary (2012). Although the study period may seem quite older but the writers have not yet come to know any other such studies carried out until May 2020. Hence this study projects the data as the nearest reference so far.

Solar UV radiation and UVI

Ordinarily, solar radiation is divided into three major energy forms with varying wavelength ranges, namely UV radiation (100 – 400 nm), visible light (400 – 700 nm), and near-infrared radiation (700 – 3500 nm). UV radiation, visible light and near-infrared radiation represent 8.7 %, 38.3 % and 51.7 % of solar energy respectively (University of Calgary, 2020). The sun emits UV radiation in three bands, UVA (315-400 nm), UVB (280-315 nm) and UVC (100-280 nm) (Figure 1). All UVC and approximately 90% of UVB radiation are absorbed by atmospheric ozone, water vapor, oxygen and carbon dioxide, while UVA is less affected by the atmosphere (WHO, 2002; Dhakal, 2009; CCOHS, 1997-2020). Therefore, the UV radiation reaching the earth's surface is largely composed of UVA with a small UVB component. The release of certain industrial chemical pollutants, such as chlorofluorocarbons into the atmosphere, is gradually eroding the earth's protective shield (ozone layer) which stops the sun's harmful UV radiation from reaching the earth (Diffey, 2004; Kerr & Fioletov, 2008; Barnes, 2019).

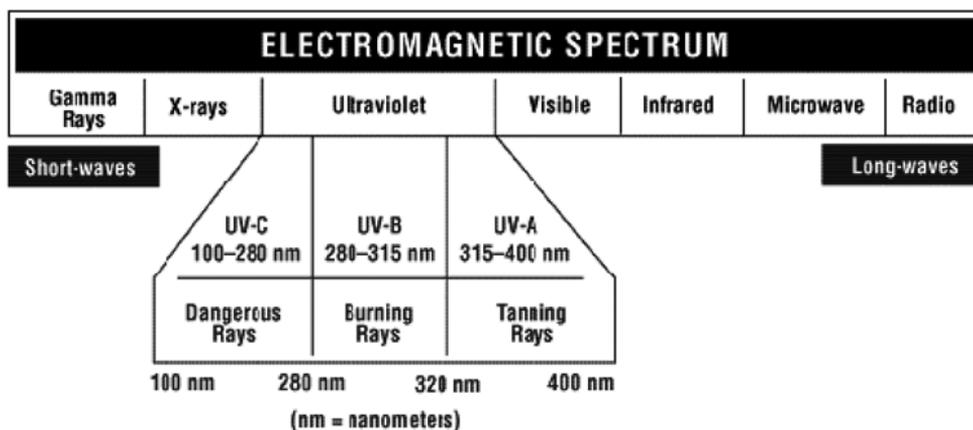


Figure 1: Solar electromagnetic spectrum; shorter wavelengths (higher frequency) have higher energy, thus increasing the effect on chemical and biological systems (Adapted from CCOHS, 1997-2020).

The UVI is a simple and informative index jointly developed by WHO, United Nations Environment Programme (UNEP), and the World Meteorological Organization (WMO) to measure the level of UV radiation exposure (WHO, 2002; CCOHS, 1997-2020). The UVI describes the level of solar UV radiation at the earth's surface that is relevant to effects on the human skin, and is dependent largely on UVA and partly on UVB radiation. UV radiation levels and therefore the values of the index vary throughout the days, months and seasons. The UVI can be measured directly with an instrument (e.g. UVS-E-T broadband radiometer, UVI sensor) or calculated by using empirical equations (Casale et al., 2003; Singh & Singh, 2004; Pokhrel & Bhattarai, 2011).

Methodology

UVI was calculated according to Pokhrel and Bhattarai (2011), who found an excellent quadratic relationship between observed UVI and global solar radiation at a station in Lukla. The equation is

$$Y = 8.6 \times 10^{-6} X^2 - 0.0021X + 0.22$$

Where, Y: UVI, and X: Global solar radiation

Although UV radiation at a place is affected by the atmospheric water vapor and concentration of the ozone layer in the stratosphere, these parameters were ignored in the equation. For this reason, hence the formula especially works in the high elevations, for instance, the Himalayas where the atmospheric effect is smaller. Scatter chart, and line and bar graphs were prepared in excel software.

Results

Figure 2 shows the monthly maximum instantaneous global solar radiation observed around solar noon (± 1 hour) under clear-sky conditions at each high altitude meteorological station. The intensity of solar radiation (solar insolation) is found to be quite high; the parabolic trend clearly indicates that the monthly maximum solar radiation from the late spring to the early autumn was close to the solar constant (a yearly average value: 1367 W/m^2), solar radiation available at the top of the atmosphere where the effects of the atmosphere including the clouds are nil (Johnson, 1954).

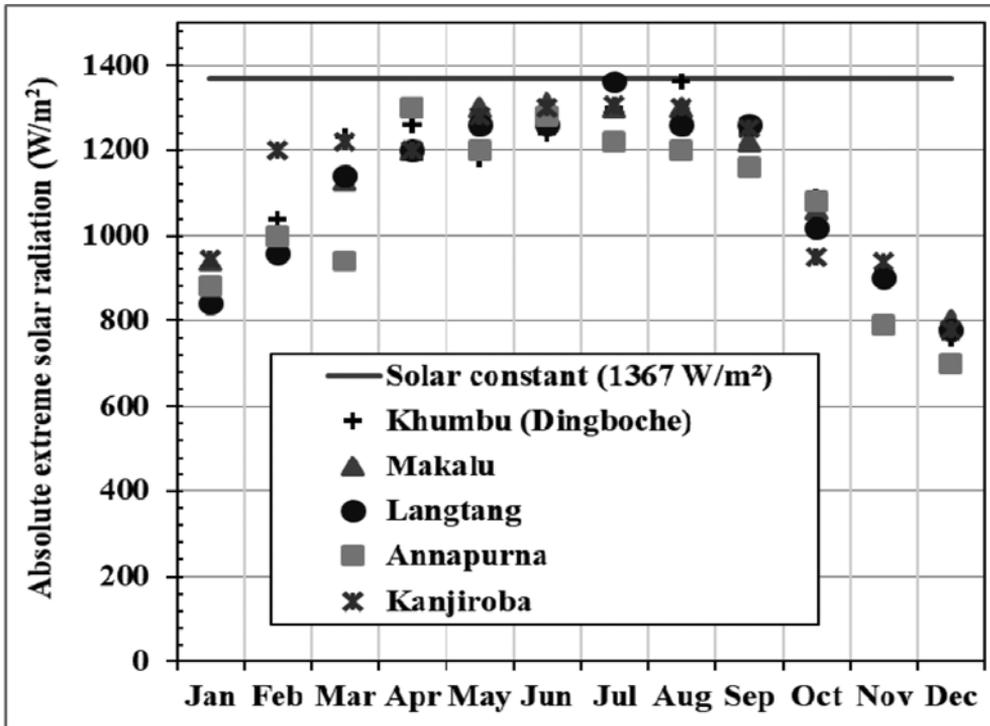


Figure 2: Monthly maximum instantaneous global solar radiation observed around local noon (± 1 hour) under clear-sky conditions at each meteorological station, evaluated from January, 1993 to December, 1994 data. The solar constant (a yearly average value: 1367 W/m^2) is plotted to illustrate how close the maximum values are to the solar energy available at the top of the atmosphere.

Figure 3 shows the maximum seasonal average UVI at each station, calculated from the data shown in Figure 2. The seasonal and spatial variations of UVI are clearly seen. The magnitude

of spatial variation, however, is relatively small; the altitude effect is weaker. In the Himalayan stations, the maximum seasonal average UVI around the local noon under clear-sky conditions were alarmingly high in summer (11–12) followed by spring (9–11), autumn (7–9) and

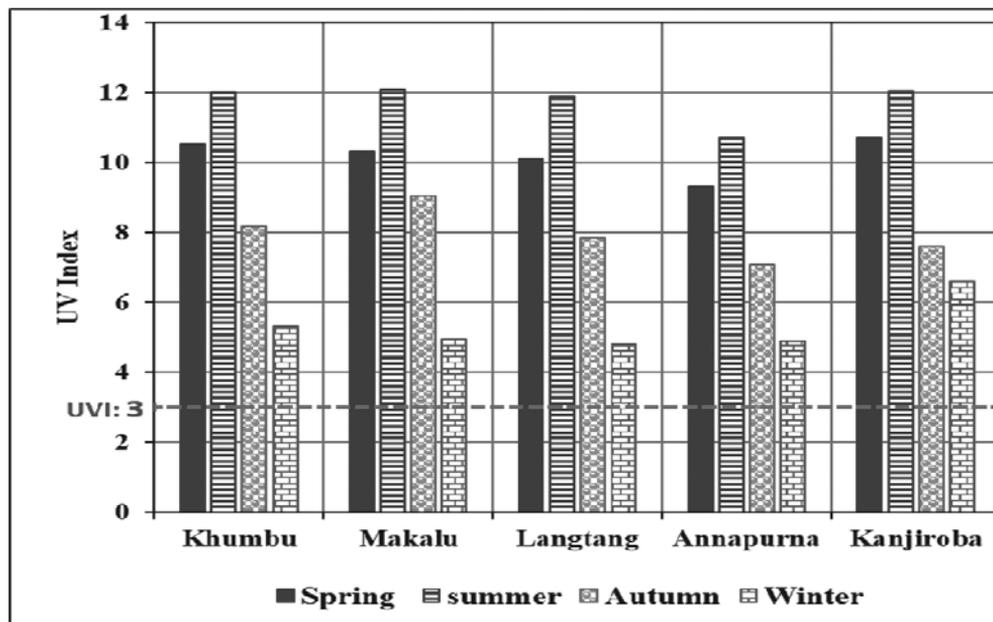


Figure 3: Maximum seasonal average UVI calculated from the data shown in Figure 2 for each meteorological station under clear-sky conditions. The broken horizontal line indicates, based on the WHO guidelines, the level (UVI: 3) above which UV protection is required for outdoor activities.

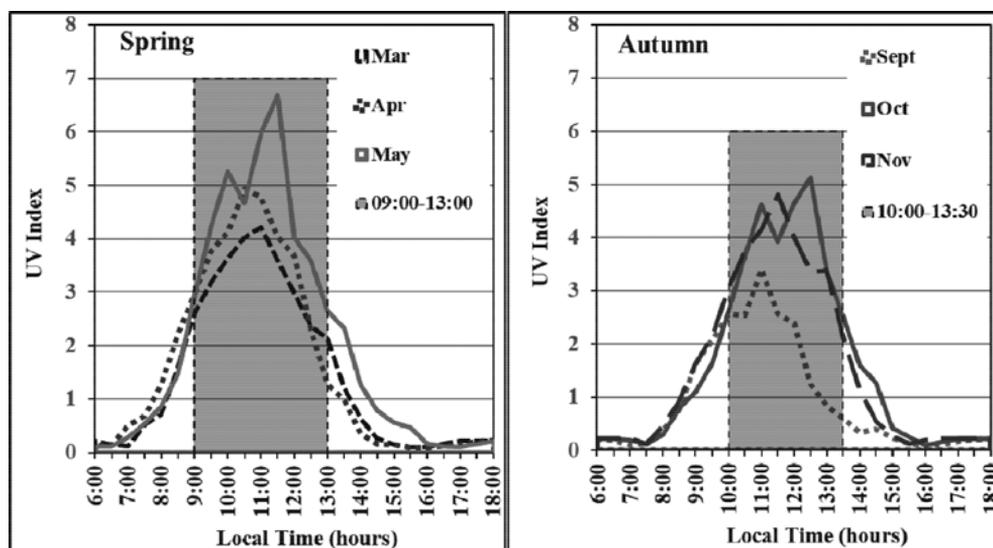


Figure 4: Diurnal variation of hourly averaged solar UVI estimated at Syangboche (Khumbu) GEN-AWS for spring (March-May 1997) and autumn (September-November 1996). The shaded areas indicate time durations during which UV protection measures are required for outdoor activities.

winter (5–7). The seasonal variation of solar UVI is due to the difference in solar zenith angle (solar zenith angle increases from summer to winter) that influences the attenuation of solar UV radiation reaching the earth's surface. The similarities and differences of UVI at the stations may have been influenced by similarities and differences of topography (altitude and aspect) and microclimates.

Figures 4 and 5 show the diurnal patterns and the values of the hourly averaged UVI from June 1996 to May 1997 at the Syangboche (Khumbu) GEN-AWS as an example. The graphs grouped into different seasons shed some light on diurnal scenarios of UVI for different months and seasons at the sites. As shown in Figure 4, the diurnal patterns and trends of the two seasons (spring and autumn) are similar except that the magnitudes of the UVI were slightly lower during the autumn (October: maximum 5.1 at 12:30 LT) than the spring (May: maximum 6.7 at 11:30 LT). On the other hand, the diurnal patterns and trends of summer and winter (Figure 5) are not similar, however, their magnitudes were similar; for example, maximum UVI for August (summer) and December (winter) were found to be 3.7 (at 9:30 LT) and 3.8 (at 12:00 LT) respectively. The implications of the UVI are summarized in Table 2.

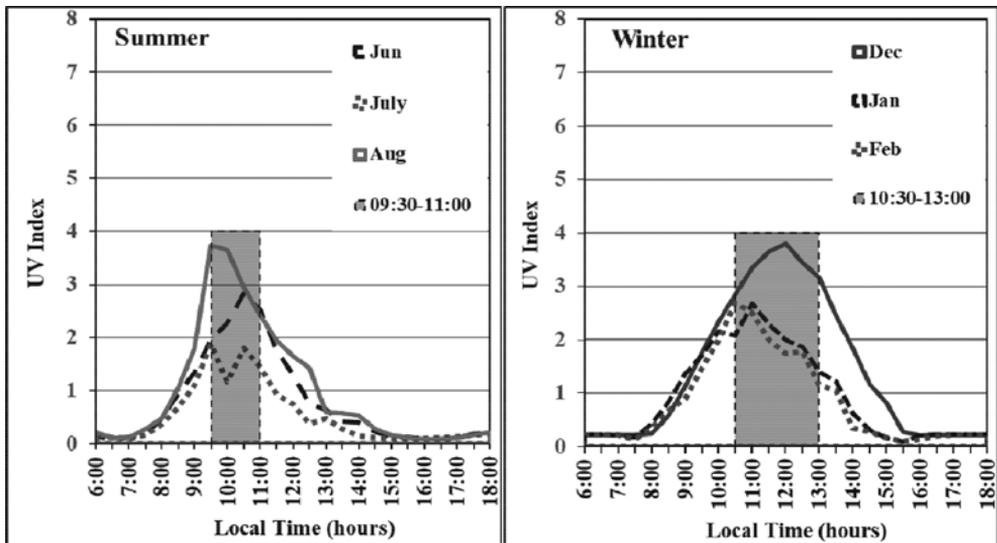


Figure 5: Diurnal variation of hourly averaged solar UVI estimated at Syangboche (Khumbu) GEN-AWS for summer (June-August 1996) and winter (December 1996-February 1997). The shaded areas indicate time durations during which UV protection measures are required for outdoor activities.

Discussion

In the Nepal Himalayas, the solar radiation and its corresponding UVI (11–12) around the solar noon under clear-sky conditions were extremely high in summer (June-August) (Figures 2 & 3) owing to the stronger solar radiation at the top of the atmosphere with shorter path-length of the sun's ray and the negligible effect of thinning atmosphere at higher altitudes. Also, strong UV irradiance in the fine days is due to less atmospheric water vapor with cold climate in the high elevations of the Himalayas (Blumthaler et al., 1997; Schmucki and Philipona, 2002; Sharma et al., 2015). However, in the Himalayas, fine days are quite rare in summer because of the high amount of atmospheric water vapor and a large amount of

prevailing clouds associated with the monsoon (Ueno et al., 1993; Bollasina et al., 2002). As a result, the average UVI should be much lower in summer than spring and autumn with generally clear-sky conditions. The relatively lower UVI in the winter season is due to the shorter winter days with reduced light caused by higher zenith angle in winter, and occasional rain/snow characteristics in the Himalayas (Srivastava et al., 2006). This is supported by the UVI results obtained from the Syangboche (Khumbu) GEN-AWS (Figure 5).

Sharma et al. (2015) reported similar results from Lukla (2850 m a.s.l.); UVI reached up to 9–11.5 during summer months (May–August) under clear-sky conditions, and maximum instantaneous UV value of more than 16 was observed at local noon in a typical clear-sky day of 28 July 2010. Singh and Singh (2004) also observed extremely high UVI values of 15 and 13 on cloud-free clear-sky days (at local noon in July) from western Himalayas (India) at Hanle (4517 m a.s.l.) and Leh (3441 m a.s.l.) respectively. An early study from the Tibet region at Lhasa (3648 m a.s.l.), by Ren et al. (1997) has shown that the UVI at local noon reached as high as 16, with an average value of 9.

The diurnal patterns of the hourly averaged UVI were investigated for each month (season) at the Syangboche (Khumbu) GEN-AWS (Figures 4 & 5). In contrast with the UVI results presented in Figure 3 (under clear-sky conditions), the solar radiation data recorded at the Syangboche (Khumbu) GEN-AWS that have been used to calculate UVI represent all types of prevailing weather conditions. The high values of UVI around midday (local noon) for all seasons are due to higher solar insolation caused by higher solar elevations. The diurnal variability of UVI and hourly maximum value depend also on different factors, such as solar zenith angle, atmospheric ozone, cloud cover and aerosols present in the atmosphere (Sharma et al., 2015; Sharma, 2016). The significantly low UVI in summer compared to other seasons was attributed to the attenuating effects of the high amount of cloudiness, increase in relative humidity and precipitable water molecules in the atmosphere on the incoming solar radiation in Nepal Himalayas (Ueno et al., 2001; Ueno and Pokarel 2002; Bollasina et al., 2002; Pokhrel and Bhattarai, 2011; Sharma et al., 2015). The sudden drop and rise of the UV values around noon, particularly in May and October indicate the attenuating effects of boundary layer clouds intruding to the Himalayas (visual and photographic observation by K. Ueno, 1991) on the incoming solar radiation. Clouds generally reduce solar UV radiation by absorption of sunlight; however, light or thin clouds have little effect and may even enhance UV radiation levels because of scattering from cloud particles (Schmucki & Philipona, 2002; Sharma, 2016).

The WHO (2002) has categorized degree of UV radiation exposure in terms of UVI and has given a color code for each category; less than 2 as low (green), 3 to 5 as moderate (yellow), 6 to 7 as high (orange), 8 to 10 as very high (red) and 11+ as extreme (purple) (Table 2). The WHO advises that the UVI should be presented as a single value rounded to the nearest whole number, and some sort of protection is required when the UVI is 3 or more. The present results from the Nepal Himalayas strongly suggest that extra UV safety precautions are needed, especially around local noon under clear-sky conditions. Similarly, as the UVI of 3 or more were observed during midday sun (spring: 09:00–13:00; autumn: 10:00–13:30; summer: 09:30–11:00; and winter: 10:30–13:00) (the shaded areas in Figures 4 & 5) under prevailing weather conditions UV protection actions must be taken accordingly (Table 2). The higher amount of UVI during spring and autumn (target seasons for mountaineering or tourism) suggests that mountaineers or tourists are vulnerable to the exposure of UV radiation.

Table 2: UV radiation exposure categories and practical sun protection measures for mountain dwellers/mountaineers focusing in the Himalayas (based on WHO, 2002; CCOHS, 1997-2020, and the present research)

UVI	Description	Sun (UV) protection measures
0 - 2	Low	<ul style="list-style-type: none"> Minimal sun protection required for normal activity. If outside for more than one hour, wear sunglasses and sunscreen.
3 - 5	Moderate	<ul style="list-style-type: none"> UVI 4 around midday is common in summer and winter, while UVI 5 is common in autumn. Take precautions — cover up, wear a broad-brimmed hat, sunglasses and sunscreen especially if you will be outside for 30 minutes or more. Look for shade near midday when the sun is strongest.
6 - 7	High	<ul style="list-style-type: none"> UVI 6 and 7 around midday are common in winter (clear-sky condition) and spring respectively. Protection is required as UV radiation damages the skin and can cause sunburn. Avoid the sun at midday and take full precautions. Seek shade, cover up, and wear a broad-brimmed hat, sunglasses and sunscreen.
8 - 10	Very High	<ul style="list-style-type: none"> UVI 8-10 around midday are common in spring and autumn (clear-sky condition). Extra precautions are required as unprotected skin can be damaged and can burn quickly. Avoid the sun between 09:00 LT and 13:30 LT or take full precautions in the sun. Seek shade, cover up, and wear a broad-brimmed hat, sunglasses and sunscreen.
11 +	Extreme	<ul style="list-style-type: none"> UVI 11 or more around midday are common in summer (clear-sky condition). Unprotected skin will be damaged and can burn in minutes. Avoid the sun between 09:00 LT and 13:30 LT or take full precautions in the sun. Cover up, and wear a broad-brimmed hat, sunglasses and sunscreen.
<p>Note: Avoiding the sun and seeking shade may not be applied to mountaineers/climbers. Also, the reflection of snow and glaciers can nearly double UV strength, so it is advisable to wear 100% UV protection sunglasses and apply a broad-spectrum waterproof sunscreen of sun protection factor (SPF) 30+ on exposed body parts.</p>		

At high altitudes where snow and ice are abundant, the degree of UV exposure would be much higher because of reflection from snow and ice-covered surfaces. For example, McKenzie et al. (1998) and Henderson et al. (2010) reported that clean fresh snow can reflect up to 90% of UV radiation on a sunny day. This means that one can be exposed to almost a double dose of UV – directly from the sun and reflected of snow-covered surfaces. Also, according to Blumthaler et al. (1997), Schmucki and Philipona (2002), Pfeifer et al. (2006), Sharma et al. (2015) and Barnes (2019), erythematous UV radiation levels increase by as much

as 10-35 % per 1000 m increase in altitude, and the altitude effect in winter is higher (about 20% per 1000 m) than that in summer (about 15% per 1000 m). Hence mountaineers/climbers are exposed to extremely high levels of UV radiation due to the coupled effect of the altitude-related increase of UV radiation and the reflection from snow and ice-covered surfaces.

The UVI results from different locations of the Nepal Himalayas, western Himalayas (India) and Tibet revealed an extremely high intensity of UV radiation during clear-sky conditions followed by moderate to high intensity during prevailing weather conditions. The results and the UV radiation exposure categories together with respective sun protection measures (WHO, 2002; CCOHS, 1997-2020) (Table 2) suggest that the inhabitants and mountaineers visiting the high altitudes, such as the Himalayas, are considerably at high risk to UV radiation health hazard and serious protection measures should apply, particularly during spring and autumn when the weather is relatively fine and mountaineering activities are favorable.

Conclusion and recommendation

In this study, global solar radiation data observed at different locations, covering the elevation range of 2735 m a.s.l. to 4355 m a.s.l. that are scattered and extended approximately 450 km from east to west of the Nepal Himalayas were analyzed. The data then used to calculate the UV radiation level (UVI) for the respective locations that are popular for mountaineering activities. Additionally, a few existing research results on UVI reported by other researchers from the Indian Himalayas and Tibet, and WHO UV guidelines were reviewed.

The main results and recommendations are briefly summarized below.

- The maximum seasonal average UVI around midday under clear-sky conditions at the high altitude meteorological stations were alarmingly high in summer (11–12: very high/extreme) followed by spring (9–11: very high), autumn (7–9: high/very high) and winter (5–7: moderate/high). However, in the Himalayas, fine days are quite rare in summer because of a large amount of prevailing clouds associated with the monsoon that result in a much lower average UVI level than that of other months/seasons.
- In Khumbu, UVI around midday under prevailing weather conditions were minimum during summer (4: moderate) and winter (4: moderate), compared to spring (7: High) and autumn (5: moderate). The UV protection actions should be taken during midday; spring: 09:00-13:00 LT, summer: 09:30-11:00 LT, autumn: 10:00-13:30 LT, and winter: 10:30-13:00 LT.
- Sun protection measures should be applied according to the UVI range/categories associated with existing weather conditions and seasons (see Table 2) while out climbing or mountaineering, especially during high-intensity sun hours (09:00–13:30 LT).
- Mountaineers/climbers are exposed to extremely high levels of UV radiation - one of the potential mountaineering health hazards due to the coupled effect of the altitude-related increase of UV radiation and the reflection from snow and ice-covered surfaces.
- In order to gain a greater level of understanding of the distribution of UV irradiance in the Himalayas, more simultaneous measurements of solar radiation and erythemal UV radiation at various spatial/altitudinal locations in different seasons are needed.

Acknowledgement

We acknowledge the Department of Hydrology and Meteorology, Ministry of Energy, Water Resources and Irrigation, Government of Nepal for providing solar radiation data used in this study. We thank Prof. Dr. T. B. Chhetri for critically reviewing this paper and providing important comments and suggestions. Mr. Romnath Gyawali, CEO and Campus Chief of Nepal Mountain Academy (NMA), and Prof. Dr. Ramesh Bajracharya, Senior Faculty of Tri-Chandra College & NMA inspired one of the authors to write this article; we sincerely thank them for their contributions.

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Book Review

Tourism in Mountain Regions: Hopes, Fears and Realities A Critical Review

This 110 pages brochure book is published by the Department of Geography and Environment, University of Geneva, the Centre for Development and Environment, University of Bern, and the United Nations Environment Program in 2014 and edited by the editors: Bernard Debarbieux (UNIGE), Mari Oiry Varacca (UNIGE), Gilles Rudaz (OFEV), Daniel Maselli (SDC), Thomas Kohler (CDE), Matthias Jurek (UNEP).

The publication has been made with a clear purpose of informing the sustainable tourism development situation to the concerned stakeholders of sustainable tourism entrepreneurs and policy makers around the globe.

Martin Dahinden (Director General SDC) and Dr. Martin Ledolter, (Managing Director of ADA) very aptly synthesize the much coveted and feared sectors of sustainable development aspects of the world where countries and communities vie and interact for tourism development as a tool for national and community level economic opportunity. In their *Foreword* Mr. Dahinden and Dr. Ledolter bring out the hopes and fears enveloped in ground realities in the following words:

The economic potential tourism holds, for many – although not all - mountain communities, is quite clear: in most mountainous regions of the world, people have limited possibilities for generating income. Agriculture, forestry and animal husbandry form the backbone of local economies, but these contend with shallow soils, harsh weather conditions, and low market competitiveness. Therefore, diversification of livelihoods is often not a choice, but a necessity for mountain households.

The writers seem to have addressed Nepal's own acutely felt mountain tourism experiences.

Mountain ranges offer possibilities to all kinds of tourists: sport fans come for hiking, climbing or skiing. Others come simply to appreciate beautiful landscapes. In remote valleys and on mountain peaks, many endemic plants invite visitors to discover unique biodiversity. Those interested in cultural heritage find compelling destinations along Andean Inca trails, in the rock churches of Ethiopia, or at sacred Buddhist sites and ceremonies in the Himalayas.

These words speak the minds of the people of the tourism industries who have long felt the necessity of immediate efforts to execute appropriate mechanisms of sustainable development works in the tourism sectors but somehow lack the effective coordinating factors at the local and policy making levels. The result is dissatisfaction at all levels. The book is an effort to respond the anomalies felt and bring both the entrepreneurs and the policy makers at the front to make them aware of the situation.

This review work is limited to its debate focusing particularly on Nepalese concerns for tourism in the mountains. As the book has tried to encompass almost all the continents in bringing most of the nagging issues and also highlighting brighter sides of tourism so as to disseminate the high and low of possibilities to the concerned stakeholders.

The book is divided into six evenly-spread-out chapters which cover 28 thoroughly studied

scholarly yet practically discussed issues which have market and policy driven ideas. The review section, however, covers the main six papers from chapter two simply because the other remaining papers are case studies which in many ways are repetition of the ideas expressed in the second chapter works. All the ideas represent the authors' own experiences and the editors' well balanced critical reviews of the relevant sectors. All the chapters are headed by succinctly prepared introductory remarks which show the editors' hard work gone in to the preparation of the publication. These introductory discussions briefly summarize the papers in the particular chapter and offer critical reviews as well. In overall perspectives the authors seem very well aware of the sustainable tourism development situation. They believe:

...tourism carries risks of harming ecological goods and services, compromising cultural identities, and increasing social inequalities. Tourism is not a "one size fits all" solution, as there are various factors and conditions that need be considered if tourism development is to be a lasting success. These range from favorable weather to reliable transportation infrastructure, from diverse and high quality services to social and political stability, and include minimal administrative requirements, such as means for issuing visas and other permits. (5)

The ideas obviously express the hopes and fears in the sectors but they also are equally aware of the realities of developmental and administrative loopholes and obstacles that hamper the path. Nepal's present situation cannot express itself better than this globally felt tourism phenomena. The concerned authorities like the two scholars in their *foreword* have voiced the highs and lows of tourism sectors even in the developed regions, "Switzerland and Austria have both experienced the bright as well as the dark sides of tourism" (5). Hence they might have felt the necessity to bring out a work that could argue well and set forth agenda pertinent to all the burning issues of various sectors in sustainable development of tourism, "This is why the decision was made to jointly finance a publication that addresses and explores the key issues and opportunities of sustainable mountain tourism at a global scale" (5).

This book sheds light on mountain tourism by focusing on the economic, ecological and social dimensions which constitute the pillars for sustainable development. In seeking paths toward sustainable mountain tourism, the text explores important case studies from all over the world which suggest both attractive examples and mistakes to avoid.

Once again Mr. Dahinden and Dr. Ledolter set out their views, "Our hope is that this publication will inspire both policy makers and practitioners to move towards sustainable tourism development in mountain regions, benefiting local communities while inspiring visitors from around the world" (5).

In line with the views expressed in the foreword, most writers have viewed the various sectors of tourism with hopes and fears. In the first introductory chapter "Challenges and opportunities for tourism development in mountain regions", the three writers Bernard Debarbieux, Mari Oiry Varacca, Gilles Rudaz debate that the abundance of protected natural areas in mountain regions, while providing a solid foundation for tourism, is not a guarantee of sustainability. Admittedly, such areas can contribute to the responsible management and protection of environmental resources, and they are often tourist attractions in their own right. But protected areas are also subject to a number of threats: overuse, antagonism from local residents who may receive little economic benefit and may even deny access to visitors. It is also important to keep in mind that, although tourism, in the best of worlds, is an important motor for economic growth, the redistribution of wealth, and the social development and empowerment

of local populations, this activity is particularly vulnerable to a number of factors: climate change, political and economic crises, internal instability, and competition for resources (11).

The second chapter which introduces six papers which are the primary concerns of this brief review is titled 'Cultural diversity and social change' and it highlights the globally experienced common factors that tourism is associated with and supposed to have affected: communities and their cultural aspirations. The pros and cons experienced have their own stories of success and failures. Debarbieux argues that the diverse impacts of tourism on culture and identity are perceived locally as bringing both possibilities and dangers (15). Nepal has a significantly experienced cultural effect during the 1960s when international visitors had started pouring in for various purposes and Hippies had their own special interests. Till today the footmarks are visible in the heartlands of Basantapur Durbar Square and *Jhanchhe* or popularly known as the *Freek Street* where the Hippies had created and felt their own haven. Economic growth is very clearly visible but the cultural erosion experienced among some very traditional Newar host communities in terms of loose and open physical behaviors, open dress patterns, and personal or self-gratification through toxic substances like hashish and opium consumption understood as western identities have had negative impacts. High mountain trekkers and mountaineers have had their own impacts onto the Nepalese highlanders like the Sherpas and other communities. Again social and cultural acculturations have been felt with both socio-economic and cultural impacts.

Nigerian northern mountains and local sustainable tourism is the concern of the first paper 'Tourism and the Tuareg in the Air Mountains of Niger' by Marko Scholze. Marko argues that if the locals have to remain in tourism business then the traditional format must be followed. He argues that in the Air Mountains, tourism provides opportunities for Tuareg men and women of diverse social strata to diversify their sources of income. Beyond the economic benefits to individuals, tourism helps generate taxes for the communes. Camel tours (*meharees*) are especially suitable for tourism development in the region, as they are consistent with local cultural practices and appropriate to the fragile natural environment. Security will have to be restored to the region if tourism is to enjoy a renaissance. When that occurs, it will be important to foster an ongoing process of professionalization and training of the Tuareg involved, be they the owners and staff of the travel firms, or the artisans, smiths and merchants who produce and sell handicrafts to tourists. In this way, sustainable, equitable and culturally appropriate tourism practices may be promoted and extended (19).

Be the Nigerian camel tours or Nepal's Chitwan and Bardia's elephant rides in the national parks, both entertain some traditional means of transportation which otherwise are exotic for the Europeans or American visitors.

The next paper 'All-terrain vehicles and Mother Earth: tourism, identity and the Dakar Rally in Bolivia' is an argument on the ambivalence of tourism product like Dakar motor rally vs economic perspectives and environmental issues. Yuri Sandoval and Sébastien Boillat who have produced this paper for their academic purpose bring out these dual facets of modern form of tourism product. They mention that in January 2014, for the first time, two stages of the Dakar Rally were disputed in Bolivia. The Bolivian government was very active in promoting the event, paying a 2 million dollar membership fee to ASO, the French company organizing the rally, and investing in infrastructure to enable the event to take place. The economic benefits of the rally to Bolivia, however, remain unclear. The largely off-road long-distance rally, which currently entails hundreds of cars, motorcycles, trucks and all-terrain

vehicles crossing principally Argentina and Chile, was promoted in Bolivia to boost tourism in the Southern Altiplano, a high-altitude arid region inhabited mainly by indigenous people, and home to the emblematic Salar de Uyuni, the world's largest salt flat and one of Bolivia's principal attractions (20).

This is one of the most unusual experiences which runs against the very notion of eco-friendly or sustainable approach to tourism activities. The local government's support to such event is a lesson to the rest of the global partners.

'Pilgrimage in the transboundary Kailash Sacred Landscape' is the first work that mentions Nepal and highlights the importance of high mountain tourism in the form of pilgrimage touristic destination. The authors Marjorie van Strien and Rajan Kotru discuss that the remote south-western portion of the Tibet Autonomous Region of China, together with the bordering districts of Nepal and India, is a global 'cultural hotspot' of historical and spiritual significance. The area represents a sacred landscape for over one billion people in Asia and around the globe, and is considered holy by a number of religions, including Hindu, Buddhist, Bon Po, Jain, and Sikh. As hundreds of thousands of visitors come to this unique landscape to pay homage and their visits return abundant economic opportunities to the local and people enroute who support in the logistic management to the visitors. But because of such heavy frequency of outsiders' encroachments to this holy high mountain negative impacts have become visible. The authors opine that its deep and rich cultural diversity has become threatened in recent years by the impact of poverty, globalization, and unregulated development, challenging the sustainability of local livelihoods and ecosystems. This situation is now further complicated by perceptible climate change, which is likely to worsen in the years to come, thereby placing further demands on practices and policy to adapt (22).

Taking considerable insights from such experiences, the researchers conclude that the initiative seeks to improve communication between the corresponding country partners, for example, by facilitating a mentorship program featuring joint visits to other landscapes featuring international cooperation, and by working to deepen ownership of an agreed set of principles for project planning and implementation, including good governance. Transboundary cooperation requires a conducive political atmosphere; it must grow organically within the framework of what is, at times, a fragile balance. Responsible tourism, a widely shared interest, has proven a promising vehicle for international cooperation, communication and action in the Kailash Sacred Landscape.

The fourth paper 'Agrotourism and the development of multiple professional identities in the Austrian Tyrol' is a much favored area of tourism development sector as it's a worldwide available form of work and yet less concerned entrepreneur product. But author Markus Schermer has researched on one of the successful stories. He reports that over the past fifty years, tourism has played a pivotal role in sustaining farming as a livelihood in the mountainous region of Tyrol, Austria. The most complete integration of tourism into the economy of a farm is probably reflected in the offering of farm stays, or vacations on a farm. Currently about one third of the 15,000 farms in Tyrol offer on-farm accommodation, and about 400 have specialized in this activity, forming part of a professional association called 'Holidays on the Farm (24).

This Austrian experience can be an upfront and inspiring source of information to a country like Nepal which primarily boasts as a country of plains and mountain-farmers and thus agrotourism could be an organized sector to boost an eco-friendly and sustainable tourism area.

The fifth paper 'From electrometallurgy to outdoor recreation in Vicdessos (Ariège, French Pyrenees)' offers an opportunity to the concerned stakeholders' knowledge how one closure opens up another avenue. Pierre Dérioz explains that for the small mountain territory of Vicdessos, the closure of the Pechiney metallurgy plant in Auzat, in 2003, brought to an end a century dominated by industrial activity. The closure has led to a new economic project based on tourism development. The shift from aluminum electrometallurgy to outdoor recreation will entail a far-reaching change in local cultural identity, seen as key to the success of the project and the employment opportunities it envisions based on new economic foundations. This is a lesson to the policy makers how a premeditated effort can transform one aspect of development to another even more worthy enterprise.

'Heritage policies and the renewal of local communities in the Carpathians' is a work that ignites hopes in the regions that prides itself as a home of heritage grandeur. The writer Zbigniew Niewiadomski mentions that in the Carpathian Mountains of Central, Eastern, and Southern Europe, an international Convention is helping to advance sustainable development, environmental protection, and heritage preservation.

The Carpathian Mountains, a region of high cultural and biological diversity, extend into the territories of seven states: the Czech Republic, Hungary, Poland, Romania, Serbia, the Slovak Republic, and Ukraine. In 2003 in Kiev, Ukraine, these states signed the Framework Convention on the Protection and Sustainable Development of the Carpathians (Carpathian Convention). Among the Convention's many goals is the strengthening of local communities in this mountain region and finding synergies between sustainable tourism development and heritage preservation. The richness of local cultures in the Carpathians, a melting pot of Roman and Byzantine rites, developed from interactions and exchanges between various nations and ethnic groups who migrated and settled along the range between the 13th and 17th centuries (28).

The last sixth paper 'Cultural routes: serving tourism, local economies and landscape' mentions Nepal as well for its experiences in cultural route and tourism. The writers Guy Schneider and Werner Paul Meyer report that in recent years, the concept of 'cultural routes', developed in Switzerland, has attracted interest not only in European countries but also in the Himalayan region. In May 2010, the International Centre for Integrated Mountain Development (ICIMOD), based in Kathmandu, invited ViaStoria, a Swiss entity dedicated to protecting and promoting historical transport routes, to share its experiences. One of the most nagging issues was brought up to the front where adventure lovers lamented for this very popular trekking trail's loss.

The decline of the formerly attractive Annapurna round trek is a notable example of how this kind of ill-planned or destructive development can undermine the economic opportunities that trekking provides local populations. Interest in trekking in the Himalayas, which offer exceptional opportunities to experience culture, history, and vistas that include the highest mountains in the world, is increasing. The implementation of a network of 'Trans-Himalayan Heritage Routes, analogous to the Swiss Cultural Routes, combined with well-directed poverty alleviation measures, could have several benefits: preservation of historic routes and their associated monuments as a valuable cultural good; and preservation of the cultural landscape.

The book's third, fourth and fifth chapters deal more or less the similar experiences discussed above. The remaining works are individual case studies of different countries which have

dealt with all the available traditional forms of tourism activities yet one or two stand out as exemplary experiences because of their dedicated efforts.

The conclusion part is the last sixth chapter ‘Moving from hopes and fears to sustainable realities’ by Bernard Debarbieux, Matthias Jurek, Thomas Kohler, Daniel Maselli, Mari Oiry Varacca. The writers have come to understand that the initiatives to develop sustainable tourism presented in the case studies correspond to relatively recent endeavors, many with short track records. Monitoring and comparative analysis will be crucial for future development-oriented research, which should aim to further identify relevant practices and lessons learned, while refining policy advice for genuinely sustainable tourism development.

The book is undoubtedly a commendable effort on the part of the organizations involved to disseminate the commonly experienced yet not very vocal in the international arena for real time planning and execution of tourism sectors. Mere benevolent remarks alone won’t be sufficed to bring the needed result to the concerned communities as such. Hence this effort is to gear up them to move forward with stories to share with one another’s success and pitfalls. Once realities are realized then fears may pave the way for hopes.

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NEPAL MOUNTAIN ACADEMY