



Contents lists available at ScienceDirect

Environmental Development

journal homepage: www.elsevier.com/locate/envdev



The cultural context of climate change impacts: Perceptions among community members in the Annapurna Conservation Area, Nepal



Susanne Becken^{a,*}, Anu Kumari Lama^b, Stephen Espiner^{c,1}

^a Department of Tourism, Leisure, Hotel and Sport Management, Griffith University, Gold Coast campus, QLD 4222, Australia

^b Institute for Regional Geography, Julius-Maximilian-University, Wuerzburg, Germany

^c Environment, Society & Design, PO Box 84, Lincoln University, Lincoln 7647, Christchurch, New Zealand

ARTICLE INFO

Article history:

Received 24 February 2013

Accepted 10 May 2013

Keywords:

Nature-based tourism

Climate change

Risk perceptions

Nepal

Local climate knowledge

Culture

ABSTRACT

There is increasing empirical evidence that the climate in Nepal is changing and will continue to do so for the foreseeable future, with substantial impacts on the long-established ways of life of the local people. The development of responsive actions, or climate change adaptation, hinges on understanding how people make sense of changes in their local climate and how they interpret associated risks and opportunities. Based on a qualitative case study with 30 tourism stakeholder participants in the Annapurna Region of Lower Mustang, Nepal, this research explored people's understanding of climate change and their perceptions of different levels of impact. The range of perceived impacts is discussed against the background of multiple livelihoods and diverse cultural interpretations. Participants, while not always scientifically 'accurate' in their assessments, displayed a high level of engagement with, and understanding of their local environment and climate. The results of this study provide further testimony to the value of local knowledge on relevant climate parameters and impacts, and the role it could play in enhancing the usefulness of macro-level climate projections, as well as local-level climate change adaptation initiatives.

© 2013 Elsevier B.V. All rights reserved.

* Corresponding author. Tel.: +61 7 555 28827.

E-mail addresses: s.becken@griffith.edu.au (S. Becken), LAMA_1125@yahoo.com (A.K. Lama), stephen.espiner@lincoln.ac.nz (S. Espiner).

¹ Tel.: +64 3 325 3838.

1. Introduction

Heralding the arrival of climate change as a political issue and emphasising the wide-ranging impacts on the Himalayas ahead of the 2009 UN climate summit in Copenhagen, the government of Nepal held its cabinet meeting at the base of Mount Everest. Despite national politicians' efforts to raise international awareness, a global Gallup survey showed that half of Nepalese citizens knew nothing about climate change, and an additional 12% had never heard of it (Gallup, 2009). According to the survey, awareness was lowest in rural areas, even though it is the rural populations that are more likely to experience the impacts of climate variability and change, given their immediate dependence on the natural environment. In order to improve understanding about the possible impacts of climate change on rural people's livelihoods as well as future adaptation options, it is important to study how climate assessments integrate with other socio-economic changes (NTNC, 2008).

There is increasing empirical evidence that the climate in Nepal has been changing and will continue to do so for the foreseeable future (Shrestha et al., 1999; OECD, 2003). Changes have been particularly marked at higher altitudes with temperatures in the Trans-Himalaya having risen by between 0.03 and 0.07 °C per year, and 1.8° in total, over the last 25 years (ICIMOD, 2010; Shrestha et al., 1999). Research indicates that climatic zones in Nepal have shifted (e.g. increases in monsoon precipitation and more erratic rainfall) with locals experiencing increasingly unfavourable conditions for agricultural activities (Malla, 2008). Climate models project temperature increases in the order of 2.8° by 2060 and up to 4.0° by 2090 (NCVST, 2009), with increases most pronounced in the winter months. Among the predicted impacts of these climate changes are early snow-pack melt, receding glaciers, and increasing risk of glacial lake outburst flow. Seasonal snow packs are critical as they supply melting water and feed river systems on which livelihoods in lower regions depend. Across the Greater Himalaya region the typical contribution of snow and glacial melt to river flows is between 5 and 45%. The contribution of melt water is particularly important in years when the monsoon rain was weak (Xu et al., 2009). Changes in precipitation patterns and more frequent extreme events have been predicted for Nepal (Shrestha et al., 1999; Nyaupane and Chhetri, 2009; ICIMOD, 2010).

Information about the science of climate change and associated biophysical impacts is essential for the development of adaptation policies and measures; however these risk being incomplete, irrelevant, or difficult to implement without adequate acknowledgement of public attitudes, beliefs and perceptions about climate risks (Patt and Schroeter, 2008; Sakurai et al., 2011). Lack of cultural understanding may even result in maladaptation (Adger et al., 2013). However, many impact assessments still fall short of an in-depth understanding of how people make sense of climate change and how this shapes their responsive actions (e.g. Byg and Salick, 2009). Climate change perceptions are influenced by many factors, such as perceived ownership of the problem, perceived responsibility, various biases, and personal experiences or memories of climatic events (Patt and Schroeter, 2008). Importantly, and critical to the case study presented in this paper, perceptions of risks, such as climate change, and the processing of relevant information are also shaped by cultural dimensions (Whitmarsh, 2011). Culture frames the way people perceive, understand, experience and respond to key elements of the world in which they live (Heyd and Brooks, 2009; Hulme, 2009). Cultural processes and structures can also act as major social barriers to climate change adaptation, for example through norms, institutions and differential "opportunity structures" (Jones and Boyd, 2011, p. 1264).

Taking a case study approach, this research explored tourism stakeholders' perceptions of climate change in the Lower Mustang region of the Annapurna Conservation Area, Nepal. The study adopted a qualitative approach in which the researcher in the field (Ms Lama) sought to build "practical wisdom" (Manuel-Navarrete et al., 2011, p. 251) by spending extensive time in the case study area, interviewing key informants and reflecting on how the context shapes perceptions. This researcher had previously worked in the area as an ACAP Tourism Officer, affording 'insider' knowledge of the research context in the earlier phases of the research, enabling access to the area and its people, and presenting the opportunity to build on existing rapport and trust. The aim of this research was to examine how locals interpret the concept of climate change, and whether they perceive, based on their personal experience, that the climate is changing (Akerlof et al., 2012). The role of the social-cultural context as an integral part of people's experiences and perceptions has been given particular

consideration. The focus was on stakeholders involved in tourism, because tourism is at the core of substantial changes to settlements and livelihoods in the Annapurna Region (Nepal, 2007). At the same time, tourism stakeholders are deeply embedded in the multiple livelihood approach that is so important for this region.

2. The case study: Annapurna Conservation Area

The Annapurna Conservation Area (ACA) is among Nepal’s most important mountain Protected Areas, hosting globally significant biodiversity, providing ecosystem services, and offering development opportunities for the local population, mainly through tourism. The focus of this research is on the seven Village Development Committees (Fig. 1) of Lower Mustang that are part of the internationally acclaimed Round Annapurna Trek. The north, being located in the trans-Himalayan zone, has a distinct, desert-like climate with low precipitation, strong winds and rapid evaporation. Without the high Himalayan range as a barrier, the south experiences much higher rainfall and lighter winds, making it the greenest part of Lower Mustang. Annual maximum temperatures occur in June and reach their lowest in December or January (Regmi and Adhikari, 2007). Living conditions in this remote mountain region are challenging, because of difficult access, fragility of ecosystems, diverse natural hazards, and marginality of livelihoods (Manzardo, 1982). Lower Mustang represents a complex social-ecological system, which is characterised by constant interactions between the local and global economies (including those related to tourism) that occur against the background of culture and religion that shape the every-day life of local communities.

Lower Mustang is home to a number of ethnic groups (e.g. Gurung, Bista and Thakali), amongst which the Thakalis are the dominant population (Macfarlane and Gurung, 1990). The Thakalis are

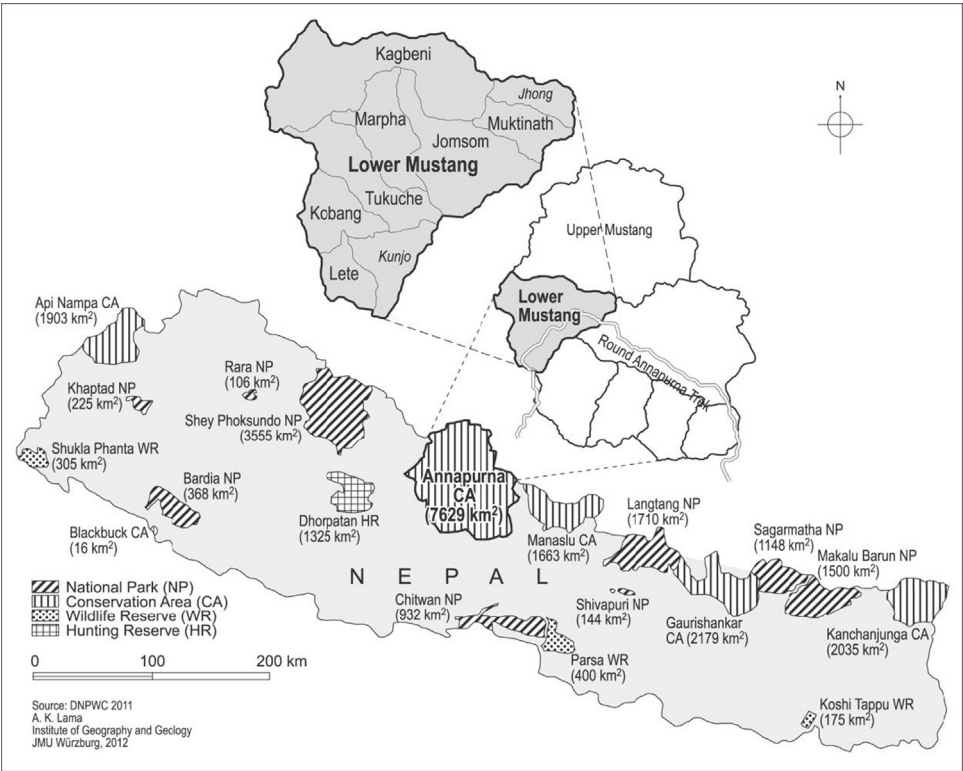


Fig. 1. Map of the Annapurna Conservation Area and lower Mustang.

agro-pastoral and trading people, with a history of adaptation to changes in their social, religious, economic and political environments. The religious system that underpins the Thakali ways of life is influenced by various layers of belief, including Shamanism or Bon, Buddhism and Hinduism (Messerschmidt, 1982). In Thakali religion, the mountains are not just a physical structure but an abode of God. Thakalis consider Mt. Annapurna as “Goddess of the Heaven – the Divine Mother Provider”, and they also assign Gods to specific weather conditions and forms of landscape. Praying for the god of rain is an established practice for seeking more rain in times of drought, or less rain during heavy rain events. Worshiping the mountains is seen as a critical component of the cultural responses in securing the livelihood of the local people. Culture also defines social relations (Wildavsky and Dake, 1990) and creates hierarchical structures, for example in response to caste, class, or gender. Specific structures for resource governance have developed amongst Thakalis (Kvaloy and Sandvik, 1992). The *Mukhiya* (Village headmen) system is an indigenous, informal governance system that guides the allocation of resources. The *Mukhiyas* play a crucial role in facilitating all decision-making related to land, water and labour (Messerschmidt, 1982), and they now collaborate closely with the Annapurna Conservation Area Project (ACAP) and District Development Committee.

In recent decades, those governing the ACA have recognised the potential of tourism to enhance livelihoods around protected areas (Tao and Wall, 2009) and as an important strategic tool for facilitating sustainable development in the Lower Mustang region (NTNC, 2008). Tourism is now a major contributor to the Lower Mustang economy, providing the major source of revenue for conservation and development activities in the ACA. The Annapurna Trek receives about 40% of all tourists visiting the ACA, contributing more than US\$ 1.1 million in fees alone (NTNC, 2008). Tourism growth has stimulated major development in the ACA, resulting in a shift from primary to service industries, and a reverse migration from the lower altitudes back to the highlands (Nepal, 2007).

3. Perceptions of climate change

The ways in which people perceive changes in their environment is critical for understanding how communities respond to risks. In other words, irrespective of the experts' estimation of the *actual* presence of risk, it is the *perception* of risk that will govern people's behaviour. Thus, studies that value the perceptual knowledge of the non-scientific community are becoming important elements in the field of risk communication and management (Horlick-Jones et al., 2003; Seipt et al., 2013). Risk perceptions are subjective evaluations (Niemeyer et al., 2005) formed through experience and personality dispositions which, within a cultural context of everyday life, combine to influence attitudes and behaviour (Bickerstaff, 2004). Many studies emphasise the role of proximity and ‘common sense’ perception in people's interpretation of the physical world around them (Bickerstaff, 2004, 2006). These perceptions are derived from and reinforced by people's daily sensory observations of experienced physical conditions and their local memory (Whyte, 1985), which often differs from the ‘de-cultured’ climate that is presented by scientists (Hulme, 2012). Experiential processing often involves feelings and simple heuristics (Marx et al., 2007), but while it might foster contingent planning (e.g. for certain weather events), it is likely to be biased towards memorable events that have a disproportionate effect on risk perceptions (Weber and Stern, 2011).

More recently, researchers have begun to examine people's perceived experience of climate change as it manifests in every-day weather over time (Hulme, 2009). While it is inherently difficult to detect long term trends (climate is defined as a 30 year average) and people are subject to a range of biases, it has been shown that people can identify changes in their environment (e.g. Goebbert et al., 2012), especially for those groups who still live in a relatively symbiotic relationship with their environment (e.g. Laidler, 2006 on Inuit's knowledge of sea ice). For example, research on pastoral nomads in Mongolia reported detailed experiences of climatic changes, such as longer and more intense droughts and sand storms. According to the nomads, rains have become more patchy (but intense) and summer rains arrive later. These changes have substantial impacts on the nomads' livelihoods (Marin, 2010). In an example from a Western society, it was found that residents in Alger County, Michigan, accurately perceived changes in seasons, storm events and lake levels. The same study also showed that local residents failed to correctly describe changes in snowfalls, indicating a lack of

alignment between perception and measurement for this climate parameter (Akerlof et al., 2012). For the case of the Kakani area in Nepal, Gurung (1989) noted that local people held very detailed knowledge about their environment, formed “through a continuous process of visual, tactical, and even verbal contacts with the environment” (p. 356). People’s local understanding of weather phenomena has been of increasing interest to researchers who seek to understand localised perceptions of global concepts, such as climate change (Burningham and O’Brien, 1994).

Rooted in the socio-cultural paradigm, perceptions of environmental change cannot be separated from their social and cultural context (Wildavsky and Dake, 1990; Proctor, 1998). Rather than attempt to standardise and quantify the relationship between culture and risk perceptions, a more complex socio-cultural approach has been proposed (Zinn, 2004). ‘Thick’ descriptions of people’s relationships to risk and a social constructionist paradigm inform the socio-cultural approach, meaning that all perceptions of risk are equally valid, including those of lay people and experts (Tulloch and Lupton, 2003). The current research is underpinned by such a socio-cultural perspective, and explicitly embraces diverse, socially constructed risk perceptions that are influenced by underlying values and beliefs, social roles, cultural practices and demographics (Bickerstaff, 2004; Ster and Storch, 1995). Traditional gender socialization processes that occur, for example, through overt and covert encouragement of women to be cooperative and compassionate (Torgler et al., 2008) shape how women frame risk perceptions and how they approach environmental problems. Consideration of gender is particularly relevant in the traditionally patriarchal Nepali context where women are restricted in their opportunities due to defined cultural roles and norms (Jones and Boyd, 2011). Values and beliefs are an integral part of culture. A community and the places it occupies can, therefore, be seen as much as social and religious constructions, as physical locations. Thus, tourism destinations in remote mountain regions, besides being physically attractive, are also important cultural landscapes, socially constructed by the community residing there (Gurung, 1989; Pritchard and Morgan, 2001).

This review of the literature highlights the benefit of analysing people’s perceptions of climate in their social-cultural context. While a number of studies have begun to gather empirical evidence, most notably Marin (2010) and Byg and Salick (2009), the current research contributes to the growing body of knowledge in this field by focusing on how tourism stakeholders perceive climate changes in the highly complex system of livelihoods in the Lower Mustang, Nepal. More specifically, in-depth qualitative research undertaken by an expert who is intimately acquainted with the local culture, language and geographical circumstances, provides new insights into how people make sense of changing environmental conditions and the effects of these changes on their everyday lives.

4. Methodology

Rich insights into diverse climate change perceptions can best be achieved through adopting a research approach that emphasises subjective realities, social constructions and holistic perspectives. For this reason, the research uses a constructivist–interpretivist paradigm. The case study reported here represents an empirical enquiry of real-life situations (as opposed to an experimental design), in which the boundaries between phenomenon and context are fluent (Yin, 2012). Constructivism/Interpretivism, generally characterized as ‘Verstehen’ (or understanding) in human inquiry research, are useful in exploring (rather than testing) human action (Schwandt, 1998). Human beings act by making sense of the world in which they live, requiring interpretation of an event or stimulus, before it is translated into action. This approach emphasizes the importance of both personal knowledge and subjectivity (Schwandt, 1998), and has been discussed in previous sociological research related to global change (Proctor, 1998), particularly for understanding cultural and social processes involved in the interpretation of climate science, societal awareness and climate change responses (Rosa and Dietz, 1998). A micro-level perspective, as presented in this research, is also increasingly advocated by institutions such as the Intergovernmental Panel on Climate Change (IPCC, 2007).

The research was conducted involving tourism stakeholders in 12 communities of Lower Mustang, namely Muktinath, Jharkot, Kagbeni, Jomsom, Marpha, Puthang, Tukuche, Kobang, Larjung, Lete, Kalopani and Ghasa. The inclusion of 12 villages was important as they represent activity nodes along the route of the Annapurna Trek, which is the key tourism attraction in Lower Mustang, and thus provides the basis for the

livelihood of many people in the region. Through encompassing a wide range of communities, it was also possible to include the diversity of environmental and climatic conditions that people experience and perceive, and that form the context of their livelihoods and cultural practices. The empirical material for this study consisted of in-depth interviews and observations. Material was collected in June and July in 2009 during 6 weeks in Lower Mustang, followed by 2 weeks in the regional administrative centre of Pokhara.

Thirty participants were selected for interviews using a combination of the snowball sampling technique and purposeful sampling. This approach ensured the greatest possible amount of information and facilitated access to key people. Initial interviewee selection was informed by the researchers' previous work in the area, as well as by conversations with ACAP officials in Pokhara and Jomsom before and during the field work. The identification and selection of subsequent interviewees was achieved with the assistance of the research participants (i.e. 'snow balling' interviewees), an approach that positively influenced people's willingness to participate. At the same time, the researchers ensured that those participating in the research represented a wide range of views, including those represented by different income groups and livelihood types (Table 1). The criterion for participation was a significant interest in tourism service operation in lower Mustang, or decisions made concerning its management. The final sample included participants who operated tourism businesses, guides and other tourism service staff, local tourism managers from the Conservation Area Management Committees (CAMC), and representatives of Tourism Management sub Committees, Mothers Groups and Mukhiyas.

An interview guide with question topics was used, complemented by probes where necessary to elicit more detail. The interview guide consisted of two parts, building on the climate vulnerability and capacity assessment framework developed by ICIMOD (2011) for mountain areas in the Himalayas. First, questions related to general background information about the participants, their everyday life experiences revolving around livelihood activities, socio-economic status and how they had coped with significant weather events in the past. The second part of the interviews contained questions related to people's understanding of climate change, their observations on weather and natural disasters, and their personal experiences of these including ethno-climatic practices. In line with the qualitative approach adopted, all interview questions were open-ended, facilitating spontaneous opinions and avoiding potential bias from restricting responses to pre-determined categories. Interviews lasted 45–50 min, and were transcribed and translated from Nepali into English. This posed challenges at times because some words in Nepali had no direct translation or a subtly different meaning. "Climate change", for example, in Nepali language is "*Jalbayu Parivartan*", which, when translated literally, means changes in water and air.

Table 1

Participant typology and their involvement in multiple economic activities.

Socio-economic status	Types of stakeholder	Supplementary livelihood options
Wealthy households (<i>n</i> =15)	Hotel/lodge owner Mukhiyas (village headmen)	Own retail shops/stores Own apple orchards, and distillery, above 5 ha of agricultural land, livestock Operate travel/ticketing and money changer service Own truck, jeep or bus and motorcycle Work as construction and ration contractors Have family members working abroad, either in Japan, Korea or USA
Middle income households (<i>n</i> =13)	Small lodge/inns retail shop owners Guide	Own agricultural land, apple orchards and livestock Have family members working abroad Own motorcycle Trade Own small farmland
Low income households (<i>n</i> =2)	Local inns Porters	Rent lands for agriculture Own a small apple orchard Take casual jobs Collect and sell fuel wood Labour jobs Work in the farm

The empirical material was analysed inductively by identifying major themes and interpreting the text dialogically, in the manner described by Manuel-Navarrete et al. (2011) in his critical analysis of climate change adaptation in the Caribbean. Interview data were enhanced by information collected through direct observation, for example when visiting participants' houses or businesses. Observations were made of the local environmental conditions and the participants' activities (e.g. worshipping) to ground their reported perceptions in the reality of their day-to-day life experiences. Field notes of the observations and reflections following interviews were also carried out as part of this research. Observations and personal reflection added value to the interview data, particularly because one of the team's researchers possessed great familiarity with the place and people. Ms Lama's 'insider' perspective (emic approach) has been a crucial element in this study process and allowed a greater appreciation of the cultural context than would have otherwise been possible.

5. Results

The results from the interviews are presented in three sections. The role of multiple livelihoods is explored first since it is essential context for the later subsections assessing research participants' understanding of climate change and perceptions of associated impacts.

5.1. The multiple livelihoods context

The interviews highlighted the importance of multiple livelihoods, despite accounts that tourism growth had fostered the development of service industries relative to agriculture (Nepal, 2007). The multiple livelihood strategy of the Thakalis builds on a long history of pastoralism and trading, in which dividing time across several productive activities has always been an important coping strategy. Since the 1960s, tourism has become a significant source of income for most residents of the area. In addition, the establishment of the horticultural research centre in 1966 introduced intensive agriculture systems that resulted in the cultivation of fruit (e.g., apples, pears, and apricots) and vegetables that were previously considered impossible to grow in the region. A hotel owner/CAMC Chairman from Tukuche highlighted the need for several productive activities: *"We operate tourism business 6 months a year due to seasonal limitations. The remaining months we will be busy with the farming activities. Tourism alone is not sufficient to sustain livelihood. Only 10–15% of the business owners solely rely on tourism and can sustain from it. The rest of us have to engage ourselves in 2–3 occupations to sustain our livelihood."*

Practising several livelihoods requires intimate knowledge of the environment and the climatic conditions that allow different activities throughout the year. Based on the interviews, a seasonal calendar was constructed for tourism stakeholders in the case study area (Fig. 2). The calendar reveals a sophisticated system of multiple livelihoods that seek to optimize economic yield from the harsh conditions as a matter of survival (e.g. see also Macfarlane and Gurung, 1990). The months of September, October and November were seen as the most favourable for tourism activities, although spring and summer also offered suitable tourism products, such as the rhododendron blossom in spring. The diversity of livelihoods differs for the climatically different areas in the north and the south of Lower Mustang. Horticulture is more prominent in the north (Tukuche and above) and harvesting of the produce is one of the dominant activities in the autumn. People from both the north and south compensate for the non-productive winter months by engaging in trade or migrating temporarily to southern Nepal and north India.

The interviews provided examples of the typical livelihood portfolios of those involved in tourism (see Table 1). Owners of large accommodation or Mukhiyas, who are typically relatively wealthy, were also involved in a range of other capital-rich tourism activities, such as transport services or the operation of retail shops. As a result of higher levels of education they also often had family members working abroad and contributing financially from overseas. In contrast, guides and porters are typically less wealthy community members and they supplement their tourism income with labour jobs or subsistence farming on small plots.

Seasons	Winter			Spring			Summer/Monsoon			Autumn		
	Dec	Jan	Feb	Mar	April	May	June	July	August	Sept	Oct	Nov
Weather	# Clear, stable, freezing cold at night, # Suitable for trekking below 2500 meter			2 nd Best Tourism Season # Warm, pleasant and calm, # Rhododendron colour in the mountains, # Bird migrate to their high altitude breeding areas			# Rainy Season # Best time to enjoy the trek in alpine area with flowers and butterflies, # Mountain views are rare			Best Tourism Season # Pleasant, dry and clear weather, # Excellent mountain view		
Average Precipitation	Southern area ≈ 1400 mm/year, Northern area ≈ 200 mm/year (Baidya et al., 2007, 3; NCVST, 2009, 10)											
Livelihood	Southern area – Ghasa, Lete and Kobang											
	Trade and Migration			Hotel/Guest House Operation Guiding			Trade and Migration			Hotel/Guest House Operation		
				Maize Plantation		Barley Harvesting				Maize Harvesting		Barley Plantation
							Wheat/Buckwheat Harvesting			Wheat/Buckwheat Plantation		
	Northern Area – Tukuche, Marpha, Jomsom, Kagbeni, Muktinath											
	Trade and Migration			Hotel/Guest House Operation Guiding				Harvesting of Peach and Apricot			Apple Harvesting	
							Trade and Migration			Hotel/Guest House Operation Guiding		
	Barley Plantation				Maize Plantation		Barley Harvesting and Buckwheat Plantation			Buckwheat Harvesting and Barley Plantation		
	Potato Plantation				Potato Harvesting							

Fig. 2. Seasonal calendar highlighting the different livelihood options throughout the year.

5.2. Understanding of climate change

Study participants interpreted the phenomenon of climate change in diverse ways. These are organised under five themes: (i) changing weather patterns; (ii) media events and discussions; (iii) pollution and waste generation; (iv) deforestation; and (v) the wrath of God.

The majority of participants related climate change to variable weather and extreme events. It became clear that this interpretation of climate change was strongly shaped by the personal experience of some recent events. The year 2008–2009 was mentioned frequently as an unusually dry winter season with no snowfall in 2008, followed by a prolonged drought in 2009, and an increased number of forest fires. The researcher herself was able to observe the extent and effects of drought in the region (including wildfires during the field research), as well as the unusual sight of no snow on the mountains (e.g., Mt. Nilgiri) and de-glaciated areas in the Dhaulagiri Icefall. During the same period, hailstorms were observed for the first time in villages such as Marpha and Tukuche. Most participants interpreted the extreme weather events as climate change, and often related these directly to their livelihoods: “My experience in apple farming has taught me that they need good snowfall. This year’s poor harvest tells me that something’s wrong with the climate” (CAMC Chairman/Hotel Owner and Farmer, Tukuche).

Most research participants (27 out of 30) reported that they had heard about climate change via the media (e.g., radio, television, newspapers), at public gatherings and through organizations such as ACAP. Of those who reported having learned about climate change through the media, most were owners of big hotels or lodges, or they were Mukhiyas. They were also able to approximately explain that changes in greenhouse gas emissions related to the melting of glaciers. Five participants specifically stated that they had heard about climate change, but did not know exactly what it meant and they had not paid much attention to it. These were typically women and less educated porters.

The high association of climate change with media activity and public communication may have been influenced by a number of events that took place during the data collection period, including the observation of Conservation Day at ACAP and World Environment Day – 2009, a meeting in which the researcher, Ms Lama, participated and which was also attended by several research participants. In addition, the World Tourism Day-2009 event was dedicated to climate change with its slogan “Your Planet Needs You – UNite to Combat Climate Change”. Events to mark this campaign were organized in several villages included in this research.

Many participants believed that air pollution from vehicles and waste accumulation related to population growth and sprawl in the villages were the causes of climate change. In the minds of research participants, climate change was also linked to deforestation, although the role of forests was discussed in relation to forest fires, excessive logging, and their ability to ‘purify’ the surrounding environment and air, rather than their role as a carbon sink “*I feel it is the increasing deforestation that is causing changes in the climate. Everyday an average of 200 to 400 cubic feet of trees is being cut.*” (Small Lodge/Inn Owner, Tukuche).

For some participants, especially women, the possibility of climate change has cultural meanings and accordingly, they provided more religiously embedded explanations for observed changes. For these women, actions taken to reduce the impacts of climatic events were based on religious rituals. As one hotel owner and member of a mothers’ group from Larjung village expressed: “*When there is continuous rainfall for several days we carry the Kangyur (religious books) around villages to request the god of rain to stop, or when we have prolonged drought we carry the books asking for rain. I don’t know why but these days God is not listening to us as before*”. Such incidences are creating doubt and confusion in the minds of the participants about their long-held rituals and the beliefs surrounding these.

Consistent with their beliefs, women interpreted the perceived changes in climate as the consequence of human actions that have angered God. For example, a participant from Marpha pointed out that, in the past, people had strong reservations about growing and eating garlic and onion, because these were considered impure ingredients. Local folklore had been that if people grew garlic on their farms, their land would suffer disasters such as floods. While people along the river valleys no longer live by this rule, another respondent (a woman from Jomsom) emphasised that the region’s high mountains are revered places, in which visits by those who had consumed impure ingredients are strictly forbidden. According to this female participant, the sacred areas have become the sites of unholy activities performed by the Yarsagumba (*Cordyceps sinensis*) collectors, from within and outside the region, who “*trample the abode of God*” and leave their waste behind. Such activities are believed to cause untimely snowfall, floods, landslides and forest fires in the area.

5.3. Perception of climate change impacts

The interviews were rich with personal experiences of climatic events and ‘cascades’ of perceived impacts. In comparison to their recollection of historical seasonal patterns, interview participants reported a number of changes in the climatic conditions (perceived exposure) and also explained how these constituted threat factors and impacted the local communities (Fig. 3). Most impacts were negative, although a small number of opportunities were discussed. While no research participant provided a comprehensive account of all changes and impacts, collectively an informative picture emerged. Based on the perceptions shared by the participants, the researchers compiled an impact pathways flow chart of four key dimensions of change, resulting in a complex network of impacts. The four broad themes are: (1) warmer winters and increased temperatures; (2) cold, wet and unsettled spring conditions; (3) intense and erratic summer monsoons; and (4) seasonal anomalies.

The most commonly reported impact perceived by research participants in Mustang was warmer and drier winters: “*In earlier days winter used to be very cold, while summer was just warm. Now-a-days the place has become very warm in winter*” (hotel owner and community leader from Puthang). In their responses, our interviewees linked warmer winters to reduced snowfall, melting snow and ice cover, and increased evaporation. These changes were perceived to affect the aesthetic attractiveness of the landscape and undermine the tourism value of the place: “*if the mountains don’t have any snows*

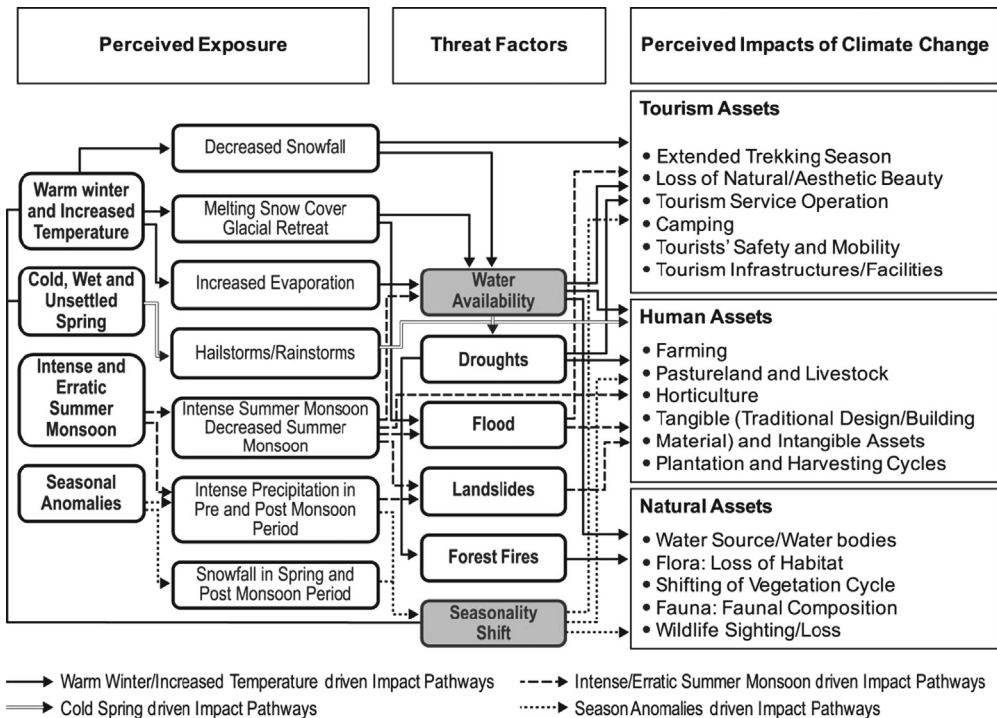


Fig. 3. Climate change impact pathways: stakeholders' perception of climate change and associated impacts on communities in lower Mustang.

it spoils the trekkers' experience. Unhappy tourists mean no good publicity of our area and this is not good for tourism" (CAMC Chairman/Farmer, Syang/Marpha). Changes to snow cover were also seen as a threat to water availability, with flow-on effects for agricultural irrigation and tourism. Several villages reported that hotel operation had been affected by lack of water and reduced stream flow was a problem for camping activities in Upper Mustang.

The traditional seasonal calendar in Lower Mustang characterises spring as a calm, warm and pleasant season. According to our participants, however, in recent years, spring has become wet, unsettled, and windy, accompanied by snowstorms, hail and rainstorms. In addition to their observations about general seasonal changes, the participants often talked about particular weather events: "The rainfall pattern is just the opposite of the usual form, while this year's monsoon started from Jestha (May–June) instead of Asar and Shrawan (June–July and July–August), which is the standard monsoon season. It rained heavily in Jestha (May–June) and even in Chaitra (March). In fact on 26 Chaitra (25 of March), there were hailstorms, the most unusual weather experienced in our lifetime. After this day we experienced continuous frosts (sheet lahar)" (Retail shop Owner/Mir Mukhiya, Tukuche).

Participants from settlements in southern parts of Lower Mustang also reported increased and more intense summer monsoons. One hotel owner from Kalopani-Lete noted "I personally feel that our summer monsoon is becoming intense. Normally we receive the highest rainfall in the entire Mustang region and this used to be a long continuous, yet calm downpour. Nowadays, we don't have long continuous monsoon rainfall. It has become intense and erratic in nature". Seasonal anomalies across the whole year have also been experienced by other participants in the region: "We are observing some new activities which we have never seen or experienced before. We have experienced snowfall in the month of Kartik (October–November), before last year. Even an 85 year old grandfather told me that he has never experienced such an event in his life before" (Hotel Owner/Mukhiya, Puthang). Extreme events, including flooding, landslides, and forest fires, were widely perceived by participants as the most worrying observed changes to date.

While interviewees often expressed surprise and even bewilderment at the changing seasonal conditions, and there were certainly concerns about the threats to resources and livelihoods, not all of the observed changes were interpreted negatively. The warming of winter, for example, was recognised as an opportunity to extend the trekking season and increase business for hotels, trekking operators, guides and porters. Traditionally, trekking in Mustang occurred in spring (March–May) and autumn (September–November), but our research participants now report that trekking is possible throughout the winter, from September to May. Warmer winters have also altered horticultural and agricultural practices, making it possible for farmers of northern areas above Kagbeni to grow apples; and those in southern areas to grow crops typically found in the lower valley plains.

6. Discussion

The research findings show that those involved in tourism in Lower Mustang hold quite specific views about what climate change means and how it impacts on their society. We argue that the Mustang people's sensitivity to climatic issues is the result of unique cultural and livelihood factors that have been shaped by limited resources and harsh conditions over many centuries. Understanding the rhythm of the seasons is critical for the survival of people in this area, and strategies have been developed to cope with climatic events. This built-in flexibility of culture and practices amongst the Thakali (Turin, 1997) could arguably be interpreted as resilience, and is best interpreted as the interplay of geographic factors, social practices and spiritual beliefs. People's understanding of climate change, the importance of the social-cultural context, and the importance of local weather observations are discussed in more detail below.

6.1. *Understanding climate change*

The participants interviewed in this study were generally aware of the term 'climate change', a finding which differs from a similar study undertaken in Eastern Tibetan villages (Byg and Salick, 2009) and one that contradicts the Gallup survey (2009) mentioned earlier. It became clear, however, that not all associations with climate change were 'scientifically correct', and, rather, were unscientific in the sense that they were embedded in a spiritual worldview. Place and location also clearly influenced interviewees' understanding, with local causes, such as deforestation and air pollution, offered as explanations for climate change. Despite the lack of detailed knowledge on the exact causes of climate change, it would be inaccurate to conclude that people in Lower Mustang have no understanding of climate change. Moreover, statements such as the one made by the authors of the Gallup survey (2009); "... if progress is to be made, Nepal's citizens – poor rural farmers, in particular – will need to be educated about global warming", must be called into question. Thus, this study underlines the findings of Gurung (1989) who investigated human perceptions of mountain hazards in Nepal, and concluded that locals' knowledge is "not articulated in modern scientific terms but it is accurate in its own way" (p. 356).

Notwithstanding the obvious physical properties of climate change, to an important extent climate change is a social phenomenon at the intersection of physical realities and people's interpretations, values and beliefs (Akerlof, et al., 2012; Brand and Brunnengräber, 2012; Nordensted and Ivanisevic, 2010). Our study shows that locals' understandings are not necessarily to be taken as misconceptions, but as an important indicator of how mountain people process and make sense of what is happening in their surroundings. The importance of culture, and how it is intimately interwoven with nature, was reinforced by the observations of the researcher in the field, who was in a unique position to understand the way villagers make sense of the world around them. On reflection, it became very clear that any climate change communication (e.g. scientific projections) would only be relevant to the people of Lower Mustang when grounded in their day-to-day experiences and clearly connected to their practices and beliefs. Likewise, understanding these grassroots perspectives, especially in developing countries where formal scientific education is less wide-spread, is very important for scientists, policy makers and researchers. It is often this missing link that fails to make communication meaningful.

Interestingly, almost all of the participants associated climate change with specific events of media coverage, indicating that global and national efforts to communicate the issue have had some impact in Nepal. Further research on the role of media coverage on local climate change perceptions in Nepal would be useful (e.g. Boykoff, 2008; Pasquare and Oppizzi, 2012; Russill and Nyssa, 2009). Therefore, while local people have some understanding of climate change and make sense of it in their own world, there is also an opportunity for making available further information on underlying causes and effects of climate change from a global perspective. This could be achieved via the media or other forms of capacity building and would benefit from the adoption of a cosmopolitan approach to knowledge generation and management (Hulme, 2010), shaped by place and context but highly mobile. Whether such efforts would enhance people's (often engrained) perceptions and adaptive behaviours is an important sociological question that deserves further attention.

6.2. Social-cultural context

Lower Mustang is a cultural landscape that has been socially constructed by centuries-old traditions and ethno-climatic practices. Against this background, climate change impacts have strong cultural and spiritual connotations. Our findings indicate that changing climate is bringing cultural change, not only in terms of livelihood portfolios and livelihood practices, but also in the ethno-climatic rituals around the four seasons. Also, several local participants have commented on the weaker correlation between religious rituals and climatic conditions, creating confusion about whether or not the weather gods were still listening. This was particularly noted for female participants in this study whose worldview appeared to be more informed by common cosmology compared with men. Given that locals' knowledge about climatic conditions and dealing with adverse weather are grounded on their religious faith and cultural upbringing, the mismatch between this world view and the emerging reality may cause them to question their own observation and weather forecasting practices, ultimately eroding part of the cultural belief system of these groups. As found elsewhere in the literature (Byg and Salick, 2009; McDowell and Hess, 2012), traditionally, these ethno-climatic practices constituted important (perceived) elements of protecting villagers, but also helped maintain culture and place identity. From a tourism perspective, these beliefs and rituals, alongside many other traditional practices, contribute to the richness of the ACA cultural landscape, which is so appealing for tourists to visit. Loss of these traditions may therefore not only undermine cultural resilience, but also decrease the attractiveness of the destination.

The societal structure based on wealth (e.g. lodge owner versus porter) and caste (Thakali versus non Thakali), amongst others, inherently leads to differential vulnerabilities among members of the population in Lower Mustang. As Regmi and Adhikari (2007) observed, it is the poor, marginalized and disadvantaged groups who are most vulnerable to climate change impacts. In comparison to the wealthy, such community members have far fewer opportunities to diversify their livelihoods and adapt to changing conditions in the climate. The communities of Lower Mustang, however, may have some protection against the worst effects of calamity via traditional social institutions (e.g., the *Panchgaon Samaj*, *Terhagaun Mukhiya Samaj*, *Baragaun Samaj* and *Thakali Samaj*) as well as an informal traditional financial networks called "Dhikuri" which are successfully practised in the region. These schemes support the victims of tragic events, such as those who have lost their property in natural disasters, or those who are trapped in debt due to business failures (NTNC, 2008). To date, people rely on these institutions and networks as a safety net. Such arrangements may remedy some of these distributional constraints in times of hardship, and a more detailed analysis of these institution and network's ability to incorporate climate change impacts would be beneficial. Overall, while societies that are closely related to the natural environment, such as those living in Lower Mustang, may provide some useful insights for resilience and adaptation for those in Western Societies, our research also indicates that the culturally mediated subsistence efforts may not suffice to deal with the extent of climate change impacts anticipated in the future.

Attempting to understand the cultural context as a crucial factor in the social construction of climate change is important. However, we argue that such research is likely to be most successful if the researcher (at least one in the team) has substantial anthropological knowledge of the particular

area, and also is able to secure the trust of those participating in the research. While Ms Lama was able to perform this role, she also observed that the requirements of a Western University to obtain written consent for interview participation (a formality demanded by Lincoln University's ethics protocol) constituted a substantial barrier that risked undermining the trust she had developed. More broadly spoken, it is often difficult to identify researchers and research protocols that fit harmoniously with the local research context. This also highlights the need to work with local counterparts who not only speak the language but also have an intimate understanding of the values and practices that shape the every-day lives of the people and places under study (Mapfumo et al., 2013). For the ethnic group of the Thakali, for example, it has been reported that – because of their interesting history and culture – they have been subject of substantial research. More specifically, Turin (1997) reported that, maybe because of this interest, Thakali are very conscious of what they share and what they hold back, especially with a view of constructing their own image in anthropological research. We suggest that the use of a local researcher reduces the potential for such biases and the 'labelling' of indigenous knowledge by an outsider (Laidler, 2006).

6.3. *The value of local weather observations*

Though it is difficult for lay people to assume a macro perspective on climate change, they are in a favourable position to provide first-hand observations of what climate change or climate variability means to them and how it anchors in their history and culture (Hulme, 2012; Vedwan and Rhoades, 2001). The individual and combined effect of warmer winters, increased and intense summer monsoon, cold, wet and unsettled spring and seasonal anomalies, have resulted in significant threat factors to people in Lower Mustang, such as reduced water availability, natural disasters and seasonality shifts. Most of the observations made by locals are consistent with the scientific literature on climate change impacts in Nepal (Shrestha et al., 1999; ICIMOD, 2010). In terms of response, the local subsistence practices (e.g., livelihood modifications/diversification, migration, cultural and religious approach) and the participatory management approach have been crucial to the participants in responding to change.

Importantly, participants were also able to identify that some of the climate change impacts provide new opportunities. The expanded trekking season means that income from tourism can be grown, and because of this it could be argued that tourism is less vulnerable than some other traditional activities, for example agriculture. The possibility of tourism being more resilient than other livelihoods was also discussed by Byg and Salick (2009) for the case of Tibetan villages. Increasing tourism has clear management implications, for example in relation to water management, the maintenance of tracks, and staffing of the Protected Area. Shifts in seasonality that change environmental conditions, such as the iconic Rhododendron blossom in spring, may also require adjustments to the established tourism patterns and the way local stakeholders distribute livelihoods.

Clearly, local observations of weather and climate provide a great depth to understanding both the manifestation of climate change and its relevance or outcomes (Laidler, 2006). While it has been discussed earlier that seasonal calendars only reflect perceptions and recent events overshadow more distant ones (Jones and Boyd, 2011), local information with a high resolution is of great significance. This present study of Lower Mustang highlighted that people discussed climate change mainly in the context of recent signature climate events, such as winters with no snowfall (2008) or the prolonged droughts in 2009. At the same time, however, participants were able to relate these events to (perceived) longer term trends and the historic climate they remembered. Therefore, as postulated by Marin (2010), local data can be used to fine tune the outputs of scientific models, or to point climate modellers to anomalies and local idiosyncrasies that are not captured in the generalised models (Byg and Salick, 2009). This is even more important for regions with limited or poor-quality climate records, as is the case for Nepal (Jones and Boyd, 2011). Thus, while not replacing large-scale scientific climate studies, the inclusion of a wide range of beliefs and knowledge about the world in the form of 'spectral knowledge' (Hulme, 2010, 562) would be beneficial. By integrating the two types of knowledge it is also possible to bridge more successfully from climate modelling, to climate impact and adaptation research.

7. Conclusion

The tourism stakeholders of Lower Mustang have a good understanding of their local climate as a result of longstanding intergenerational knowledge, personal experience, and their dependence on the challenging natural resources in this remote mountain region. Strong cultural response mechanisms and practices form the basis of adaptation to change, and changes to the climate are no exception to this. The existence of multiple livelihood options and their continuous adaptation to climatic conditions is testimony to the adaptability of people in this region. Climate change is largely perceived through its manifestation of extreme events. Moreover, stakeholders were able to describe in great detail how specific elements of the climate are changing and how this impacts upon their livelihood, including tourism opportunities. While a full scientific understanding of causes and consequences is not existent, the very intimate understanding of people's local environment means that it is unjustified to conclude that rural communities in Nepal, such as the ones studied here, require further 'education' on climate change. Instead, the existing traditional knowledge about the climate could be integrated with scientific knowledge in a cosmopolitan or spectral way to further enhance collective understanding and adaptive capacity. Such an approach might make climate change more meaningful for those social segments (such as women and the socio-economically disadvantaged) for whom coping with changing conditions pose the greatest challenge. This study further validates the existence of different types of climate knowledge systems (traditional and scientific) with the potential to complement each other in an integrated micro-macro level approach (Hulme, 2010; Laidler, 2006), for the purpose of more meaningful dialogue with, and improved outcomes for, local communities facing change (see also Seipt et al., 2013).

Acknowledgements

We would like to thank Lincoln University and the Mingma Norbu Sherpa Scholarship and for financing and facilitating the data collection in Nepal, and we also express our gratitude to NTNC-ACAP and Community members of Mustang for their assistance, feedback and contribution to this research. We thank Mr. Weber from the University of Wuerzburg for preparing the graphical illustrations.

References

- Adger, N.W., Barnett, J., Brown, K., Marshall, N., O'Brien, K., 2013. Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change* 3, 112–117.
- Akerlof, K., Maibach, E.W., Fitzgerald, D., Cedeno, A.Y., Neuman, A., 2012. Do people "personally experience" global warming, and if so how, and does it matter? *Global Environmental Change* 23 (1), 81–91.
- Bickerstaff, K., 2004. Risk perception research: socio-cultural perspectives on the public experience of air pollution. *Environment International* 30, 827–840.
- Bickerstaff, K., Simmons, P., Pidgeon, N., 2006. Public Perception of Risk, Science and Governance: Main Findings of a Qualitative Study of Six Risk Cases. Technical Report 06-03. Center for Environmental Risk, Norwich. Available at (http://psych.cf.ac.uk/understandingrisk/docs/report_2006.pdf).
- Boykoff, M.T., 2008. The cultural politics of climate change discourse in UK tabloids. *Political Geography* 27, 549–569.
- Brand, A., Brunnengräber, A., 2012. Conflicting knowledge construction on climate change through mainstream and alternative media. *Transience* 1, 7–24.
- Burningham, K., O'Brien, M., 1994. Global environmental values and local contexts of action. *Sociology* 28 (4), 913–932.
- Byg, A., Salick, J., 2009. Local perspectives on a global phenomenon—climate change in Eastern Tibetan villages. *Global Environmental Change* 19, 156–166.
- Gallup, 2009. High Risk, Low Awareness of Climate Change in Nepal. Available from (20/10/2011) (<http://www.gallup.com/poll/124658/high-risk-low-awareness-climate-change-nepal.aspx>).
- Goebbert, K., Jenkins-Smith, H.C., Klockow, K., Nowlin, M.C., Silva, C.L., 2012. Weather, climate, and worldviews: the sources and consequences of public perceptions of changes in local weather patterns. *Weather, Climate & Society* 4, 132–144.
- Gurung, S.M., 1989. Human perception of mountain hazards in the Kakani-Kathmandu area: experiences from the middle mountains of Nepal. *Mountain Research and Development* 9 (4), 353–364.
- Heyd, T., Brooks, N., 2009. Exploring cultural dimensions of adaptation to climate change. In: Adger, W.N., Lorenzoni, I., O'Brien, K. (Eds.), *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge University Press.

- Horlick-Jones, T.H., Simme, J., Pidgeon, N., 2003. Social dynamics of environmental risk perception: Implication for risk communication research and practice. In: Pidgeon, N., Kasperson, R.E., Slovic, P. (Eds.), *The Social Amplification of Risk*. Cambridge University Press, Cambridge, pp. 262–285. U.K..
- Hulme, M., 2009. *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge University Press, UK, Cambridge.
- Hulme, M., 2010. Problems with making and governing global kinds of knowledge. *Global Environmental Change* 20, 558–564.
- Hulme, M., 2012. Telling a different tale: literary, historical and meteorological readings of a Norfolk heatwave. *Climatic Change* 113, 5–21.
- ICIMOD, 2010. *Climate Change in the Eastern Himalayas: Observed Trends and Model Projections*. International Centre for Integrated Mountain Development, Kathmandu, Nepal.
- ICIMOD, 2011. *Framework for Community-Based Climate Vulnerability and Capacity Assessment in Mountain Areas*. International Centre for Integrated Mountain Development, Kathmandu, Nepal.
- IPCC, 2007. *Climate change 2007: impact, adaptation and vulnerability. Working Group II contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. In M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Eds.), Cambridge University Press, UK.
- Jones, L., Boyd, E., 2011. Exploring social barriers to adaptation: Insights from Western Nepal. *Global Environmental Change* 21, 1262–1274.
- Kvaloy, F., Sandvik, G.R., 1992. *A Study of the Development Process in Thak Khola Valley: The Nepal Himalaya, a Socio-economic Approach*. Unpublished Master's Thesis, Norway.
- Laidler, G.J., 2006. Inuit and scientific perspectives on the relationship between sea ice and climate change: the ideal complement? *Climatic Change* 78 407–444.
- Macfarlane, A., Gurung, I., 1990. A guide to the Gurungs. Ratna Pustak Bhandar, Kahtmandu.
- Malla, G., 2008. Climate change and its impact on Nepalese agriculture. *The Journal of Agriculture and Environment* 9, 62–71.
- Manuel-Navarrete, D., Pelling, M., Redclift, M., 2011. Critical adaptation to hurricanes in the Mexican Caribbean: development visions, governance structures, and coping strategies. *Global Environmental Change* 21, 249–258.
- Manzardo, A.E., 1982. Impression management and economic growth: the case of the Thakalis of Dhaulagiri zone. *Kailash: A Journal of Himalayan Studies* 9, 45–60.
- Mapfumo, P., Adjei-Nsiah, S., Mtambanengwe, F., Chikowo, R., Giller, K., 2013. Participatory action research (PAR) as an entry point for supporting climate change adaptation by smallholder farmers in Africa 5, 6–22.
- Marin, A., 2010. Riders under storms: contributions of nomadic herders' observations to analysing climate change in Mongolia. *Global Environmental Change* 20, 162–176.
- McDowell, J.Z., Hess, J.J., 2012. Accessing adaptation: multiple stressors on livelihoods in the Bolivian highlands under a changing climate. *Global Environmental Change* 22 (2), 342–352.
- Messerschmidt, D.A., 1982. The Thakali of Nepal: historical continuity and socio-cultural change. *Ethnohistory* 29 (4), 265–280.
- NTNC (National Trust for Nature Conservation), 2008. *Sustainable Development Plan Mustang: 2008–2013*. Available at (08/10/2012) (http://www.rrcap.unep.org/nsds/uploadedfiles/file/sa/np/mnmt/document/sd_masterplan_Mustang.pdf).
- NCVST, 2009. *Vulnerability through the eyes of vulnerable: Climate change induced uncertainties and Nepal's development predicaments*. Institute for Social and Environmental Transition-Nepal (ISET-N, Kathmandu) and Institute for Social and Environmental Transition (ISET, Boulder, Colorado) for Nepal Climate Vulnerability Study Team (NCVST), Kathmandu.
- Nepal, S., 2007. Tourism and rural settlements. Nepal's Annapurna Region. *Annals of Tourism Research* 34 (4), 855–875.
- Niemeyer, S., Petts, J., Hobson, K., 2005. Rapid climate change and society: assessing responses and thresholds. *Risk Analysis* 25 (6), 1443–1456.
- Nordensted, H., Ivanisevic, J., 2010. Values in risk perception: studying the relationship between values and risk perception in three countries. *Journal of Disaster Risk Studies* 3 (1), 335–345.
- Nyaupane, G.P., Chhetri, N., 2009. Vulnerability to climate change of nature based tourism in Nepalese Himalayas. *Tourism Geographies* 11 (1), 95–119.
- OECD, 2003. *Development and climate change in Nepal: focus on water resource and hydropower*. Organisation for economic co-operation and development. 2 rue André Pascal, 75775 Paris, Cedex 16, France.
- Pasquare, F.A., Oppizzi, P., 2012. How do the mafia affect public perception of climate change and geohazards? An Italian Case Study. *Global and Planetary Change* 90–91, 152–157.
- Patt, A.G., Schroeter, D., 2008. Perceptions of climate risk in Mozambique: implications for the success of adaptation strategies. *Global Environmental Change* 18 (3), 458–467.
- Pritchard, A., Morgan, N.J., 2001. Culture identity and tourism representation: marketing Cymru or Wales? *Tourism Management* 22 167–179.
- Proctor, J.D., 1998. The meaning of global environmental change: retheorizing culture in human dimensions research. *Global Environmental Change* 8 (3), 227–248.
- Regmi, B.R., Adhikari, A., 2007. *Human Development Report 2007: Climate Change and Human Development—Risk and Vulnerability in a Warming World, Country Case Study-Nepal*. LI-BIRD, Pokhara, Nepal.
- Rosa, E.A., Dietz, T., 1998. Climate change and society: speculation, construction and scientific investigation. *International Sociology* 13 (4), 421–455.
- Russill, C., Nyssa, Z., 2009. The tipping point trend in climate change communication. *Global Environmental Change* 19, 336–344.
- Sakurai, R., Jacobson, S., Kobori, H., Primack, R., Oka, K., Komatsu, N., Machida, R., 2011. Culture and climate change: Japanese cherry blossom festivals and stakeholders' knowledge and attitudes about global climate change. *Biological Conservation* 144, 654–658.
- Schwandt, T., 1998. Constructivist, interpretivist approaches to human inquiry. In: Denzin, N., Lincoln, Y. (Eds.), *The Landscape of Qualitative Research: Theories and Issues*. Sage Publications, Thousand Oaks.
- Seipt, C., Padgham, J., Kulkarni, J., Awiti, A., 2013. Capacity building for climate change risk management in Africa: encouraging and enabling research for informed decision-making. *Environmental Development* 5, 1–5.

- Shrestha, A.B, Wake, C.P., Mayewski, P.A., Dibb, J.E., 1999. Maximum temperature trends in the Himalaya and its vicinity: an analysis based on temperature records from Nepal for the period 1971–94. *Journal of Climate* 12 (9), 2775–2786.
- Ster, N., Storch, H.v., 1995. The social construct of climate and climate change. *Climate Research* 5, 99–105.
- Tao, T.C.H., Wall, G., 2009. Tourism as a sustainable livelihood strategy. *Tourism Management* 30, 90–98.
- Torgler, B., Valinas, M., Macintyre, A., 2008. Differences in Preferences Towards Environment: The Impact of Gender, Age and Parental Effect. Center for Research in Economics, Managements and the Arts (CREMA), Basel, Switzerland.
- Tulloch, J., Lupton, D., 2003. *Risk and Everyday Life*. Sage Publications, London.
- Turin, M., 1997. Too many stars and not enough sky: language and ethnicity among the Thakali of Nepal. *Contribution to Nepalese Studies* 24 (2), 187–199.
- Vedwan, N., Rhoades, R.E., 2001. Climate change in the Western Himalayas of India: a study of local perception and response. *Climate Research* 19, 109–117.
- Weber, E.U., Stern, P.C., 2011. Public understanding of climate change in the United States. *American Psychologist* 66 (4), 315–328.
- Whitmarsh, L., 2011. Scepticism and uncertainty about climate change: dimensions, determinants and change over time. *Global Environmental Change* 21, 690–700.
- Whyte, A.N., 1985. Perception. In: R.W. Kates, J.H. Ausubel, M. Berberain (Eds.), *Climate Impact Assessment: Studies of the Interaction of Climate and Society*. SCOPE 27. Paris, France.
- Wildavsky, A., Dake, K., 1990. Theories of risk perception: Who fears what and why? *Daedalus* 119 (4) 41–60.
- Xu, J., Grumbine, R.E., Shrestha, A., Eriksson, M., Yang, X., Wang, Y., Wilkes, A., 2009. The melting himalayas: cascading effects of climate change on water, biodiversity, and livelihoods. *Conservation Biology* 23 (3), 520–530.
- Yin, R., 2012. *Applications of Case Study Research*, 3rd ed. Sage Publications.
- Zinn, A., 2004. Social Contexts and Responses to Risk Network (SCARR). Literature Review: Sociology and Risk. Working Paper. Available at (<http://www.kent.ac.uk/scarr/papers/Sociology%20Literature%20Review%20WP1.04%20Zinn.pdf>).