BACKGROUND

By 2010, there had been at least two cases of false alarms of Imja glacial lake outburst flood (GLOF) in Pharak Mount Everest region (Fig. 1). In one of these events, news of rising water in the nearby rivers and possible GLOF was spread to several villages of this remote mountainous region within hours by mobile phones. The Sherpas, local residents, fled to higher grounds with their belongings, including one mother with her newborn child in the middle of night only to find refuge in their potato field. This incident had occurred a week after climate change information-sharing workshop was organized in Namche. Prior to the Copenhagen Climate Summit, COP-15, there had been a crowding of similar climate change related institutional activities, from art competition to marathons to the cabinet meeting in Kalapatthar. After December of 2009, such activities declined significantly. In light of these reports from the Everest region, and scientific literature discussing the imminent threat from Imja GLOF and rapid melting of glaciers, the present ethnographic research was developed to better understand how climate change is unfolding locally and how the Sherpas are affected.

The objectives of this research at its inception were: 1) to complement the existing research on the physical and biological effects of global warming in this region, by including the perspectives of local people on climate change’s ecological and socio-cultural impacts; and 2) to facilitate inclusion of local people in the local, regional, national and international process of climate change preparedness and risk management.

Climate Change Knowledge in Everest Region

The 2011 National Climate Change Policy of Nepal recognizes rising trend in temperature and erratic pattern of rainfall, and associated natural disasters such as landslides, floods and drought including GLOF as climate change risks for Nepal (Ministry of Environment 2011). On the overall Climate Change Vulnerability Index, Solukhumbu district, where Everest region lies, is ranked as high. On the Climate Change Adaptation Capability Index, Solukhumbu district is ranked low (Ministry of Environment 2010). Dudh Koshi basin of the Everest region is the largest glaciified basin in Nepal with 278 glaciers and 10 potentially dangerous glacial lakes (Bajracharya & Mool 2009).

Scientists have recorded warming trend (Shrestha & Aryal 2011) and its effects in the Everest region (Watanabe et al. 1995; Byers 2007; Somos-Valenzuela et al. 2013). McDowell et al. (2012) used vulnerability approach to assess human vulnerability to hydrological change in four Khumbu communities. In the present climate change context, their work serves in developing a baseline understanding of changing water resource dynamics and human well being in Khumbu. An anthology of contemporary research in Mt Everest region published by Nepal Academy of Science and Technology (NAST 2010) presents several studies providing baseline information from Khumbu regarding environmental concerns that could serve future climate change researches. The research presented here is the only relatively long-term ethnographic study of climate change issues in the region.

Pharak

The Everest region consists of Pharak and Khumbu, local Sherpa names for areas covered by Sagarmatha National Park Buffer Zone (SNPBZ) and Sagarmatha National Park (SNP) respectively. From an administrative perspective, Pharak lies within Chaurikharka VDC and Khumbu consists of Khumjung VDC and Namche VDC. VDC (Village Development Committee) is the lowest administrative stratum in Nepal. Pharak is the southern part of the Everest region, where Tenzing-Hillary airport of Lukla is located, which serves as the gateway into the region (Fig. 2). Villages in Pharak are lower in elevation and warmer in temperature than Khumbu villages. This allows diverse flora and fauna to thrive here compared to the alpine conditions in Khumbu.
According to the 2011 census, there are 968 households and a population of 3,709 in Pharak. The population in Pharak is largely Sherpa practicing Nyingmapa Buddhism but there is also a growing non-Sherpa population. Majority of the residents depend on traditional agriculture, small businesses, construction and the trekking industry for income. Traditional herding is still practiced but minimally by a few households. Although tourism businesses in on-route villages offer employment opportunities, they are seasonal and the benefit sharing among these businesses are also unequal. Only a handful of businesses in popular villages like Lukla, Phakding and Monjo are able to profit well.

**METHODOLOGY**

Altogether 15 months of ethnographic fieldwork was conducted between 2010 and 2011. This research focused on the Sherpas of Pharak but it became apparent that it also needed to include Khumbu and Kathmandu as its field sites because these places influence climate change narratives and actions—vulnerability assessment, adaptation and resilience—for the Sherpas, and influence cultural changes in Pharak.

Participation observation of daily lives, rituals and festivals, farming, and herding were conducted, and field notes and diaries were kept. Participant observation of institutional meetings (n=14) was conducted in Khumbu, Pharak and Kathmandu. At these meetings, participation, performance and productivity of the organizers and attendees were observed. Semi-structured interviews (n=39) were also conducted with open-ended questions about climate change and cultural changes in Pharak and Khumbu. On-route and off-route informants were identified using stratified random sampling. Impromptu conversations among informants were also recorded, which provided additional insights into how the Sherpas perceived and responded to extreme events. The interviews and conversations (50+ hours, in Nepali and Sherpa) were digitally recorded and transcribed in English. Additionally, web-based multi-level institutional analysis was conducted, whereby institutional interests, programs and reports were reviewed to examine how their activities concerning the Sherpas in the Everest region are designed and implemented.

Grounded theory approach was employed for analysis, finding themes and subthemes from within the collected data to develop a theoretical framework. Developed by sociologists (Glaser & Strauss 1967, Strauss & Corbin 1990), this approach is widely used by researchers to analyze ethnographic data. It allows the researcher to be grounded in the data and to understand how things really work. The grounded-theory approach is a set of techniques for 1) identifying categories and concepts that emerge from text; and 2) linking the concepts into substantive and formal theories (Bernard 2006). “Indeed grounded theory is more objective and scientific [compared to other approaches used in qualitative researches] because it enables the research participants to set the agenda or to have a voice independently of the researcher’s” (O’Reilly 2012).

**FINDINGS**

Climate change in the Everest region is an institutional term, which narrowly refers to the melting of glaciers and GLOFs. This research found that such climate change narrative was introduced and sustained by institutional activities since 2004. It was also found that while a small group of people, mostly hotel-owning men from on-route villages in their 20s-40s, were informed about institutional understanding of climate change, majority of the villagers including those who are most vulnerable to climate change effects due to their limited socio-economic capital were found to be excluded from these conversations. When investigating the wider climate change effects on the Sherpas, it was revealed that they are noticing and experiencing changes in snowfall, rainfall, temperature, arrival of insects and extreme events. However, extreme events were the most discussed climate change effect due to their assumed and experienced danger. It was also revealed that individual Sherpas were exposed to different climate change effects and perceived them based on their socio-economic background. Social heterogeneity was thus found to be an essential factor that influences the
Sherpa perceptions of climate change in addition to the natural process they observe in their environment. It is very likely that the nature of the Sherpa social heterogeneity as described below will change in the near future considering the ongoing mobility of the Sherpas and non-Sherpas within and out of the region. Following are discussions of the changes the Sherpas are noticing which were revealed during this research, and of the Sherpa social heterogeneity. Further examinations of the environmental changes described below including studies of how they are occurring are necessary because as previously stated such studies are currently lacking and also because these changes were not compared against metrological data.

Changes in Snowfall and Temperature
The Sherpas perceived that the temperature is warmer now and therefore, there is not much snow on the mountains. They perceived that there has been a significant decrease in the amount of snowfall they receive in their villages. The Sherpas also perceived changes in seasons. While making such observations, they compared the present situation with their childhood and also used different festivals and natural events as time markers. Older informants shared that during Lhosar festivals, which generally falls in February, people used to get plenty of snow and this does not happen now. Similarly, in the past the Sherpas used to grow limited varieties of crops but now, facilitated by greenhouses, the Sherpas are able to grow diverse crops including tomatoes. Use of refrigerators was also found to be widespread along on-route villages, which increased after around 2005 with then newly built hydropower stations. Villagers described that the food items need to be refrigerated, if not, they will attract flies and insects and get spoiled quickly, an effect attributed to the warmer temperature.

Changes in Rainfall
The Sherpas perceived that rainfall is irregular and unpredictable now. They shared that in the past, they were able to predict rainfall patterns but now it is difficult to do that. The Sherpas, whose agriculture depends on the monsoon rains were especially concerned about the unpredictable rainfall. In 2010, the Sherpas noted that it was a dry year causing many potato plants to die. In 2011, the Sherpas were initially pleased with the rain but later with heavy rainfall, they were concerned. Tourism business owners were also concerned about heavy rainfall because it limited air traffic and affected the arrival of tourists to this roadless region.

Insects
This researcher first recorded discussions about the presence of mosquitoes in the region in 2008. It was easier to find mosquitoes in the summer of 2013 compared to 2008, 2010 and 2011. In addition to mosquitoes, the Sherpas also described finding newer species of insects in their vegetable gardens and were not sure how to deal with it.

Extreme Events
Extreme events were perceived as the direct effect of climate change on the Sherpas. During the course of this research, one heavy rain flooding, an earthquake and two severe windstorms in Pharak stalled lives for days. These events were perceived to be linked with the potential GLOFs and with the apocalyptic view associated with climate change.

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are seen as acts that anger local deities, who protect the region against harm. Scientific and religious explanations were found to coexist without visible conflicts. A hotel owner from an on-route village who was trained as a Buddhist monk described that while scientific explanations are logical, religious explanations are necessary, and that both of them have an important role to play in addressing local climate change issues.

CONCLUSION
In conclusion, this anthropological study of climate change was developed based on the need to better understand climate change impacts on the Sherpas of the Everest region. Although scientific literature including alarmist reports, which were later criticized by Watanabe et al. (2009) initially fueled this study and many others, it has now become clear that sustaining current institutional climate change narrative limits our understanding of wider climate change effects and their impacts on people. In order to understand how climate change is affecting people at the local level, it is necessary to complement quantitative research with qualitative that takes into consideration local experiences and observations of the nature as well as the socio-cultural conditions that influence exposure and access of individuals to different climate change knowledge and resources. As shown here, climate change perceptions among the Sherpas are not homogeneous just as the Sherpas themselves are not homogeneous in this mountainous region. This qualitative research model is expected to serve as an alternative approach to the existing narrow institutional perspective and practice to dealing with human dimensions of climate change in Nepal.

REFERENCES