

Spring 2015

EXISTENTIAL AVALANCHE THE LIVED EXPERIENCE OF CLIMATE CHANGE IN DOLPO AND MUSTANG, NEPAL

Keegan McChesney
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EXISTENTIAL AVALANCHE
THE LIVED EXPERIENCE OF CLIMATE CHANGE IN DOLPO AND MUSTANG, NEPAL



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Submitted in partial fulfillment of the requirements for
Nepal: Tibetan and Himalayan Peoples, SIT Study Abroad, Spring 2015

Abstract

Himalayan communities stand precariously in an era of phenomenological uncertainty. Climate change is merely a lens through which we may observe and begin to understand such localized modern complexities. The people of the Tarap Valley in Dolpo, Nepal have experienced an increase in avalanches, snow leopard attacks and unpredictable precipitation patterns in recent years. In upper Mustang, Nepal, people have endured the harshest winter in generations and suffered from reduced water access. Environmental, climatic and weather related changes in both Himalayan districts have severely impacted traditional livelihoods and led some to adopt modern means of adaptation. Despite the scientific evidence suggesting anthropogenic climate change is the culprit, local perceptions of these shifts are widely based on religious, astrological and traditional understandings. Himalayan communities are among the most impacted by climatic variability, and according to scientists, the changes will only become more drastic. The geographical remoteness of many Himalayan communities exemplifies the disconnect between the modern, international academic understanding of climate change and the confusing reality of the lived experience of climate change. This paper aims to provide a voice to some of the voiceless victims of climate change in the Himalayan communities of Nepal. By understanding the changes, impacts, adaptation methods and perceptions in two communities, practical solutions can be enacted.

** Cover photo taken by Keegan McChesney in Tingkhar, Mustang, Nepal, March 2015*

Acknowledgements

First I would like to thank Nepal. The people and the places of this geographic region have inspired me to learn; Nepal is a student's paradise for the simple fact that every site and encounter is an educational experience. The artificial lines drawn between history, science, anthropology and religion are seamlessly blurred throughout Nepal. The cultural and geographic diversity of this country makes one feel as if they are not in a solitary nation-state, but rather, in a timeless encapsulation of humanity's dance with planet earth and the surrounding universe. The devastating earthquakes that have shaken the region are heartbreaking, but I know that Nepal, despite the loss of lives and monuments, will long remain a place of global inspiration.

I arrived in south Asia full of ignorance and curiosity; I would like to thank my extraordinary teachers for alleviating both conditions to a commendable degree. Isabelle Onians, with her deep understanding of linguistics and South Asian everything, provided me with a fascinating interdisciplinary education that sprung up at the most pleasurable of times. Patrick Dowd is a wealth of knowledge with a radiant understanding of Buddhism and Tibetan history from whom I learned a great deal via impromptu lessons. Tenzin "Tenchoe" Choezom not only facilitated my incredible homestay experience in Boudha, but she also helped me to grasp the Tibetan language through her charismatic teaching style. Pasang "Rinzi" Sherpa was a friend and invaluable resource throughout my experience, and I thank him for both the logistical assistance and laughs he granted me. Hubert Decleer was a welcome expert with an unforgettable knack for relevant storytelling. Nazneen Zafar was an invaluable consultant with extensive experience and contacts, with a friendly honesty and knack for critical advice that helped me navigate uncharted waters. Finally, I would like to thank Rinchin la and my Tibetan language partners for helping me learn a language which I truly thought was impossible to learn.

I would like to thank my project advisors, Phurwa Dhondup and Gregory Pierce, for their guidance throughout this independent study period. Without Dhondup, a native Dolpo-pa from Dho, I would have never experienced Dolpo in such a fulfilling way. Dhondup's academic insight combined with his localized understanding of Dolpo granted me direct access into the heart of modern Dho-Tarap. Dhondup helped foster connections to pivotal Dolpo-pa's and gave critical advice every step of the way, for which I am eternally grateful. Pierce's thesis, "The Vitality of Ice and Bone," was a formative piece of literature which significantly influenced my understanding of Dolpo. Along with the crucial knowledge taught through his work, Pierce also provided personal advice from one foreign Dolpo researcher to another. Pierce's radical academic commentary and personable conversation were vital to my research.

I would like to thank the district of Dolpo, particularly the Tarap Valley and the villages of Dho, Dhoru, Shipdrek, Tokyu and Thakshi for their unrivaled hospitality; I am grateful for every cup

of *po-cha* and every bowl of *tsampa* that was generously shared with me throughout my time in Dolpo. While I would like to thank everyone in Dho-Tarap for their kindness, a few people deserve a special thanks. Sonam and Dorje, two students from Dho, were with me every step of the way, both literally and figuratively, and I thank them for their unconditional acceptance and assistance. I would also like to thank Dorje, his older sister Wangmo and their grandmother “Ebee” for providing me with a loving home in Dho, in which I learned much, ate well, felt welcome and grew close to the family. Dolpo will remain dear to my heart and I thank the Tarap Valley for all it has taught me. I hope this paper may serve as a small token of my gratitude.

I also owe a special thanks to the district of Mustang and the people of Lo. As my first encounter with the Himalayas, Mustang was a profound experience. To all those who graciously lent me their time for conversation, their food for eating, their tea for drinking or their home for sleeping, I thank you. In particular, to the village of Tingkhar, I have never grown so fond of a place and felt such a bond with people in such a short period time. To my homestay family in Tingkhar, along with the children, lamas and elders who were ever-present in the home, I thank you for the memories. I also owe a huge thank you to my Lowa research collaborators, especially Amchi Pema, who provided me with personal insight into the life of the Lowa people. Again, I hope this paper will repay my indebtedness to the Lowa people to some small degree.

To my fellow students, I am grateful to have shared this semester with you. I have learned a great deal from you all and I look forward to future encounters. To Noah Stone, thank you for your companionship, geology lessons and research coordination throughout our journey in Dolpo.

To my host family in Boudha — Rabzay la, Lhamo la, Yanphel la and Tenzin Damey — thank you for everything. My experience in Nepal never would have been the same without such a caring family to support me.

Finally, to my family in Seattle, particularly my mother Lisa and my sister Ryann, thank you for encouraging me to follow my heart and spread my wings all the way across the globe.

Table of Contents

Introduction: Geographically Remote, Globally Pertinent.....	5
Climate Change in the Himalayas, A Scientific Perspective.....	5
Methodology.....	6
The Dolpo-pa Perspective.....	7
Historical Sketch of Dolpo.....	7
Environmental Observations: Precipitation Variability, Seasons and Avalanches.....	10
Livelihood Impacts: Pastoralism, Snow Leopards, Barley and Mud Houses.....	13
Local Adaptation: <i>Yartsa Gunbu</i> , Greenhouses, <i>Po-Cha</i> , Crystal Mountain School and Migration.....	19
Understanding Change: Outsiders, Religion, Tibetan Calendar, Science and the Unexplainable.....	22
The Loma Perspective.....	26
Historical Sketch of Lo.....	26
Climate Change in Mustang, A Scientific Perspective.....	27
Previous Investigations.....	28
Environmental Observations: Coldest Winter, Heavy Rainfall and Unpredictability.....	28
Livelihood Impacts: Pastoralism and Farming.....	29
Local Adaptation: Occupational Transitions, Globalization and Consumerism.....	31
Understanding Change: Religion, Nature and Humanity.....	33
Conclusion: Ungeneralizable Generalizations, Among Other Paradoxes.....	34
Looking Forward.....	34
Government Programs.....	36
Non-Governmental Organizations.....	37
Suggestions for Further Research.....	38
Interview Participants.....	39
References Cited.....	43

Introduction

Himalayan communities stand precariously in an era of phenomenological uncertainty. Climate change is merely a lens through which we may observe and begin to understand such localized modern complexities. Like a camera lens, a research lens confines immensity into a comprehensible frame. Through two case studies in Dho-Tarap, Dolpo and Lo, Mustang, Nepal, conclusions are drawn based on extensive interviews with the local population. By examining similarities between the two case studies, generalizations may be drawn upon the impact of climate change in Himalayan communities, but further research is necessary across Nepal's Himalayan communities in order to avoid false conclusions.

Anthropogenic climate change is a process that is now widely understood. Planet earth's climate has been altered by the industrial scale production and consumption of over 7.24 billion people. The mystery is how this change is affecting humans. Unjustly, the effects of this planetary shift are being incurred initially by irresponsible persons. The Himalayan bio-region is experiencing some of the most dramatic environmental shifts and Himalayan communities are experiencing the effects. The Himalayan regions of Dho-Tarap, Dolpo and Lo, Mustang, Nepal are places that remain devoid of industrial-scale production infrastructure, and, largely, industrial-scale produced goods, thus having little to no contribution to anthropogenic climate change. However, due to their geographic location and the climatic outcome of unrestricted global greenhouse gas emissions, Dho-Tarap and Lo are facing a future of uncertainty.

Scientific research has provided the academic and globalized world with an account of the causes and predicted effects of climate change. However, this information, along with many other modern concepts, remains absent from the local conversation in places such as Dho-Tarap and Lo. Moreover, scientific research focuses on scientific data. The 'hard' data tells one story, but the real narrative lies outside the realm of quantifiable data. Studies of ecological and geologic processes often hypothesise on the possible human impact of the environmental changes which they have discovered, but this is mere speculation. Scientists have more or less proven what effect climate change will have on glaciers and snow leopards, ecological boundaries and precipitation levels, but what effect climate change is having on humans remains relatively unknown. Therefore, the aim of this paper is to illuminate how climate change is impacting the lives of humans, not by scientific hypothesizing or future speculation, but by talking with people who are living with the ramifications right now. The overarching goal of this paper is to provide a voice to the voiceless victims of climate change.

Climate Change in the Himalayas, A Scientific Perspective

Anthropogenic climate change is disproportionately affecting the Himalayan mountain region. The rate of temperature increase in the Himalayas is greater than the global average, making the Himalayan region among the most vulnerable to climate change (Shrestha et al.

2012; Xu et al. 2009; Aryal et al. 2014). Extensive scientific research has been conducted on the changing environment of the Greater Himalayas. Biologists have examined the ecological impacts, geologists have documented glacial retreat and climatologists have studied changes in temperature and precipitation. According to “The Melting Himalayas” published in the journal *Conservation Biology*, “Rapid reduction in the volume of Himalayan glaciers due to climate change is occurring. The cascading effects of rising temperatures and loss of ice and snow in the region are affecting, for example, water availability... biodiversity ... ecosystem boundary shifts ... and global feedbacks” (Xu et al. 2009). Shrestha et al. (2012) found that in the Himalayan region, from 1982 to 2006, the amount of average annual precipitation has increased 163 mm. A World Water Council report concluded that the “Himalayas display great climatic variability,” making the region extremely susceptible to water related hazards (Eriksson et al. 2008).

Methodology

Interviews were the primary methodology employed for this study. Participant and environmental observation were also employed to verify information provided by informants. Participants were chosen somewhat randomly: any opportunity that presented itself for conversation was utilized for research. Rather than stale formal interviews, conversations flowed naturally as we talked about daily life. Oftentimes a group would gather around to listen and offer their two cents. The best information was drawn from such experiences, where I was able to exit the role of foreign researcher and instead become a spectator in a community forum. At times this community discussion caused difficulty in the translation process and subsequent quote attribution, and for this I apologize to any Dolpo-pa’s and Loba’s for any misquoting or wrongful attributions.

Over a three week period in Dolpo, I conversed with 43 informants. The majority of interviews were with Dolpo-pa’s concerning their lived experience of climate change. I spoke with 12 informants from Dho, 11 from Tokyu, six from Shipdrok, four from Dhoru, three from Thakshi, one from Namduh, one from Lang, one from Phoksundo, one from Shemen, as well as a few informants from outside areas such as Kathmandu. The participants varied in age from 20 to 84. The occupations and socio-economic status of the individuals was also diverse. Tsering Wangmo and her younger brother Dorje were gracious enough to serve as hosts, guides and translators throughout my stay in Dolpo. Both Wangmo and Dorje have a phenomenal grasp of the English language and an embedded understanding of Dho-Tarap; since both were educated in Kathmandu and have since returned home to Dho, they proved to be invaluable research collaborators. Dolpo-pa-English translation is incredibly difficult, as vocabulary and grammatical structure vary greatly, thus, any mis-translations are less attributable to linguistic ineptitude of translators, and more to translational impossibilities.

Over a one week period in upper Mustang, I conversed with 17 Loba’s concerning their lived experience of climate change. I spoke with nine informants from Lo-Manthang, four from

Tingkhar and three from Chungjung. Unfortunately I was unable to visit Samjung and Gheya, the two villages most impacted by climate change in Mustang. The participants varied in age from 28 to 85. The occupations and socio-economic status of the individuals was also diverse. Pema Angyel was my primary research collaborator, translator and village guide. Pema Angyel is a native Lowa born in Tingkhar and educated as an *amchi* in Lo-Manthang. Pema Angyel was a phenomenal translator, host and guide, but at times he admitted to his own translational errors. I also must admit possible imperfections in the quotes recounted in the Mustang section of this paper due to the difficulty of Lowa-English translation.

Interview participants were primarily asked four questions, from which the conversation flowed naturally: What role does the weather, climate and environment play your life? Have you experienced a change in the weather, climate or environment in recent years? If so, what will you do if conditions continue to change? If so, why do you think these changes are happening? These general questions were enough to spur fascinating conversations about livelihood, tradition, climate, history, religion, education, belief and the future. Nearly every informant from both Dolpo and Lo had observed recent changes and were kind enough to share their thoughts with me. Throughout the paper, informants are named, and a reference number is provided so readers may access the age, occupation, birthplace and other informant information where it is not provided in the text. I am thankful to all of the Dolpo-pa's and Lowa's with whom I had the pleasure of speaking with for sharing with me their lived experience of climate change.

The Dolpo-pa Perspective

Historical Sketch of Dolpo

The earliest historical documents from Dolpo date back to the 8th century C.E. Beginning in the 6th century, the Yarlung Dynasty of Tibet began conquering the Tibetan-speaking world; in this process, many migrated south to avoid conflict and settle. Fleeing south, migrants then settled in the four valleys of Dolpo — Panzang, Nangkhong, Tsarkha and Tarap — where they established a network of high-altitude, predominantly Buddhist villages. Dolpo fell under the control of neighboring kingdoms for centuries, but were able to maintain a relative level of autonomy throughout. In the 14th century, Dolpo became a part of the Kingdom of Lo which

Figure 1: Dolpa District, Nepal

McChesney/Merodesh Nepal



ruled over the Kali Gandaki River region to the east. Dolpo-pa's were required by the King of Lo to pay a tax as well as provide annual manual labor for the King's fields. The Gorkha's conquered Kathmandu in 1769, establishing the Kingdom of Nepal, and by 1789, Nepal had absorbed the Kingdom of Lo, and along with it, Dolpo. Since that time, Dolpo-pa's have been working to balance their Tibetan kinship and their Nepali citizenship in a geographical locational of dynamic remoteness. (Bauer 2004; Bauer 2014; Snellgrove 1967; Snellgrove 1989)

Dolpo has always been geographically remote, but always interconnected with neighboring regions. As Kenneth Bauer argues in his book *High Frontiers*, Dolpo was drastically changed when the border with Tibet was closed in 1959. The Dolpo-pa's relied on winter pastures and trade-partners in Tibet to supplement the limited resources available in Dolpo. The past sixty years since the closing of the border, Dolpo-pa's pastoralists have been transitioning into a new era of trade and livelihood.

Figure 2: Dho-Tarap

McChesney/The Great Himalayan Trail



The modern history of the Tarap Valley is epitomized by two phenomena: *yartsa gunbu* and the Crystal Mountain School. One cannot talk about Dolpo today without talking about *yartsa gunbu*, locally known as *bu*; in fact, one can hardly have a conversation in Dho-Tarap without *bu* being mentioned. *Yatsa gunbu* is a caterpillar fungus (*Cordyceps Sinensis*) which in Tibetan literally translates to “summer grass, winter

worm” (Silverman 2011; Winkler 2005; Zhang et al. 2012). According to Bauer (2014), *yartsa gunbu* “is the product of a singular ecological interaction between a caterpillar and a fungus. A fungus (*Ophiocordyceps sinensis*) parasitizes the larva of ghost moths (*Thitarodes spp.*), resulting in a dried, club-shaped fruiting body with the larva that today is worth more than its weight in gold.” *Bu* grows naturally across the Himalayas at altitudes between 3000 and 5000 meters, but it is particularly abundant in Dolpo (Boesi and Cardi 2009; Bauer 2014). In recent years, thousands of people have flocked to Dolpo's high altitude pastures in May and June to collect *bu*. The environmental impacts of massive springtime migration has been devastating. As outsiders come to collect *bu*, many informants observed them cutting down trees, ripping up shrubs and digging up the pasturelands. The visiting *bu* collectors also set up camp, where they eat, sleep, defecate and litter all across the region and in local waterways. Pastoralists have noticed the abuse of their pasturelands is directly affecting their animals, who now have less to eat and are dying more frequently.

In an effort to find justice, a loose agreement was made between the government of Nepal and the citizens of Dolpo. The people of Dho-Tarap would be allowed to collect a tax from the migrant *bu* collectors in order to pay for damages; since 2008, locals have been collecting ‘donations’ from migrant pickers. The Shey Phoksundo Buffer Zone management committee (SPBZMC), which is in charge of keeping statistics in the region, insisted on collecting an additional tax in Dunai, the capital of lower Dolpo, which has been collected since 2011 (Dhondup 2014). Arguably, even more controversial than the collection of royalties, is the regulation of picking in the winter pastures of Lang — Dho-Tarap residents depend on the pastures and want access restricted to pickers, but government officials insisted on open entry to Lang. In 2014, the SPBZMC increased their collection fee threefold and declared pickers unregulated access to Lang. In June, after submitting a petition to the government which was ignored, locals from Dho-Tarap organized a peaceful protest to protect their pasturelands and right to tax collection. When local people and stationed policemen began to debate the issue at the heart of *bu*-picking season, the situation turned violent. According to a number of informants, it began with a debate, followed by shouting and then shoving. Police batons were unveiled, rocks were thrown in retaliation, and soon police drew their rifles. On July 4, 2014 two Dolpo-pa men were tragically shot point blank and killed, as live ammunition was shot haphazardly at a group of unarmed protestors (Dhondup 2014).

The armed police then went on a raid of the Tarap Valley, entering every house to round up all young men in the village. Many men went into hiding in distant pastures or small dwellings; 12 men were caught, locked up, wrongfully charged and brutally beaten. A curfew was set by the police, and the Valley lived out the remainder of the season in fear.

Bu has brought income to many Dolpo-pa’s for the first time. Nearly all informants we spoke with pick *bu* each season or have picked it at some point in their life. With the money they earn from collecting *bu*, people can buy rice, solar panels, and other helpful resources which would otherwise be difficult to acquire. As Bauer argues in “Dolpo Revisited,” *yartsa gunbu* has brought an entirely new economy to Dolpo. The outcome of this economic phenomenon is yet to be understood, but the current social, economic and environmental impact of the caterpillar-fungus is significant.

Another major player in the modern history Dho-Tarap is Action Dolpo and the Crystal Mountain School (CMS). Action Dolpo was started in 1992 by Marie-Claire Gentric, a native of

Yartsa Gunbu

NPR/Daniel Winkler



France who became connected with Dolpo during a trek. The organization seeks to promote sustainable development, cultural preservation, environmental conservation and overall health in Dolpo, with its base in the Tarap Valley. CMS, the main facet of Action Dolpo, has brought a modern, Western-style education to a previously school-less region. Many children in the village can now be found in the classrooms of CMS rather than the fields during the day. Students learn English, Nepali and classical Tibetan, as well as math and science. Gregory Pierce, in his thesis *The Vitality of Ice and Bone*, asserts that in classes at CMS, “Dolpo-pa children only learn *about* their culture, practicing their language in what becomes a sad second-order attempt to salvage it as learning Nepali and/or English is framed as more a skill for progress in the eschewing of subsistence as backwards” (2012). Bridging a traditional education with a ‘modern, global’ education is a challenging, if not impossible task. After students complete the 7th grade, which is only a small percentage of each class, they are invited to continue their secondary studies in Kathmandu and to live at the Snow Leopard Residence (SLR) in Boudha with the other CMS graduates. Currently about 200 students attend CMS and about 30 live at SNR, both of which are funded by Action Dolpo through donors, the majority of whom are French. After completion of secondary school in Kathmandu, many students go on to complete a plus two, bachelor's or higher degree program. Starting with a foundational education at CMS, many Dolpo-pa students of a new generation are receiving an education their parents were never able to obtain. While this causes many young people to leave their home for extended periods of time, many educated Dolpo-pa's are committed to bettering their community. Nyima Dhargay, a teacher at CMS explained, “The villagers depend a lot on the slightly more educated people — older people give ideas to the younger ones, who then go and talk to the government. In the past we were left behind because we couldn't speak the language, now things are changing” (42). Dolpo has been thrust into the modern era and CMS may be the best possibility to ensure that looming changes benefit the community.

Environmental Observations: Precipitation Variability, Seasons, and Avalanches

The weather is changing in Dolpo and everyone has noticed. Traditionally, the Tarap Valley has been cold in the winter and warmer in the summer. In the winter, it snows for a long, up to six-month period and in the summer it rains for a short, two-month period. But things have begun to change. Since the Tarap Valley is located in a high-altitude, semi-arid landscape, the ecosystem is very fragile — barley, and more recently potatoes, are the only crops capable of growing in Dho-Tarap. Precipitation and subsequent irrigation, therefore, are of great importance. “If the snow is too heavy, it is very difficult. If the snow is too light, it is very difficult,” said Tsering Yongzom, illuminating the importance of consistent precipitation (29). When the level of rainfall or snowfall is unusual, people notice, since it has a direct effect on their livelihood. The ideal situation is to have light snowfall in the winter for quality grazing and heavy rainfall in the summer for quality irrigation, but unfortunately the climate seems to be

shifting away from the ideal. “The environment that was here six years ago is no longer here,” observed Nyima Dhargey. “The environment has changed” (42). Whether changes happen everywhere in every season of every year, but when conditions reach extremes, people notice.

For nearly every informant in Dho-Tarap, this has been the coldest winter recountable. 64-year-old Punjuk Tsewang said “This was the coldest winter of my life. It was so cold due to the heavy snowfall” (29). In a community discussion, all eight local informants agreed that this was the coldest winter they could remember. Among the informants, Tsewang Tsering, an 84-year-old village elder from Dho, said “This winter I couldn’t work because it was so cold, so I slept for seven straight days” (18). Every winter is cold in Dho, the conditions are always difficult; People have been migrating to Lower Dolpo, Tibet, Kathmandu and other warmer places for the winter for generations, but for those who remained this winter, it was almost unbearable. “I have stayed here many winters, but this winter was the snowiest winter in my entire life” said Nyima Dhargey, a teacher at CMS (42). Heavy snowfall is problematic, but snow melt is also the primary water source in the Tarap Valley. Many informants observed a decrease in the amount of snowfall the past five to seven years, which has impacted water levels in local rivers as well as local vegetation. When snowfall is sparse, rainfall becomes especially important, but most informants agree that winter precipitation levels — manifested in snow — are followed in the summer in the form of rain.

Community Discussion in Dho

Noah Stone



The Tarap Valley has experienced a decade of abnormal precipitation patterns. Pasang Lhamo observed that the past few “summers have been very dry. Without water, it is hard to grow our crops” (9). Agriculturalists elaborated that with less rainfall, the quantity of crops grown remains about the same, but the quality and yield of each barley plant decreases. Thukten, an artist and agriculturalist from Tokyu, observed, “Before 2009, the weather was always the same. But now things are different. For example, now when it rains in the summer, it will downpour heavily for a few days, but other times it won't rain at all for months. It has become erratic” (1). Floods and droughts are becoming increasingly common, a recent paradox brought about by this erratic rainfall. “Two years ago there was a very big rain and it swept out of all of the bridges in Thakshi. But last year there was very little rain,” commented Tsering Lhadol (2). Many informants are worried that a heavy rainfall will follow this winter's heavy snowfall, thus resulting in floods. When a flood hits, it destroys many small bridges, making it extremely difficult for agriculturalists to get their animals across the river to the pasturelands. Additionally, flooded fields may alter barley production levels. The Dolpo-pa are culturally Tibetan and follow the Tibetan calendar. According to Nyodup Dolma, “It normally rains in the 4th and 5th months of the Tibetan calendar, which is good for the crop. But the last three years it has been raining in the 6th and 7th months [of the Tibetan calendar] and that was bad for my crop... If it continues to rain in the 6th and 7th months [of the Tibetan calendar], I will feel sad” (3). A number of other informants reiterated this point: rain is coming later in the year, which negatively affects crop production.

Changing precipitation patterns alter people's perception of seasons. Seasons, especially in Dho-Tarap, are based on weather conditions: in the summer, it is warm and it rains, in the winter, it is cold and it snows. When the experience of summer and winter changes, it appears that the seasons themselves are actually changing. “The seasons are changing slightly: spring comes a bit earlier than it used to,” explained Monlam Jama (22). The weather is changing, which is hard for anyone to comprehend. Remembering the climate of the past is a challenging task, but Lakpa Tsering reflected that “It feels like it is warmer than when I was a kid” (37). The multifold shift in precipitation patterns and temperatures is a frightening combination. “In the past, it used to get colder earlier. Water would freeze in certain places at certain times. Now it gets cold later, it snows later, the water freezes later,” said Nyshar Sangmo. “The same thing is happening with rain. Now it starts to rain in the middle of spring instead of the beginning” (11). The seasonal alterations of precipitation and temperature patterns are affecting the environment around the Tarap Valley, which is causing an increasing in disasters such as avalanches.

An unprecedented number of avalanches were witnessed around Dolpo this winter. According to Ang Bahadur Lama of the High Mountain Agribusiness Livelihood and Himalayan Project, around 280 yaks in migration from upper to lower Dolpo were killed in avalanches this year — a record high number. Near Ang Lama's home in Phoksundo, a neighboring district of Tarap, an avalanche killed four of his yaks and the young boy who was grazing his yaks this year. “There never used to be avalanches in this area. Things are very different than they used to

be. It is very difficult for people right now” Ang Lama said (7). Bimba Batur Barala, Director of the District Agricultural Development Office in Dunai — the capital of lower Dolpo and government headquarters in the Dolpa District — concurred that this winter a record-high number of avalanches were recorded throughout Dolpo, which has direct impacts on agricultural production (6). Not only is the number of avalanches increasing, but the avalanches are happening in places where they never occurred before. Informants reported that avalanches were primarily observed north of Dho-Tarap in the past, on particular mountain faces, but this winter, a number of avalanches occurred in the west and south on slopes where they were never seen before. “It is all quite strange,” said Nyshar Sangmo. “We no longer know where the avalanches will occur. This year it took place on this mountain, next year it will happen on another mountain” (11). In a group with eight elder informants there was a consensus that avalanches have drastically increased in number and avalanches occurred this year where they have never been observed before (12-19). Tunen is among the numerous informants who observed avalanches in peculiar places: “Normally there are not many avalanches in Tokyu, but this year there were many close to The Valley and there were an especially high number in Lang” (34). Phurwa Gyaltsen, a science teacher at CMS with a bachelor's degree in physics, has a deep understanding of how climate change is affecting his community and admitted he is most frightened by the increase of avalanches and floods (39). Ultimately, changes in precipitation patterns and temperature have led to an increase in natural disasters, which is in turn impacting the livelihoods of Dolpo-pa's.

Livelihood Impacts: Pastoralism, Snow Leopards, Barley and Mud Houses

Pastoralism is the primary occupation of Dolpo-pa's living in Dho-Tarap. The vast majority of households in Dho-Tarap own some combination of the following animals: yak, di (female yak), *dzo* (yak-cow combination), cow, horse, mule, goat and sheep. Goat and sheep, commonly referred to together as *ra-luk* (goat and sheep, respectively), are the most abundant and least valuable of the animals — their mainly utilized are for their meat, fur, dung and milk.

Ra-Luk in Dhoru



Noah Stone ***Yak in Tokyu***



Noah Stone

Yak are the most valuable and second most abundant animal in the Tarap Valley, used for transporting goods as well as providing high quality fur, meat and dung. Three primary disturbances have caused an untold number of livestock to perish in recent years: avalanches, pastureland alterations and *sawa* (snow leopard) attacks. Sherap Sangmo's woeful experience reflects that of many other community-members: "I lost 30 *ra-luk* this year due to avalanches, lack of grass and *sawas*" (34). The animals in Dolpo are particularly sensitive to environmental disturbances.

Avalanches took a heavy toll on livestock this winter. Animals are such an inherent part of existence in Dho-Tarap that any loss is costly. Nyshar Sangmo explained the value of her yaks:

Last year the snow wasn't very heavy, but this year there was so much snow and so many avalanches. Two of my yaks were killed in an avalanche. I used to have five yaks, now I only have three. All of our food, wool and dung [fuel], is collected from far away and carried home on yaks. Now that I only have three yaks left, it is very difficult. Yak is our main mode of transportation, so I think I will have to buy new yak, which cost [\$600 to \$1,000 USD] each in Dolpo. (11)

Yaks are not just an essential means of transportation and commerce, they are a principal source of life. Losing a yak can be a devastating economic, as well as emotional blow for many. It is tradition in Dolpo to keep one yak as a spiritual leader, not to be eaten, but the death of yak usually results in the drying of meat and collection of fur. Many households lost animals to avalanches this year, as well as to starvation and depredation. "Ten years ago, we used to get heavy snowfall every winter. Now we get light snow, except for this year. This year was the heaviest snowfall, and lots of yak and di died due to avalanches, starvation and *sawa* attacks" said Namgyal, a 64 year-old agriculturalist from Dho (20). Avalanches, starvation and depredation are interconnected issues diminishing the livestock in Dho-Tarap.

The pasturelands in Dolpo are of vital importance to the well being of domesticated animals, especially yak. "This year there was so much snow; it was very hard on the animals because there was nowhere to graze," explained Nima Sangmo, a 45-year-old agriculturalist from Dho (23). In his book *High Frontiers*, Kenneth Bauer investigates how the closing of the Nepal-Tibet border has changed the lives of Dolpo-pa pastoralists (2004). Dolpo-pa's used to graze on winter pastures in Tibet and trade with their Tibetan "fictive kin" until the Chinese government closed the border in 1959 (Bauer 2014). Nowadays, the pastoralists of Dho-Tarap migrate to various winter pastures, with most heading to Lang in the south. Usually Lang is a fruitful pastureland, but this winter, it was covered in snow. Nyshar Sangmo, Nima Sangmo and Tsering Sumduk expressed similar grievances, respectively, regarding the condition of their pastures: "Now that it snows heavily in late winter, it is very difficult to find pastureland. Many animals die; they starve to death because there is no food" (11); "Things are getting harder for our animals because there are less places to graze" (23); "Things used to be easier for my animals. Now there are fewer places for the animals to graze so it is difficult" (35). Scarce and

severe snowfall — which as of recent have been in abundance — both disturb pasturelands; additionally, *yartsa gunbu* pickers who come from outside are often credited with the degradation pasturelands. Precipitation changes and human exploitation are likely complementary forces pushing pastureland distress. Regardless of the cause, Tsering Yongzom and her fellow community-members incur the effects:

It usually starts snowing at the 10th month of the Tibetan calendar and ends around this time [late-April]. But it hasn't happened this way for the past few years. This year it began to snow earlier in the year. We weren't prepared for the pastures to be covered in snow, that is why all of our animals are so weak. This is the weakest they have ever been. 10 *ra-luk* died this winter, four to the *sawa* and six to starvation. (28)

Livestock are dying en masse in Dho-Tarap and other Himalayan regions. Unfortunately, endangered species, such as the snow leopard, are feeling the effects of climate change as well.

Waste Pollution in the Waterways of Dho

Noah Stone



Human-wildlife interactions flare up under environmental stress. According to the World Wildlife Fund, “Climate change poses perhaps the greatest long-term threat to snow leopards. Impacts from climate change could result in a loss of up to 30 percent of the snow leopard habitat in the Himalayas alone.” Habitat loss in-turn means a loss of prey. According to Aryal et al. (2013) in their investigation of human-wildlife-ecosystem interactions in the Trans-Himalaya of Nepal:

Concurrent with the recent change in climate, there have been substantial changes in vegetation communities. Between 1979 and 2009, grasslands and forests in the Mustang district have diminished by 11 and 42 %, respectively, with the tree line having shifted towards higher elevation. Further, grasses and many shrub species are no longer found in abundance at higher elevations and consequently blue

sheep (*Pseudois nayaur*) move to forage at lower elevations where they encounter and raid human crops. The movement of blue sheep attracts snow leopard (*Panthera uncia*) from their higher-elevation habitats to lower sites, where they encounter and depredate livestock. Increased crop raiding by blue sheep and depredations of livestock by snow leopard have impacted adversely on the livelihoods of local people.

Snow Leopard in the Himalayas
Foundation

World Wildlife



Snow leopard attacks in Dho-Tarap this year were unprecedented. In Dhoru, a few kilometers north of Dho, snow leopards are more common than in other parts of Dolpo. Amchi Karwang Dorje Lama has encountered snow leopards his entire life:

The *sawa* has killed many of our *ra-luk* in the past, but this year they have killed more than any other year. Today three *sawa* came down near the village and killed one of our *ra-luk*. This is very strange behavior. They have already killed four of my *ra-luk* this year, usually they might get one or two at most each year. But our goats are weak this year, so it is easier for the *sawa* to catch and kill them. Since there is so much snow on the pastures, our *ra-luk* have nothing to eat, they are starving. The *sawa* can easily catch them because they are not strong enough to run away. (27)



Amchi Karwang tried to poison the goat carcass with medicinal herbs after he chased the snow leopards away. He wanted to kill the snow leopard. He would have used a trap, but the trap was lent to another village dealing with the snow leopard problem. When the snow leopards came back that evening to collect the poisoned carcass, Amchi Karwang ran after the the snow leopards with a knife in his hands. Tashi Gyurme lost five di in Lang this year: “Two were killed by wolf, three were killed by *sawa*. The animals need to graze at night because they are starving, but there is no one to look after them at night, so they get killed” (33). Heavy snowfall, struggling pasturelands and increased attacks are interconnected problems. Many informants explained that because of the heavy snowfall, the pasturelands are barren, and therefore their animals are weak, thus making them susceptible to depredation. Tsultrem Dyengyel shared a similar experience: “This year the *sawa* have killed two of my yaks. It killed one small yak in the daytime and one big yak at night. The yaks lack enough grass to eat this year, so we had to let them graze at night. When the yaks graze at night, they are vulnerable to *sawa* attacks. Two more of my yaks were killed in an avalanche this year” (30). Many informants heard about a Nepali government compensation program to reimburse pastoralists for animals killed by snow leopards; unfortunately, most were too skeptical or unsure of how to collect compensation, and the few who made the three-day journey to Dunai to try to collect reimbursement were unsuccessful. Lakpa Tsering was skeptical of a quick fix and explained that “5 of my yaks were killed by *sawas* this winter. With such heavy snowfall this winter, [the snow leopards] are hungry. There are also more baby *sawa* now, so they have to kill more. There is no good solution. Some plan to use poison to make the *sawa* sick so it will stop attacking” (37). Many more throughout Dho-Tarap, Dolpo and the greater Himalayas have experienced increasing snow leopard attacks in recent years. The snow leopards are becoming more hungry, more desperate and more brave. Tsering Yongzom observed that “*sawa* used to only kill in the high mountains,

but now they come all the way down into our village, into our compound, it may even come into our house!” (28). The tragedy is that two struggling species are vying for the same resources and habitat, and if nothing is done soon, one will surely drive the other to extinction. The other primary life-source besides livestock is barley, which has also struggled in recent years.

Barley has been the staple crop of upper Dolpo since the settlement of Tibetans in the region in the 8th century C.E. Most families own barley fields that they plow in the springtime and harvest in the summertime; yaks are crucial assistants in the sowing season. Barley is the staple crop in upper Dolpo, as well as many other Himalayan communities, and it makes up an important percentage of people’s nutritional and caloric intake. The semi-arid climate of Dolpo is only capable of producing barley, and in recent years, some potatoes. Due to the harshness and fragility of the environment, however, barley, like most crops, is susceptible to climatic variability. Tsering Sumduk, a 51-year-old agriculturalist from Tokyu, explained that “There has been less snow than usual the past six or seven years, but this year there was so much snow. The rain has remained mostly the same, but it has become unpredictable. Both affect the grass and barley negatively. Less grass means less animals; less barley means less food” (35). The people of the Tarap Valley are at the mercy of the climate, and for the past few years, the dependable climate has failed them. There is also the matter of planning for the rough winter, as Nima Sangmo explained: “If there is no rain in the summer, barley and grass don’t grow well, and we need to collect both for the winter” (23). In Dho-Tarap, the systems for survival are built on the presence of a certain climate. If it is a difficult summer, it will prove to be an extremely difficult winter.

The vast majority of houses in Dho-Tarap are made of mud and stone. Animals usually dwell around the house and on the ground level. Wood is commonly stored on the roof for winter and displayed as a status-symbol. Water is generally stored in large jugs and collected by women and children from local taps on a daily basis. In harsh conditions, especially in winter, everyday tasks of maintaining such a household become extremely difficult. Abnormally heavy snowfall has a direct impact on the community, it affects every part of life, as Pasang Lhamo described: “It was extremely cold this winter, very different than before. It is very difficult to live in such cold conditions, it is even hard to come out of the house. When it snows so heavily, we only have time for breakfast, the rest of the day we have to work very hard to keep the house standing and the animals alive” (10). Seemingly small changes in atmospheric conditions can have significant impacts on the community. The living practices of the Dolpo-pa’s, which have been carefully crafted and passed down over the past twelve-hundred years, are threatened due to climate change. Climatologist, geologists, ecologists and other scientific researchers all agree the environmental changes in the Himalayas are going to increase in severity; therefore, marginal adaptation may be the only option if Dolpo-pa’s hope to remain in the Tarap Valley.

Local Adaptation: Yartsa Gunbu, Greenhouses, Po-Cha, Crystal Mountain School and Migration

The physical makeup of the Tarap Valley is changing. Precipitation is becoming increasingly unpredictable, avalanches are smothering in all directions, snow leopards are descending into the villages, and subsequently, animals are dying, crops are under-producing and people are suffering. The Dolpo-pa's living in the Tarap Valley have already begun to adapt to such phenomena in a multifaceted ways. "Many people are selling their animals and growing barley is becoming more difficult. If there are no more animals and no more fields, there is nothing to do here. I fear people are losing their livelihoods and that their standard of living will suffer" said Phunthok Choephel, a graduate of CMS who studied in Kathmandu and has lived at SLR for the past five years before returning home in April (38). The environmental pressure to change is exacerbated by external social pressure to adopt a more 'modern, global' way of living. The phenomenological process at play have cajoled Dolpo-pa's into adopting paper money, packaged food, modern electronics and consumeristic desires.

Yartsa gunbu has brought an entirely new economy to Dolpo in the past two decades. The price of *bu* has skyrocketed and the income from collection are relied upon ever-heavily by Dolpo-pa's. In "Dolpo Revisited," Kenneth Bauer explains, "The value of this myco-medicinal increased by 900% between 1997 and 2008 in China, creating a globally unique rural fungal economy that has thus become a novel and unprecedented source of capital accumulation for rural populations across the Tibetan Plateau and the Himalayas." For many households, *bu* has become the first and only source of monetary income. This income has been used to purchase a wide range of goods, particularly Chinese products which are obtained at the bi-annual border market in Tibet. Phunthok Choephel, the 20-year-old student from Tokyu educated in Kathmandu, is worried about the long term effects of this single commodity dependence, "Right now, living standards are high because people have money from *yartsa gunbu* and selling animals, but if *yartsa gunbu* stops growing, what will people have left?" (38). Many informants also admitted to being in-debt from *bu*. 'Businessmen' from lower Dolpo are said to give out loans in the winter based on expected earnings from *bu* collection, which are expected to be repaid after the summer picking season. Interest on these loans is upwards of 70 percent. With a dwindling supply of *bu* and more pickers gathering every year, debtors are oftentimes unable to repay their debts. Some informants admitted to selling their animals in-part to pay off debts. Additionally, the lenders often fix the price of *bu* before the season starts, so local collectors receive less money per myco-medicinal when they pay back their debts with *bu*, instead of selling it at the market in Tibet or to local businessmen. The loan system is a classic example of Marxian slave labor, where people are forced to work just to repay predatory loans. Regardless, *bu* is providing the households of Dho-Tarap with goods unattainable prior the phenomenon. Nima Sangmo, a 45-year-old agriculturalist from Dho said "Before, we had no money. Now we

can buy food instead of working for it. We used to wear all handmade woolen clothes, now we can buy synthetic” (23). Despite the environmental and social calamities, many Dolpo-pa’s view the new income as a blessing. “Compared to twenty years before,” said local businessman Pasang Tsering, “people are doing less farming; due to *yartsa gumbu*, people have a new way to live, an easier way to live. But if *yartsa gunbu* disappears then people will go back to farming” (40). This transition away from a agriculturalist economy to a more ‘modern’ form of commerce is what Bauer (2014) calls a “hybrid barter-capitalist economy.” This new economy has brought many physical benefits to the Tarap Valley, but some are worried about the long-term risks of single-commodity-natural-extraction-based income reliance, otherwise known as The Dutch Disease (The Economist 1977; Corden 1984). But adaptation strategies have not only come in the local economy, but also in local agricultural practices.

Action Dolpo has brought many new things to Dho-Tarap. Among the most physically apparent are greenhouses, which in the past decade have popped up all around The Valley. A few greenhouses were originally constructed by Action Dolpo representatives as a tutorial for future building. The greenhouses were intended to provide a warmer space, isolated from the harsh elements, to grow food. Potatoes, chinese cabbage, and a few other vegetables have been successfully grown in these greenhouses, diversifying both diets and crop output. The greenhouses, however, are being used for much for than just agriculture. As a warmer, well-lit room, the greenhouses provide a great space for weaving, *pujas* (religious ceremonies) and daily community affairs such as drinking *po-cha* (Tibetan di-butter tea). Nima Sangmo, a 45 year-old agriculturalist from Dho, explained how his greenhouse has helped him in recent times:

We have had our greenhouse for the past seven years. We don’t have to make a fire in here and it is still warm. Before if it snowed, we would stop work, but now we can still work in the greenhouse. The greenhouse has become more important than rain. Fields need rain, but people don’t need rain. I spent most of the winter in my greenhouse because I don’t have yaks to collect firewood with anymore. So without the greenhouse, I could have died this winter! (23)

A Greenhouse in Dhoru, Similar to those Found Across the Tarap-Valley

Keegan McChesney



The greenhouses in the Tarap Valley have proven to be a multifunctional amenity for those households fortunate to have enough capital to build one. While on the one hand, greenhouses are an effective adaptation measure against unpredictable weather conditions, the greenhouses have simultaneously become a status symbol and a comfortable dwelling place. The transformation of social space is paralleled by a change in another fundamental element of Dolpo life — *po-cha*.

Po-cha, Tibetan butter-tea, is drunk throughout the day in nearly all Dolpo-pa households, as is customary through Tibet and the Himalayas. Gregory Pierce, in his thesis “The Vitality of Ice and Bone,” expresses the importance of these biometabolically produced electrolytes in Dolpo (2012). *Po-cha* has traditionally been made with a combination of di butter and black tea, and it has been a key nutritional element in the limited diet of Dolpo-pa’s. *Po-cha*, however, has been commodified in recent years — few households today use real di butter, but rely instead on imported Chinese margerine. Dolpo-pas began purchasing Chinese margerine at the bi-annual border markets about a decade ago, and since then it has become a staple in most households. It may be due to an increase in the amount of *po-cha* being drunk, or a change in the number of di per household, or a prioritization of other tasks over the making of di butter, but whatever the cause, the effect is significant — Dolpo-pa’s now drink upwards of 40 cups per day of *po-cha*, which they still believe is butter tea (as it is advertised in Tibetan on the package), but it is in fact margarine (as it is printed in English on the same package). Di butter and technometabolically produced margarine are very different products with very different nutritional content; the long-term health effects of drinking a synthetic versus an organic *po-cha* are yet to be realized. The impact of other outside influences are also yet to be understood.

The Crystal Mountain School is the first school ever established in Dho-Tarap. Started by French philanthropists, the school is inherently influenced by Western notions of education. The impact of such an institution is nuanced, but significant. Penba Gyaltsen noted that “The power is shifting. It used to be entirely in the hands of the Nepalese government, but now, with Action

Dolpo and the Crystal Mountain School, the younger generation is opening up communication with the outside government” (24). One of the primary focuses of CMS is language — students learn English, Nepali and classical Tibetan. These three languages open doors unknown to the previous generation. The outside world, many parts of which were previously unreachable, has become a communicable mystery. Students leave Dho-Tarap and return with a wealth of new information. Students are choosing the classroom over the field, a generation is prioritizing

“Welcome to Tarap, CMS” Keegan McChesney



Crystal Mountain School Students Noah Stone



“Care for Environment” at CMS Noah Stone



education over tradition.

Agriculture has become a more difficult, less predictable occupation due to climate change, and other avenues may appear more traversable. Tsewang Bungyal, a bön monk who has been living in a monastery in Kathmandu, observed, “Many changes have come to Dolpo since I left five years ago, I think mostly due to the CMS” (21). The complexities of this single entity phenomenon are incomprehensible; for tangible better and for untold worse, CMS is changing Dolpo.

CMS has also played a part in the changing migration patterns of Dolpo-pa’s. Traditionally, Dho-Tarap community-members would lead a seasonal migration to lower Dolpo in the winter on a labor-food trade agreement. Upper Dolpo workers would come down to the more arid climate of lower Dolpo in the winter to work in the fields, and in the fall they would return back home with bags of rice, cabbage and other food-goods. Nowadays, residents of upper Dolpo migrate to cities in the winter, such as Kathmandu, if they can afford it. Those who can’t afford it stay in Tarap or other valleys for the winter and try their best to keep their families and their animals alive. In Kathmandu, many Dolpo-pa’s are exposed to modern luxuries such as smartphones; when they return home, they bring with them a new perspective and new goods. Income from *bu* collection and opportunities brought about through CMS have enabled a large number of Tarap Valley community-members to escape the harsh winter. A number of younger and elder Dolpo-pa’s have decided to stay in Kathmandu long-term — the former generally for employment opportunities, and the latter due to the difficulty of traveling to Dolpo. According to Douglas Bardsley and Graeme Hugo (2010), in an article on the intersection of climate change and migration:

For most voluntary "environmentally motivated" migrants, the change to their socio-ecological systems is unlikely to be critical before it influences their

decision to move. Thus, the threshold level of environmental change that will influence migration patterns may be relatively low and less attributable to particular events. Rather, voluntary out-migration results in part from a perceived reduction in the value of remaining within a place.

The physical value of living in Dolpo may be diminishing. With more difficult, less predictable weather conditions, especially in the winter, migration may be an unavoidable adaptation measure.

Understanding Change: Outsiders, Religion, Tibetan Calendar, Science and the Unexplainable

Phenomenological change of such magnitude is difficult to comprehend. In the post-Enlightenment era of Western society, we have employed science to explain the seemingly unexplainable. However, at different scales of experience, there also exist different frames of understanding. Dolpo-pa's are experiencing a shift in the immediate world around them. The understanding of change from the perspective of the Dho-Tarap community illuminates how isolated Dolpo-pa's are from the conversation revolving around anthropogenic climate change. (Pierce 2012)

Many Dolpo-pa's in the Tarap Valley draw on lived-experiences for answers, rather than books, scientists or other authorities we rely on in Western academia. In the Tarap Valley, the most pertinent experience in recent years has been the influx of thousands of outsiders for the *bu* picking season. An estimated 9,000 outsiders came to Dho-Tarap in 2013 alone to pick *bu* in May and June (Dhondup 2014). Bringing upwards of 9,000 people into a community of 923 (Nepal Census, 2011) inevitably risks calamity. Outsiders have observably damaged pasturelands and polluted the rivers, but the outsiders are also being blamed for the strange weather of the past decade. Thukten, Tsering Sumduk and Nyima Dhargey explained, respectively: "now many outsiders come and use the local resources, and it has changed the weather" (1); "It is because when many outsiders come to pick *bu*, they destroy the land and the forests, and this affects the weather and causes avalanches" (35); "Due to so many outsiders exploiting the land, the very landscape has changed" (42). The general sentiment is that outsiders who come to pick *bu* frequently break the unwritten laws of The Valley. *Bu* has changed so much in Dho-Tarap in the last 10 years that it is only logical that this is the cause for the change in the weather as well. Nyshar Sangmo expressed this train of thought:

Everything used to be the same. People the same, village the same, mountains the same, weather the same. But now everything is different. People are coming here from all over. Outsiders chop down trees around a spring where we have not cut trees for many years. This may be the reason for irregular rain patterns. (11)

Tarap Valley residents obey a set of unwritten rules, rules which have been followed for generations because of their mutually beneficial qualities. For example, stones and vegetation from certain places are not collected — an ancient conservation method intertwined with

religious adherence. The pasturelands are a cherished resource and therefore they are meant to be respected landscapes. Many informants attributed increased avalanches to the outsiders exploitation of the pasturelands, a claim backed in part by scientific evidence that proves vegetation increases slope stability and the angle of repose (Patten and Knight 1994). The rules are not only beneficial to the community, but they are also a part of a religious covenant, as Nima Sangmo explained, “The past few years there has been less rain and snow because more outsiders are coming in. There is some kind of spirit looking after the village; when outsiders come and break the rules, the spirits are not so happy” (23). Nima Sangmo illuminated the intertwined nature of experience and belief in Tarap, which is a way to understand climate change in Dho-Tarap.

Religion is a part of everyday life in Dho-Tarap. Dolpo-pa’s in The Valley are primary followers of a unique adaptation of Tibetan Buddhism, with a small minority following bön, the ancient pre-Buddhist religion of Tibet. Local mythology still persists, but is adapted to modern experience and understanding. Interestingly, when discussing religion, some informants used the pronoun ‘we believe’, whereas others, mostly younger informants, used ‘they believe’, which obviously indicates a shift in religious belief. The shift, according to Nyodup Dolma, is a possible cause: “We used to believe in one God, but as people stopped following God, God got angry, so this may be resulting in changing weather” (3). The environmental changes feel to many like a punishment, and for some, this punishment is explained by the disrespect of God, rules and local deities. Nima Sangmo, a 45-year-old agriculturalist from Dho said, “Lha and Lhu are the spirits of the valley. Lha is god of the upper space, Lhu is ruler of the lower space. Lha and Lhu are not happy, so they bring suffering in different forms, such as changing the weather” (23). Lha and Lhu explain the circumstances in the Tarap Valley, but other Himalayan neighbors are struggling as well. Those individuals who are aware of the conditions in adjacent regions, such as Lakpa Tsering, have a harder time attributing the change to local affairs: “In our religion, when we carry stones and trees from the wrong places, the local gods, Lha and Lhu, get angry and create less rain. But it can’t be Lha and Lhu because this winter was difficult everywhere, not just the Tarap Valley” (37). To appease the gods or local deities, *pujas* are often performed. Certain lamas in The Valley are responsible for performing certain *pujas* that are used to bring rain or stop hail. Lay community-members also get involved in the rituals at times, as Nyshar Sangmo explained: “In Dolpo, when it is not raining at the right time, people carry books of Buddhist scripture and perform a ceremonies, and after 2 to 3 days, it rains. Now with people’s bad activities the rituals aren’t as effective as they used to be” (11). For many informants, explanations are drawn from traditional sources of authority; in some cases, the authorities are local lamas, and for others, it is a long trusted-time keeping method.

The Tibetan calendar is based is a hybrid lunar-solar system of chronology. Founded on ancient astrological knowledge, the calendar can predict auspicious days and weather patterns. Today, Tibetan calendars are purchased from the Tibetan border market or from Kathmandu, and its contents are widely trusted. Many informants explained that the strange weather was in fact

predicted on the Tibetan calendar. Tsering Yongzom, a 47-year-old agriculturalist from Dhoru, said that “This winter was predicted to be very cold by the Tibetan calendar, and the next few winters may also be very cold. The Tibetan calendar is very accurate” (28). A discussion with eight informants exposed that the erratic rainfall patterns of the past few years were also predicted on the Tibetan calendar. The Tibetan calendar provides an explanation for the unexplainable, a way to comprehend a phenomenon which many are having a hard time understanding.

The majority of informants found explaining the climatic conditions to be a laughable matter. The ‘environment’ and ‘climate’ are words that do not exist in Dolpo-pa, and to attempt to explain their nature is a comical endeavour. Changes in the weather are simply unexplainable to many. “It’s a mystery why the rain has changed” said Nyodup Dolma (3); “There is no reason that this winter was so cold” added Tunden (34). A majority of informants shied away from questions addressing the cause of peculiar weather, environmental shifts or animal behavior. In the contexts of Buddhism and the Himalayas, there are simply things bigger than oneself that are beyond concepts (Khyentse 2008). Pasang Lhamo found that her vocabulary didn’t extend into the realm of atmospheric hypothesis: “There have been many changes here in recent years — they are hard to explain” (9). The minority of informants who conjured up a scientific explanation for recent occurrences were those who had spent significant time outside the Valley.

For those who have been educated or spent significant time outside of Dho-Tarap, new ideas are acquired. Exposure to the scientific community and the authoritative voice of global media influences some Dolpo-pa’s. For those with an education in the sciences or a nose in the newspapers, climate change, the greenhouse gas effect and global warming are familiar concepts. Phurwa Gyaltsen, the 24-year-old science teacher at CMS from Tokyu who holds a bachelor's degree in physics from a Kathmandu university, is among those with an outside perspective:

Climate change is definitely taking its toll on Dho-Tarap. Previously as I child, I never saw fluctuating weather like this. It used to snow for two to three days maximum, now it will snow for weeks at a time. It used to be the same weather all day, but now it can change from sunny to snowy in a matter of minutes. The climate here is very fragile and the land is arid. I am worried about the increase of floods and avalanches in the Valley.

Many of those with outside information have returned home to use their education to benefit their community. Tsering Wangmo is a 24-year-old nurse from Dho who plans to restructure the entire health system in Dolpo. Tsering Wangmo has observed substantial changes in the valley, but will remain close to home in order to keep her community healthy: “I have heard a lot about global warming and I think it is really happening here. This mountain used to be covered in snow when my parents were children, now it’s all melted. Before there used to be a regular pattern of snow and rainfall, but now it’s unpredictable” (26). Students who graduate CMS and head to Kathmandu to live at SLR often encounter classes such as Population and the Environment, where they learn about environmental issues. Phunthok Choephel, the student from Tokyu, said

“The greenhouse gas effect is affecting the Tapap Valley. I think there was so much snow this year and there were so many problems with livestock because of global climate change” (38). The younger generation has an understanding of the looming challenges and seems to be in a collective state of brainstorming solutions. Village leaders of older generations, such as Penba Gyaltsen, appear ready to pass the torch to the young experts in an era of such uncertainty: “The changing weather is not only in Tarap, it is all around the world. The winter was harsh everywhere. I’m not sure exactly what this is due to; I think science has more answers. With education, the younger generation is prepared.” (24). Science may provide some answers and predictions, but ultimately experience is the relevant reality in Dho-Tarap, and throughout the Himalayan world.

The Lowa Perspective

Historical Sketch of Lo

In 1380, the warrior Ame Pal established the Kingdom of Lo, a Buddhist kingdom in the central Himalayas. Ame Pal ordered the construction of the walled city of Lo-Manthang, which today still stands amongst ancient monasteries and palaces as the capital of Lo. With a strategic location on the Kali Gandaki River, the Kingdom of Lo flourished as a key trade route, particularly in the salt trade between India and Tibet. The Kingdom controlled parts of the central Himalayas until the 18th century, when the Gorkha’s ‘united’ the Kingdom of Nepal. When Nepal became a republic in 2008, Lo’s monarchy was formally outlawed.

Lo, known by the Nepalese government as upper Mustang, was opened to tourists in 1992. Tourism infrastructure has developed since that time, and in 2013, a road was completed connecting Lo-Manthang to Jomsom, the capital of lower Mustang and the site of the nearest airport. The government charges a USD\$50 per day permit fee to outside visitors, however, the funds go to the government of Nepal rather than the Lowa community, which has caused recent tension. Today, Lowa’s — the residents of present-day upper Mustang, Nepal — are in a perpetual state of change. (Dhungel 1999; Peissel 1967; Snellgrove 1989; Chao 2011)

Figure 3: Mustang District, Nepal

McChesney/Merodesh Nepal

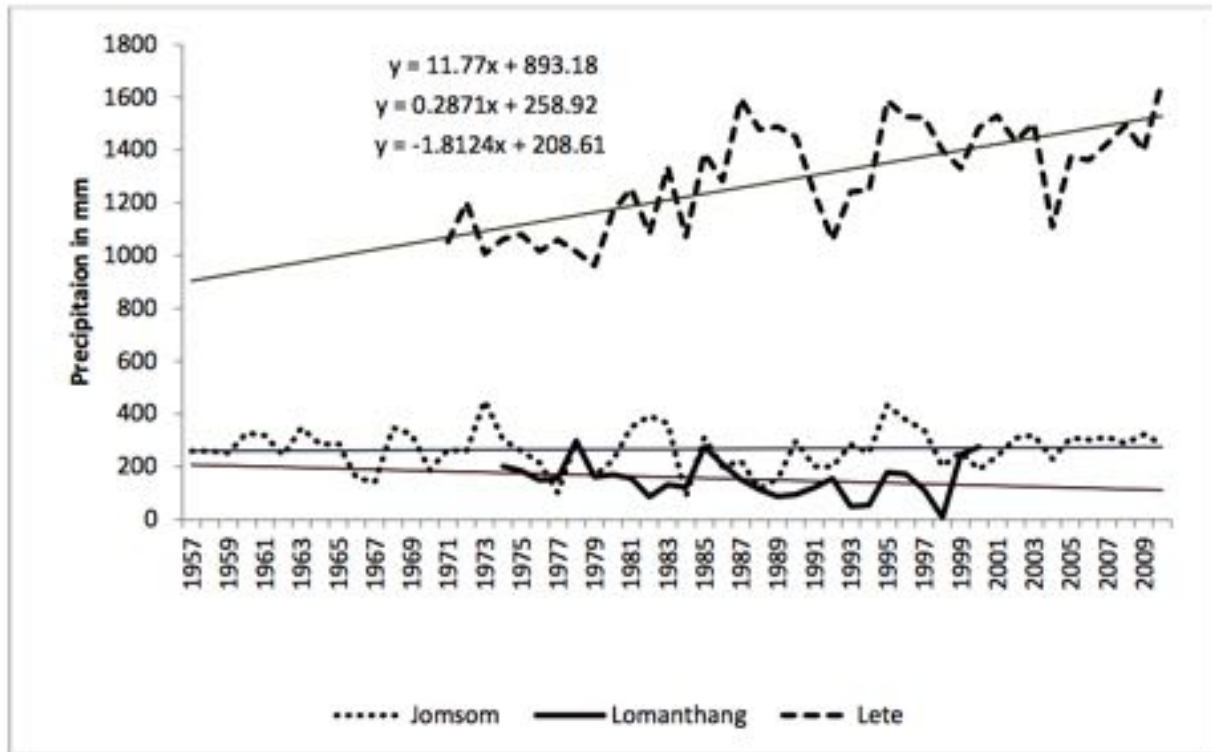


Climate Change in Mustang, a Scientific Perspective

A small body of scientific research has focused on Mustang as a region highly vulnerable to climate change. Since upper Mustang is a semi-arid region whose primary water sources are snowmelt-based, the ecosystem is especially sensitive to acute environmental changes. Aryal et al. (2014) discovered that in upper Mustang, over the past 23 years the average annual temperature has increased by 0.13 degree C per year, which is a higher annual temperature increase than in other Himalayan regions. The impact of climatic alterations are observable: “The combined effects of increased temperature and diminished snowfall have resulted in a reduction in the area of land suitable for agriculture. Most seriously affected are Samjung village (at 4,100 m altitude) and Dhey village (at 3,800 m) in upper Mustang, where villagers have been forced to relocate to an area with better water availability” (Aryal et al. 2014). Figure 15 illustrates the precipitation variability in Mustang. In *Environmental Earth Science*, Monique Fort (2015) examines the possibility of increased natural disasters in semi-arid Himalayan regions, with a focus on Mustang. Fort (2015) concludes that gullying, debris flow, flash floods and avalanches are likely to increase in Mustang due to rising temperatures. Remote scientific research, however, can only hypothesise about the human effect of environmental changes. In order to understand the lived-experience of climate change, direct field research is a necessity.

Figure 4: Annual Rainfall Trend in Mustang

Anapurna Conservation Area Project



Previous Investigations

As a historic Kingdom and trade route, Mustang is a popular destination for both travel and research. A few investigations of the human impact of climate change in Mustang have been conducted. In July 2012, a report titled “Climate Change Impact on Livelihood and Natural Resources of upper Mustang” was prepared by the National Trust for Nature Conservation for the Annapurna Conservation Area Project. The report utilized surveys to gauge local perceptions of environmental changes and compared it with qualitative meteorological data. Additionally, a 2011 Al Jazeera documentary illuminated the devastating effects of climate change in the village of Samjung. According to an article in *The Nepali Times*, “More than half of the 16 families in Samjung and 22 families in Gheya village of upper Mustang have migrated elsewhere because of climate change” (Sharma 2010). The environment in Lo continues to change; further qualitative research is thus important to understand how climate change is affecting the local population.

Environmental Observations: Coldest Winter, Heavy Rainfall and Unpredictability

The climate is noticeably changing in upper Mustang. Over the past five years, community-members have experienced strange, erratic weather patterns. With an intimate connection to the environment, Lowa’s are especially apt to recognize a climatic shift. The most observed transformation has been of seasonal precipitation patterns. The duration and nature of each season is changing, which is affecting the community in numerous ways.

For residents of upper Mustang, this has been the snowiest year in memory. “This winter there has been the most snow I have ever seen,” said Tsering Wangmo, a 56 -year-old housekeeper in Lo-Manthang (2). Tingkhar, a village just north of Lo-Manthang, experienced a

similar chill. The 78-year-old village elder of Tingkhar named Tseten, an agriculturalist and former nomad, observed, “This is the most snow I have ever seen at this time of year; the wind is bringing it in from the north and keeping the land frozen” (6). In Chungjung, a far-north village near the Nepal-Tibet border, Tamling, a 56-year-old agriculturalist, expressed that “Things are

Tseten, Tingkhar’s Village Elder *Allie Baer Chan*



getting harder, it’s getting colder. This year we got more snow than ever before.” The immensity of snowfall caused hardship in the region. Japyang Gyaltsen, a 57-year-old Tingkhar agriculturalist, suffered this winter; “This is the snowiest year I have ever seen,” he said. “This winter, I ate one meal a day and spent the rest of the day removing snow from the roof and around the house” (9). Over a dozen more Lowa recounted similar observations. The weather is noticeably changing in upper Mustang. Numerous community-members told of how the past four years received much less snow than usual. Without snow, the community was strapped for water resources. Everyone hoped the snowfall would return this winter, but when it came in such an overwhelming quantity it had a devastating impact. The winter season has seen the most drastic changes, but other seasonal normalities are also being altered.

Precipitation is crucial for crop production. Though located in the Himalayan rain shadow, upper Mustang still receives occasional rainfall in the summer. “For the past three or four years, it has been raining much more in the summer than usual,” observed Dikee Dolker, a 30-year-old from Lo-Manthang (1). Dikee’s father, Aanguuk, a 71-year-old agriculturalist, concurred: “In summer, rain is good, but if you get too much rain, it is not good for the crops and animals. Recently we have had too much rain” (5). Chhumi, a businessperson in Lo-Manthang noticed a similar trend, “The past three years we had less rainfall, but this year we had the most rain. This is very dangerous for our mud houses — if there is too much rain, our house begins to leak, it begins to melt, and it can be destroyed” (15). But villagers in Tingkhar have perceived changing precipitation patterns differently. “It should rain a lot in the summer, but the last few years, it hasn’t rained much. If there is no rain, there is no grass; if there is no grass, there are no animals. When the grass dries up or is covered in snow, the animals have nothing to eat and they die,” explained the elder Tseten (6). Japyang Gyaltsen, a 57-year-old Tingkhar agriculturalist said “Recently there has been too much snow, not enough rain and too much sun. This makes it difficult to grow, and if nothing grows, then we can’t feed the animals” (9). Precipitation patterns are changing, the seasons are changing, and it is changing the lives of the Lowa people.

Ultimately, the weather is becoming more unpredictable in upper Mustang. For a people historically dependent on the land for survival, this is a drastic problem. Kunsang, a 43 agriculturalist from Lo-Manthang said “The weather has become very unpredictable the past four years. The past three years there has not been enough snow, but this year, there has been way too much snow. We can’t even plant our crops now, we are missing the sowing season” (13). Agriculture, including animal husbandry, is the primary occupation of Lowa’s. The Lowa have

spent centuries in a relatively harmonious balance with their environment, migrating to Tibet for trade and winter grazing, but primarily living within the confines of their natural resources. Unpredictable weather causes unpredictable lives. Ultimately, a changing climate in upper Mustang has the greatest impact on the traditional livelihoods of the Loba community.

Livelihood Impacts: Pastoralism and Farming

Historically, Loba have relied heavily on the land and animals for survival. However, climate change and other global phenomena are causing Loba's to pursue new avenues of living. While artisans, *amchi's* (Tibetan doctors) and monastics are essential members of the Loba community, pastoralism and farming have for centuries been the primary occupation of the inhabitants of upper Mustang. The weather is changing and it is having significant impacts on Loba's livelihood.

Environmental disturbances directly affect animals. Loba communities utilize animals products for a wide range of things: dung for fuel, meat for food, milk for dairy products and fur for clothing and trade. For people who rely on animals for food, fuel and economic production, the impacts of climate change are significant. The main domesticated animals in upper Mustang are goats, sheep, horses, mules, cows, yak, *di* and *dzo*. In *High Frontiers*, Kenneth Bauer examines the changing life of Himalayan pastoralists after the closing of the Nepal-Tibet border. When pastoralist could no longer migrate to Tibet for winter grazing, they were forced to adapt. Many Loba pastoralist and nomads were forced to change their main means of livelihood after the Chinese occupation of Tibet. The impact on livelihoods now is not only political, but also environmental. "We're going to have to change, but we have to grow food no matter what the weather does," Kunsang said. "It's going to be hard, especially for our animals" (13). Loba animals thrive on native grass, as Japyang Gyaltzen explained: "When there is too much sun, the grass is dry and you can't feed the animals. When there is too much snow, the grass is covered, and you can't feed the animals. We need the right amount of water and snow to feed the animals. The past three years the balance has not been right" (9). Similar to the plight of the Tarap Valley of Dolpo, the lack of available grazing land this year is ever-present throughout upper Mustang. "Tingkhar is supposed to be the greenest village in Mustang at this time of year. But look at it now, it's brown and snowy," Tseten said. "As the years have passed I have lost more and more animals. The weather is giving hard times to a lot of people. Lots of animals are dying — there is no grass to eat. Yaks are dying of starvation because the mountain is covered in snow. I heard that 100s of yaks died this year" (6). The weather kills the grass that feeds animals. With no grass there are no animals and Loba's must try to embrace an entirely new way of living.

Yak in Chungjung, Grazing Where it Should Be Green

Keegan McChesney



The cultivation of crops is another chief occupation practiced by the majority of Lowa's. Wheat, buckwheat, potatoes, mustard, barley and peas are the primary crops grown upper Mustang. The conditions are so harsh in upper Mustang that these are possibly the only crops that can be grown (Manandhar et al.). Small agricultural fields are plowed by *dzo* in the early spring after the snow melts in order to capitalize on the prime sowing season. Industrial agriculture, defined by machinery, mono-cropping and pesticides, has not yet made its way to upper Mustang. Consequently, the agriculturalists are at the mercy of the climate. "This is the time to plant my crops, but I can't because of the snow," said Mingur, a 54-year-old agriculturalist from Tingkhar. "If I have to plant my fields late, then the crops won't be as large or as plentiful. Since the sowing is going to be late, the harvest will also be late" (7). Kunsang elaborated on how the changing climate is impacting his agricultural practices: "The weather has become very unpredictable the past four years. The past three year there has not been enough snow, but this year, there has been way too much snow. We can't even plant our crops now, were missing the sowing season" (13). The livelihoods of agriculturalists are directly linked to the climate. If the climate continues to change, the agriculturalists of Lowa will be forced to adapt.

Local Adaptation: Occupational Transitions, Globalization and Consumerism

Lowa's are subject to the changing world around them. With new conditions, new ideas, new opportunities and new goods coming to the region, the communities of upper Mustang are in a state of flux. Families are adapting to the changing times, as well as the changing climate. When your main sources of income, transportation, fuel and sustenance are strained, adaptation is more of a demand than a request. Climate change, along with other global phenomena, is changing the lives of Lowa's. In the words of Japyang Gyaltsen, "Everything is changing, not only the weather" (9). The communities of upper Mustang are in a major period of transition.

Occupational transitions in upper Mustang are becoming increasingly common. Nomads have become agriculturalists; agriculturalists have become businessmen. Tashi, a 43-year-old

from Chungjung observed, “Everyone used to have animals. Animals were our everything. We always had to work hard to keep the animals alive. Now we can buy food and cars, so the animals aren’t so important” (12). With the influx of new goods, many things have become easier; the burden of self-sufficiency has been reduced. “Compared to before, life is much easier. Travel, communication, cooking, everything in our life, besides farming, has become much easier,” said Tashi (12). Karma Gonpo, a 43-year-old veterinarian and secretary for the Anapurna Conservation Area Project (ACAP) from Tingkhar, explained that “The main reason to leave is weather conditions. If people could grow good crops with no weather problems, then they would continue being agriculturalists” (8). Businesses are popping up all over Lo-Manthang. Since the opening of Mustang to tourists in 1992, many have turned from farming to tourism for income. With the increasing difficulty of growing crops and grazing animals, the allure of the tourism industry becomes even more appealing to some. Mingur explained that “The road brings motors, the motors bring tourist, the tourists bring money and the money brings development,” thus occupational adaptation for some is a bridge to modern development.

Modern Goods in a Traditional Home *Keegan McChesney*



With adaptation comes mobility. While seasonal migration is a longstanding tradition in the region, it is beginning to reach new heights. In Lo-Manthang this winter, only two women stayed behind full-time to care for the village and animals. While pastoralists used to migrate to Tibet in the winter, Lowa’s now migrate to Pokhara, Kathmandu and India to avoid the harsh winter cold. According to Bauer (2004) “Mobility is a means of avoiding risk and resolving conflict, an adaptation to economic and political events as well as the natural environment” (119). Urban migration is becoming a major trend. People have different reasons for leaving. While the older generation tends to return

home, their children are starting to remain in the outside world. According to Karma, “The younger generation will go to the city, get an education and go to college. They will get new jobs and no longer be dependent on the land, their animals and the weather” (8). Education and comfort may both play a factor in the urban migration of Lowa’s. “In the summer it is nice here, in the winter it is nice the cities. In cities you learn, but you have to buy things. Here you just live, but you don’t learn,” Tashi explained (12). Not only are people moving to the cities, but they are also migrating internationally. Tashi has one son in Paris, France and one son in Delhi, India; out of her five children, none were in Mustang this March. The world around Lo is changing, but Lowa remain akin to the Kingdom of Lo. Adaptation may take many forms, but many are determined to endure the conditions, as Mingur explained, “It will be a difficult time, but we have to stay here, this is our village, this is our home” (7). Lo will always remain the homeland, but a homeland susceptible to challenges of identity.

Due to its geographical and political isolation, Mustang has retained qualities of an ancient past. As the world becomes more accessible, however, modernity is seeping into the region. Tamling explained that “It’s getting harder, people are selling their animals and moving to the city. Comparing our lives to theirs makes life feel difficult” (11). Comparison has brought

new ideas such as poverty to the region. Mustang has always been an incredibly difficult place to live, but previously there was no alternative. The first road to upper Mustang was completed a few years ago, which has brought many new things, including motor vehicles, which are a new sight and sound in the region. “Many people are switching from horse and donkeys to motors for transportation,” Mingur said. “It makes sense, you don’t have to feed motors, they won’t die. The cost is similar to having a horse, but a motor is easier to take care of. I am excited to get a motorcycle” (7). Goods require currency, which is a relatively new concept in Mustang; historically Loma’s relied on barter system with close Himalayan and Tibetan trade partners. Consumerism is breaching traditional ways, as Kunsang explained with an anecdote: “It’s human nature to consume. Before all we had was barley and buckwheat. But now that is not enough, it’s never enough” (13). But consumer goods have also brought many positive improvements to the area. Instead of burning semi-toxic dung in open indoor fires, the dung is now burned in Chinese-produced stoves with smoke chimney’s. Sanitation products are also reducing the prevalence of illness and disease. Regardless of effect, multifaceted global processes are quickly ushering Mustang into the age of modern consumerism.

The ‘Road’ to Lo-Manthang

SIT Nepal



Occupational transitions are bringing new ways of living into upper Mustang. Urban and international migration are altering the educational attainment levels, perspectives and demographics of the population. Globalization, modernization and consumerism are leaking into a previously inaccessible region. Climate change is a force that is exacerbating the effects of other change-agents.

Understanding Change: Religion, Nature and Humanity

Loma’s are fully aware of the changing skies. The snow has killed their animals and the rain has warped their houses. The weather has become unpredictable and it is affecting the

livability of the community. The environment of the Lowa's homeland is deteriorating; some, such as Japyang Gyaltsen, would say "We're running out of luck" (9). There is no simple way to explain the changing winds, but Lowa's understanding of why this is happening falls into three primary categories: religion, nature and humanity.

There is a Buddhist monk named Synapa Lama who is in charge of looking at the weather and the mountains in upper Mustang. "He has the power of the weather," Pema Angyel, a 30-year-old *amchi* from Tingkhar explained. "Last year he came and saw that the snow was empty. He observed that there was very little snow on the mountains. He did a *puja* for snow, and that is why all of the snow came this year" (3). Though Tibetan Buddhist texts are full of teachings on karma and wrathful deities, Lowa's generally did not choose to explain the changing climate through a religious lens, rather, the majority of Lowa's believe weather patterns to be entirely under the jurisdiction of nature.

Lowa's have traditionally lived in a relative state of harmony with their natural environment. Aanguuk said "There are always small changes. This is natural according to the Tibetan calendar. For example, this year it is colder. Some years it is hotter. Some years it is windier. It all depends on nature" (5). Many Lowa's, such as Dikee Dolker, agree; "The change is natural. I heard Chinese people say there would be much snow and cold this year; it was predicted on the Chinese calendar," she said (1). Discussing the ways of nature was a comedic topic for some. "How can we know the weather? Who knows the weather?" Mo Lak Pa, an 85-year-old former nomad and the village elder of Chungjung, said with a chuckle (10). Tsering Wangmo, a 52-year-old from Lo-Manthang, said matter-of-factly, "The weather wanted to snow here, so it did" (2). The weather is controlled by nature, thus making its tendencies unexplainable.

Other Lowa, however, blame humanity for the changing climate. "The climate is changing by the people," (4) Nima Lama, a 45 -year-old cook from Lo-Manthang said, and elaborated that:

The growing population is making things warmer. For example, in this room, if you don't burn fire, then you don't get warm. In this village, only two people stayed here in the winter and it got very cold. When there are more people, there is more warmth. You see that abandoned village up on that hill? There are no people there, it is very cold. But if we all go there, make a fire, bring our animals, build a house, then we will destroy the snow and create heat. (4)

Some who have been educated outside of Mustang have heard of anthropogenic climate change, such as Karma Gonpo: "I think the weather is changing because of all of the motor vehicles and industry; it is all due to pollution. As other countries develop, they create this pollution which changes the weather" (8). In the end, the climate is undoubtedly changing, no matter who's to blame.

Conclusion: Ungeneralizable Generalizations, Among Other Paradoxes

Looking Forward

Dho-Tarap and Lo are in an era of phenomenological acquiescence — anthropogenic climate change is a major contributing factor among of variety of encroaching change-agents. Due to their geological, geopolitical and geographical similarities, other Himalayan communities

may be dealing with similar changes. Dolpo-pa's and Lowa's have observed altered weather patterns first hand. The shifting ecology is immediately apparent to high-altitude residents. For societies relatively reliant on nature, these changes are having significant impacts on everyday life. Ironically, industrially produced goods that have contributed significantly to global emissions are working to mitigate immediate-term environmental damages. The lure of the outside world is drawing some Dolpo-pa's and Lowa's away from their homeland permanently, following the trend of urbanization which has brought the majority of humans into urban centers for the first time in history. For the Dolpo-pa's, Lowa's and other Himalayan peoples, the future is unpredictable. "We don't know what is happening, and we don't know what is going to happen" the Lowa Japyang Gyaltzen said. "It is going to be very hard if things keep happening this way. People talk about what is happening, but we don't know why these things are happening, then the season passes and we try again" (9). Observable climatic alterations have occurred in the past five years, but scientific analysis predicts that conditions are only going to get more extreme. "We are scared of the future," voiced the Lowa Mingur, and this sentiment is shared by many (8). The future is uncertain for all of humanity, but the future is an ever-present behemoth for the Himalayan world. Resilience is a term tossed around in climate literature, but for people such Nima Sangmo from Dho, resistance is not a choice, it's a necessity: "Everything has become very unpredictable. I am always in fear now and not so happy. But we will continue to live like before, we can't prevent what happens" (23). Climate change is going to continue to affect the communities of Dolpo, Mustang and other Himalayan regions; only time will tell what the outcome of this existential avalanche will be.

Two tangible examples reify the complex processes at play in the Himalayan region: *po-cha* and roads. *Po-cha*, as highlighted above, is a significant part of life in Tibetan and Himalayan culture and a poignant vignette. The shift from using di butter to Chinese margarine exemplifies the acceptance of ease. People may have less di, less time to make di butter or less desire to labor over *po-cha*, but ultimately the purchase of packaged margarine is easier than the raising of di and the churning of their butter. People, especially in Dolpo, have additionally adopted blenders — rather than using the traditional method hand churning *po-cha* in a wooden cylinder, many households have adopted an electric mixing method. The environment has become an even more challenging colleague and the effortless nature of global goods makes them undeniably attractive.

Similarly, roads and the goods they carry represent an acceptance of inanimate assistance. Many informants stressed the increasing difficulty of living in relative remoteness: feeding animals is difficult, enduring cold is difficult, collecting water is difficult and growing food is difficult. Roads are perceived as an ameliorator of such difficulties. In comparison to yaks, horses and mules, as a few informants pointed out, motor vehicles represent resilience — they don't require food and they never die. Roads are capable of transporting an untold number of goods which may relieve an untold number of difficulties. It may simply be human nature to desire less suffering. The paradox of course is that motors and the goods they deliver are both the cause and the solution to the current predicament we find ourselves in.

An example of a solution outside the realm of industrial economic production exists in Dho-Tarap: greenhouses. Greenhouses represent an adaptation method which lies somewhere

between the abstract divide of the global economy and the Dolpo-pa's economy. The greenhouses brought by Action Dolpo employ manufactured materials such as plastic and metal, but they also employ the local tradition of agriculture. Weather conditions are increasingly unpredictable and the greenhouses provide a degree of environmental stability. While the greenhouses have been utilized for much more than food production, the framework of the solution is sustainable. For those interested in helping Dolpo-pa's or Loma's, an understanding of the Dolpo-pa or Loma community is a necessity. By utilizing the existing knowledge and skillsets of a community, sustainable solutions can be delivered. If the government of Nepal or foreign sympathisers want to truly help the Himalayan communities impacted by climate change, then understanding the community is a fundamental prerequisite for success.

Government Programs

The republic of Nepal is very young — the country is still in the process of drafting a constitution. The government is largely reliant on foreign aid and tourism revenue. Infrastructure throughout the country is haphazard and corruption runs rampant. The country is still recovering from a civil war that lasted from 1996 to 2006 and the ongoing earthquakes have set the country back significantly. The government lacks funds for, as well as understanding of many high-altitude Himalayan communities. Programs such as the snow leopard compensation program sound great on paper, but seldom succeed on the ground. Sponsored, funded and carried out by Western conservationists, many environmental conservation programs in Nepal have flopped due to the disconnect between foreign agents and local people (Bauer 2004; Campbell 2013). A number of government programs exist related to climate change, but the legitimacy of these programs is hard to gauge. According to Rishbhdeb Khanal, a District Forest Officer in Dolpo, the Nepal Department of Forests runs a small program dedicated to teaching people in remote Village Development Committees (VDC) about climate change. Ang Bahadur Lama is involved in a disaster risk reduction program, because due to climate change, he explained that “Things are going to keep getting worse. It's a natural disaster” (7). Reports such as “Nepal: Strategic Program for Climate Resilience” advocate a USD\$60 million aid program help Nepal's climate victims, but others advocate for small, grassroots resilience programs. A complete table of government agencies, INGO's and donors working on issues relating to climate change in Nepal is illustrated in Figure 5:

Figure 5: Agencies Working in Climate Change in Nepal

Singh and Smith 2009

Agencies working in climate change in Nepal

Actors	Existing Capacity and Activities	Proposed Actions for USAID
Government Agencies		
Ministry of Environment, Science and Technology (MEST)	Focal point for climate change issues and actions; coordination with other agencies	Capacity enhancement and the institutionalization of climate change issues
Ministry of Forest and Soil Conservation (MFSC)	A member of the climate change network	
Department of Forests	None	
Department of Soil Conservation and Watershed Management	None	
Department of National Parks & Wildlife Conservation	None	
INGOs		
WWF Nepal	Works in the areas of community-based disaster risk management and natural resource management; systematically links climate change issues to its projects	
HEMCO	Works in disaster risk reduction, glacial lakes, and GLOFs and associated issues, climate change impact assessment and vulnerability mapping; has a useful GIS-based information system	
IUCN Nepal	Works mainly in freshwater programs	
CARE Nepal	Works in the areas of community-based disaster risk management and natural resource management; systematically links climate change issues to its projects	
Central Department of Hydrology and Meteorology of the Tribhuvan University	Is engaged in research related to water and climate change which is mainly carried out by its research students; a member of climate change related organizations	
Practical Action Nepal	Works in the areas of community-based risk reduction. Additional projects include reducing vulnerability to and the monitoring of indoor air pollution	
Nepal Water Conservation Foundation	Works in the areas of policy synthesis on climate and weather and implements freshwater climate change adaptation projects	
Clean Energy Nepal	Works in climate change advocacy and to develop climate change awareness in schools and colleges	
LI-BIRD Pokhara & Kathmandu	Works in the areas of climate change impact and natural disaster management	
Donors		
UNDP-GEF Kathmandu	Provides funding to carry out research on climate change, water and biodiversity conservation	
USAID and US Embassy	Provides funding to CARE Nepal and other agencies to carry out projects related to climate change	
Embassy of Denmark	Provides funding for UNDP's climate change work - particularly NAPA preparation	
UK/DFID	Provides funding for the preparation of NAPAs	
Finnish Embassy	Provides funding for adaptation projects and for establishing a national forest and carbon baseline for REDD	
World Bank	Provides funding for preparing REDD	

Non-Governmental Organizations

NGO's and INGO's play a huge role in Nepal. The country is home to a plethora of endangered species, cultural richness and geological immensity, therefore the international community has a vested interest in the nation's well-being. The Nepal Climate Change Support Program (NCCSP) was starting in 2013 in collaboration with the government of Nepal, foreign governments, the United Nations Development Programme (UNDP) and other stakeholders with the overall goal of ensuring that "Nepal's poorest and most vulnerable people are able to adapt well to climate change effects." The primary funders of this program are the European Union, UKAID, and the UNDP. Prashanna Pandey, a 30-year-old civil engineer from Kathmandu, is Project Manager for NCCSP stationed in Dolpo. Pandey and his team are working on

infrastructure, agriculture, development and training projects to help foster climate resilience in Dolpo:

We want to help people cope with the negative impacts of climate change and improve the livelihoods of rural people. We can't stop climate change, so now we must try to adapt. Many people are already affected by climate change, such as people here in Dolpo, so we want to provide skill enhancement training so that people may be able to adapt to these changes. If people can no longer grow crops because of climate change, then we must help them, be it through new training, new trade or new goods, the livelihood and money is needed just the same. Climate change is a cross cutting issue. Without doing anything directly relating to the climate, we are still supporting climate change adaption. This is like a painkiller to the people who are already suffering from climate change.

Mitigation takes a lot of time, but adaptation has immediate impacts.

There are a great number of NGO's and INGO's involved in the climate change realm, all with different funders, goals, ideology and methods. The scope and effectiveness of each organization will also vary greatly and is yet to be understood.

Suggestions for Further Research

Only two communities are documented in this study. While many similarities exist between the experience of climate change in both regions, the experience also differs in many respects. Therefore it is of vital importance that further research be conducted throughout Himalayan communities, both in and out of Nepal. In order to understand the current impact as well as future adaptation strategies, extensive research is pressing necessity.

In Dolpo, many particulars stood out as worthy of deeper investigation. Trash is rampant throughout the Tarap Valley and the surrounding rivers — an investigation into the causes and possible waste management programs is needed. An investigation into human-snow leopard interactions, especially in the village of Dhoru, is needed to help both the snow leopards and the people of Dhoru. An interesting study could also be done on the Crystal Mountain School and the various impacts it is having on the Tarap Valley. A thorough investigation into the health effects of Chinese margarine tea versus di butter tea may also prove revealing. A study focused on the increases of avalanches in Dolpo is also important.

In Mustang, more research needs to be conducted in the villages of Samjung and Gheya, the two villages most impacted by climate change in Mustang. A study focused on water availability might also reveal some important information. Further investigation into the physiological effects of bringing cars, electronics and other modern goods into Mustang for the first would also prove fascinating. There is growing Chinese involvement in the region, and although highly politicized, this is an area also in need of further investigation.

Interview Participants

** 'Agriculturalist' is indicative of both pastoralism involving yaks, dzo, cows, horses, mules, goats and/or sheep, as well as the cultivation of food, which most Dolpo-pa and Lowa are involved in to varying degrees.*

** 'Householder' encompasses the multitude of chores required for maintaining a functional stone and mud house, which usually overlaps with Agriculturalist, and may include, but is not limited to, tasks such as firewood collection, animal feeding, water retrieval, weaving, fire stoking, meat drying, grass storing, po-cha mixing and meal preparation.*

Dolpo Informants

Participant's name. Date of interview. Time of interview. Place of interview. Age of participant. Primary occupation of participant, secondary occupation of participant. Birthplace of participant. Language spoken in interview.

1. Thukten. 14 April 2015. 5:30pm. Tibrakor. 33. Artist, Agriculturalist. Thakshi. Dolpo-pa dialect of Tibetan.
2. Tsering Lhadol. 14 April 2015. 6:20pm. Tibrakor. 30. Agriculturalist, householder. Thakshi. Dolpo-pa dialect of Tibetan.
3. Nyodup Dolma. 14 April 2015. 6:20pm. Tibrakor. 50. Agriculturalist, householder. Dolpo-pa dialect of Tibetan.
4. Dawa Bhuti. 14 April 2015. 6:20pm. Tibrakor. 50. Agriculturalist, householder. Shemen. Dolpo-pa dialect of Tibetan.
5. Kadar Binod Pandey. 15 April 2015. 2:15pm. Dunai. 43. Director, Crystal Mountain School. Kathmanu. English.
6. Bimba Batur Barala. 16 April 2015. 3:45pm. Dunia. 52. Director, District Agricultural Development Office. Kathmandu. Nepali.
7. Ang Bahadur Lama. 16 April 2015. 4:00pm. Dunai. 33. District 6 Director, High Mountain Agribusiness Livelihood and Himalayan Project. Phoksundo. English.
8. Rishbhdeb Khanal. 16 April 2015. 4:20pm. Dunai. 45. District Forest Officer. Jajarkot. Nepali.
9. Pasang Lhamo. 20 April 2015. 8:40am. Dho. 48. Agriculturalist, householder. Dho. Dolpo-pa dialect of Tibetan.
10. Pasang Lhamo. 20 April 2015. 8:45am. Dho. 48. Agriculturalist, householder. Thakshi. Dolpo-pa dialect of Tibetan.

11. Nyshar Sangmo. 20 April 2015. 9:45am. Dho. 48. Agriculturalist, householder. Tokyu. Dolpo-pa dialect of Tibetan.
12. Chempel Pasang. 20 April 2015. 1:00pm. Dho. 34. Agriculturalist. Lang. Dolpo-pa dialect of Tibetan.
13. Tsering Tenduk. 20 April 2015. 1:00pm. Dho. 48. Agriculturalist. Dho. Dolpo-pa dialect of Tibetan.
14. Karwang Dorje. 20 April 2015. 1:00pm. Dho. 51. Amchi, Agriculturalist. Dho. Dolpo-pa dialect of Tibetan.
15. Dawa Gyaltzen. 20 April 2015. 1:00pm. Dho. 47. Amchi, Agriculturalist. Dho. Dolpo-pa dialect of Tibetan.
16. Tsering Palmo. 20 April 2015. 1:00pm. Dho. 69. Agriculturalist, householder. Dho. Dolpo-pa dialect of Tibetan.
17. Karma Tashi. 20 April 2015. 1:00pm. Dho. 64. Agriculturalist. Dho. Dolpo-pa dialect of Tibetan.
18. Tsewang Tsering. 20 April 2015. 1:00pm. Dho. 84. Agriculturalist, householder. Dho. Dolpo-pa dialect of Tibetan.
19. Nyishar Jangmo. 20 April 2015. 1:00pm. Dho. 49. Agriculturalist, householder. Dho. Dolpo-pa dialect of Tibetan.
20. Namgyal. 21 April 2015. 9:00am. Tsukcho, Dho. 64. Agriculturalist. Tsukcho, Dho. Dolpo-pa dialect of Tibetan.
21. Tsewang Bungyal. 21 April 2015. 10:00am. Tsukcho, Dho. 20. Bon monk in training in Kathmandu. Tsukcho, Dho. Dolpo-pa dialect of Tibetan.
22. Monlam Jama. 21 April 2015. 10:15am. Tsukcho, Dho. 43. Agriculturalist, householder. Shipdrok. Dolpo-pa dialect of Tibetan.
23. Nima Sangmo. 21 April 2015. 11:00am. Tsukcho, Dho. 45. Agriculturalist. Tsukcho, Dho. Dolpo-pa dialect of Tibetan.
24. Penba Gyaltzen. 21 April 2015. 12:00pm. Dho (village wall-building project). 42. Business, Agriculturalist. Tsukcho, Dho. Dolpo-pa dialect of Tibetan.
25. Sonam Dolma. 21 April 2015. 3:20pm. Dho. 20. Student. Thapcha, Dho. English.
26. Tsering Wangmo. 21 April 2015. 3:40pm. Dho. 24. Nurse. Lunge, Dho. English.

27. Karwang Dorje Lama. 21 April 2015. 7:15pm. Dhoru. 42. Amchi. Dhoru. Dolpo-pa dialect of Tibetan.
28. Tsering Yongzom. 22 April 2015. 9:00am. Dhoru. 47. Agriculturalist, householder. Dhoru. Dolpo-pa dialect of Tibetan.
29. Punjuk Tsewang. 22 April 2015. 9:40am. Dhoru. 64. Agriculturalist, householder. Tokyu. Dolpo-pa dialect of Tibetan.
30. Tsultrem Dyengyel. 22 April 2015. 12:00pm. Shipdrok. 49. Agriculturalist. Shipdrok. Dolpo-pa dialect of Tibetan.
31. Lakpa Tsering. 22 April 2015. 12:00pm. Shipdrok. 52. Agriculturalist. Shipdrok. Dolpo-pa dialect of Tibetan.
32. Karma Numbay. 22 April 2015. 12:00pm. Shipdrok. 59. Agriculturalist. Shipdrok. Dolpo-pa dialect of Tibetan.
33. Tashi Gyurme. 22 April 2015. 12:00pm. Shipdrok. 29. Agriculturalist. Shipdrok. Dolpo-pa dialect of Tibetan.
34. Sherap Sangmo. 22 April 2015. 12:00pm. Shipdrok. 51. Agriculturalist, householder. Shipdrok. Dolpo-pa dialect of Tibetan.
35. Tsering Sumduk. 23 April 2015. 9:15am. Tokyu. 51. Agriculturalist, householder. Tokyu. Dolpo-pa dialect of Tibetan.
34. Tunden. 23 April 2015. 11:00am. Tokyu. 58. Agriculturalist. Lang. Dolpo-pa dialect of Tibetan.
35. Guyawa Rimpoche. 23 April 2015. 11:15am. Tokyu. 54. Agriculturalist, musician. Tokyu. Dolpo-pa dialect of Tibetan.
36. Sonam Chugyal. 23 April 2015. 1:00pm. Tokyu. 24. Agriculturalist. Tokyu. Dolpo-pa dialect of Tibetan.
37. Lakpa Tsering. 23 April 2015. 1:00pm. Tokyu. 47. Agriculturalist. Tokyu. Dolpo-pa dialect of Tibetan.
38. Phunthok Choephel. 23 April 2015. 1:20pm. Tokyu. 20. Agriculturalist. Tokyu. English.
39. Phurwa Gyaltsen. 23 April 2015. 1:45pm. Tokyu. 24. Teacher at CMS, Agriculturalist. Tokyu. English.

40. Pasang Tsering. 23 April 2015. 3:00pm. Tokyu. 37. Business, Agriculturalist. Tokyu. Dolpo-pa dialect of Tibetan.
41. Amchi Karma. 26 April 2015. 9:30am. CMS. 61. Amchi, Agriculturalist. Tokyu. Dolpo-pa dialect of Tibetan.
42. Nyima Dhargey. 26 April 2015. 11:20am. CMS. 28. Teacher at CMS, Agriculturalist. Tokyu. English.
43. Prashanna Pandey. 29 April 2015. 8:30pm. Dunai. 30. Project Manager for Nepal Climate Change Support Program, civil engineer. Kathmandu. English.

Mustang Informants

Participant's name (Nepali surname). Date of interview. Time of interview. Place of interview. Age of participant. Primary occupation of participant, secondary occupation of participant. Language spoken in interview.

1. Dikee Dolker (Gurung). 22 March 2015. 11:30am. Lo-Manthang. 30. Guesthouse manager, householder. English.
2. Tsering Wangmo (Gurung). 22 March 2015. 1:00pm. Lo-Manthang. 52. Guesthouse assistant, householder. Lowa dialect of Tibetan.
3. Pema Angyel. 22 March 2015. 1:30pm. Lo-Manthang. 30. *Amchi* (Tibetan doctor). English.
4. Nima Lama. 22 March 2015. 1:45pm. Lo-Manthang. 48. Cook. Lowa dialect of Tibetan.
5. Aanguuk (Gurung). 23 March 2015. 6:45pm. Lo-Manthang. 71. Agriculturalist. Lowa dialect of Tibetan.
6. Tseten. 24 March 2015. 11:15am. Tingkhar. 78. Agriculturalist, former nomad. Lowa dialect of Tibetan.
7. Mingur (Gurung). 24 March 2015. 11:45am. Tingkhar. 54. Agriculturalist. Lowa dialect of Tibetan.
8. Karma Gonpo (Bista). 24 March 2015. 12:00pm. Tingkhar. 43. Veterinarian, ACAP secretary. Lowa dialect of Tibetan.
9. Japyang Gyaltsen (Gurung). 24 March 2015. 8:00pm. Tingkhar. 57. Agriculturalist, animal breeder. Lowa dialect of Tibetan.
10. Mo Lak Pa. 25 March 2015. 11:45am. Chungjung. 85. Former nomad. Lowa dialect of Tibetan.

11. Tamling (Gurung). 25 March 2015. 12:00pm. Chungjung. 56. Livestock Agriculturalist. Lowa dialect of Tibetan.
12. Tashi (Gurung). 25 March 2015. 12:00pm. Chungjung. 42. householderer. Lowa dialect of Tibetan.
13. Kunsang (Gurung). 25 March 2015. 12:30pm. Lomantang. 43. Agriculturalist. Lowa dialect of Tibetan.
14. Chhyumi (Bista). 27 March 2015. 8:00am. Lo-Manthang. 32. Business person, householderer. English.
15. Wangmo (Gurung). 27 March 2015. 8:00am. Lo-Manthang. 56. Agriculturalist, householderer. Lowa dialect of Tibetan.
16. Karma Wangyal. 27 March 2015. 10:00am. Lo-Manthang. 54. Businessman, Agriculturalist. Lowa dialect of Tibetan.

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The author, Keegan McChesney, in Tingkhar conversing with Tseten and in the classroom working with CMS students

Allie Baer Chan

Noah Stone



The author, Keegan McChesney, in Dho saying goodbye to Dorje, Wangmo and Sonam and with baby *ra-luk* in Dhoro

Noah Stone

Noah Stone

