

IMPACTS OF EXPANDING RURAL ROAD NETWORKS ON COMMUNITIES IN THE  
ANNAPURNA CONSERVATION AREA, NEPAL.

A Thesis

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## ABSTRACT

Contemporary development studies recognize road networks as a key element in economic development, socioeconomic well-being, and poverty alleviation. However, the outcome of road construction projects has not always met the original goals of the project, has contributed substantially to environmental degradation, and in some cases has led to the loss of cultural traditions and marginalization of indigenous peoples. The World Bank, one of the main financiers of road construction projects, admits that there is a paucity of empirical evidence about the amount and quality of the benefits, who receives them, and how they are dispersed, despite the numerous socioeconomic evaluations of road projects already conducted. Environmental studies have shown few, if any; positive environmental impacts of road construction projects. To date, there have been very few studies on the sociocultural impacts of roads and no studies on how all three spheres of impacts influence each other. My research seeks to fill this gap by evaluating the impacts of the recently completed (2008) Kali Ghandaki Road, and the ongoing construction of the Marsyangdi Road, along the Annapurna Circuit Trail in the Annapurna Conservation Area of Nepal.

I conducted 231 interviews in 45 villages along the road alignments. Employing a multiple case study framework derived from quantitative and qualitative data and methods, I explored the following questions: What impacts are the new roads along the Annapurna Circuit Trail having on local communities? How do socioeconomic, sociocultural, and environmental factors influence each other in road construction projects? What adaptive strategies are communities' using to cope with the changes the road is bringing, and how do those strategies evolve?

Given the complexity of the interaction of environmental, socioeconomic, and sociocultural spheres of road construction, I developed a Coupled Human and Natural Systems model of road impacts based on the analysis of **Case Study 1**. I then apply this model as a template to illuminate specific road impacts in each of the case studies.

Based on this Coupled Human and Natural Systems model and the ten case studies I came to the following conclusions:

- Road impacts cannot be accurately evaluated by analyzing only one sphere, such as socioeconomic impacts.
- All three spheres of road impacts influence each other in complex interconnected couplings, requiring a Coupled Human and Natural Systems framework for analysis and interpretation.
- Due to these complex couplings, the impacts of road construction in Nepal are dynamic and change over time, often have a lag effect, and cross spatial boundaries impacting coupled systems not only in the immediate area, but also areas scales of magnitude distant.
- Road construction projects in Nepal have both positive and negative impacts in all three spheres, environmental, socioeconomic, and sociocultural and these impacts manifest over time producing short-term, medium, and long-term effects.
- The combination of the above factors often result in road projects that have unintended and unforeseen impacts making predictions about their outcome largely speculative.
- Finally, trails and roads are a fundamental component of every culture. They are essential to our survival and yet they are often taken for granted in developed countries. Considering the cumulative environmental and human history that lies beneath many of our modern roads, which were once ancient trade routes, I argue that roads are embedded with a coupled human and ecological memory that has become a fundamental component of the human psyche.

These conclusions highlight the importance of viewing roads as if they were living organisms with their own ecosystem. As roads grow, connecting to other roads to form road networks, the road ecosystem also grows encountering other human and ecological ecosystems. To understand the multitude and complexity of interactions between these ecosystems requires a

comprehensive framework that can bridge the different spheres of influence, such as the Coupled Human and Natural Systems model described in this thesis.

## **BIOGRAPHICAL SKETCH**

Robert E. Beazley was born in Niagara Falls, New York on April 21, 1954. During his teenage years, he developed a love for being outdoors and exploring rivers and lakes by canoe. In 1976, after graduating with a M.S in geography from the University of Calgary, he worked as a research associate in the Fluid Dynamics and Diffusion Laboratory of Colorado State University, Fort Collins, Colorado. In 1981, he moved to North Carolina to work as a canoe and kayak instructor, and adventure travel leader for the Nantahala Outdoor Center. He visited Nepal for the first time in 1984. From 1985 to 2007, he continued to lead whitewater and trekking adventure travel expeditions in Nepal as well as in, India, Bhutan, Japan, South America, North Africa, Europe, and the United States. In 2004, he studied Traditional Chinese Medicine at the Colorado School of Traditional Chinese Medicine, in Denver.

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## LIST OF ACRONYMS

ACT	Annapurna Circuit Trek
ACA	Annapurna Conservation Area
ACAP	Annapurna Conservation Area Project
ADB	Asian Development Bank
BBC	British Broadcasting Corporation
CIA	Central Intelligence Agency
CFUG	Community Forest Users Group
CAMC	Conservation Area Management Committee
CEQ	Council on Environmental Quality
DCAMC	District Conservation Area Management Committee
DDC	District Development Committee
DNPWC	Department of National Parks and Wildlife Conservation
DoR	Department of Roads
DoTM	Department of Transport Management
DoLIDAR	Department of Local Infrastructure and Agricultural Roads
EIA	Environmental Impact Assessment
ERS	Environmental Resources Management
GIS	Geographic Information System
GoN	Government of Nepal
GoN/MPPW/DoR	Government of Nepal, Ministry of Physical Planning and Works, Department of Roads
GoN/NPCS/CBS	Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics
GDP	Gross Domestic Product
GNH	Gross National Happiness
GNP	Gross National Product
HVMAPs	High Value Medicinal and Aromatic Plants

HMGN His Majesty's Government of Nepal

HMGN/CBS His Majesty's Government of Nepal, Central Bureau of Statistics

HMGN/MFSC His Majesty's Government of Nepal, Ministry of Forest and Soil Conservation

HMGN/MPPW His Majesty's Government of Nepal, Ministry of Physical Planning and Works

HMGN/MWT/DOR His Majesty's Government of Nepal, Ministry of Works and Transport,  
Department of Roads

ICDP Integrated Conservation and Development Programme

ICIMOD International Centre for Integrated Mountain Development

ILO International Labour Organization

IRF International Road Federation

KMTNC King Mahendra Trust for Nature Conservation

LRN Local Road Network

LTEK Local and Traditional Ecological Knowledge

MDG Millennium Development Goals

NEA Nepal Electricity Authority

NRB Nepal Road Board

NGO Non-Governmental Organizations

NTFP Non-Timber Forest Products

PA Protected Area

RBGE Royal Botanical Garden of Edinburgh

SRN Strategic Road Network

TEK Traditional Ecological Knowledge

UNDP United Nations Development Programme

UNESCAP United Nations Economic and Social Commission for Asia and the Pacific

UNFPA United Nations Population Fund

UNRTF United Nations Regional Task Force on Mobility and HIV Vulnerability Reduction

USAID United States Agency for International Development

VDC Village Development Committee



## CHAPTER 1. INTRODUCTION

*“Few forces have been more influential in modifying the earth than transportation.”*

*~ Edward Ullman (1956)*

The above quote by Edward Ullman, one of the leading transportation geographers of the Twentieth Century, is a statement that most of us, on reflection, would probably agree with but are rarely aware of in our day-to-day activities. The majority of people growing up in developed countries have had roads as a part of their world since they were born. When we talk about roads, we tend to think of paved roads. Not many people in the developed world would consider living very far from a paved road. Those in developed countries take roads for granted.

For many people in rural areas of the developing world the road head, where one can access vehicular transportation, is hours, sometimes days, or even a week’s walk away. Often the road at the trailhead is dirt, which eventually leads to a paved road. Road networks are essential for the economic development of a country and are often cited as one of the main infrastructure projects developing countries need to help raise standards of living and reduce poverty (Gachassin, Najman and Raballand 2010, Warr 2010, Kandker et al. 2009, Strickland 2009, Van de Walle 2008, Stifel and Minten 2008, ADB 2006, WB 2006, Fan and Chan-Kang 2009, Gibson and Rozelle 2003, Jacoby 2000, Kreutzman 2000, UNESCAP 2000, Calvo 1998, Fan et al. 1999, Windle and Cramb 1997, Richards 1984, Schroeder 1971).

However, roads can have both positive and negative influences (**Table 1.1**) that have far ranging, unanticipated, and unintended consequences on environmental, socioeconomic, and sociocultural spheres. Many of these unanticipated and unintended consequences are a result of focusing on only one of these spheres in isolation, when in fact they are all interrelated. There is a wealth of literature on the impacts of roads on the environment and on socioeconomic development. However, there is a paucity of literature on the impacts of roads on sociocultural traditions and virtually no literature on how each of these three elements affects one another. In

addition, the implications of connecting remote areas with diverse ethnic backgrounds to a network of roads are rarely considered.

**Table 1.1** Positive and negative impact of road construction in the environmental, socioeconomic, and sociocultural spheres.

<b>Road Impact Effects</b>	<b>Positive</b>	<b>Negative</b>
Environmental	Road verges provide habitat for birds, butterflies, and other small animals Roads in forested areas can enhance growth by increasing available light and act of fire breaks	Habitat fragmentation Pollution – air, water, noise Alteration of surface runoff Alteration of ground water recharge Mass wasting - erosion, landslides Road kill Invasive species Urban heat islands
Socio-economic	Increased mobility Better access to: markets, employment opportunities, schools, health care	Change in land values usually takes advantage of the poor Relocation or loss of land Increased disparity between rich and poor Increased in-migration takes jobs from locals
Socio-cultural	Increased mobility Better access to: relatives and friends, sacred spaces, cultural sites, spiritual teachers	Social conflict due to in-migration Increase in AIDS and sexually transmitted diseases Increase in human trafficking and commercial sex Increase in crime Loss of traditional culture Loss of sacred space

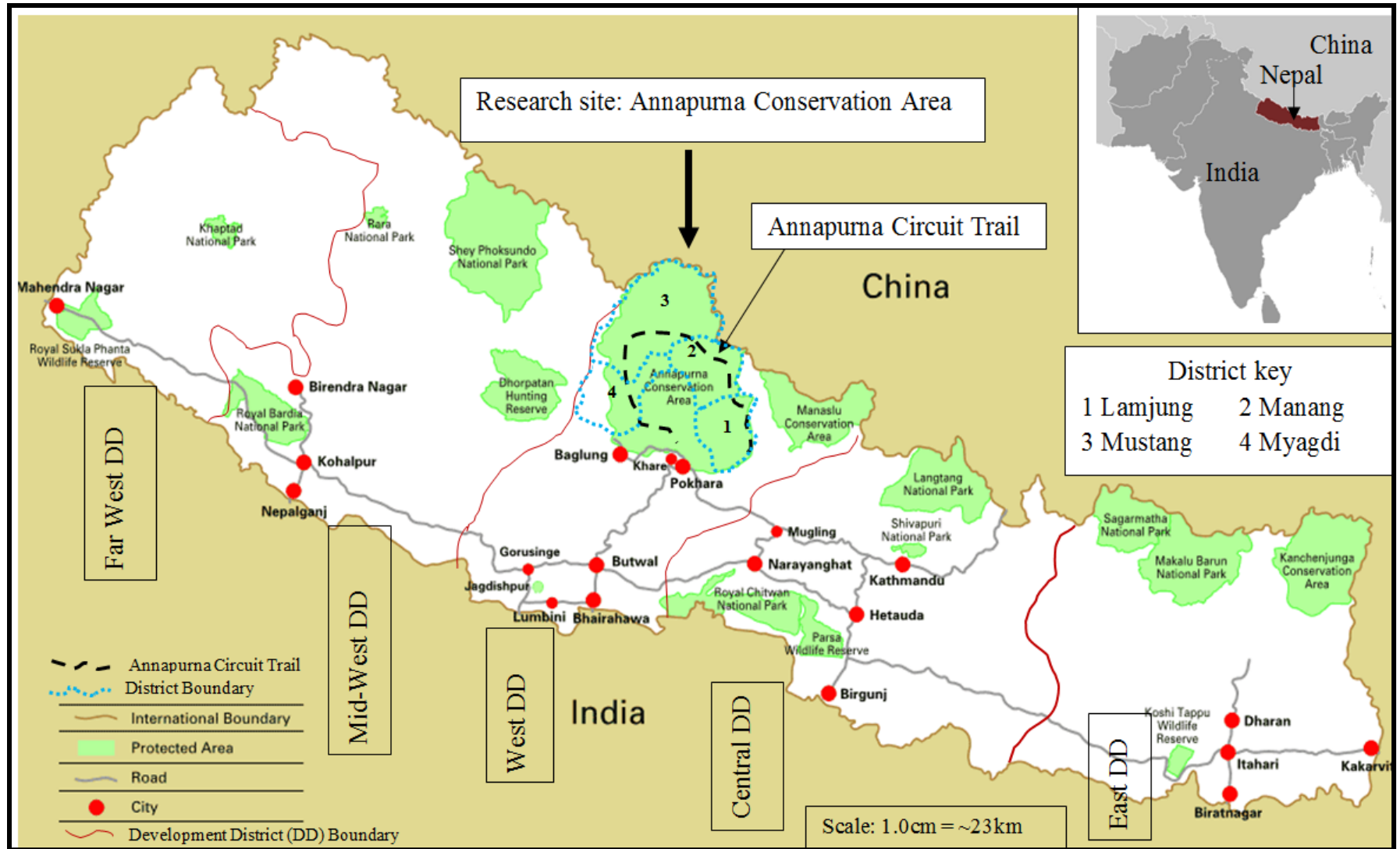
In light of the importance of roads for economic development and the multitude of roads presently under construction in developing countries, this research stems from the urgent need to gain a better understanding of how roads affect local communities. In particular, I argue that environmental, socioeconomic, and sociocultural factors do not act independently of each other and therefore policy makers need to understand and address their interaction when planning road networks in developing countries. I use case studies from my research site along the Annapurna

Circuit Trail in the Annapurna Conservation Area of the West Development District of Nepal (**Figure 1.1**) to argue my point.

### **1.1 The importance of roads**

Before the 1960s and arguably still today transportation development was considered a necessary precursory to development with an underlying assumption that the outcomes could be nothing but positive. This is reflected in some of the early literature on transportation development in underdeveloped countries as cited in Howe and Richardson 1984 (1984:49), for example: “The material development of Africa may be summed up in the one word ‘transport’” (Lugard 1922, quoted in Howe and Richardson 1984 1984:49), and “There seems to be no other type of development which can effect so speedy a change in the economic and social conditions of a backward country” (Hailey 1956 cited in Howe and Richardson 1984 1984). Finally a quote from a report from British Guiana: “...striking proof of the principle in colonial development that if you drive a road or railway through a cultivable area, you automatically stimulate economic growth” (Chisholm 1962 quoted in Howe and Richardson 1984). This approach to development was based on the apparently successful economic growth of developed countries where transportation systems and road development had been given top priority. However, by the 1970s some studies were starting to question whether transportation investment was a requisite precondition for economic development (Howe 1984).

Nonetheless, contemporary development projects still recognize road connectivity as a key strategy in poverty alleviation and in increasing socioeconomic well-being (Lakshmanan 2010, World Bank 2005, Jacoby 2000, Van de Walle 1999, Howe and Richards 1984, Carnetmack et al. 1977). However, the outcomes of each road project do not always lead to these intended objectives (Van de Walle 2008, Hettige 2006, Cook et al. 2005, Howe 1984), and in some cases have even lead to greater inequality between rich and poor (Hettige 2006, Cook et al. 2005, Howe 1984).



**Figure 1.1** Map of Protected Areas of Nepal with the research site; the Annapurna Circuit Trail in the Annapurna Conservation Area, Nepal (Adapted from <http://www.map1001.com/Nepal+map-4.html>)

## **1.2 Road impacts**

The following is a brief summary of road impacts. I consider the positive and negative impacts of roads in environmental, socioeconomic, and sociocultural spheres (see **Table 1.1**). I go into more detail about this subject in **Chapter 2**.

### **1.2.1 Environmental impacts**

Environmental impacts of roads are mostly negative, in that they contribute to habitat fragmentation, soil erosion, air, noise, and water pollution, the introduction of invasive species, and the death of wildlife, livestock, and humans (Forman et al. 2002, Spellberg 1998).

A few positive environmental impacts of roads have been reported, such as road verges providing habitat for birds, butterflies, and other small animals (Munguira and Thomas 1992, Adams 1984, Oxley et al. 1974), and roads in forested areas enhancing plant growth by increasing light availability and acting as fire breaks (Brown 2001).

### **1.2.2 Socioeconomic impacts**

In theory, roads lead to economic development by increasing connectivity, which leads to cheaper transportation costs, and shorter travel times. In the case of rural mountain farmers, these benefits allow them to take advantage of better access to markets (Jacoby 2000, Richards 1984) and expand their production. In addition, by enhancing connectivity roads give people the opportunity to travel outside their local area to seek employment, access education and health care facilities, and enhance their social capital, which in turn can have positive impacts on poverty reduction.

### **1.2.3 Sociocultural impacts**

Relatively few studies have examined the sociocultural impacts of road development and in particular, how such impacts are interrelated to both socioeconomic and environmental impacts. Four case studies that addressed sociocultural impacts highlight the negative effects of roads on indigenous groups: one along the Alaska Highway (Cruikshank 1985) and the others in South America (World Bank 2006, Ayers et al. 1991, Gilio 1986).

One of the other sociocultural impacts that is well documented is the increase in the sex trade, HIV, and sexually transmitted infections (STI) associated with roads, increased mobility, and migrants. These diseases are often called ‘highway diseases’ due to the well-established connection between the commercial sex trade and roads (ADB 2008, Brushett and Osika 2008, UNDP 2006).

### **1.3 Nepal roads in context**

It is not easy for an outsider from a western industrialized country to understand what roads mean to a Nepali living in a rural mountain community because we have grown up with good road network access. In this section, I will provide some context to help the reader appreciate what a road means to those living in Nepal.

In Nepal, 23% of the population (~ 6 million people) live more than 4 hours walk to the nearest road, 60% live more than 2 hours away, and another 23% live greater than 4 days away. Some villages are as far as a 13-days walk from the nearest road. Children often walk 2-3 hours to go to school and it is not unusual for a pregnant woman to walk two days to a health clinic (SDC 2008). Average walking times for most Western people on flat ground is about 4 miles per hour. If you lived 4 hours from the nearest road head, calculating at a pace of 4 miles per hour, the nearest road would be 16 miles away. That is approximately the same as walking from Ithaca, NY to Cortland, NY, an 18-mile distance. However, there is a huge difference between walking in the hills of New York and walking at altitude in the Himalayas of Nepal. As the popular joke in Nepal goes, “there are six directions in Nepal, North, South, East, West, and Up and Down” (SDC 2008).

Only three in every thousand people in Nepal own a car (SDC 2008) and Nepal has a total road network of 20264 km (Sharma 2010) (see **Appendix A: A Brief History of Roads in Nepal**). By comparison, in Switzerland, which has a smaller land size than Nepal, 518 in every 1000 own a car (SDC 2008) and the total roadway network is 71355 km (World Bank 2008). Roads are lifesavers for Nepalis because they ease the burden of carrying goods by human porters, increase the opportunities to find work and education outside the local area, and reduce

the time it takes to get health care. Road construction also provides direct employment through the non-governmental organization (NGO)-sponsored Green Roads Program and the World Health Organization's Food for Work Program that pays locals in cash or food to build roads with manual labor. For example, SDC (Swiss Agency for Cooperation and Development) a Swiss NGO that is one of many NGO's in Nepal involved with rural road construction, in collaboration with the Government of Nepal employs more than 4000 Nepalis in their rural road construction program (SDC 2008).

#### **1.4 Research framework: Coupled Human and Natural Systems (CHANS)**

After studying the literature, I am convinced that many infrastructure projects, including road construction, fail to meet their intended objectives because, for the most part, they only address socioeconomic concerns. I argue that there is much more to the picture than just the socioeconomic aspects and that without addressing the interaction of environmental and sociocultural aspects with socioeconomic elements most projects are tenuous at best, will fail to meet their goals, and sometimes make matters worse. When analyzing the impacts of road construction on local communities the interactions between environmental, socioeconomic, and sociocultural spheres is extremely complex. I chose Coupled Human and Natural Systems as my research framework because it integrates all three of the components and examines their interconnected links, thereby giving clarity to the complexity of the issues involved.

New understanding of the complex interconnected links in ecological and human (biological, socioeconomic, and sociocultural) interactions is highlighted by the Coupled Human and Natural Systems (CHANS) model (Kassam 2011, Kassam 2010a,b Lassoie and Sherman 2010, Kassam 2009, Walsh and McGinnis 2008, Liu et al. 2007a,b,c, Buntaine et al. 2007, McPeak, Lee, and Barrett 2006, Olsson, Folke, and Berkes 2004, Machlis et al. 2005, Berkes et al. 2003, Folke et al. 2002, Liu et al. 2001, Machlis 1997). For example, a comprehensive study by Liu and colleagues (2001) using the CHANS model illustrated how a government policy to help protect panda habitat in the Wolong Panda Reserve in Sichuan, China by paying local people to monitor illegal cutting, was actually contributing to more illegal cutting and a higher

rate of panda habitat destruction. This was due to a policy that rewarded individual households to guard against illegal cutting. As a result, households began splitting up to form new households to take advantage of the subsidy. More households required more wood, which led to more cutting.

This body of CHANS research along with the work of others (ADB 2008, Brushett and Osika 2005, Salick et al. 2005, Flower 2004, Buffetrille 2003, Peet 2003, Cook 1991, Price 1989, Cruikshank 1985) points out the importance of a comprehensive approach to evaluating policy, development, and management practices. This should include analysis of environmental, socioeconomic, and sociocultural spheres, and how they interact and influence each other (Buntaine et al. 2007).

Within the CHANS paradigm, two other components should be highlighted. Local and traditional ecological knowledge (LTEK) plays a vital role in facilitating adaptation to a complex and constantly changing environment (Berkes 2012, Berkes 2010, Kassam 2010a, b, Folke 2004, Ghimire et al. 2004, Berkes et al. 2000). Carl Folke (2004:7) recognized this in his editorial comment to the special issue of *Ecology and Society* on traditional knowledge. He wrote, “It comes as no surprise that knowledge of resource and ecosystem dynamics and associated management practices exists among people of communities that, on a daily basis and over long periods of time, interact for their benefit and livelihood with ecosystems (Berkes et al. 2000, Fabricius and Koch 2004).” Local and Traditional Ecological Knowledge is a term that has not been singularly defined however, Berkes (2012:7) has suggested the following working definition of Traditional Ecological Knowledge:

..a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living being (including humans) with one another and with their environment.

Embedded in CHANS and LTEK is the concept of pluralism, which “asserts diversity” (Kassam 2010a:1). In other words, diversity offers a greater pool of information and resources that can combine in infinite ways in the production of LTEK and adaptation. In particular,

pluralism reflects in the ability of CHANS to deal with perturbations through a process that ultimately preserves the integrity and utility of the CHANS. As Kassam (2010a:1) acknowledges, "...understanding of resilience in coupled socio-cultural and ecological systems is enhanced by the concept of pluralism. The idea of ecological niche is enriched by sensitivity to culture, religion, ethnicity, lifestyle, and habitat." He further states (Kassam 2010a:1), "The common good is achieved by harnessing ethnic, religious, and ecological diversity."

### **1.5 Research rationale**

Situated in the context of the research framework my study focus originates from several interrelated factors.

The evolution of these factors from general to specific is as follows:

- Roads are rapidly infiltrating developing countries as a heuristic for economic development and poverty alleviation.
- Case studies show that road projects often do not accomplish their original goals and the impacts are far ranging and often unpredictable. In the most extreme examples the road actually made the situation worse.
- There are no studies that address the interrelation of environmental, socioeconomic, and sociocultural aspects of roads on local communities and how they influence each other, therefore there is a need for this type of research.
- This understanding can help guide policy and implementation of road projects to minimize the negative impacts.
- Study of change in response to perturbation can facilitate understanding of the processes of adaptation and resilience, which is vital for coping with the impacts of globalization and climate change.

Given that roads are currently being built very rapidly in developing countries and will continue to be built in the future, my research contributes to an area that is lacking in information and has significant importance in understanding biocultural diversity within Coupled Human and Natural Systems.

Through this study, I hope to gain a better understanding of how roads affect rural mountain communities so that I can make policy recommendations to minimize their negative consequences. Furthermore, by studying the adaptive strategies that communities use to deal with the rapid changes that roads bring, I can also understand how they will adapt to future changes including natural events such as earthquakes, floods, and climate change. These coping strategies are particularly important not only for communities in my research area, but may also prove to be beneficial to other communities facing the same challenges.

### **1.6 Research questions**

My original hypothesis concerned the use of rural mountain tourism as a means of sustainable development. However, after my first three interviews I realized there was a much more pressing issue in communities in my research area. Everyone I interviewed wanted to talk about the impact the new road was having on their livelihood and culture. Therefore, in addition to the questions I asked about tourism, I added several questions about the road. In the end, this turned out to be fruitful because I could compare information about tourism with information about the road to see what impact it was having on trekking lodge owners as well as farmers in my research site. My research is framed by the following questions:

- What impacts are the new roads along the Annapurna Circuit Trail having on local communities?
- How do socioeconomic, sociocultural, and environmental factors influence each other in road construction projects?
- What adaptive strategies are communities using to cope with the changes the road is bringing and how do those strategies evolve?

I chose these questions in light of the dramatic impact that climate change and globalization are having on rural Himalayan communities. Information about how these changes are affecting livelihoods and culture is particularly relevant to policy agencies, development institutions, and academia.

## 1.7 Overview of the thesis

My thesis conforms to the common order of most theses, from introduction through literature review, and methods, to results and discussion. **Chapter 1** sets the thesis within the broader context of road impacts studies while defining my rationale and research framework as well as my justification and research questions.

**Chapter 2** addresses the salient literature relevant to this research. First, I review the literature on road impacts on environmental, socioeconomic, and sociocultural spheres. Where appropriate I include examples from my research. Next, I outline the framework of my research by discussing the pertinent literature on Coupled Human and Natural Systems (CHANS).

**Chapter 3** explains the different parts of my research methodology. First, I explain how I designed my approach to collecting data. Then I explain the methods used to analyze the data to answer my research questions and how I chose the case studies I use.

**Chapter 4** presents the results of the road impacts based on the 10 case studies. I present the case studies in the order that most trekkers hike the Annapurna Circuit, counter clockwise. I further group the case studies in each of the four different districts (see **Figure 1.0**) that the Annapurna Circuit Trail traverses. To help the reader understand the context in which each case study takes place, I first explain the human ecology of the district in which the case study is situated. I use **Case Study 1** to construct a CHANS model of the road impacts that I then use as a template for the remaining case studies. Each of the remaining case studies addresses a specific aspect of road impacts and the CHANS couplings involved. **Case Study 5** has additional historical information that is essential to understanding key elements central to my argument.

**Chapter 5** reviews the conclusions of my research in addition to considering some broader conclusions that apply to the field of consideration in general. I also make some policy recommendations and consider areas of future research in this field.

**Appendices A through I** provide supporting material for this thesis including in depth background material on Nepal and additional maps and diagrams.

## **CHAPTER 2. LITERATURE REVIEW**

This literature review is divided into two sections. The first section reviews the impacts of road construction on environmental, socioeconomic, and sociocultural spheres. The second section provides a literature review of my analytical framework, Coupled Human and Natural Systems (CHANS).

### **2.1 Impacts of road construction**

Impacts of road construction are generally divided into three main categories: environmental, socioeconomic, and sociocultural.

#### **2.1.1 Environmental impacts**

Road construction involves a profound alteration of the earth's surface, which leads to many negative impacts on the environment. These impacts are frequently not just localized events restricted to the particular road location and often have far reaching effects in other areas. While some effects are immediate others evolve over a period of time and involve an interconnected chain of events. Consequently these effects can be categorized as direct, indirect, and cumulative impacts. To assess the overall environmental impact of road construction projects, activities associated with the project that do not take place at the main site should be considered also. For example, the materials used for the project may actually be excavated from a site some distance from the project area.

##### **2.1.1.1 Land and water effects**

The most obvious initial effect is the alteration of the ground surface. This involves removing the surface cover and compaction of the soil beneath it, which can lead to a number of negative consequences. First, it decreases the amount of productive soil available for agriculture and depending on the road alignment it may actually displace a portion of land already under cultivation. Erosion often becomes a major problem as the vegetative root system holding the soil together is removed allowing water to easily carry it away often impacting areas far from the erosion area. Erosion can lead to many other serious problems such as slope instability and water

quality issues that in turn affect plants, animals, and humans. Slope instability is further affected by a number of other factors; improper cut and fill techniques can lead to landslides as a result of a combination of making the cuts too steep, improper placement of the fill resulting in dangerously loaded slopes, and poor drainage (Tsunokawa and Hoban 1997). Road construction is cited frequently as a contributing factor in deforestation, erosion, and landslides in many countries (Petley et al. 2007, World Bank 2006, Daming et al. 2004, Ives 2004, LPSPT 2001).

#### **2.1.1.2 Biodiversity and habitat loss**

In terms of biodiversity the most detrimental impact of road construction is loss of habitat, habitat fragmentation, and edge effects (Laurence et al 2007, Forman 1998, Mader 1984). Furthermore, Wilcox and Murphy (1985:884) state that most ecologists agree that "...habitat fragmentation is the most serious threat to biological diversity and is the primary cause of the present extinction crisis." Shaffer and Stein (2000) report that habitat loss is the greatest threat for 85% of the species identified as being endangered. It has been estimated in the United States that one mile of interstate highway eliminates up to 48 acres (19.4 ha) of habitat (CEQ 1976 cited in Noss 1995). In China, a recent study in Yunnan province (Wang et al. 2007) showed that road network (RN) disturbance in the area resulted in a 1900 billion RMB (~US \$300 billion) loss in ecosystem value (ESV) from 1985-2000. The study predicted that as a result of increasing RN projects ESV would decrease by an average of 1.2% annually from 2010 to 2020, equaling an average loss of 30 billion RMB (~US\$4.8 billion) per year in ESV. It further concluded that landscape fragmentation and eco-environment degradation was mainly the result of road construction networks.

Habitat loss can be the direct result of the road surface eliminating a piece of habitat or decreasing the overall size and accessibility through habitat fragmentation. Fragmentation results from the barrier effect that roads create when they divide up unified pieces of landscape (Wei et al. 2010). This reduced connectivity has a profound effect on species by restricting movement between local populations (Vos and Chardon 1998, Mader 1984, Oxley 1974), which can result in a smaller population sizes. These isolated smaller populations are more at risk to extinction

than larger populations due to several factors including the smaller gene pool size (Evink, 2002). A study by Findlay and Houlihan in 1997 (cited in Findlay and Bourdages 2000:87) found that “...for a sample of wetlands in southeastern Ontario, current herptile, bird, and vascular plant species richness showed significant negative correlations with the (more or less contemporaneous) density of roads on adjacent lands, up to distances of at least 2 km from the wetland. From this and ancillary evidence, we inferred a causal relationship, namely, that road construction leads to reduced species richness because of one or more processes (e.g., restricted movement of species).” The introduction of invasive species is another result of road construction that contributes to loss of biodiversity (Lonsdale and Lane 1994, Cowie and Warner 1993). Invasive species can enter an area along roadways either by being planted to revegetate the roadside or are carried as seeds by vehicles from other areas.

### **2.1.1.3 Pollution**

Pollution associated with roads includes air, land, water, and noise pollution. The use of vehicles on roads contributes a number of pollutants that contain heavy metals such as lead in diesel fuel, zinc in motor oil, and nickel in gasoline that end up in the soil in the vicinity of roads (White and Ernst 2003). Other chemicals associated with road maintenance such as deicers, salt, and herbicides are common also (Amrhein, Strong, and Mosher 1992). A report by the National Cooperative Highway Research Panel (Evink 2002:19-20) states, “The EPA (1996) reports that between the mid-1980s to the mid-1990s approximately 10 million tons of rock salt was used on the nation’s roads and caused at least 11% of the 20 impaired stream miles reported nationally.” Many of these chemicals end up being transported to other areas by water either as surface runoff, in roadside ditches, or seeping into groundwater increasing water pollution levels and having negative impacts on plants and animals. Water quality can also be negatively affected when erosion caused by road construction adds high sediments loads to runoff. This can result in siltation and lower oxygen content affecting stream, lake, and wetland flora and fauna (Aruga et al. 2005).

Roads have a large impact on the hydrology of areas they pass through. Removing the surface vegetation affects not only the direction the runoff travels, but also the rate at which it percolates into the soil. Paved roads create an impervious surface that accentuates the diversion of surface runoff away from its natural pattern. White and Ernst (2003:8) claim that “A one-acre parking lot produces 16 times as much run-off as a one-acre meadow.” Usually ditches are dug along roadsides to channel water off and away from roads and further alter the natural drainage pattern affecting groundwater recharge and channeling large volumes of water to new areas (Schneider 2010). Many negative impacts can result, such as increased erosion and siltation at the point of ditch discharge and high concentrations of pollutants (White and Ernst 2003). Motor vehicles are responsible for a large portion of the gases that contribute to air pollution and create acid rain in addition to lowering visibility and air quality due to smog and dust. Noise pollution is another obvious result of roads that has been shown to negatively affect breeding rates in birds (Reijnen et al. 1995), and road lights have been shown to affect both plants and animals (ERS 1966). These effects, in addition to the physical barrier created by roads, roadside ditches, and fences, alter the movement behavior of animals. Cutting, mowing, scraping, and burning techniques as well as herbicides used in roadside maintenance affects birds, other animals, and insects that inhabit these areas. Some of these effects can be positive depending on the maintenance cycle and the type of vegetation that is present, but this requires careful planning not only for verges, but also for the construction of suitable animal movement corridors (Smith 1993).

#### **2.1.1.4 Road kill**

Vehicles are responsible for killing a large number of animals every year. The Humane Society and the Urban Wildlife Research Center estimated that one million vertebrates are killed every day across the United States’ road network (Noss 1995). Forman and Alexander (1998:212) state: “Sometime during the last three decades, roads with vehicles probably overtook hunting as the leading direct human cause of vertebrate mortality on land.” There are several reasons why roads and vehicles have become such a deadly threat to wildlife. Roads cut

across traditional migration routes and intersect home territories of many animals. As animals try to move along or across roads in relation to their natural habitat, death from vehicles is a frequent outcome. Wildlife may also attempt to cross a road to access sources of forage and water or may even find habitat suitable to them along the roadside (Harris and Scheck 1991). The impact of wildlife mortality by vehicles is highlighted by Harris and Schneck (1991:192): “Collisions with motor vehicles is now known to be the number one source of mortality for all of Florida’s large rare and endangered vertebrates including panther, black bear (*Ursus americanus*), key deer (*Odocoileus virginianus clavium*) and American crocodile (*Corocodylus acutus*).”

#### **2.1.1.5 Positive environmental impacts**

Several positive environmental impacts of roads have been reported, such as road verges providing habitat for birds, butterflies, and other small animals (Munguira and Thomas 1992, Adams 1984, Oxley et al. 1974). Roads in forested areas can also enhance growth by increasing available light and acting as firebreaks (Brown 2001).

#### **2.1.1.6 Environmental impacts in Nepal**

Two of the major environmental impacts of road building in Nepal that have been well documented are erosion and landslides (Hasegawa et al. 2009, Dahal et al. 2008, Petley et al. 2007, Dahal et al. 2006, Merz et al. 2006, Merz et al. 2003, Hearn 2002, Upreti and Dhital 1996, Deoja 1994, Carson 1985). This relationship between roads, erosion, and landslides has been observed in other mountainous areas in Asia (Salick et al. 2005, Daming et al. 2004, Ives 2004, Hamilton and Bruijnzeel 1997, Hewitt 1997, Deoja 1994, Karan and Iijima 1985) and other parts of the world (see Sidle et al. 2006). Roads are more influential in terms of the greatest landslide losses and surface erosion per unit area affected than any other type of land use. This type of mass wasting is significantly higher along roads than in steep forested areas that have not been disturbed (Sidle et al. 2006). In Nepal, Deoja (1994) estimated that 3,000 to 9,000 cubic meters of landslides per kilometer of road occur during the construction of mountain roads. After completion, 400 to 700 cubic meters of landslides per kilometer per year continues to occur

along mountain roads. Road construction in Nepal results in significantly greater soil loss with estimates as high as 150 tons per hectare from poorly constructed roads (Deoja 1994).

A recent study east of Kathmandu in the Andheri Khola (river) catchment found that road construction had increased the sediment load to the river by 300 to 500% per year (Merz et al. 2006). After studying numerous landslides along roads in Nepal, Suichi et al. (2009:1424) conclude that the combination of improper land use practices and seasonal monsoon rain make "...the Nepalese Himalayas the most unstable landscapes in the world." Their use of GIS mapping of landslides showed that road alignment had a significant relation with landslide occurrence and that most of the Mugling-Narayanghat Road, the main road that accesses the Kathmandu Valley, runs through landslide terrain. Dahal et al. (2006) report 213 landslides along one section of the Mugling-Narayanghat Road that were triggered by rainfall. They go on to say that landslides in Nepal always occur during the monsoon, implicating rainfall as the main triggering factor. It is not surprising then that improper drainage is cited frequently as one of the main problems with road construction in Nepal (Dahal et al. 2008, Dahal 2006, Hearn 2002, Deoja 1994). In addition to poor drainage, cut and fill techniques can lead to slope instability if not done correctly.

During the construction of the Lamosangu-Jiri Road, cut mountain slope material was thrown down the valley side of the road destroying vegetation. Numerous landslides during the first monsoon occurred on both the mountainside of the road, due to undercutting the slope, and on the valley side, due to the loss of vegetation (Schaffner 1987). Road alignment is critical in terms of both avoiding unstable slopes and mass balancing of cut and fill materials. A poorly aligned road, and dumping fill material indiscriminately over the side, can lead to serious road problems that make maintenance very expensive and in some cases require realignment of the road (Schaffner 1987).

Hearn (2002) points out that many roads in mountainous areas such as Nepal are designed with insufficient data to assure proper alignment, thereby increasing landslide potential. He points out the need for an integrated approach involving geologic, soils, and

geomorphological data. While this is the ideal situation, the reality in Nepal is that politics and budget constraints often preclude such an integrated approach. This is highlighted by the comment made by Dahal et al. (2006:512), that the Department of Roads "...does not have a single geologist as an employee."

This frequent improper road assessment is exacerbated by the lack of uniform and compulsory national procedures, standards, and guidelines. Consequently, road construction is often dictated by the desires of politicians and donor agencies (Dahal et al. 2006). Even well planned and engineered roads in Nepal are not safe from landslides. The Dharan-Dhankuta Road, which was considered one of the best engineered roads at the time and cost over US\$ 1 million per km to build, had to be closed periodically during monsoon season, including 1984 when mass wasting along the road created more than US\$ 5 million in damage (Carson 1985). A study of landslide occurrence in Nepal by Petley et al. (2007) suggests that the recent trend in both landslide occurrence and landslide fatalities could be the result of the also increasing trend in rural road construction since the 1990s. He points out that these low budget projects may result in poor alignment and improper construction techniques, both of which have been shown to increase the likelihood of landslides along roads.

#### **2.1.1.7 Summary**

While not all road construction, road networks, and related vehicle effects have a negative impact on the environment, the large majority of them do contribute in some way to environmental degradation and loss of ecosystem services. The main impact is biodiversity loss arising from habitat fragmentation and habitat degradation due to bisecting large contiguous patches of habitat, deforestation and erosion, slope instability and landslides, pollution from various road related activities, alteration of surface run-off and groundwater, and spread of invasive species. Forman and Alexander (1998) estimate that as much as 15 to 20% of the land surface area of the U.S. is affected by roads. Considering the amount of roads currently on the surface of the earth, it is obvious that roads represent one of the most negative anthropogenic impacts on the environment.

In Nepal, the major environmental impacts are soil erosion and landslides, which are often the result of poor alignment and improper construction techniques, including lack of balancing cut and fill materials and poorly designed drainage systems. However, even properly designed road projects are not immune to landslides due to the intense rainfall pattern during the monsoon period, which has been shown to be one of the main triggering factors for landslides in Nepal.

### **2.1.2 Socioeconomic impacts**

When considering socioeconomic impacts of roads, a distinction should be made between urban and rural roads. The scope of this paper is limited to rural roads and their impact on rural mountain villages in Nepal. Consequently, the literature cited here concerns socioeconomic impacts of rural roads in developing countries.

In many developing countries, rural populations are involved in some type of agriculture, therefore much of the literature highlights the impacts of rural roads on rural, agriculturally based communities. From an economic point of view, in theory, the benefit from road development accrues from the reduction in cost of both transport and travel. This allows several processes to take place that can have an impact on reducing poverty. From an agricultural perspective, a road provides access to new markets for locally produced products in addition to access to new technologies, which may help maximize local production. Roads increase the volume and speed that goods can be transported, reducing the cost of transportation and the time to market. This allows farmers to take advantage of cash crops with less risk of them perishing before reaching the market and reduces the price they pay to get them there in addition to the price they pay for incoming goods and products they need (Richards 1984).

Another important benefit from reduced travel and transport costs is enhanced ability to travel for employment both locally and to urban areas, which can then lead to poverty reduction. This enhanced ability to travel, in addition to the direct link to employment opportunities, is also beneficial in terms of social capital and access to health and education facilities, which can also have impacts on poverty reduction (Richards 1984).

Poverty reduction is often measured over a broad area without specific reference to what members in a poor rural area are benefitted. Poverty reduction does not necessarily mean that the poorest members of a community are the beneficiaries. For example, roads have been known to change land values dramatically creating both increased land consolidations and landlessness (Howe 1984). Increased accessibility may lead to an influx of cheap outside labor and consequent local unemployment. The use of vehicles may mean loss of employment for those who provided that transport before the road either through the use of animals or human porters. Some studies indicate that rural roads can result in greater inequality between poor and rich (Hettige 2006, Cook et al. 2005). Each situation has a unique set of circumstances resulting in winners and losers, making predictions about road programs often speculative at best.

Many studies have been done on this subject because one of the main strategies for poverty alleviation in developing countries is the development of infrastructure, and roads are one of the basic building blocks of infrastructure development. Without roads it would be very difficult to build other types of infrastructure, such as schools, hospitals, telecommunications, and dams. In addition, roads provide access to other areas with road networks that facilitate people's movement. This in turn is thought to provide a number of social benefits, such as access to jobs and markets, enhanced social capital in terms of ease of contact with friends, family, and business associates, access to health and education facilities, and an easier way to travel and transport goods.

A review of donor institutions reports from different developing countries highlights the importance of rural roads. "Inadequate rural transportation infrastructure and lack of mobility pose important constraints on rural development in Sub-Saharan Africa. Poverty assessments from Sub-Saharan Africa stress the close link between isolation and rural poverty" - World Bank (Calvo 1998:7). "A key component of the Chinese government's poverty reduction initiative is to link the rural poor to major economic centers. Enabling poor people to benefit from greater mobility would increase their employment opportunities, open up trading and marketing of farm

products, and improve access to health, education, and other social services.”- Asian Development Bank (ADB 2006:1).

Considering the number and scope of rural road projects in developing countries it is surprising that there is little agreement on the actual benefits, as Van de Walle (2008:1) of the World Bank observes:

In recent years, rural roads have been extensively championed as poverty alleviation instruments by the World Bank and donor institutions. It is argued that rural roads are key to raising living standards in poor rural areas (for example see Gannon and Liu, 1997). By reducing transport costs, roads are expected to generate market activity, affect input and output prices, and foster economic linkages that enhance agricultural production, alter land use, crop intensity and other production decisions, stimulate off-farm diversification and other income-earning opportunities, and encourage migration. Claims have also been made that by facilitating access to social service facilities, better roads enhance social outcomes. Yet despite a general consensus on the importance of rural roads for development and living standards, there is surprisingly little hard evidence on the size and nature of their benefits, or their distributional impacts. Indeed, there have been relatively few rigorous and credible impact evaluations of rural roads.

Some common criticisms of rural road impact assessments are (Van de Walle 2008):

- failure to follow projects for a sufficient time to document the full effects,
- lack of proper comparison groups, and
- Not taking into account unobserved agents influencing the project in relation to the observed results.

The very nature of road projects makes impact assessment complicated leading to a variety of different methods and formulas being used during assessment. Consequently, it is very difficult to compare studies when different techniques are used for evaluation. While it is useful to identify some of these complicating factors, one of the overarching problems in assessment is that impacts can be short, intermediate, and long term. Some impacts will be noticeable immediately while others may take a long time to appear making accurate impact assessment challenging. A road by itself does not impart benefits directly, but rather through the connections it makes with other complementary factors such as schools, vehicles for transport of goods, and

demand for local goods. Due to the large number of factors involved in determining the benefits and the beneficiaries from road programs, assessment studies face the challenge of taking all of these derived and conditional benefits into account. Road projects are capital intensive and are planned to take advantage of certain aspects of their placement or for a specific purposes. Changes in the area once the road is built may not necessarily be the result of the road, or the results may be biased because of a preexisting condition in the project area. Impacts from road projects can also vary greatly across different groups within an area and proper assessment must take into account all these different groups (Van de Walle 2008).

These are a few of factors that make accurate road project assessment complicated and conflicting. Howe (1984:50) points out that it is very difficult to assess the validity of these project studies without "...highly sophisticated experimental controls and equally sophisticated analysis." After reviewing numerous road assessment reports he concluded that: "Rarely has the design of any impact study approached these 'necessary' scientific standards. Thus it must be expected that results will usually be tentative and contradictory and that only broad conclusions will be possible."

It is interesting to note that the comments made in 1984 by Howe about the lack of impact studies with 'necessary' scientific standards, is very similar to the comment made 24 years later by Van de Walle (2008:1) when he says "Indeed, there have been relatively few rigorous and credible impact evaluations of rural roads." This again may be an indication of the complexity of interrelated factors involved in road projects and the inherent difficulty in assessing the impact of rural road projects. Van de Walle (2008:30) summarizes the essential elements of this complexity by saying:

The benefits of rural roads are indirect and conditional on interactions with the geographic, community and household characteristics of their location. Road locations are typically determined by those same characteristics confounding inferences based on comparisons of places with roads versus without them. Additionally, impacts may be distributional, felt across multiple outcomes and

take a long time to emerge. These features of rural roads have implications for evaluation design and data collection.

Even when rigorous methods have been used for project evaluation there still appears to be ambiguity on overall outcomes of rural road impacts.

In recent years a number of studies have assessed the impacts of rural roads rigorously using impact evaluation methods that expressly deal with selection. These studies show mixed results, some finding substantial impacts and others more muted impacts. They have examined disparate outcome variables, in diverse circumstances, using various techniques — some of which can be questioned. Sources of ambiguity in impacts can also be expected due to heterogeneity. It thus remains difficult to draw definitive conclusions concerning the impacts of rural roads (Van de Walle 2008:26).

Therefore, it must be recognized that each road project is extremely context specific and while it may be informative to review previous rural road project assessments, drawing conclusions that can be applied to other countries or even others areas in the same country has many pitfalls. Nevertheless, this body of impact assessments forms the existing hard data on rural road project outcomes. Consequently, it is useful to review it, but with the above mentioned limitations in mind.

#### **2.1.2.1 Socioeconomic impacts in Nepal**

Several particularly interesting rural roads studies have been done in Nepal that looked at road development in the same area of Nepal over a twenty-year period. In 1971 an *ex-ante* study of the Sonauli-Pojhara Highway near Pokhara was done to “...determine the potential of the individual farmer to respond to new technology, government programmes and changes in absolute and relative prices” (Schroeder 1971:4). After doing an in depth econometric analysis they concluded that the new road was an enabling mechanism that could create economic benefits in the Pokhara Valley in the future. The road provided the means by which the area had “...the opportunity to progress rapidly enough so that production and regional income increase faster than population growth” (Schroeder 1971:6).

In 1973, the Overseas Development Group of the University of East Anglia undertook an extensive study of Nepal’s road system, titled the Nepal Roads Research Project (Blaikie et al.

1976). This detailed three year study's objective was "...to investigate the social and economic effect of road provision, with particular reference to inequality, in the west central region of Nepal." (Blaikie et al. 1976:1.1) The study included the section of road studied by Schroeder (1971) mentioned above as part of the East-West Highway (Mahendra Rajmarga) development. In addition, two other sections of road were studied that would connect the north hill regions, one (the Prithivi Rajmarga) with Kathmandu, and the other (the Siddartha Rajamarga) with the plains and India. These last two were included by the request of His Majesty's Government of Nepal to determine if, "...the building of roads linking, different and unequal, regions would have the effect of reducing inequalities between those regions, and also, through their more general economic and social effects, between individuals and groups within each regions' as stated in the fourth Nepalese Five Year Plan" (Blaikie et al. 1976:1.1-1.2).

At the time of the study, Nepal was facing an escalating poverty trend exacerbated by a rapidly growing population and a ten-year decline in food grain yields. This was highlighted by the 1974 U.N report, which said: "Nepal is poor and is daily becoming poorer" (ARTEP 1974 cited in Blaikie et al. 1976:5). The hope of the Nepalese government was that road construction would be a solution to this problem by evening out some of the regional inequalities and stimulating agricultural and industrial growth. In the summary of the findings of the report the authors say:

The building of three main roads in West-Central Nepal over the last ten years has had very little effect on the crucial pre-requisites for any significant development in the region, namely increasing agricultural production and industry. There have been some changes in commerce and trade, but in part to the growth of population and the bureaucracy. No evidence has been found to support the optimistic prognosis of the effect of roads in the fourth Nepalese Five Year Plan. (Blaikie et al. 1977:131)

The reason for this failure of road development to deliver the results forecast had to do with several factors including Nepal's trade treaties with India, which favored India at the expense of Nepalese forms of production, the reliance of the government on foreign aid and the

corruption inherent in that system in Nepal, and the inequality of the class structure. This study then became the basis of the book *Nepal In Crisis* (1980), which predicted that Nepal would become more poverty stricken, as its economy would slowly continue an inevitable decline and roads would not alleviate this. The mitigating factors were so strong that the authors stated: “The roads would have effects but these would essentially serve to deepen dependency and underdevelopment rather than alleviate it” (Blaikie et al. 2002:1256).

Further analysis showed that no matter how good the roads are, unless there is complimentary development and support by the government or private investment to increase production, road benefits would not accrue. In Nepal the government had not implemented sufficient programs to aid poor farmers and the level of poverty was so high farmers were not willing to take on the risk of innovation without some form of support (Leinbach 1995). The situation was complicated by Nepal’s proximity to India and India’s preferential trade agreements, resulting in more imports from India, which stunted Nepalese production and industrial growth.

Blaikie and colleagues reexamined this situation in 1998, more than twenty years after their original study. Although the prediction of increasing poverty made in *Nepal In Crisis* (1980) was not evident, there still had been very little change, “...hardly any significant development of commercialized agriculture, little investment in modern inputs, aggressive forcing down the cost of hired labor, or appropriation of poor peasants’ land by an expansive class of capitalist farmers” (Blaikie et al. 2002:1267). One explanation for lack of development in agriculture was that it is better to have family members migrate, either domestically or internationally, for labor than it is to enter the market as a producer because it is less risky and pays better. This trend in migration had been increasing since the first study, almost tripling over 20 years. However, the authors failed to mention that roads aided in the migration trend, which helped preclude the deepening slide into poverty that the original study predicted. Another factor influencing the reluctance to invest in agriculture was that many farms in Nepal are so small that they do not produce enough surpluses to establish a base for major investment.

A study done in Nepal in the 1990s by the International Centre for Integrated Mountain Development (ICIMOD) (Paudyal 1998) was designed to look at several aspects of rural roads to determine how they could be used more effectively as a means of poverty alleviation and sustainable development. It examined not only the effects of rural roads on local villages, but also the conditions that affected rural road construction, functioning, and maintenance. Consequently, policy, institutional responsibilities, and production linkages were also analyzed. Four rural road projects from different areas of Nepal were picked to reflect different levels of connectivity to markets and different construction techniques. Analysis of the case studies was done at the three levels: policy, program, and project.

At the policy level the report pointed out the need to keep in mind the institutional linkages in the rural road system when planning rural road policies and studies. At the time of the study, the implementing institutions for rural roads were the District Development Committee (DDC) and Village Development Committee (VDC). However, the operational plans for road projects failed to take this into account. Therefore, many of their recommendations on how to carry out the project were unrealistic at the district and village levels. At the program level, while the local institutions (DDC) had all the elements contained in the overall road development plan, at the project level many of the steps involved in the project were ignored because the DDC and VDCs are autonomous.

The Department of Roads (DOR) of Nepal has a five-stage protocol for proper road construction, but at the local project level, it is rarely enforced. One example given is that phased construction, which allows for natural stabilization of the road over time and provides environmental protection, is often ignored because construction is based on budget allocations. Consequently, phases are not interlinked in the proper way resulting in poorly constructed roads that are hard to maintain. This is compounded by the fact that the maintenance policy for rural roads is not clear. Without having an overseeing regulator agency that can enforce proper construction techniques at the local level many of these poorly built roads lead to erosion and

landslides, and have other negative impacts on the environment. Often roads are built in the fastest, least expensive way so vehicles can begin using them as soon as possible.

At the project level, benefits were reported, such as decreases in transportation costs, but apart from kerosene and salt, the price of staple goods did not decrease. Availability of goods in the area did increase, but the base price of these goods did not fall below pre-road prices, and in fact increased over time. The savings in transport cost were absorbed by transportation owners and retailers, making them the main beneficiaries, not the consumers who had provided both free land and labor for building the road. In terms of positive social impacts, both education and health benefits were noticed because better teachers were able to move to the area and the amount of time needed to reach the hospital was reduced. An additional overall benefit of people feeling less isolated and more connected to the outside world and its services was also reported.

Recommendations included in the report pointed to several important issues for rural roads in Nepal. First, the concept of rural roads must include more than just roads that vehicles can use. It should also include interconnected trails that are used to reach the nearest motorable roads and how that road connects to the rest of the nation's road system. Without taking this overall pattern into account the full potential of rural road construction and expanding networks cannot be actualized.

Secondly, the institutional connections for planning, construction, implementation, and maintenance of rural roads lack clarity and coordination. Local level institutions should submit their needs to the national level, which in turn can provide support and the necessary supervision to ensure the project progresses efficiently using both sound technical and environmentally positive techniques. This should also involve employment of the local population in the construction of the road, which would accrue additional benefit to the local area. Creating an institution at the district level accountable to the local level to oversee the coordination of the various phases of the project and the continued maintenance and functionality of the roads after construction was completed would facilitate the connection between the local and national levels.

Thirdly, local government needs to ensure that the road will increase local production by coordinating the various actors involved in production, transportation, marketing, and storage of local goods.

Lastly, several environmental and spatial considerations were deemed critical. The construction of rural roads would benefit from following the Low-cost, Environmentally Friendly, and Self-help (LES) approach found to be successful in other areas of Nepal. This would have positive benefits for the local population and help reduce the amount of negative environmental impact. LES is a comprehensive program that employs locals under supervision by engineers to construct a road using locally available materials and environmentally friendly techniques, such as constructing in phase, balancing cuts and fills, water runoff management, and bioengineering for slope stabilization. This approach gives communities a sense of ownership of the road that helps ensure proper maintenance after the road is complete. In terms of spatial considerations, setting up a facility at the road head that could be used for storage and distribution of goods and help centralize and organize other ensuing construction at the road head, would reduce the tendency for uncontrolled sprawl and ribbon development along the road (Paudyal 1998).

Various NGOs in Nepal are involved in rural road projects and reports on their projects provide some of more recent literature on rural roads in Nepal.

The Swiss Agency for Development and Cooperation (SDC) has been doing development work in Nepal for over 50 years. In 1999 it initiated the District Road Support Programme (DRSP) to focus on "...improving road access while benefiting the people who really need it. It aims to build the capacity of the participating district organizations to plan, design and implement the maintenance, rehabilitation and construction of district roads" (SDC [http://www.swiss-cooperation.admin.ch/nepal/en/Home/District\\_Roads\\_Support\\_Programme\\_Phase\\_3](http://www.swiss-cooperation.admin.ch/nepal/en/Home/District_Roads_Support_Programme_Phase_3)). This program covered six districts in eastern Nepal. In 2009, an independent external review of the program was published (Strickland 2009). One of the main objectives of the review was to determine the economic and social impact of DRSP on the local communities. Four roads

from three of the districts were chosen to be representative of a wide range of geographical, access, and transport characteristics. The overall conclusion was that the DSRP road project had a positive impact on local communities. This was observed in both economic and social empowerment. Economic growth was enhanced directly through employment of the locals during the road construction phase, and this was found to favor the poor. Other economic benefits were accrued in terms of reduced transportation cost, which led to lower prices of imported goods, additional employment options, and access to new markets outside the local area for selling produce. Social benefits included greater equity for marginalized groups and women, from empowerment through community activities facilitated by the road linkages, and general social benefits associated with better connectivity. The report also mentions that while the poor have benefitted from employment during the road construction phase, these benefits are short term and long-term benefits tend to favor more economically advantaged groups due to their ability to invest in the new opportunities resulting from increased connectivity (Strickland 2009).

A study by the Asian Development Bank (ADB) in 2007 (Kafle 2007), emphasized the importance of integrated road construction projects, such as the SDC project mentioned above, for maximizing benefits of rural road projects for poverty alleviation. ADB conducted a pilot project in three districts in eastern Nepal named Enhancing Poverty Reduction Impact of Road Project (EPRIRP). A key element was involving four NGOs with the Department of Roads (DOR) in organizing micro-finance, skills training, and income generating activities for poor and marginalized groups along the different road sections. The positive benefits that accrued to such groups have led ADB to recommend that NGOs be involved in future road projects aimed at poverty reduction (Kafle 2007).

Jacoby (2000), using data from Nepal, developed a model based on farmland value in relation to distance to farm produce markets to predict the benefit of a hypothetical road project. His results showed that expanding rural road network connections from farm to markets would

lead to a sizable benefit. However, while the poor could earn a substantial amount of this, the size of benefit would not be large enough to offset income inequalities in the area.

Malla and Griffin (2000, cited in Ives 2004) studied four communities with varying road accessibilities. The first village, Dhulikhel, was well connected by the main road to Kathmandu. The second village, Chhattrebanjh, was connected to Dhulikhel by road. The last two villages had no road connections; Chaubas is a six-hour walk to the nearest road and Budhakani is more than a one-day walk to a road. The study covered 102 households and included extensive data on socioeconomic conditions, livelihoods, industrial development, and overall change over a 10-year period. Their general conclusion was that road accessibility was the defining element in the differences between the socioeconomic conditions of the villages.

The most outstanding difference over the 10-year period was the large increase in commercialization and trade in the two villages connected by road. In addition, increased agricultural intensity was attributed to the availability of chemical fertilizers in both of the road-connected areas, with households reporting self-sufficiency that had none a decade before. With the ability to grow surplus food for sale, choice of crops changed to meet market demand. This trend was also noticed in livestock production, with meat and milk being favored. In contrast, farmers in the two villages not connected to a road grew food primarily for home consumption; although Bukhakani did supply a substantial number of goats for sale in Kathmandu. Dhulikhel, being the closest to Kathmandu, had diversified considerably by adding numerous new businesses (e.g., carpet making, hotels, brick making, transport, and furniture making) with an attendant growth in employment opportunities. An impact on education also was noted with most children now attending school. The other important observation was that the degree of road access had a major influence on the ability to derive income from off-farm employment, which increased overall household security for those with road access.

In contrast, a study by Bohle and Adhikari (1998) was done in two areas in west central Nepal specifically chosen for their relative inaccessibility to markets. Three to five villages were investigated in each area representative of the most remote villages. In one area, only 8% of the

households had food surpluses, with 51% being self-sufficient from their own production less than 12 months and 41% for less than six months. In the other area, only 1% had food surpluses with 31% self-sufficient for 7-12 months and 68% for less than 6 months. Purchasing and bartering of food were the main ways people dealt with the food deficit. While none of these villages were directly connected by road, the authors were able to determine one of the key elements in livelihood survival was the ability to be mobile, both spatially and seasonally, to take advantage of income generating and trading opportunities between villages along the trails, and to access different ecological niches, which provided additional coping strategies. Nevertheless, indications from a caloric intake assessment showed that even in the best cases, villagers were only able to achieve 85% of the minimum food requirement established by the World Health Organization (Bohle and Adhikari 1998).

Seddon and Shrestha (2002) studied a village along the Bhimdhunga-Lamidanda Road in the central region of Nepal. Major benefits reported were decrease in transportation costs and travel times, with the increase in personal mobility considered the most important benefit. Several roadside effects were identified. Landowners along the road or immediately adjacent to it were the first to benefit due to the major increase in their land values. This translated into home improvements and an increase in consumer goods such as TVs and radios. Traders and vehicle owners were the next group to benefit, although large trucks for transportation tended to only be affordable by wealthy merchants from Kathmandu. Many new businesses along the road providing services for travelers were built, such as restaurants, shops, and small lodges. An almost complete loss of work for porters in the village came with the road, except during the monsoon season when the road was impassable. Before the road, portage provided valuable work for many of the poorer inhabitants of the village. Agricultural production also changed since the road opened. With the availability of fertilizers and connection to different market demands in Kathmandu several changes in crop production occurred including growing high yield rice instead of the tradition rice variety, and more production of vegetables and fruits.

Additionally, eating habits have changed from maize and millet, to the main staple of rice, now that cheap rice is more readily available.

Part of this success in increased agricultural production is due to the Small Farmers' Development Programme, which provided low interest credit to farmers. This production increase has been so successful that vegetable production has taken over fields that used to be sown with rice and wheat, in addition to some land being leased for vegetable production. Social benefits cited include increases in personal travel for family, social, and religious activities, and in literacy rates in road access areas versus non-road access areas, due to more primary schools being built along the road (Seddon and Shrestha 2002).

The importance of complimentary services to help stimulate the agricultural intensification benefit of rural roads has been highlighted in other mountainous areas of Asia, such as Hunza in the Karakoram (Kreutzman 1991).

A study done in 2003 using field-based surveys with GIS data examined the effects of a road on socioeconomic issues and gender roles in eastern Nepal. The study was done in the Yarsha Khola watershed along the Lamosangu Jiri Road, which links the area with the capital, Kathmandu. This study was able to compare the area along the road with the adjacent area, which had no road access. Significant impacts were found as a result of the road when comparing the two areas. Farmers in the area with road access used more chemical fertilizers, had smaller land holdings, and relied more on off-farm income to support them.

#### **2.1.2.2 Summary**

As Howe states in *The Impact of Rural Roads on Poverty: A Review of the Literature* (1984: 79): "The over-riding impression gained from reviewing available impact studies is the paucity of evidence on the effects of road investment programmes on rural incomes and income distribution." This statement points to one of the main difficulties in determining the impact of rural roads on socioeconomics. However, it is not only the lack of information; it is also the unreliability of the information available due to poor design of case studies examining this issue. In addition, the lack of consistency between different studies makes it hard to compare and

contrast their results. However, a summary of the literature on socioeconomic impacts of rural road construction suffices to point out many of the same scenarios in other developing countries.

The literature on socioeconomic benefits from rural roads in Nepal is instrumental in pointing out the numerous contributory factors that must be present for rural roads to benefit an area economically. The pre-existing political situation in Nepal, in addition to its treaties with India on its southern border, has meant that many of the roads that have been built to help develop rural areas were not able to stimulate the economic growth necessary to bring major benefits to the area. This is complicated by the historical inability of the government to develop agricultural aid programs in rural areas that would provide the support necessary to allow farmers to take the necessary risks involved in changing their mode of production to maximize the new opportunities for market access that the roads provide. In fact, the increased mobility brought about by roads has resulted in more migration in search of off-farm employment, as this has proven to be more profitable and less risky.

Recent trends in collaborative efforts with local communities to build roads have had differing results. In places where careful planning and supervision were involved due to NGO involvement in integrated pro-poor programs, results have been positive, providing employment for disadvantaged groups. Where this structural organization was lacking, the resulting *ad hoc* nature of local road building has often resulted in substandard roads that are hard to maintain and result in serious environmental degradation.

Some of the negative socioeconomic outcomes of roads when they do not have complimentary economic stimulus packages are stagnation, unequal distribution of benefits, and landlessness.

### **2.1.3 Sociocultural impacts**

There is much less literature on the sociocultural impacts of roads. While the need for this type of assessment is increasingly recognized as important by donor agencies and NGOs, sociocultural impacts are harder to quantify, and certain ones may not show up until long after the road project has been completed. One set of sociocultural impacts that has been well

documented is the increase in the sex trade, HIV, and sexually transmitted infections (STI) associated with roads increasing mobility and the number of migrants (ADB 2008, Brushett and Osika 2008, UNDP 2006). These diseases are often called 'highway diseases' due to the well-established connection between the commercial sex trade and roads. A report by the International Labor Organization cites two studies that document the linkage between roads and HIV. One study, conducted along a major highway in southern India, showed that 16% of the drivers were found to be HIV positive versus the national average, which was less than 1%. The other study, in the KwaZulu/Natal Midlands of Africa conducted in 2001 by the South African Medical Research Council, found that 56 % of long-distance truck drivers in the region were HIV-positive (ILO 2005). A World Bank report in 2008 estimated that along the major east-west transport corridor in West Africa (Abidjan-Lagos transport corridor), which connects five countries and where three million people cross borders each year, there could be as many as 300,000 HIV infected people travelling along the corridor annually (Brushett and Osika 2005). Sex is not the only source of HIV as drug use is often also associated with the spread of HIV along road corridors (ADB 2008). Mobility increases people's ability to interact and engage in activities that can lead to high risk activities contributing to increased health problems and sociocultural changes in attitudes, values, and lifestyles.

A study in the Brazilian Amazon by Ayers and colleagues (1991) showed significant sociocultural changes as the result of new road construction. The village they surveyed was isolated from any road until 1978. The first survey was done just before arrival of the road in May 1978 and the second was done 1 ½ years later, in May 1980. While the primary purpose of the study was to assess changes in subsistence hunting, the interviews and data collected showed some interesting overall sociocultural changes that were attributed to the road. One of the biggest changes was that the population size of the town increased by almost 55% as a result of immigration from the southern and eastern parts of the country. Land use and agriculture practices changed as locals discovered that land value correlated with crops, and to maintain possession of their land they needed to keep it under constant cultivation. Linkage with the

national economy brought new food sources that changed peoples' diets and their traditional livelihood strategies. Before the road, the main source of protein in diets was from animals that were hunted in the area. With the arrival of the road came access to fresh beef, which was a more reliable source of protein than hunting, resulting in an increase in beef consumption and less reliance on hunting. Other economic activities that came with the road that affected people's traditional livelihoods included large-scale agriculture, cattle ranching, mining, and logging. (Ayers et al. 1991)

Perhaps the most well-known road project that created numerous negative impacts, not only in the sociocultural sphere but socioeconomic and environmental spheres as well, is the paving of the BR-364 Highway in Brazil. This project began in the 1980s as part of the Northwest Regional Development Program (a.k.a. *Polonoroeste*) in Brazilian Amazonia. The project, partially funded by the World Bank, was supposed to "...provide an integrated approach to frontier development and avoid further land conflicts and illegal logging" (World Bank 2006:50). The reconstruction and paving of BR-364 and additional feeder roads, while only part of the project, is largely thought to be responsible to the ensuing rapid deforestation and social conflict (World Bank 2006, Peet 2003, Keck 1998, Browder 1994, Price 1989, Fearnside 1987, Lutzenberger 1985). The paving of the highway led to a mass influx of migrants looking for new opportunities with the population of the area almost tripling in six years, growing from 600,000 to 1,600,000 (Peet 2003). Sociocultural impacts included armed conflict between squatters and landowners including indigenous inhabitants over land rights (Gilio 1986), displacement of indigenous inhabitants (Price 1989), frequent abandonment of homesteads (Keck 1998), unscrupulous land profiteering (Price 1989), encroachment on Amerindian reserves (Fearnside 1987), and thousands of deaths from malaria (Peet 2003).

Several studies have also been done in China concerning the impacts of roads on ethnic minorities. For example, Salick and colleagues (2005) found that traditional agricultural practices in Tibetan villages near new roads in Northwest Yunnan had changed. Villages near roads grew significantly more cash crops, such as grapes and wheat, compared to villages not

near roads, which tended to grow more barley and buckwheat. In addition, the traditional soil fertilizers of oak leaves and dung were being supplemented with chemical fertilizers, and pesticides were also being used. Traditional livelihood practices had also changed due to roads with males leaving villages to find cash income on road construction crews and elsewhere. In one village, road construction had reduced its water supply resulting in the abandonment of rice cultivation in the area.

In addition, other studies have looked at the impact transportation, especially roads and railroads, has had on the migration of Han Chinese and the Chinese military to ethnic minority areas. The resulting socioeconomic and sociocultural changes have often led to violent conflict and marginalization of local inhabitants in areas such as the Tibet (Dreyer 2003) and Xinjiang Uyghur (Becquelin 2000) Autonomous Regions.

Cruikshank (1985) analyzed the impacts of the Alaska Highway (AH) on the First Nation (FN) inhabitants of Canada. She found a substantial migration in the First Nation population as the focus of transportation changed from river to road during the construction of the AH (March 8, 1942 – September 24, 1942). First Nation people began to abandon river communities where they had formerly traded furs based on riverboat transport. Once riverboats stopped running, they moved closer to the road, not only to take advantage of the new system of transportation for trading goods, but also to seek additional employment either working on the road or in commercial activities. These new areas near the road could not support their traditional subsistence lifestyles, so they had to seek wage labor to survive.

The First Nation traditional hunting patterns were also affected by creation of the Kluane Game Sanctuary (December 1942) along a section of the AH, which eliminated their hunting rights. In another area, competition from non-native road workers who had been granted hunting privileges by the government, affected the First Nation hunters. Many of non-natives hunted for sport, leaving the dead animal to rot without taking the meat, which the First Nation saw as wasteful and counter to their ethical code of respect for the land and animals that provide food.

As the result of a large influx of male workers and army personal during the construction of the AH, negative impacts on the Canadian First Nation people such as changes in traditional values and social behavior, increase in alcohol use, and health epidemics such as measles, whooping cough, and meningitis ensued.

“Before the highway came and split us all in different ways, we used to feed ourselves good from this country” (Yukon First Nation person, quoted in Cruikshank 1985:178). This quote reflects the breakdown of many of the traditional First Nation ways, which they identify with the coming of the highway. Benefits did accrue after the completion of the highway, such as access to medical facilities and better communication services. However, in terms of the First Nation population, Cruikshank (1985:185) points out that: “The highway was a decisive factor bringing Yukon Indians to the marginal position they have in the present Yukon economy and society.”

Impacts of transportation on gender have brought to light some interesting sociocultural aspects of road construction. Fernando and Porter (2002), after compiling many case studies from around the world concerning transportation and gender, concluded that culture has a very strong influence on women’s freedom to use transport services. In most cases, cultural rules allow men to travel without restriction provided they have the funds. Women however, do not always have the same opportunity to benefit from improved or new roads when they reach their communities. Access to funds within households and work responsibilities inside and outside the house can preclude women from taking advantage of transport options in the same way that men do. For example, in some areas of Tanzania sociocultural traditions dictate that only men should own and use transport devices. Consequently, women carry loads on their head instead of using bicycles on the road (Mwankusye 2002).

In some cases, religious practices affect whether woman can take advantage of new road construction and consequent mobility benefits. One of the case studies in a Muslim area of Nigeria found that the religious tradition of female seclusion precluded the ability of women to take full advantage of road improvement and better transport, because they rarely travel outside

the village. Another interesting case is from a Muslim area of Bangladesh where even though the village maintained the tradition of female seclusion, poorer women were not as restricted as richer women due to the cultural stigma of travel not being respectable for women of higher socioeconomic status (Fernando and Porter 2002).

Some of the benefits cited include better access to schools and health facilities and increased participation of men in chores often falling to primarily women, such as collecting firewood and accompanying children to school and the sick to a hospital (Yunusa et al. 2002).

### **2.1.3.1 Sociocultural impacts in Nepal**

Seddon and Shrestha (1992), in their study area in Nepal found that road access in some cases increased the workloads of both women and children, because male members of the family would travel to markets and seek off-farm employment, leaving them to take up the additional work burden. These authors also commented on how improvements in roads and transportation have facilitated the commercial sex trade. Women can make three times the amount of money in the sex trade as they can from labor, and for many women it provided a way to ensure adequate income for their family's survival. The town of Siliguri, on the southern border of Nepal, has become the main hub of girl trafficking and prostitution in Nepal because it has the best road links to India, where most of the girls are sold into prostitution (Siliguri Link to Nepal sex trade 2009). An International Labor Organization report estimated that 12,000 children are trafficked from Nepal every year (Bal Kumar KC et al. 2001).

Ghimire (1992) found a similar increase in the workloads of women associated with road construction. He found that improved road access in a mountainous area of Nepal increased the demand for milk and dairy products, resulting in more cattle rearing. The extra burden of rearing more cattle, including collecting fodder and mulch has traditionally been women's work. With the increase in cattle, their workload also increased. However, in the Terai where the topography is flatter he found that women's burden decreased due to the road because they were able to use bicycles to travel and carry small items. In addition, the collection of firewood, which used to be a responsibility assumed only by women, was changing because men could now use bikes to

transport firewood. Nevertheless, he points out that with the increased mobility afforded by roads, additional economic activities become available and as a result more travel and transport are required and women are typically the ones who shoulder this additional work.

### **2.1.3.2 Summary**

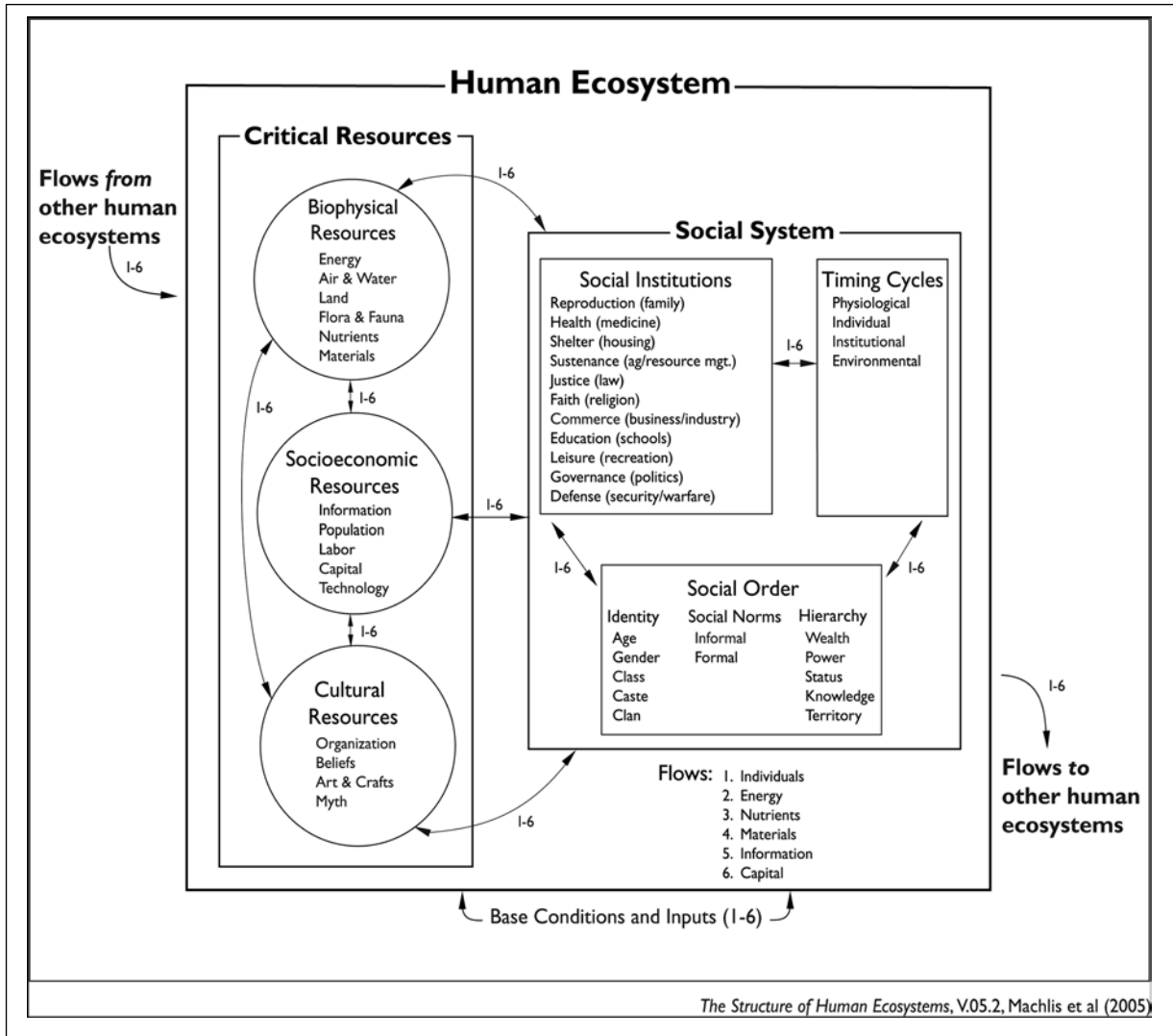
One of the main livelihood strategies that roads facilitate is in- and out-migration. This can have both positive and negative impacts on sociocultural elements. Negative impacts, such as detrimental change to traditional sociocultural values and practices, often result from the influx of migrants to areas newly opened by roads. HIV/AIDS and sexually transmitted infections, sex trafficking, and drug use has been shown to have a link to road connectivity. Out-migration of family members (usually male) to seek employment, while often having a positive socioeconomic impact, can also lead to increasing gender inequality by placing more of the burden of household chores on women. Conversely, in some areas it was noticed that increased mobility could lead to men shouldering some of the tasks previously done by women, thereby relieving some of the gender inequality. When new roads are constructed into extremely isolated areas, they facilitate a large population influx of outsiders, which can lead to the marginalization of native inhabitants.

Positive sociocultural outcomes have been observed in terms of ease of access to other areas and the resulting social capital, in addition to increased access to employment, schools, and hospitals. In some cases, empowerment of women and marginalized groups also has been noted.

## **2.2 Research Framework: Coupled Human and Natural Systems**

The focus on Coupled Human and Natural Systems (CHANS) has grown out of the awareness that the earth is experiencing profound environmental degradation despite our understanding of ecology, and concerted attempts to use technology and policy to mitigate human impact on the natural world (Lassoie and Sherman 2010). Machlis and colleagues' (1997) model of the human ecosystem (**Figure 2.1**) laid out the complex web of connections between humans and nature, and between other human systems. They put forth the idea of the human ecosystem model as an organizational structure for managing ecosystems. The impetus

for this was the realization that current population growth trends would put increasing demand on limited natural resources; and that our technological attempts to deal with this situation had not only been largely unsuccessful, but it had also increased the disparity between rich and poor, rather than redistributing those resources equitably.



**Figure 2.1** Human Ecosystem Model

This failure to find workable solutions is due to the traditional academic disciplinary boundaries, which have resulted in researchers only considering their particular field of study. Consequently, while both biological and social scientists look at impacts between humans and nature, they conduct their research as if humans were outside and distinct from natural

ecosystems. The authors highlight this by stating: “Our hope is a fusion that transcends the arcane division of the biophysical and the sociocultural – one that is truly ecological” (Machlis et al. 1997:348).

Their model has two main categories, critical resources and human social systems, which are both composed of various components (see **Figure 2.1**). Critical resources can be seen as the fuel that keeps the system running and are subdivided into natural resources, socioeconomic, and sociocultural resources. The human social system regulates the movement and consumption of critical resources and is subdivided into social institutions, social order, and social cycles. The critical element of this model is that all these components interact and influence each other and there is a dynamic flow among them that can often involve components nested hierarchically, and function at various spatial scales. The authors then proceed to give an in depth explanation of each of these components, how they are interrelated, and how they can be measured. . For example, under social institutions the subset of commerce is explained as a necessary social institution for the exchange of goods and services. It can be measured in various ways, such as number of banks or cash value of goods produced, and it can have cascading effects on other social institutions. One example given is that change in commerce can have an effect on wealth and power, which influences the social order of a system (Machlis et al. 2007). Certainly, the global consequence of the 2008 U.S. economic crisis is another recent example, which also highlights the nested hierarchical and spatial temporal elements of the model.

The potential applications of this model are discussed in several different areas including social impact assessment, development of social indicators for ecosystem management, monitoring of natural resource programs, a teaching tool for introduction to ecological science, and a rubric for social scientist to engage in issues concerning management of ecosystems. Arguably, one of the most important applications of the model is the one mentioned last (Machlis et al. 1997:362-63): “...the human ecosystem as an organizing concept is an invitation to cooperation with biophysical scientists, for many of the model's critical variables function in

ways being discovered and described by landscape ecologists, botanists, hydrologists, and others.”

In the conclusion the authors recognized that this was a first attempt at the model, which they acknowledge welcomes testing and revision. As such, it provides a valuable tool to further expand the concepts of the interconnected nature of human and natural systems. This is where the work of other researchers such as Liu et al. (2007a, b) has been instrumental in refining this model to elucidate the complexity of the coupled human and natural systems.

Liu et al. (2007a:1513), define CHANS as: “...integrated systems in which people interact with natural components.” They argue that while human-nature interactions have been studied in many ways, the complexity of these systems is not very well understood due to the conventional disciplinary partition of ecology and the social sciences. The different disciplines, which the 16 authors of this paper represent, emphasize their commitment to finding solutions to our present world problems by bridging the gap between disciplines. Liu and others (2007a) also make the point that previous studies of coupled systems have primarily been theoretical and consequently, there is a paucity of empirically based analysis. To fill this gap the authors use six case studies from around the world in which they have been involved, to illustrate the complex nature of CHANS. They do this by pointing out the interaction of human and nature components, the links between them, and explaining the nature of those links. These links are grouped under six different categories: 1) reciprocal effects and feedback loops, 2) nonlinearity and thresholds, 3) surprises, 4) legacy effects and time lags, 5) resilience, and 6) heterogeneity. The case studies are analyzed under each of these categories to point out the attributes of each of these links.

For example, reciprocal effects and complex feedback loops are elucidated in the case study in the Wolong Nature Reserve in China by using remote sensing over a 32 year time period; from 10 years before the establishment of the reserve to 20 years after (Liu et al. 2001). Their analysis showed that the quantity of high quality giant panda (*Ailuropoda melanoleuca*) habitat had decreased significantly since the establishment of the nature reserve, the reverse of what one would typically expect from the establishment of a protected area. Under the remaining

five categories, they then showed the complex links between different components and actors, inside and outside, the nature reserve that led to both the loss and fragmentation of giant panda habitat.

Another important overarching concept is that CHANS have important temporal-spatial elements. CHANS are not fixed, and over a period of time they change and consequently should be viewed as dynamic systems. The temporal changes are not limited to one scale, but can involve crossing several magnitudes of scale. And, within CHANS spatial characteristics are not uniform, often exhibiting a great deal of heterogeneity.

In a second publication later the same year, Liu and colleagues (2007c) used their previous study in combination with extensive examples from the literature to further refine and elaborate the CHANS model. The authors used their previous links, as well as additional ones, to group the links under three main categories according to their function and/or domain. Organizational couplings included: 1) reciprocal effects and feedback loops, 2) indirect effects, 3) emergent properties, 4) vulnerability, and 5) thresholds and resilience. Temporal couplings included: 1) massive increases in human impacts on natural systems, 2) rising natural impacts on humans, 3) legacy effects, 4) time lags, 5) increased scale and pace, and 6) escalating indirect effects. Spatial couplings included: 1) couplings across spatial scales, 2) couplings beyond boundaries, and 3) heterogeneity.

While it is beyond the scope of this literature review to discuss all of these couplings several that have particular relevance to this thesis are reviewed in the following section. Therefore, in this section where applicable I will use examples from my research and the literature review on road impacts to illustrate key points.

## **2.2.1 Organizational couplings**

### **2.2.1.1 Reciprocal effects and feedbacks loops, and indirect effects**

These couplings are arguably some of the keystone couplings inherent in all CHANS because they describe the very basis from which these couplings emerge, the fact that human and natural elements are embedded in each other. Consequently, whatever effect is felt in one will

have a reciprocal effect on the other, and multiple feedback loops can lead to numerous effects from this reciprocity, including indirect effects. For example, socioeconomic development drivers lead to roads being built. Removing soil and vegetation to build a road in a mountainous area can lead to mass wasting, habitat fragmentation, alteration of surface run off, water pollution, etc. This in turn affects humans in many negative ways. At the same time the road increases connectivity, this can be beneficial to humans by providing better access to health care, markets, and educational facilities, and detrimental by increasing the occurrences of theft and the spread of sexually transmitted diseases. All these examples include elements of reciprocal effects and feedbacks and indirect effects.

As the example above shows, indirect effects often occur in CHANS due to their complex couplings. A road that started out as a means for poverty alleviation in a rural mountainous area can have effects that were not anticipated. Another example is the increase in land values along the road. This can often lead to unscrupulous land speculation marginalizing the poverty-stricken people the road was designed to aid.

In the town of Jharkot in Mustang District, I interviewed a woman who told me that one of the families on the outskirts of town was robbed after the road arrived. She went on to say that before the road, everyone in the village left their houses unlocked, but after the robbery everyone is suspicious of outsiders and now locks their doors (A. Gurung, personal communication, May 1, 2009). The increase in crime is an indirect effect of the road, because it now allows outsiders a much easier way to get into the valley. Most thieves would not be interested in looting a house that required a five-day hike over mountain terrain to reach.

### **2.2.1.2 Emergent properties**

Due to the intimate interconnectedness of variables in CHANS inimitable properties emerge. These emergent properties are not inherent in human and natural systems separately, but emerge specifically from the interaction of the coupled systems.

Many changes that happen with road building are emergent properties because a road is a direct human and natural systems interaction. The leapfrog and ribbon development examined in

**Case Study 2** in this thesis (**Chapter 4**) is an emergent property of building a road that would not occur in the human and natural systems separately. In addition, the direct link between road construction and landslides along road cuts also discussed in **Case Study 2** is another good example of an emergent property. Even though landslides occur in Nepal in places without roads, the frequency of landslides along road cuts is evidence that landslides are an emergent property of removing the root system of the soil in combination with monsoon rains. In addition, other common poor road construction techniques in Nepal contribute to landslides such as:

- indiscriminately dumping the fill material down the low side of the cut, which removes even more of the slopes root system and
- no fill or poor fill techniques on the up slope side, as well as improper cut angles, which further exacerbates slope instability.

### **2.2.1.3 Vulnerability**

Vulnerability refers to the degree of functionality of CHANS in response to changes in both internal and external variables. These changes may occur over multiple scales including global trends, regional impacts, and local changes. The oil spill in the Gulf of Mexico in 2010 is a good example of a local change that quickly became a regional change and will probably have global consequences. The degree to which each of these levels of CHANS experience harm from this perturbation is their degree of vulnerability. In this case the human factor was the cause of the change (the oil spill) and as a result of its interaction with the natural system (the movement of tides and currents) the change has had a much greater effect. Due to the interconnectedness of CHANS vulnerability can be seen to encompass the entire CHANS on all three scales. However, this can also be seen as its strength in that this interconnectedness on multiple scales may give the systems more capacity to absorb the perturbation and keep functioning on some or all of the levels.

The pressure put on natural resources in Annapurna Conservation Area Project (ACAP) during the Maoist War, as discussed in **Case Study 1 (Chapter 4)**, provides an example of vulnerability. As the Maoists systematically forced conservation institutions and officers out of

ACAP in their attempt to gain control of the area, incidents of illegal tree cutting, endangered wildlife poaching, and harvesting of endangered high value medicinal plants rose significantly (Baral and Heinin 2006). This put stress on the ecosystem that had deleterious effects on the biodiversity in ACAP during the 10-year insurgency. With the signing of the Peace Accord in 2006 Maoist troops left ACAP and previous conservation policies were reinstated, which averted reaching the threshold of biodiversity loss. This case involves both vulnerability and threshold and resilience couplings evidenced by the resilience of ACAP to adjust to its prewar capacity.

#### **2.2.1.4 Thresholds and resilience**

Liu et al. (2007c:641) describe thresholds as: "...transition points between alternate states or regimes." Detrimental changes in ecosystems may not be discernible over short time periods. As a result, degradation may continue to progress eventually leading to a threshold. If the system is pushed past this threshold, a rapid decline in the function of the system will take place. Resilience is the degree to which human and natural systems can absorb shocks and return to a functional level.

**Case Study 1 (Chapter 4)** provides a good illustration of thresholds and resilience. Another similar example occurred in Nepal after the surge of tourism in the 1980-90s. Up until the mid-1980s, mountain tourism development was unplanned and completely demand-side oriented. Consequently, considerable environmental degradation resulted from cutting trees to build new lodges and supply firewood for cooking and heating. Insufficient toilet facilities and lack of knowledge of minimum impact trekking practices by most trekkers added to the problem (Gurung, C and DeCoursey 1994). The proliferation of trekkers' toilet paper along some of these trails (Gurung, C 1993) led to the common euphemism of 'trekking the toilet paper trail'. ACAP was begun in part as a response to the environmental degradation that resulted from this unplanned mountain tourism. Both ACAP and new policies in Sagarmartha National Park were instrumental in preventing going beyond the tipping point, even though the threshold of deforestation and environmental degradation was eminent by the early 1990s. Fortunately, with

new conservation regulations these two protected areas showed remarkable resilience with natural regeneration of forests and new growth from tree planting projects (Byers 2005, Gurung, C and DeCoursey, 1994, Gurung, C 1993) (see **Appendix B: A Brief History of Community Forestry in Nepal**) .

## **2.2.2 Spatial Couplings**

### **2.2.2.1 Couplings across spatial scales and beyond boundaries**

Spatial and temporal couplings are crucial to understanding CHANS. It has already been noted that coupled systems link across scales of spatial boundaries, from local to global levels. Liu et al. (2007c) point out that global influences work their way through a series of cascading intermediate links to influence local systems. Furthermore, local influences can build their way to intermediate systems, which in turn become global systems. This can happen over disparate and often great distances with the cumulative effect being greater than the sum of the parts. As a result these couplings can cross political as well as ecological boundaries and have impacts in places far removed from their original source (e.g., global climate change, dust storms in China depositing dust in Korea, the global economic crisis).

**Case Studies 3 and 4 (Chapter 4)** highlight couplings across spatial scales and beyond boundaries by analyzing the impact of the Marsyangdi Road on villages that are: 1) on the road alignment, 2) less than 10 km from the proposed road, and 3) greater than 10 km from the road alignment. All of these cases illustrate how the Marsyangdi road is having an effect on land use change and land value across varying spatial scales. Furthermore, in the adjacent Nar Phu Valley, which is currently more than 34 km from the end of road construction at Sangye and its furthest village (Phu) is 71 km from Sangye, the road is having an impact that is influencing land use changes, land values, gender equality, and gender roles, and aiding a Buddhist revival.

## **2.2.3 Temporal couplings**

The first two couplings in this category are concerned with the increase in population over time. This has resulted in major impacts on the natural environment from various

anthropogenic activities. It has also contributed to the vulnerability of human systems, as human impact increasingly degrades the value of environmental services that are essential to life.

### **2.2.3.1 Legacy effects**

Legacy effects can be thought of as the 'DNA' of CHANS. The inherited interactions of previous CHANS have an effect on present and future CHANS. Their impact is hard to predict as they can vary in both how long they last and their magnitude.

In **Case Study 5 (Chapter 4)**, I trace the legacy effects of the coupled systems of trade and pilgrimage in the Kali Ghandaki Valley, which subsequently influenced the transition in local livelihoods to mountain tourism after the end of the Trans Himalayan Salt Trade. Now that the Kali Ghandaki Road has reached Muktinath, the continuing influence of this legacy affect is evident in several of the adaptive strategies that locals have made to deal with the rapid increase in the number of religious pilgrims arriving in Muktinath.

### **2.2.3.2 Time lags**

Time lags refer to the interval between an interaction in CHANS and the resulting impact. Some may be immediate while others evolve over time making their impact much harder to ascertain and anticipate. Both of these characteristics greatly increase the complexity of CHANS making them less transparent and consequently more difficult to manage.

Time lags are illustrated in **Case Study 10 (Chapter 4)** where the new Annapurna Circuit Trail (ACT) alternate trail system developed by ACAP has the potential to increase the number of trekkers visiting ACAP despite the negative impacts of the Kali Ghandaki Road. During my research period, there were no guesthouses along the new trails. A recent story in the online journal *Republica* (May 5, 2011 [http://archives.myrepublica.com/portal/index.php?action=news\\_details&news\\_id=30948](http://archives.myrepublica.com/portal/index.php?action=news_details&news_id=30948)) confirms that trekkers are increasing and new community-managed guesthouses are under construction. This is only a short-term effect of time lag couplings, which will continue to evolve in the future.

### **2.2.3.3 Increased scale and pace**

Increasing population in combination with more efficient means of travel over long distances and global communication networks has increased the scale and pace at which human-nature interactions take place. Consequently, there has been a movement from a somewhat limited local scale of interactions to progressively larger scales. Global and intermediate scale interactions are now happening at a rapidly increasing rate and magnitude. Liu and colleagues (2007a) use the example of severe acute respiratory syndrome (SARS) and the quickness with which it spread worldwide due to modern fast transportation systems. In the past, there were other epidemics, but they took much longer to spread on a wide scale because transportation of people to other areas took much longer.

In Nepal, roads play a major role in the globalization process and the increased scale and pace couplings. As roads make their way into rural mountain areas tourists are quick to follow and villagers welcome them because providing tourist services is easier and more lucrative than farming. **Case Study 10 (Chapter 4)** looks at how the new Kali Ghandaki Road has opened up access to an area that had previously only had trails. This will rapidly increase the scale and pace of changes in the valley, especially after the last section of road that connects to the Chinese border is built. This will complete the Kali Ghandaki Road that connects India to China through Nepal (NTSC 2008). The effects will also be felt in neighboring Dolpa District, which has virtually no roads, but does have several trails that enter the Kali Ghandaki Valley that are part of the Great Himalayan Trail (GHT) trekking route. The Kali Ghandaki Road opens up speed and access to the GHT, which will lead to more trekkers entering Dolpa, bringing with them globalization.

### **2.2.3.4 Rising natural impacts on humans**

Due to increasing population in areas around frequent natural disasters, such as along rivers where floods occur or in coastal areas where hurricanes hit, more people are being affected by these disasters. This results in an increase in human vulnerability and diminished livelihood

options. Ironically, some of the changes in weather patterns that are producing an increase in natural disasters are the result of human interactions with nature.

In Nepal, landslides and floods are the most common natural disasters (Upreti 2006, Khanal 1996), and there is a strong correlation between road cuts and mass-wasting (Hasegawa et al. 2009, Dahal et al. 2008, Petley et al. 2007, Dahal et al. 2006, Mertz et al. 2006, Mertz 2004, Hearn 2002, Upreti and Dital 1996, Deoja 1994, Carson 1985). The combination of improper road cuts and intense monsoon rains results in very unstable slopes, which frequently slip. Evidence of landslides along the road sections I hiked was common, and frequently rural mountain roads are closed during the monsoon season due to either destruction or blockage from mass-wasting. As I point out in **Case Study 2 (Chapter 4)**, landslides not only block roads but they also destroy valuable farmland and houses. In this way, mass-wasting reduces livelihood options for people living in road cut areas in the mountains.

#### **2.2.4 Summary**

The work of Liu et al. (2007a, b, c) is quite significant for several reasons. First, it shows the complexity of human and nature interactions by examining empirically based case studies by an interdisciplinary team from both ecological and social sciences. The expansion and refinement of the Machlis et al. (1997) human ecological model was due, in a large part, to the commitment of the authors to work together on a common question using their collective experience and knowledge in a wide range of ecological and social science fields. This included many highly respected researchers, such as the Nobel Laureate in Economics Elinor Ostrum. The authors were able to use a multiplicity of tools and techniques to analyze variables in both ecological and human systems, which consequently led to the discovery of crucial linkages both within and between CHANS.

Second, their work compared numerous case studies from around the world that shared common characteristics that were crucial for understanding CHANS complexity. This required studies that were both situation specific, and covered long enough periods to examine both spatial and temporal characteristics.

Third, it highlighted the need to challenge current ecological and social science theory to become more adept at understanding and incorporating CHANS in their approaches and overcome traditional disciplinary boundaries.

Finally, it laid the groundwork for, and spoke to the need for, further interdisciplinary collaborative studies of this nature in the future, and the potential for equally profound discoveries. Some of these more recent studies are discussed below.

Using a CHANS framework for design, implementation, and analysis, an interdisciplinary group of researchers (Baker and Moseley 2007, Buntaine et al. 2007, Sherman et al. 2007, cited in Lassoie and Sherman 2010) conducted a study to determine the best way to implement conservation measures in Northwest (NW) Yunnan, China. This area of Yunnan is a biocultural diversity hotspot and there is concern that with the rapid growth of the Chinese economy and the ensuing development, NW Yunnan will lose this valuable biocultural diversity if conservation measures are not put in place (TNC 2010, Jianchu and Melik 2007). The study recognized the need for a multidisciplinary approach that could analyze the dynamics of the alpine ecosystem coupled with the agro-pastoralist Tibetans who inhabit the area. This required a team that included professionals with diverse backgrounds including social science, plant ecology, climate change, and conservation management. To ensure that there would be bridges connecting all these disciplines the researchers worked together from the beginning to come to consensus on goals, and the questions that needed to be asked, as well as the methodology for collecting data. This interchange helped them design common questions from each of their fields that would help verify, integrate, and enhance each other's findings. Consequently, the results of this study gave them a much greater understanding of the unified nature of this coupled system. This helped them distinguish crucial interrelated factors that were important for designing conservation measures that would mutually benefit both the human and ecological systems.

A case in point was the mutual discovery from the sociological, ecological, and climate change teams that shrubs were invading alpine grazing areas. Two of the team's surveys indicated that this was a result of the fire ban policy instituted by the Chinese Government.

However, the climate change team attributed the shrub invasion to the warming trend they had found from their research. Through triangulation of these results, the researchers suggested that it was a combination of both climate change and land use change that had contributed to shrub encroachment. In combination, these results show a complex web of interconnections between government policy, climate change, local livelihoods, and land cover change. The oral interviews with the Tibetan herders indicated that the traditional grazing system was sustainable and did not lead to overgrazing. However, the combination of government policy and climate change had led to a reduction in the amount of good grazing areas, which in turn could lead to overgrazing. This helps conservation managers consider different options, such as the need for a more flexible policy, which would allow for burning in the high pastures while banning burning in the lower forests.

Kassam (2010a) focused on two case studies, one in the arctic, and one in the Pamir Mountains of Central Asia, to illustrate how the relationships and interaction between sociocultural and environmental systems lead to adaptation and resilience. In the arctic case, Iñupiat knowledge of sea pack ice has been developing for generations and is passed on to the younger generation because it is essential for successful hunting of marine birds and mammals. This knowledge includes not only hunting activities, but also seasonal changes in the ice patterns that affect the safety of the hunters while on the ice. Traditional knowledge is context specific in the interrelated temporal and spatial livelihood spheres, which are embedded in the coupled ecological and sociocultural systems. Climate change is affecting the amount and seasonal distribution of sea ice. This in turn has introduced an element of stress in the Iñupiat's lives as it affects both the quantity and quality of the wildlife hunted and increases the danger of being on the pack ice. Due to the intimate link between their cultural tradition of sharing food and the importance of hunted animals in their rituals, a decrease in the amount of animals they are able to hunt may affect their community cultural foundations. These connections are so intimately interwoven that it essentially threatens their very identity. Therefore, a coupled environmental

and sociocultural systems approach is vital in beginning to analyze how climate change will continue to impact their community.

In the Pamir Mountains of Central Asia two different ethnic groups, the Kyrgyz and Wakhi, have adapted to each other's cultural traditions in a way that is mutually beneficial to both, even though they are from different sects of Islam and do not share the same language. Kassam (2010a) showed how their diversity in livelihood strategies actually provides the basis for their interaction and joint profit. The Wakhi are sedentary farmers whereas the Kyrgyz are nomadic pastoralists and consequently there is a certain seasonal overlap in their respective environmental niches as well as their sacred sites. Rather than see this as a point of contention, the two groups have adapted to each other in a way that ensures their survival without forfeiting either their livelihood options or their cultural traditions. In fact, both respect this diversity, and consequently they have developed a mutual bond that transcends sectarianism, which allows for common use of sacred sites, and hospitality in each other's homes. Considering the extremely difficult conditions under which they have had to survive, during extended periods of war by different factions, in addition to the challenge of surviving in a harsh mountain environment, it is obvious that the linking of the diversity in both their sociocultural and environmental strategies has given them the resilience to survive.

## CHAPTER 3. METHODS

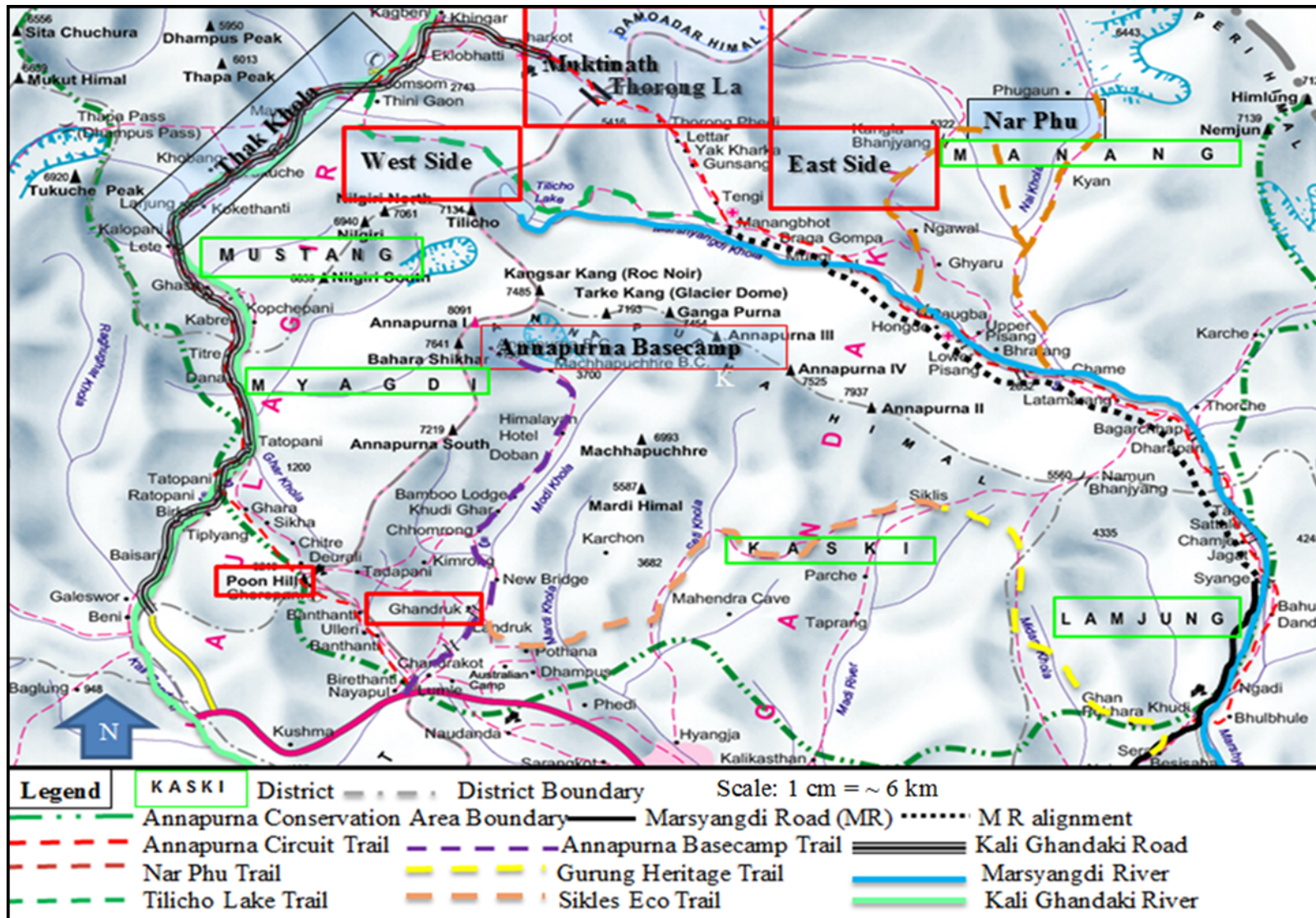
### 3.1 Introduction

I chose to do my research in Nepal because of my familiarity with the country after 20 years of seasonal work as an adventure travel guide in the Nepalese Himalayas, and because Nepal is one of the poorest countries in the world (see **Appendix C**: Nepal Country Profile). The World Bank per capita GDP estimate for Nepal in 2009 is US \$470, making it the poorest country in South Asia (World Bank 2010). According to the CIA World Factbook (2011: <https://www.cia.gov/library/publications/the-world-factbook/geos/np.html>): “Nepal is among the poorest and least developed countries in the world, with almost one-quarter of its population living below the poverty line.” Nepal still has areas in the mountains that are road less, where people manage to survive on less than the equivalent of US \$1.00 per day (ADB 2008: <http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=580>). Ever since my first visit to Nepal in 1984, I have wanted to explore how the Nepalese people are able to survive the very challenging Himalayan living conditions day-by-day on less than the price of one cup of coffee in the United States.

My original research idea was to address the sustainability of mountain tourism in Nepal. However, after I began my research in the Annapurna Conservation Area on the west side of the Annapurna Circuit Trail (ACT) (**Figure 3.1**) in April 2009, I noticed that all the lodge owners had very strong views about how the recently completed (October 2008) Kali Ghandaki Road (**Figure 3.2**) was negatively affecting their businesses. Consequently, I decided to redirect the focus of my research to consider the impact of the road on villages in this area. During the course of my study, villagers told me about the new Marsyangdi Road construction on the east side of the ACT in Lamjung and Manang Districts (**Figure 3.2**).



**Figure 3.1** Map of Nepal with development zones, district borders, the Annapurna Conservation Area, and the Annapurna Circuit Trail (ACT). (Adapted from Seddon and Hussin 2010)



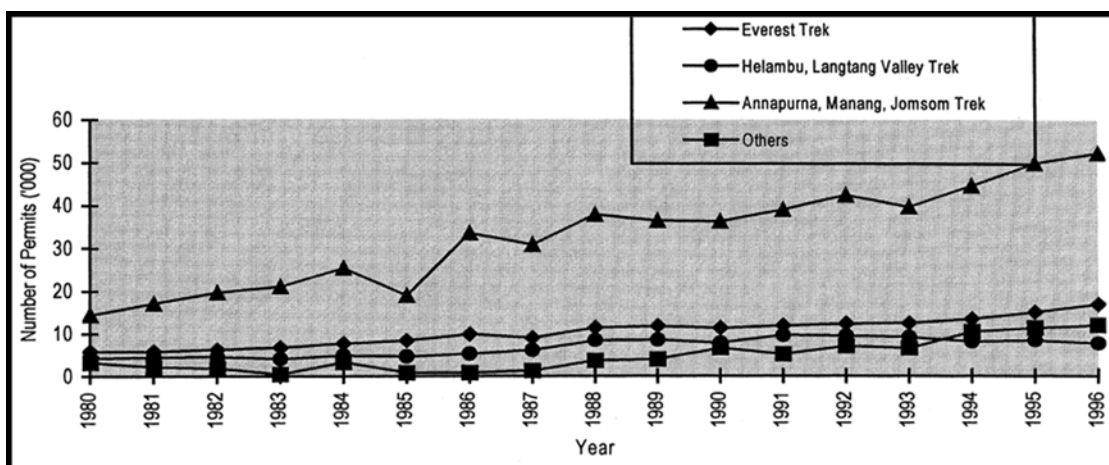
**Figure 3.2** Map of the Annapurna Conservation Area with trails and roads (Adapted from [www.flickr.com/photos/pabfou/305009799/](http://www.flickr.com/photos/pabfou/305009799/))

This provided an interesting opportunity to compare and contrast what was happening on the west side where the road was complete, with what was beginning to happen on the east side. On the east side, I was very interested in the villagers' perceptions of what changes might occur once the road was complete.

Therefore, I decided to return to the area in the fall of 2009 (October-November) to interview villagers on the east side of the ACT, as well to re-interview villagers on the west side to assess what changes had happened in the six months between research periods. Road construction is very slowly in Nepal; therefore, I was not expecting to see very much change on the west side. As it turns out, my decision to revisit the west side proved essential to my final analysis and enabled me to tell a complete story about the complex interconnections and interactions in the coupled human and natural system of rural road construction in the Nepalese Himalaya. For references purposes, I use the Thorang La Pass (**Figure 3.2**) as the dividing line between the east and west sides of the ACT.

### **3.2 Rationale for study site selection**

I chose the Annapurna Conservation Area Project (ACAP) as a research site primarily because of ease of permits to conduct research in Nepal and safety concerns. I considered several other sites for my research, such as the Kanchenjunga Conservation Area, but due to political turmoil within the country, ACAP was determined to be the best choice. Within ACAP, I chose the Annapurna Circuit Trail (ACT) because it, and its adjacent trails, are the most popular trekking trails in Nepal (**Figure 3.3**) (Bajracharya and Dahal 2008, NTNC 2008a, b, Kam 2007, Mehta and Heinen 2001). In addition, the trails are pilgrimage routes for Buddhist, Bön, and Hindu practitioners (Messerschmidt 2011), and the new roads replacing portions of the ACT are having an impact on the local communities and pilgrims (NTNC 2008a,b). This provided a timely opportunity for original research, which would lend itself to further comparative research in the future.



**Figure 3.3** Trekking permits issued in Nepal 1980 – 1996 (HMG 1996 in Nepal, S.K. 2000)

### 3.3 The Research Site: The Annapurna Conservation Area Project

#### 3.3.1 Background

The Annapurna Conservation Area (ACA) refers to the physical area encompassing Nepal's largest conservation area (see **Figure 3.1**). The Annapurna Conservation Area Project (ACAP) refers to the management plan and initiatives that are carried out in the Annapurna Conservation Area (see **Appendix D: Annapurna Conservation Area/Project**) When speaking with ACAP officials and others in the area it is common to refer to both as ACAP. Consequently, I will often use ACAP to refer to both from this point forward.

The ACAP was established in 1986 as Nepal's first conservation area. It began as a pilot Integrated Conservation and Development Project (ICDP) in the village of Ghandruk (see **Figure 3.1**) managed by an autonomous, not-for-profit nongovernmental organization (NGO), the King Mahendra Trust for Nature Conservation (KMTNC), which is now referred to as the National Trust for Nature Conservation (NTNC). As an ICDP, it was implemented to both protect the natural environment from degradation and improve the socioeconomic well-being of the local inhabitants, with the underlying philosophy that the most effective management of a protected area must involve the local people (KMTNC 1997).

The original size of the pilot project area in Ghandruk was 200 km<sup>2</sup> covering only one Village Development Committee (VDC). By 1990, ACAP's programs had expanded to encompass an area of 1500 km<sup>2</sup> covering 16 VDCs. In 1992, ACAP again expanded taking the area of Upper Mustang (see **Figure 3.1**) under its jurisdiction. Currently, ACAP is the largest protected area in Nepal with an area of 7629 km<sup>2</sup> in five districts of the Western Development Region of Nepal (Kaski, Lamjung, Manang, Mustang, and Myagdi Districts; see **Figure 3.1**), covering 57 VDCs (Bajracharya and Lama 2008). The ACAP maintains a field base of operations called Unit Conservation Offices (UCO) within each of the five districts (in addition to two additional UCOs) (**Table 3.1**), which facilitates management and development in each of the districts in coordination with the main offices in Pokhara and Kathmandu. The ACAP employs more than 200 project staff spread over its entire operation (KMTNC, 1997).

**Table 3.1** Unit Conservation Offices (UCO) within Annapurna Conservation Area Project ([http://www.nepalwildlife.net/?page\\_id=31](http://www.nepalwildlife.net/?page_id=31))

UCOs	Area (km <sup>2</sup> )	Population	Village Development Committees	Ethnic group	Focused program
Lomanthang	2567.55	5,700	7 (all from Mustang)	Loba	Biodiversity and cultural heritage conservation
Jomsom	994.50	8,600	9 (all from Mustang)	Thakali	Tourism management
Manang	1914.72	5,400	12 (all from Manang)	Manange Gurung	Tourism Management
Ghandruk	807.75	21,000	5 (3 from Kaski and 2 from Myagdi)	Gurung, Magar, Kshetri and Bahun	Tourism Management
Lwang	503.39	20,000	7 (all from Kaski)	Gurung, Bahun and kshetri	Agroforestry
Sikless	458.68	22,000	7 (all from Kaski)	Gurung, Bahun and kshetri	Integrated agriculture
Bhujung	382.42	20,000	8 (all from Lamjung)	Gurung, Bahun and kshetri	Poverty alleviation

### **3.3.1.1 ACAP goals**

The KMTNC (1997:7) states three main long-term goals in its 1997 ACAP Management Plan:

- to conserve the natural resources of the Annapurna Conservation Area for the benefit of the present and future generations,
- to bring sustainable social and economic development to the local people, and
- to develop tourism in such a way that it will have a minimum negative environmental impact.

These goals are actively pursued with participation of local inhabitants through the following management plan. The basic underlying philosophy of ACAP is that management of a protected area is most successful when the participation of the local residents is a priority. Consequently, locals are directly involved in the planning, decision-making, implementation, and management of ACAP programs. This participation is solicited through local institutions called Conservation Area Management Committees (CAMC) set up by ACAP in each of the 57 VDCs. The CAMCs are made of up of 15 members nominated by villagers, including three from special interest groups including social workers, occupational castes, and women. The CAMCs' main objectives are to manage natural resources in a sustainable way, foster community development projects, and protect cultural traditions and the integrity of the natural environment.

Various special interest committees are organized in villages to address particular issues of importance concerning conservation and development, which are then relayed to the CAMCs. These special interest committees consider areas of concern such as lodge management, health post management, women's groups, electrification, and temple management. The CAMCs interface with the ACAP representatives in the area, to collaborate on conservation and development plans that both parties agree are important, according to the overall philosophy and goals of ACAP. Ultimately, the decisions made by the local communities through this process are the final line of authority in implementation of conservation measures because ACAP staff members do not have the mandate to issue rules and regulations (Stevens 1997).

The sustainability of programs is considered crucial to long-term success consequently, local participation with labor and cash, when possible, are integral parts of each program to insure long-term local investment, maintenance, and management. In 1989, ACAP began to collect an entry fee for all international tourists visiting ACAP to help finance these local development programs and sustain ACAP (KMTNC 1997).

Mountain tourism is an integral part of ACAP and has become a vital alternative livelihood strategy for a certain segment of the population in ACAP who live in communities along the popular trekking trails. ACAP has been instrumental in providing training for community members, who have the financial means to become involved in the tourism sector, by providing lodge management and cooking workshops, in addition to promoting fuel-efficient stoves and alternative energy sources such as micro-hydro. Traditionally, most communities in ACAP have relied on wood to cook, and the influx of trekkers since the late 1970s has had a deleterious impact on forest resources. Kerosene fuel depots have been installed at various locations to supply locals and camping groups with an alternative to using wood. In areas where micro-hydro has been developed, many lodge owners now also use electric rice cookers, and in some places, biogas has been implemented to help save wood.

### **3.3.1.2 The role of mountain tourism**

The beginning of mountain tourism in the ACAP area, and for that matter all of Nepal, began with the first mountaineering attempts in the Annapurnas. In 1950, Maurice Herzog led a French climbing expedition to the summit of Annapurna I (8,091 m) (Nepal 2003). It was the first successful summit of an 8,000 m peak by Europeans and a cornerstone accomplishment in the history of modern mountaineering. Three years later, in 1953, Tenzing Norgay and Sir Edmund Hillary made history by summiting Mount Everest, the highest mountain in the world. Up to this point, many westerners had virtually no idea that Nepal was a country in South Asia and that it had eight of the ten highest mountains in the world (Nepal 2003). Mountaineering expeditions' photographs exposed the beauty of Nepal's Himalayas and eventually led to the beginning of the flow of mountain tourists to Nepal in the 1970s.

In what is now ACAP, the first trekking lodge, or teahouse as they are often called, was opened in Ghandruk in 1976. A year later, lower Mustang and Manang Districts were opened up for tourism (Nepal 2003). This made it possible for trekkers to circumambulate the entire Annapurna massif. The trekking trail connected the Marsyangdi River Valley, which runs through Lamjung and Manang Districts in the eastern half of ACAP, with the Kali Ghandaki River Valley running through Mustang and Myagdi Districts on the west side of ACAP, via the 5,416 m Thorang La Pass (see **Figure 3.1**). In the early years of trekking, there were very few lodging facilities in any of the trekking areas in Nepal. Trekkers either paid a commercial trekking group agency to arrange all the necessary equipment and staff to camp along the way, or the more adventurous carried their own backpack and stayed in local houses along the route. As the numbers of trekkers continued to increase each year, some villagers began opening their houses as trekking lodges. At first, this was done simply, either by partitioning portions of the house with bamboo walls for sleeping rooms or by allowing trekkers to sleep on the floor in the kitchen. Gradually these makeshift lodges were expanded by renovating the family home, or those that could afford it built a new facility.

I remember visiting the Annapurna Basecamp (ABC) in 1985 when there was only one makeshift bamboo lodge with basic accommodations. I returned to ABC during my 2009 research period. Currently there are three concrete lodges with private rooms and attached bathrooms that can each house more than 60 people and several smaller lodges. Until the mid-1980s, mountain tourism development was unplanned and completely demand-side oriented. Consequently, considerable environmental degradation became evident due to a combination of:

- deforestation, due to building new lodges and collection of firewood for cooking and heating for trekkers,
- lack of appropriate and convenient toilet facilities, and
- most trekkers' ignorance of minimum impact trekking practices (Gurung, C and DeCoursey 1994).

The proliferation of toilet paper that westerners carelessly dropped along some of these trails (Gurung, C 1993) led to the common euphemism in those years of ‘trekking the toilet paper trail’ (personal observation, 1986-1992).

ACAP was begun in part as a response to the environmental degradation that resulted from this unplanned mountain tourism, which had become a major problem by the mid-1980s. In addition, it was designed to include the local inhabitants in the management of the area so that they could benefit from tourism, and help protect the environment from tourism’s negative impacts.

The ACAP Management Plan (1997:6) states it this way:

The ACA was established to mitigate the problems of degradation of the fragile environment of the Annapurna region, and to improve the quality of life in this region. The King Mahendra Trust for Nature Conservation (KMNTC) implemented the Annapurna Conservation Area Project (ACAP) to experiment on a model of an integrated approach on conservation and development with an underlying philosophy that effective conservation of natural resources, and improvement in the quality of life safeguarding the fragile mountain environment, cannot be achieved without the active participation of the local community in all stages of development, from planning through implementation and evaluation.

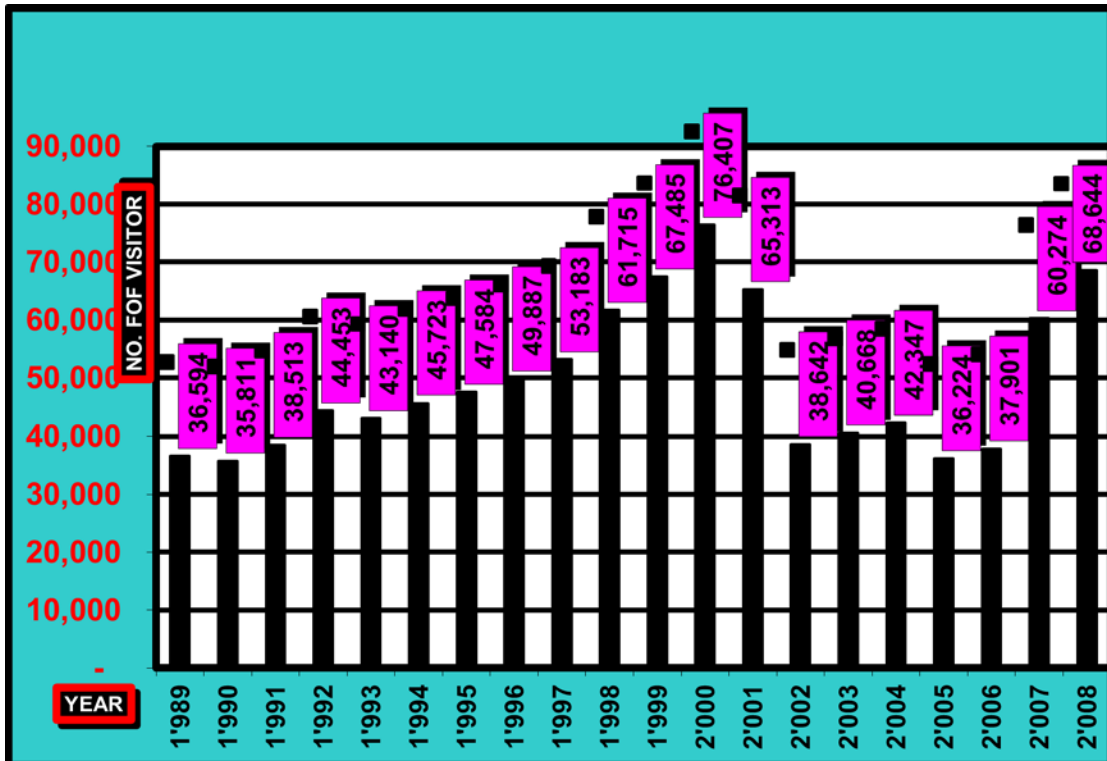
It is widely accepted that one of the main avenues for improvement of the quality of life in ACAP communities is through income generated by involvement in the mountain tourism sector directly, and through community development projects financed in part by ACAP entry fees (Nepal 2003, KMTNC 1997, Stevens 1997).

The strategy of ACAP in terms of opening new areas to tourism is: “...first control, then partially open to commercial camping groups, then open to individual trekkers” (Tarka Gurung, ACAP officer, personal communication, November 1, 2009). Access is usually first given to commercial trekking groups that are contracted through a licensed agency, in either Kathmandu or Pokhara, to supply all the necessary gear, food, guides, and staff for camping along the route. After a period, this system is evaluated. If group trekking has been successful and if facilities have been built for individual trekkers to travel the trail and stay in lodges, then the area is

opened up to everyone. (Tarka Gurung, ACAP officer, personal communication, November 1, 2009).

Two relatively new trekking areas in ACAP that were opened to only trekking groups are Upper Mustang, opened in 1992, and the Nar Phu area in 2000 (see **Figure 3.1**). Both areas required tourists to join a licensed trekking agency group expedition in order to get a permit to enter the area, and pay a special permit fee. In the case of Upper Mustang, this entry fee is a point of contention with the local inhabitants because the central government retains the fee. This is in stark contrast to other ACAP trekking fees, which are used for local community development projects. The ACAP official I interviewed informed me that while there was no set timeline for when the Nar Phu area would be opened to individual trekkers, it would happen at some point in the future (Tarka Gurung, ACAP officer, personal communication, November 1, 2009). From my personal observations after hiking this section of the trail (November 2009), it currently is feasible for fit, experienced trekkers to hike the route if they carry sleeping bags and pads. There are two overnight stops where lack of facilities requires sleeping on the floor of a stone shelter run by locals, who can prepare food but have no beds. Apart from these two stops, lodges or homestays are available the rest of the way. Distances between facilities tend to be longer than on the ACT, so trekkers should be fit and able to walk 6-8 hours per day in addition to being well acclimatized to the altitude.

Due to several factors including its extremely diverse biocultural environment and ease of access to the trailhead by road from Kathmandu or Pokhara, ACAP has been the most popular international mountain tourism destination in Nepal since 1977, when Manang and lower Mustang were first opened (see **Figure 3.2**). That year, the Kali Ghandaki River Valley trail system, and further north and east to the sacred site at Muktinath, had more international visitors than the Everest area for the first time (Nepal 2003). The number of mountain tourists visiting ACAP continued to rise steadily until 2000, when it reached a record 76,407 visitors (**Figure 3.4**). This was the largest percentage of total trekkers visiting Nepal in 2000, greater than 62% (Tucker et al. 2005).



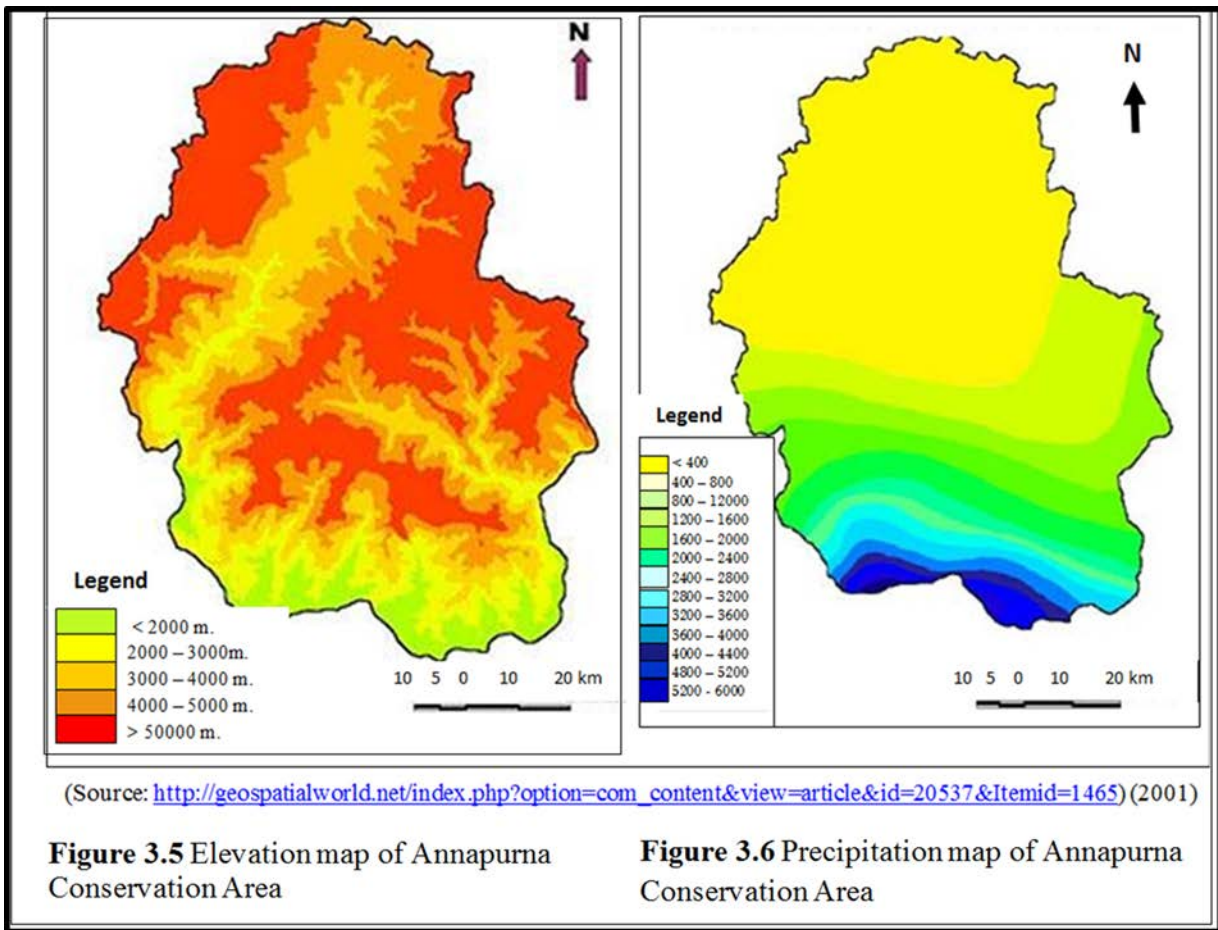
**Figure 3.4** Number of visitors to the Annapurna Conservation Area Project: 1989-2008 (ACAP Headquarters Pokhara, Nepal)

The decrease in visitor numbers after 2000 is the result of a combination of events. First, on June 1, 2001, 12 members of the royal family of Nepal, including King Birendra and Queen Aishwarya, were massacred in the royal palace in Kathmandu (see **Appendix E: A Brief Chronological History of Nepal**). Official reports claim that Crown Prince Dipendra did the shooting and then turned the gun on himself, dying shortly after (BBC 2001). Second, the September 11, 2001 Twin Towers attack had even a bigger influence because many people, especially in the United States, no longer felt safe to travel abroad. Finally, the Maoist 'People's War' (see **Appendix E: A Brief Chronological History of Nepal**), that began in western Nepal in 1996, had slowly moved east, and while the Maoists claimed not to be targeting tourists, incidents of robbery (BBC 2003) and "voluntary donations at gunpoint" (George Duckler, American trekker, personal communication, December 3, 2006) had a negative effect on those not eager to go "terrorist trekking".

Within ACAP, several violent Maoist-related incidents also affected tourist arrivals. In 2003, after peace talks between the Maoist and the Government of Nepal (GoN) broke down, the Maoists arrived at ACAP's flagship community, Ghandruk. They destroyed the ACAP office, and forced closure of all ACAP offices in the southern region (Basnyat 2003). In March 2004, the Maoists returned to Ghandruk for a revenge killing, which resulted in the torture and execution of two Nepali residents. In another incident, Nepal Army helicopters began firing randomly on Ghandruk while looking for Maoists, which in the end they never found. Following this incident, many residents left town and most of the 65 hotels remained empty for some time (Sapkota 2004 <http://www.nepalitimes.com.np/issue/2004/08/13>). In Mustang, several residents told me that the Maoist had closed the road at Ghasa (see **Figure 3.1**), preventing any traffic and tourists from coming up the valley (Rita Gurung, lodge owner, personal communication, November 29, 2009). In 2006, after the Maoist signed a peace agreement and won elections in the government, tourist numbers began to rise again. However, this was short lived due to the resignation of the Maoist prime minister in 2009 and the ensuing turmoil. On May 2, 2010, the Maoist called an indefinite all-Nepal strike (*bhanda* in Nepali) until their demands were met, closing down businesses across the country. As the strike continued, tourists began leaving in large numbers unable to continue their itineraries as planned (Bandari 2010).

### **3.3.1.3 Biophysical characteristics**

ACAP is located in the west-central area of Nepal, north of the city of Pokhara, the second largest city in Nepal. Its northern border is the Himalayas, which traverse the border with China (see **Figure 3.1**). Its southern border falls within the area called the Mid-Hills in a subtropical region along the Indian border. Between these two borders, roughly 120 km apart, the altitude rises from less than 1,000 m to more than 8,000 m (**Figure 3.5**) producing four broadly defined climatic zones. Moving from south to north they include subtropical, temperate, alpine, and mountain desert zones. Precipitation varies dramatically, the south having some of the highest in Nepal with 3000 mm annually, and the north often experiencing the effects of the Himalayan rain shadow with only 250-500 mm annually (**Figure 3.6**) (KMTNC 1997).



In the southern portion, the average rainfall of 3000 mm accumulates mostly during the seasonal monsoon period of June through August. Temperatures average between 7° C in the winter and 33° C in the summer, giving the hills and valleys of this area a humid subtropical climate. Moving north into the inner Himalayan area the precipitation drops dramatically due to the rain shadow effect, with the maximum rainfall coming in August averaging 200 mm. Winter snowfalls add substantially moisture to this deficit, contributing essential spring snow melt runoff to the valleys. Temperatures here in the winter often fall below freezing and in the summer can reach as high as 25° C. The overall rainfall pattern shows a decrease in precipitation moving from the south to the north. A similar decrease in rainfall is noticed moving from the east portion of ACAP to the west, with both of these patterns being much more pronounced north of the Annapurna massif, due to the rain shadow effect. The overall temperature pattern also

decreases moving south to north, due to the elevation gain. In general, there is a 6° C decrease for every 1000 m elevation gain.

The surface runoff is channeled into many rivers and lakes with additional water supplied by high altitude glaciers and groundwater. The river systems in the northern part are divided by the mountains in the middle of ACAP. The main western system consists of the Kali Ghandaki River and its tributaries such as the Jhong and Muktinath Rivers. The Kali Ghandaki's headwaters are near the Tibetan border in Upper Mustang, and its flow varies greatly between wet and dry seasons. The main eastern system is the Marsyangdi River and its tributaries, which eventually turn south to join the great Ghandaki River system. In the southern flanks of the Annapurnas, in the central portion of ACAP, several of the main rivers include the Modi, Madi, and Seti Rivers (Nepal 2003). As all these rivers drop from the mountains towards the flatlands of the Terai they merge as they make their way south to India.

Information on soils of the Annapurna region is scarce and tends to be localized to certain study areas. One study, done by Kemp in 1984, gives a profile from Pokhara up the west side of ACAP to the Throng La Pass, which is useful for understanding the soils in the Kali Ghandaki River Valley. The soils are classified in four different elevation zones. In the 2000-3000 m zone brown and podzolic soils with the brown soils containing more humus above 2500 m are found. The xerophile forest zone (2500-2800 m) contains rendzines and lithic regosols as well as humic cambisols together with thin rankers. From 2600-3200 m in the steppe zone both brown and chestnut colored steppe soils with podzols being predominant, and lithosols above 4000 m. The alpine zone from 3900-5400 m contains rendzines, pseudopodzols, and lithic regosols in the lower elevations with gelic regosols at elevations above 5000 m (Kemp 1984).

With this extreme variation in altitude, precipitation, and water supply and the resulting different climatic zones, nature has produced an amazing diversity of floral and faunal richness. This includes 22 different forest types with 44 different tree types, 1440 plant species including 9 species of rhododendrons, 38 species of orchids, 54 endemic species and 426 species of

medicinal plants, 478 species of birds, 21 species of amphibians, 32 species of reptiles, and over 101 different mammals. Many rare and endangered animal species inhabit the area such as the snow leopard (*Uncia unica*), Tibetan argali (*Ovis ammon hodgsoni*), Himalayan black bear (*Selenarctos thibetanus*), red panda (*Ailurus fulgens*), musk deer (*Moschus moschiferus*), Tibetan fox (*Vulpes ferrilata*), barking deer (*Muntiacus muntjak*), langur primates (*Presbytis entraluss*), Himalayan thar (*Hemitragus jemlahicus*), goral (*Nemorhaedus goral*), serow (*Capricornis sumatraensis*), and blue sheep (*Pseudois nayaur*) (Nepal, 2003, KMTNC 1997).

The scenic beauty of ACAP ranges from lush green rice paddies and jungle forests in the south, to 8000 m glaciated mountains, dry alpine steppes, and high altitude deserts in the north. The Annapurna massif stretches for 50 km from east to west in the middle of ACAP boasting numerous 7000-8000 m peaks, including the tenth highest peak in the world, Annapurna I (8091 m). Continuing from east the Annapurnas, Lamjung Himal spreads out almost touching ACAP's eastern border. The western edge of the Annapurnas ends at the Kali Ghandaki River Valley, which is the western border of ACAP. Dhaulagiri (8167 m), the seventh highest peak in the world, is only 30 km across the valley at this point, but is technically outside the ACAP boundary. These famous peaks and others including Annapurna II (7937 m), Annapurna III (7755 m), Annapurna IV (7525 m), Annapurna South (7219 m), and the sacred peak Machhapuchhre (6993 m) are just a few of the spectacular mountains that are visible from various places in ACAP.

Another one of ACAP's claims to fame is the deepest river valley in the world. The Kali Ghandaki River flows down the western side of ACAP in the north-south oriented Mustang Valley. At one point, between Annapurna I (8,091 m) and Dhaulagiri (8,167 m), the peaks are only 30 km apart, making it the deepest river valley in the world at 1131 m (Nepal 2000, Lucas 1992). The Marsyangdi River flows down the east side of ACAP in the east-west oriented Manang Valley, similarly cutting a deep gorge between Annapurna II (7,937 m) and Manaslu (8,156 m) and reaches one point where the two peaks are barely more than 35 km apart (Hagen, 1998). The 5416 m Thorong La Pass connects the two river valleys (see **Figure 3.1**).

Four distinct ecological zones are present in ACAP. Moving from south to north, they are:

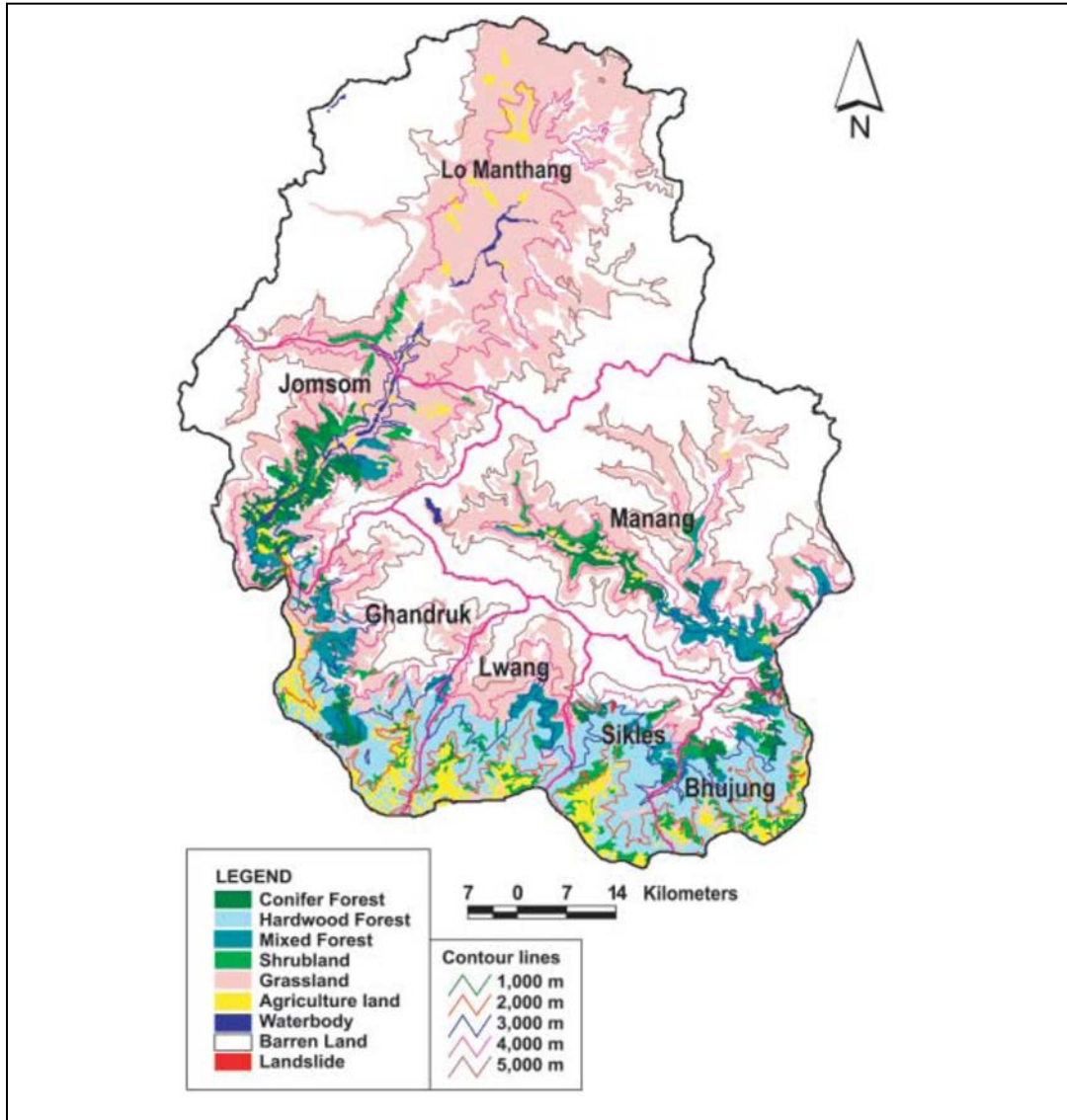
- (1) the lesser mountains (1000-6000 m) which are often referred to as the Middle Hills,
- (2) the greater Himalayan zone (5000 m and greater),
- (3) the dry inner Himalaya, also referred to as the Bhot valleys, which consist of the Domador and Muktinath ranges in the Manang and Mustang valleys (2400-5000 m), and
- (4) the Tibetan marginal range which run east to west to form the northern border of Nepal and Tibet Autonomous Region of China along the Tibetan Plateau (6000-7000 m) (Poudel 1966 cited in Nepal 2003:41).

The change in elevation and microclimates in these ecological zones produces a variety of different habitat types including, hardwood and conifer forests, shrub land, grassland, and landscapes suitable for agriculture (**Figure 3.7**).

### **3.3.1.5 Human characteristics**

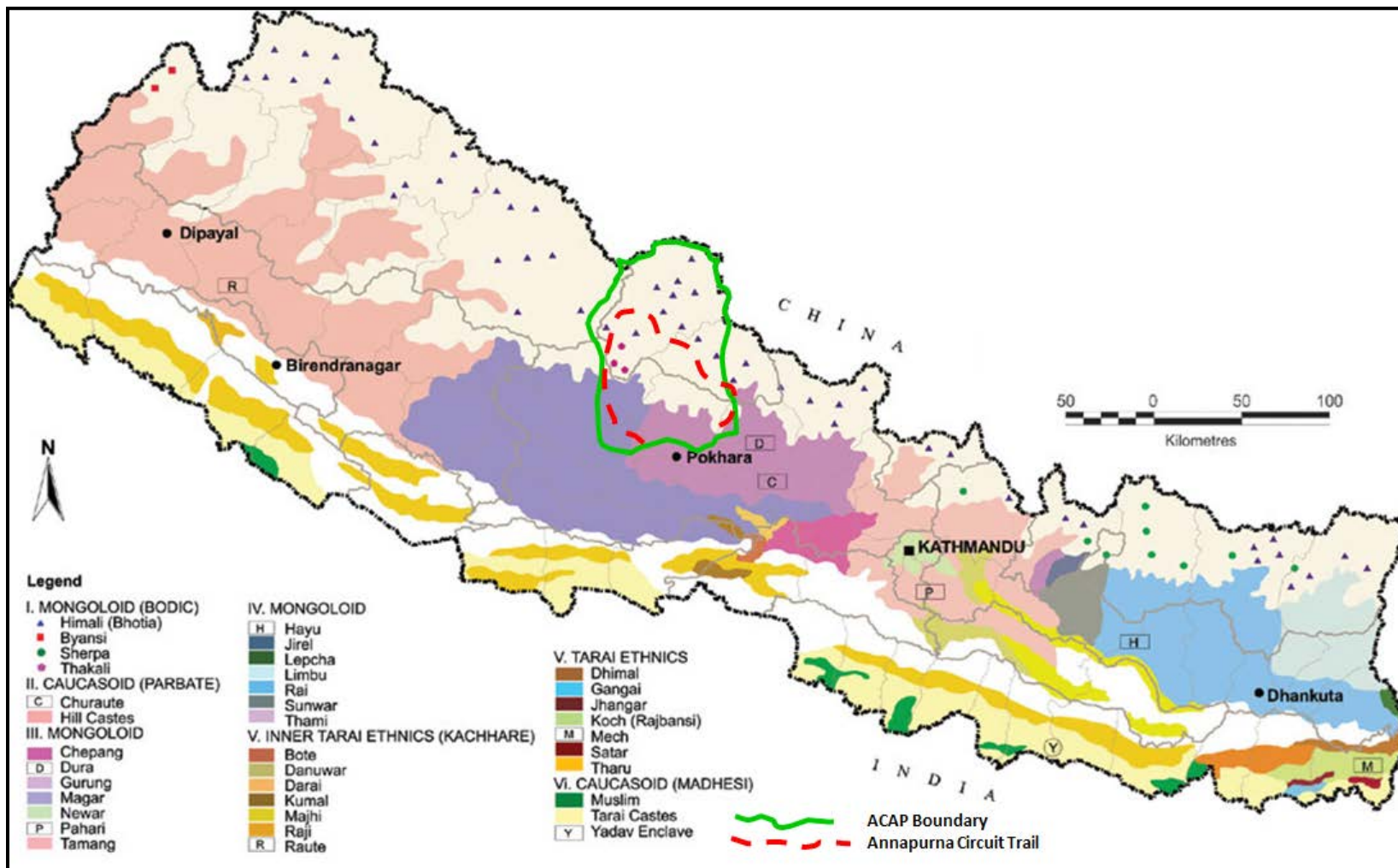
The human population of ACAP is equally diverse. ACAP is home to more than 120,000 people living in more than 300 villages (Stevens 1997). They comprise numerous distinct ethnic and caste groups (**Figure 3.8**), each with their own language (**Figure 3.9**), as well as using Nepali, the national language.

The population can be divided into two wider cultural traditions, Indio-Aryan and Tibeto-Burmese (Bista 1987). The Tibeto-Burmese are made up of Gurung, Thakali, Bhotia, Ethnic Tibetan, and Magar ethnic and tribal groups. The Indio-Aryan consists of Brahmin, Kshetri, Kami, Damai, and Sarki Hindu caste groups as well as several other groups. These cultural traditions reflect the origins of their ancestors who migrated to Nepal. In general, the people living in the southernmost parts of ACAP migrated from India entering Nepal from the southern, eastern, and western borders. These people comprise the Hindu caste groups including Brahmins, Chhetris, and occupational castes such as Damais (tailors) and Kami (blacksmiths). Mixed with them are several *janajati* or ethnic tribal groups such as Magar and Gurung.



**Figure 3.7** Major habitat types, Annapurna Conservation Area ([www.unep-wcmc](http://www.unep-wcmc))

As one continues to move south to north in the Middle Hills area and the southern flanks of the Annapurna and Lamjung Himal of ACAP, the predominant group is Gurung. The Middle Hills of this area of central Nepal was settled by several movements of people south from Tibet, and the Gurung make up one of the largest of these groups (Gurung, H 1980). On the northern side of the Annapurna range is the Manang Valley of the Marsyangdi River.



**Figure 3.8** Ethnographic map of Nepal (native area of ethnic/caste groups) (adapted from Gurung, H 1998)

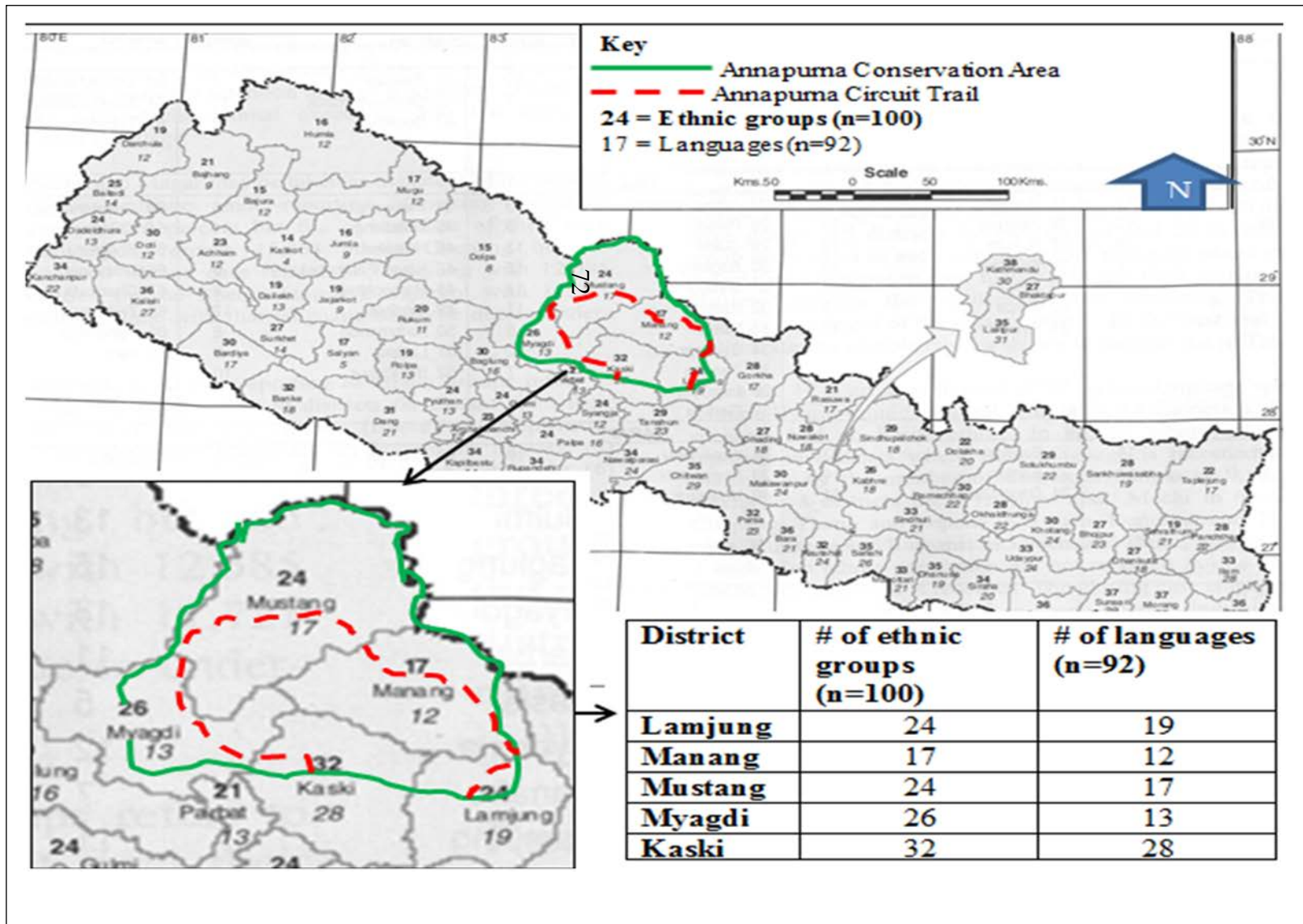


Figure 3.9 Ethnic and language groups of Nepal (Adapted from Grurung et al 2006:9)

A group of people who migrated from either Tibet or Mongolia, who are referred to as Manangis or Nyeshangbas, as well as Tibetan refugees, inhabits this valley. The Nyeshangbas presently include five different clans: Tende phobe, Marsongba phobe, Nimshiri phobe, Kamizindu phobe, and Samde phobe (Aase and Manandhar 2007). North and east of the Manang Valley, towards the Tibetan border, live the Narpa and Phuba people of the Nar and Phu Valleys.

The Kali Ghandaki River Valley delineates the western border of ACAP. The upper section in Mustang District, which is wide and flat, was one of the main Trans Himalayan Salt Trade routes until the closing of the border with Tibet in 1959. This area is home to several different groups. The Thakaklis take their name from a 30 km area of the Kali Ghandaki River Valley stretching from Ghasa at the southern limit to Jomsom, called the Thak Khola (see **Figure 3.1**) (Vinding 1998). Tibetan refugees also settled in the area after migrating from Upper Mustang, near the Tibetan border, and presently live in the Namgayal Ling Tibetan Refugee Settlement, at Tserok near Marpha in the Thak Khola area (see **Figure 3.1**) (Tenzing Norbu Tibetan, Tibetan refugee, personal communication, April 25, 2009). North of Thak Khola are several other groups known as the Baraganolis, the Shopa, and in Upper Mustang the Lopa. Upper Mustang was formerly known as the independent kingdom of Lo, until the 1780s when it became a part of Nepal. Until 1951, it was ruled by the local king, the Maharaja of Lo, as a separate principality within Nepal (Vinding 1998).

Hinduism and Buddhism are the main religious systems practiced with Hinduism predominating in the south and Buddhism in the north. In the Middle Hills area, where these two religious traditions meet, some communities practice a combination of both, and describe themselves as Hindu-Buddhists (Lakshmi Gurung, farmer, personal communication, October 29, 2009). In some areas north of the Annapurna range, there are still practitioners of animistic religions and the pre-Tibetan Buddhist religion called Bön (Stevens 1997). There are numerous sacred sites associated with Hinduism, Buddhism, and Bön scattered throughout ACAP, with the Hindu sites mostly in the southern portion, and Buddhist and Bön sites in the north. One exception is Muktinath, one of the most famous and frequently visited sacred sites in Nepal

(Messerschmidt 2011). It is located on the west side of ACAP immediately below the Thorang La Pass (see **Figure 3.1**). Both Hindu and Buddhist pilgrims in Nepal make pilgrimage to Muktinath, in addition to many Hindus from India.

The majority of people in ACAP are involved in some type of agriculture and livestock rearing. Animal husbandry is closely linked to agriculture because chemical fertilizers are expensive, and hard to obtain in many of the road less areas of ACAP. Animals provide dung used for both fertilizer and fuel for heating, especially in the more northern dry areas where wood is scarce. The degree to which these highlanders can survive on agriculture as their main livelihood strategy depends on the agricultural productivity of the land, the climate, and the altitude. The southern area has proven productive for rain fed agriculture, with terraced rice cultivation being one of the main crops. In the inner Himalayan valleys where precipitation is much lower, there is a food deficit (Nepal 2003). In the areas where growing conditions are limited, alternative livelihoods strategies are crucial for the survival of many households. Some of these additional livelihood strategies include wage labor, trade, and collection and sale of high value medicinal plants. Since the late 1970s, tourism has become an increasing important livelihood strategy for a segment of the population living along the popular trekking routes in ACAP (NTNC 2008a, b).

The area south of the Annapurnas is relatively productive and low in elevation, therefore terraced irrigated rice is one of the main crops, in addition to wheat, rapeseed, barely, potatoes, millet, maize, and various vegetables such tomatoes, carrots, radish, and greens. Hindu hill castes and several ethnic groups, the majority being Gurung, inhabit this area. Anthropologists suggest that the Gurung, who migrated from the north, learned sedentary irrigated rice agriculture from their Hindu neighbors (Messerschmidt 1976).

North of the Annapurna Range, in the Manang Valley and the adjacent area west in Mustang, conditions for growing crops are much harsher. Due to the higher altitude, less rain, limited cultivatable land, and long winters, the people in this area can only grow one set of crops a year. These crops consist of vegetables such as cabbage, onion, radish, potatoes, maize, and

cauliflower as well as grains including wheat, barley, and buckwheat. As a result, it is common for many people in this northern Trans Himalayan area to migrate south during the winter to engage in trade in southern Nepal and India. The Manangis in particular have benefitted greatly from international trade due to trade privileges they were granted by the King of Nepal on several occasions. Tourism has also been an important component of some Manangis' income, as the Annapurna Circuit Trail runs through the valley.

Further north, in the Nar Phu area (see **Figure 3.1**), is one of the highest crop growing areas in the world reaching 4100 m in Phu and 4200 m in Nar (Chaudhary, Aase, and Vetaas 2007). Mustang District, over the Thorang La Pass from Manang (see **Figure 3.1**), has a similar pattern of livelihood strategies. While the middle and southern sections can sustain two crops per year, the northern section is limited to just one. Buckwheat, barley, and wheat are the main grains grown and potatoes, maize, mustard, and peas are some of the vegetables. Mustang is famous for its apples and exports 700 tons annually in addition to distilling the apple juice locally for wine and brandy. Trade, wage labor, animal husbandry, and tourism are the other livelihood strategies in Mustang (NTNC 2008b). Tourism, as in Manang, has increasingly been an important alternative livelihood strategy since the late 1970s, when this area was opened to tourism and trekkers.

### **3.3.2 Reputation**

When ACAP was first established, it was hailed as a new approach to protected area management because it allowed the residents to stay within the protected area boundaries (Nepal 2000). In addition, it gave much of the decision making power to the local level through the Community Area Conservation Committee (CAMC). As ACAP continued to evolve, a user fee was established with the revenues invested in a savings account set up for community development projects. In the mid-1980s, the unique feature of ACAP was that it allowed communities to stay in ACAP and continue to live their traditional lifestyle, while at the same time improving their quality of life. An additional goal was to enlist the help of the communities to protect their environment through active participation in the design and implementation of the

management plan. ACAP is now acknowledged as one of the success stories for community based protected area management, and one of the most widely cited in the literature (Nepal 2002, Chaudhary et al. 2009, Nepal 2003, Stevens 1997, Wells 1994).

The success of community based conservation approaches in Nepal, such as ACAP, was recently highlighted in the Nepal Fourth National Report to the Convention on Biodiversity (Chaudhary et al. 2009:xi) which stated, under lessons learned:

Community-based conservation is most essential for the conservation and sustainable use of biodiversity. Different community perspectives should be considered in making decisions on the use and management of biological resources. Empowering the communities and dissemination of the knowledge to them at the grassroots level have been vital for effective implementation of CBD in Nepal.

### **3.3.3 The Annapurna Circuit Trail**

The Annapurna Circuit Trail is considered by many to be one of the top ten trekking routes in the world. Lonely Planet, in their *Trekking In Nepal* guidebook (Mayhem and Bindless 2009:142) states:

The Annapurna Circuit has long been considered one of the world's great treks. Like all great journeys, the trek reveals itself gradually, climbing through subtropical scenery to a Tibetan-influenced valley and then over the high Thorung La to the Kali Gandaki Valley, a desert-like Trans- Himalayan region that was once a vital trade corridor to Tibet. The side trips that line the circuit trail rank among Nepal's most spectacular, so this is one trek not to rush.

In 2009, *Backpacker* magazine rated it as still the number one trek in the world

([http://www.backpacker.com/march2009\\_hiking\\_annapurna\\_circuit/destinations/12741](http://www.backpacker.com/march2009_hiking_annapurna_circuit/destinations/12741)) saying:

Fact is, the Annapurna Circuit is so well-known it's as much cliché as trek. The 128-mile horseshoe-shaped route circles Nepal's heaven-high Annapurna range, and it's been hailed as the holy grail of trekking since it was first opened to foreigners in the early 1980s. Travel writers and hikers everywhere gush about the trail, even as others discover unknown life-listers elsewhere. There are treks that are more rugged or more remote, huts that are more luxe, pilgrimage sites that are more holy, wildlife that's more exotic, and even scenery—sacrilege!—that's more beautiful. Can another trail please step up and swipe Annapurna's crown? Afraid not.

A recent article in the New Times Travel Section (<http://www.nytimes.com/2010/03/21/travel/21nepal.html?pagewanted=print>) reported:

Many walks lay claim to the title of World's Greatest Trek — the Milford Track in New Zealand, Mount Kilimanjaro in Tanzania and the Inca Trail in Peru are a few. But none of those are epics through valleys surrounded by five-mile-high peaks, staying every night in teahouses run by local villagers and stocked with good kitchens, cold beer and Snickers bars. The Annapurna Circuit marries natural grandeur, cultural immersion and relative luxury in a union found nowhere else.

The reason the Annapurna Circuit trail is held in such high regard is a combination of:

- its exotic location,
- spectacular views of 8000 m Himalayan peaks, including four of the world's ten highest peaks,
- diverse climatic and ecological zones,
- multi-cultural landscapes,
- friendly interesting villages with inexpensive food and accommodation, and
- a relatively easy gradient.

If one walks counterclockwise, as most trekkers do, the gradient summiting at the 5416 m Thorong La Pass is quite reasonable, provided one takes the requisite one to two days of acclimatization in Manang (see **Figure 3.1**). After the Thorong La Pass, the trail gradually descends for several days until the final portion of the trek, which leads to one of the best panoramic mountain views in the world, Poon Hill (see **Figure 3.1**). From here one has the option to do an additional trek into the Annapurna Sanctuary where the Annapurna Basecamp (ABC) (see **Figure 3.1**) is situated (an additional 5-7 days), or continue on the main trail for one to two days to the finish of the trek. The diversity of scenery ranging from subtropical jungle through alpine meadows, to high altitude desert is matched only by the ethnic diversity in the villages the trail passes through. Consequently, every day is unique and surprises are always waiting at the crest of each hill. Numerous side hikes are possible, as well as interesting cultural

explorations in the many Buddhist and Hindu sacred sites along the way. The human ecology of the four districts the ACT passes through is provided in detail in **Chapter 4**.

### **3.4 Sampling design**

I designed my method of sampling to provide the best perspective on the impact the road is having on villagers and trekkers along the ACT. Consequently, I chose to hike the trail and interview in villages that were approximately a one-day walk apart. This gave me access to not only villagers' perceptions of the impact of the road, but also personal experiential knowledge of what trekkers and villagers encounter as they walk the trail/road. In retrospect, this was invaluable as it confirmed the reports that lodge owners and trekkers made about the noise and dust from vehicles, and its negative impact on the number of trekkers on the trail/road. This served to verify the perspectives of locals and trekkers gleaned from interviews, and provided ample time for observation and photo documentation.

In addition to the main trail, I chose to conduct interviews along two alternate trails on the east side, because ACAP has proposed them as alternate trails for trekkers once the road is complete. The interviews on these alternate trails help give a better overall view of the wide-ranging impact of the road, rather than just the immediate area next to the trail/road.

I identified four groups for interviews to reflect the greatest number of different perceptions about the road.

1) Key informants in each village were consulted to get an overall picture of the community, the location of other groups of interviewees, additional important interviewees to consult, and the key informants' perceptions of the road's impacts. Key informants were identified as individuals who had more comprehensive knowledge of the community and its issues, which included village officials and ACAP personnel.

2) Lodge owners were interviewed because they represent the largest group that is directly involved in the trekking tourism business.

3) Shop and restaurant owners were chosen because they are affected by the road in terms of local business and the supply chain, and are peripherally involved in trekking tourism as well.

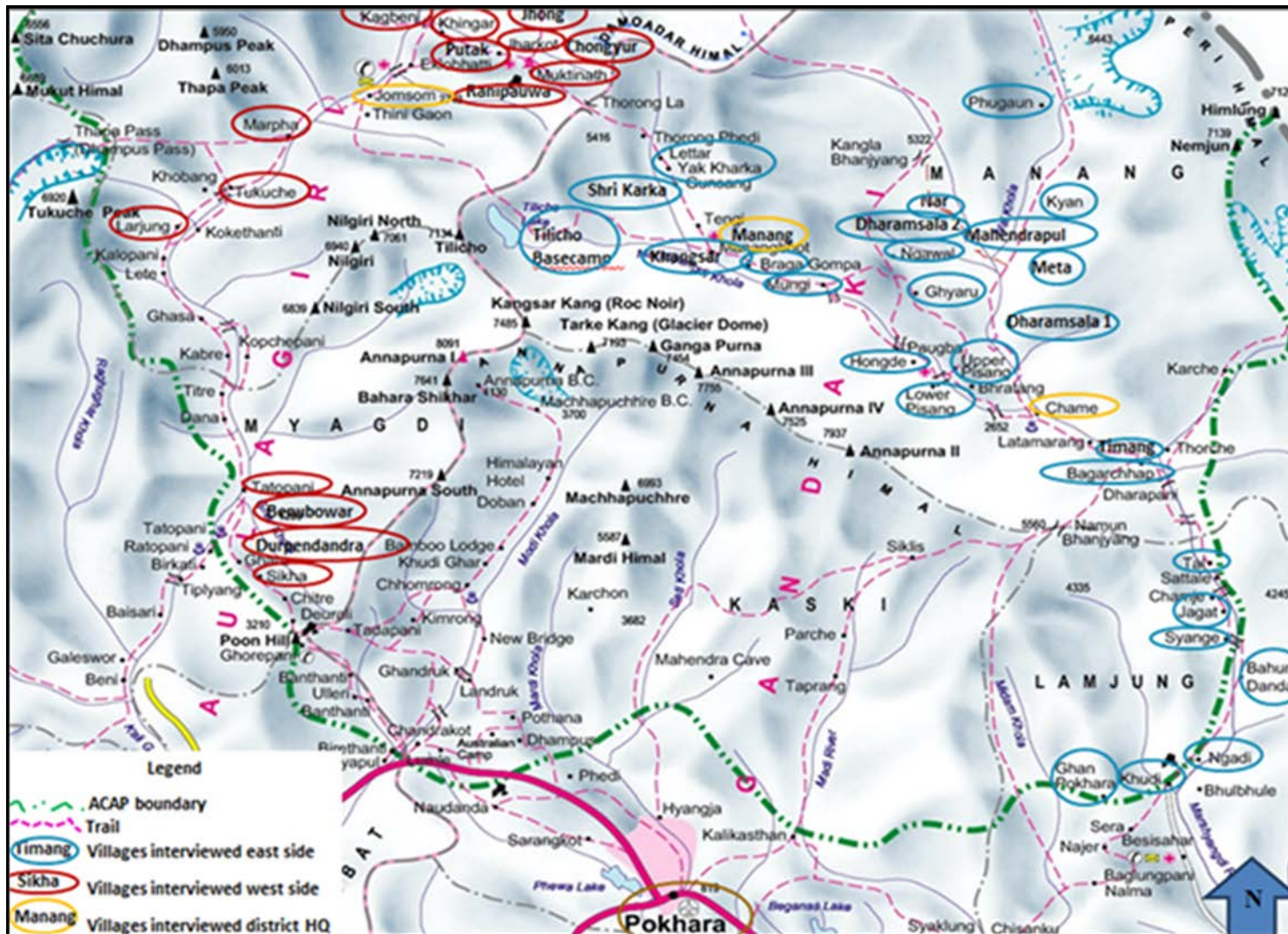
4) Farmers were chosen because they are not directly involved in trekking tourism (although some do find work as porters and sell produce to lodges) and would potentially benefit greatly from the road in terms of access to markets and lower transportation costs.

### **3.4.1 Sampling types**

Given the limitations of time, and the length of the ACT (~ 250 km), several types of sampling were used. Opportunistic interviews were done ‘on the fly’ while walking the trail when time and location proved beneficial. For example, several times when I stopped for lunch early, I was able to conduct interviews because other trekkers had not arrived and lodge owners were free to talk. Most interviews, however, were conducted in villages where I stayed overnight. The larger villages that are popular trekking hubs required 3-5 days to complete my interviews.

### **3.4.2 Sampling procedure**

Upon reaching a village the first procedure was to walk the village from one end to the other and sketch a map of the lodges, shops, and other buildings (see **Appendix F: Select Village Maps**). The number of lodges, local taverns, and shops was identified, and a target of 50% of the lodges was set as a minimum number to be interviewed. Interviews were conducted on a random basis by going from lodge to lodge until I found a lodge owner who was available to be interviewed. Lodge owners who were not available were revisited in the following days until at least half of the lodges had been sampled. The interviews were conducted with the head of the household, or whoever was designated as the head in his/her absence. The same procedure was used with the other groups as well. A native Nepali field assistant translated the interviews while I transcribed them into field notebooks. I conducted interviews in 45 villages (**Figure 3.10**) during my two research periods. During my first research period (April 20 to May 9, 2009), I conducted 55 interviews on the west side of the ACT in Mustang District. During my second research period (October 20 to December 13, 2009), I conducted 176 interviews with 137 on the east side (41 in Lamjung District, 96 in Manang District) and 39 on the west side (33 in Mustang District, 6 in Myagdi District), a total of 231 interviews (**Table 3.2**).



**Figure 3.10** Villages interviewed in the Annapurna Conservation Area (Adapted from <http://www.flickr.com/photos/pabfou/3050509799/>)

**Table 3.2** Interviews conducted in each semester and each district.

Spring Semester April 20 – May 9, 2009							
West Side – Mustang District							
Group	Lodge Owners	Shop Owners	Farmers	Officials	Teachers	Other	Total
Total	24	11	13	4	2	1	55
Fall Semester October 20 – Dec 13, 2009							
East Side - Lamjung District							
Total	13	5	15	5	2	1	41
East Side – Manang District							
Total	68	6	8	1	1	12	96
West side – Mustang District							
Total	16	3	2	2	2	8	33
West Side – Myagdi District							
	2	4	0	0	0	0	6
Totals	123	29	38	12	7	22	231
Combined total = 231							

### 3.4.3 Interview questions

Interview questions were a combination of structured household family background information, semi-structured questions about the impact of the road, and open-ended questions designed to elicit relevant qualitative information about livelihoods, culture, traditional knowledge, and sacred sites (see **Appendix G**: Research Questionnaire). I recorded the structured questions about the road on a three-point scale of road impacts; positive, negative, or no impacts. The three-point criteria were applied to five questions that were designed to reflect the overall impact of the road. This three-point scale is the same system used by Nagendra and Ostrom (2011:4) in their interviews with forest user groups to ascertain changes in forests in Nepal, India, Kenya, Uganda, and the United States. The five questions were:

1. Is the road good, bad, or both? Why?
2. Has your business increased, decreased, or remained the same? Why?
3. Has the price of goods gone up, down, or remained the same? Why?
4. Has the price of transportation gone up, down, remained the same? Why?

5. Have the number of trekkers gone up, down, remained the same? Why?

### **3.5 Data analysis**

I entered the responses in excel spreadsheets to analyze the percentages of answers to the different standardized questions concerning the impact of the road. The results were compared using different groups of data including the following categories: villages connected by road vs. villages not connected by road, comparison of perceptions of all four sample groups, comparison of perceptions in terms of ethnicity and religion, and comparison of the east side to the west side.

I analyzed the qualitative data by reviewing the interviews numerous times and identifying keywords that I used to identify themes. I identified 29 different themes and ranked them according to frequency of occurrence. The 10 most frequent were chosen for further review and analysis.

I obtained secondary data from the two main ACAP offices in Kathmandu and Pokhara. This provided valuable background information on various aspects of the research site including trekker numbers, surveys of trekkers' attitudes toward the road, and reports from past research in ACAP, as well as alternate trekking routes under consideration. While there was not enough time to interview trekkers during the research period, the secondary data from ACAP in addition to trekkers' comments about the road on internet travel blogs provided a representative sample.

The literature review and additional library research are essential parts of the analysis in that they provided extremely valuable background information on a wide range of topics. This allowed for an analysis of the complex interrelated factors from a coupled human and natural systems perspective. This body of information included: environmental, socioeconomic, and sociocultural impacts of roads in Nepal and abroad; human ecological aspects of ACAP; impacts of globalization and climate change in Nepal; and anthropological, archaeological, and paleoethnobotanical information on present and historical aspects of livelihood strategies, adaptive change, religious practices, and pilgrimage in the study site.

Three of the most important sources of secondary data were literature on the Trans Himalayan Salt Trade, links between trade and pilgrimage, and recent archaeological and paleoethnobotanical findings. These sources illuminated the origins and livelihood strategies of inhabitants of the area as early as the First Century B.C.E. This information was extremely valuable in verifying both the existence of crop cultivation similar to present practices and the use of international trading routes over 2,500 years ago, indicating a strong oral history of traditional ecological knowledge as well as a diversity of cultural influences. This historical background is essential for understanding the present situation.

Due to the complexity of the human and environmental couplings, I used case studies as the basis of my results and discussion chapter (**Chapter 4**). Many of the villages exhibited similar impacts from the road; therefore, I chose different case studies to illustrate different impacts. The narrative is intended to be used with the many maps provided in text, showing the location of each of the case studies in relation to the trail/road, in addition to a map showing the location of each of the case studies in relation to the trail/road (see folio). In this way, the reader can see where the different cases are relative to being located either on or off the trail/road, in addition to the villages' proximity to other important features, such as sacred sites, historical trade routes, and different ethnic groupings.

### **3.6 Scope and limitations**

Initial interviews revealed that very few, if any, lodge owners keep written records of the numbers of guests or expenditures. Consequently, most of the information from lodge owners about their business is from memory, and are estimations. However, verification of general trends was possible through comparing responses in each village, and in some cases whole areas. Triangulation using personal observation and secondary data was used to further verify responses. These interviews are perceptions of short-term impacts.

Another limitation is the bias in the groups interviewed. Farmers are the hardest to interview, as they are usually in the field during the day and do not have time to talk until evening. Lodge owners are the easiest to interview because their lodges are along the main trail

and therefore easy to find. Between 10:00 and 16:00, they have time to talk because trekkers are on the trail during these hours. Consequently, more interviews with lodge owners were conducted than with any other group. Nevertheless, all farmers interviewed expressed the same opinion about the positive aspects of the road, so I assumed that most farmers would give the same answer. The Manang Sustainable Development Plan, which acknowledges that the majority of the local inhabitants are in favor of road construction, further supports this assumption (NTNC 2008a:21). According to the Manang Sustainable Development Plan, the Village Development Committee in Manang allocate 50% of their budget toward road construction (NTNC 2008a:25) and the Mustang Sustainable Development Plan states that the Mustang District Development Committee funded the Kali Ghandaki Road on the west side (NTNC 2008b:19). This is further proof that villagers are eager to have a road. In addition, I also based this assumption on 20 years' experience of walking trails in Nepal as an adventure travel guide, and seeing how difficult it is for people living in the mountains to get to a road.

An additional limitation, due to time constraints, was the lack of focus group interviews. This would have provided a forum for a range of participants to voice their views together, and offer valuable dialogue about the questions, in addition to allowing for verification of previous interviews.

## CHAPTER 4. RESULTS AND DISCUSSION

### 4.1 Introduction to Case Studies

The links between environmental, socioeconomic, and sociocultural spheres in the Coupled Human and Natural Systems (CHANS) of communities impacted by road construction are extremely complex. I chose to use case studies from my research area to exemplify certain aspects of these impacts and their couplings to simplify the overall dynamic of these interactions. In many villages, the road produces very similar impacts, such as land use and land value changes. The circumstances of each case are different, but the general evolution of the impacts is similar. For this reason, I have chosen to use 10 specific case studies to analyze different impacts. While these are not all the road impacts that were observed, they are indicative of the most common and pervasive elements. The case studies are presented in three parts. **Part 1 (Section 4.1)** looks at the communities along the Marsyangdi Road on the east side of the Thorang La Pass, which was completed in 2008. **Part 2 (Section 4.2)** analyzes the impacts on communities along the Kali Ghandaki Road on the west side of the Thorang La Pass, which currently ends in Sangye and is still under construction. **Part 3 (Section 4.3)** presents an overall picture of both sides and how the findings fit together to tell a whole story (**Table 4.1**)

Each case study uses a quotation from my interviews (except **Case Study 8** and **10**) as a title, which is descriptive of the particular focus and main CHANS coupling that the case study illustrates (**Table 4.1**). All participants' names in this thesis have been changed to protect their confidentiality. In addition to the main CHANS coupling, I also address other couplings that I observed during my analyses (**Table 4.1**). **Table 4.2** is a key to the abbreviations used in **Tables 4.1**.

**Table 4.1** Master Summary of Case Studies (key for **Table 4.1** abbreviations are on the following page in **Table 4.2**)

CS #	Side	Dist.	Title	Focus	O			S			T						
					R E F	I E P	E V P	V T R	T C S	C H B	H M I	M R I	R L E	L T L	T I S	I E P	
1	E	L	“Many tourists want to stay here because there is a good view of the Himalayas.” <sup>1</sup>	Overall CHANS Model	X	X	X	X	X	X	X	X	X	X	X	X	X
2	E	L	“The road is 1 percent good and 99 percent bad” <sup>2</sup>	Road alignment	X	X	X	X	X	X	X	X	X	X	X	X	X
3/ 4	E	M A	“The sooner the road gets here the better” <sup>3</sup>	Proximity to road – distant/close	X	X	X		X	X	X						X
5	W	M	“The Indian pilgrims get out of the jeep and fall over” <sup>4</sup>	LE, sociocultural change and adaptation	X	X	X		X	X	X	X	X	X	X	X	X
6	W	M	“The whole village is planning to build many guesthouses on the hill” <sup>5</sup>	Land use and land value changes	X	X	X		X	X	X					X	X
7	W	M	“The Government needs to let everyone know how beautiful it is here so people will come.” <sup>6</sup>	Tourism and place attributes	X	X	X		X	X	X			X			X
8	W	M Y	“There is never just one road.” <sup>7</sup>	Expanding road networks	X	X	X		X	X	X	X				X	X
9	E/ W	L/ M	“Rich people can buy jeep but poor people get no service.” <sup>8</sup>	Power and agency: Unintended consequences	X	X	X		X	X	X	X					X
10	E/ W	All	“If you build it they will come” <sup>9</sup>	Synthesis of all case studies	X	X	X	X	X	X	X	X	X	X	X	X	X

<sup>1</sup> K. Gurung, homestay owner, personal communication, October, 23, 2009

<sup>2</sup> B. Ghimire, guesthouse owner, personal communication, October, 25, 2009

<sup>3</sup> Lama Kalsong, Tibetan Buddhist Lama, personal communication, November 17, 2009

<sup>4</sup> K. Gurung, motorcycle taxi operator, personal communication, April 4, 2009

<sup>5</sup> P. Gurung, homestay owner, personal communication, April 27, 2009

<sup>6</sup> L. Thakali, guesthouse owner, personal communication, April 20, 2009

<sup>7</sup> This author, Cornell University, March 10, 2011

<sup>8</sup> K. Thakali, personal communication, November 30, 2009

<sup>9</sup> Popular misquote from the movie “Field of Dreams” (Wikipedia)

**Table 4.2** Key to **Table 4.1**

<p><b>Dist. = District:</b> <b>L</b> = Lamjung, <b>M</b> = Mustang, <b>MA</b> = Manang, <b>MY</b> = Myagdi,</p> <p><b>Side:</b> <b>E</b> = East side of the ACT/Marsyangdi Road, <b>W</b> = West side of ACT/ Kali Ghandaki Road</p> <p><b>Couplings:</b> <b>O</b> = Organizational: <b>REF</b> = reciprocal effects and feedbacks, <b>IE</b> = indirect effects, <b>EP</b> = emergent properties, <b>V</b> = vulnerability, <b>TR</b> = thresholds and resilience</p> <p><b>S</b> = Spatial: <b>CSS</b> = couplings across spatial scales, <b>CBB</b> = couplings beyond boundaries, <b>H</b> = heterogeneity</p> <p><b>T</b> = Temporal: <b>MI</b> = massive increases of humans on natural systems, <b>RI</b> = rising natural impacts on humans, <b>LE</b> = legacy effects, <b>TL</b> = time lags, <b>ISP</b> = increasing scale and pace, <b>EIE</b> = escalating indirect effects</p> <p><b>X</b> = Main couplings portrayed by the Case Study</p>
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The order of the case studies starts from the beginning of the Annapurna Circuit Trail (ACT) at Besisahar walking in a counter clockwise direction, which is the most typical way to trek the ACT. It is usually hiked in this direction because the elevation gain to Thorang La Pass is gentler going counter clockwise. The ACT passes through four different administrative districts in Nepal. In a counter clockwise direction, one begins in Lamjung District passing through Manang District, Mustang District, and ending in Myagdi District. To provide context for each case study, the human ecology of the district in which the case study is situated precedes the analysis and discussion. More in depth information about the overall country background is presented in **Appendix C: Nepal Country Profile**. A large number of maps and photographs are included in the text of this thesis so that the reader can follow along with the description. The maps and photographs provide additional context that enhances the narrative by showing the locations of sacred sites and ethnic diversity, as well as orienting the reader geographically.

## **4.2 East Side of the ACT: Marsyangdi Road (Lamjung and Manang Districts)**

### **4.2.1 Background: ACT and Lamjung District**

The ACT follows the traditional trail up the Marsyangdi River Valley. The first trekkers who ventured up this trail in the late 1970s started near the village of Dumre. Since then the beginning of the trek has migrated up the valley as the government upgraded sections of the trail to rural road status. When I first started trekking in this area in the mid-1980s, it was possible to go by bus to Besisahar and then on to Khudi by jeep (**Figure 4.1**). Currently the road reaches Sangye and jeeps can go another 2 km to Sirchaur (**Figure 4.1**). As part of the current development plan, the Government of Nepal put high priority on connecting all district headquarters by road (NTNC 2008a). Besisahar, the district headquarters for Lamjung, is already connected and the road is being extended up the valley to the district headquarters of Manang in Chame (**Figure 4.1**). Local governing bodies in the valley above Chame allocated money and widened a section of the trail from near Chame to the village of Manang (**Figure 4.1**). This portion of the valley above Chame is relatively flat and most of it is now passable by jeep. Therefore, once the section of road from Sangye to Chame is finished there will be a road all the way up the valley. The alignment of the road stays on the west side of the Marsyangdi River the whole distance to Manang (**Figure 4.1**). The ACT, however, crosses from the west side to the east side and back several times on its way up the valley. The road will completely bypass the communities on the east side of the river. This is already a reality in Bahundanda and Ghermu and has created concern in other villages further up the valley that the road has not reached yet (**Figure 4.1**). Road alignment has significant impacts on the communities along the ACT due to the complexity of the coupled human and natural systems.

Twenty-four ethnic groups, with 19 different languages (see Figure 3.9 in Chapter 3) inhabit Lamjung District (Figure 4.2) (Gurung, H et al. 2006). The largest single ethnic group is the Gurung making up 33% followed by Hindu caste groups of Bahun and Chhetri, both at 16% each. The remainder makes up smaller percentages.

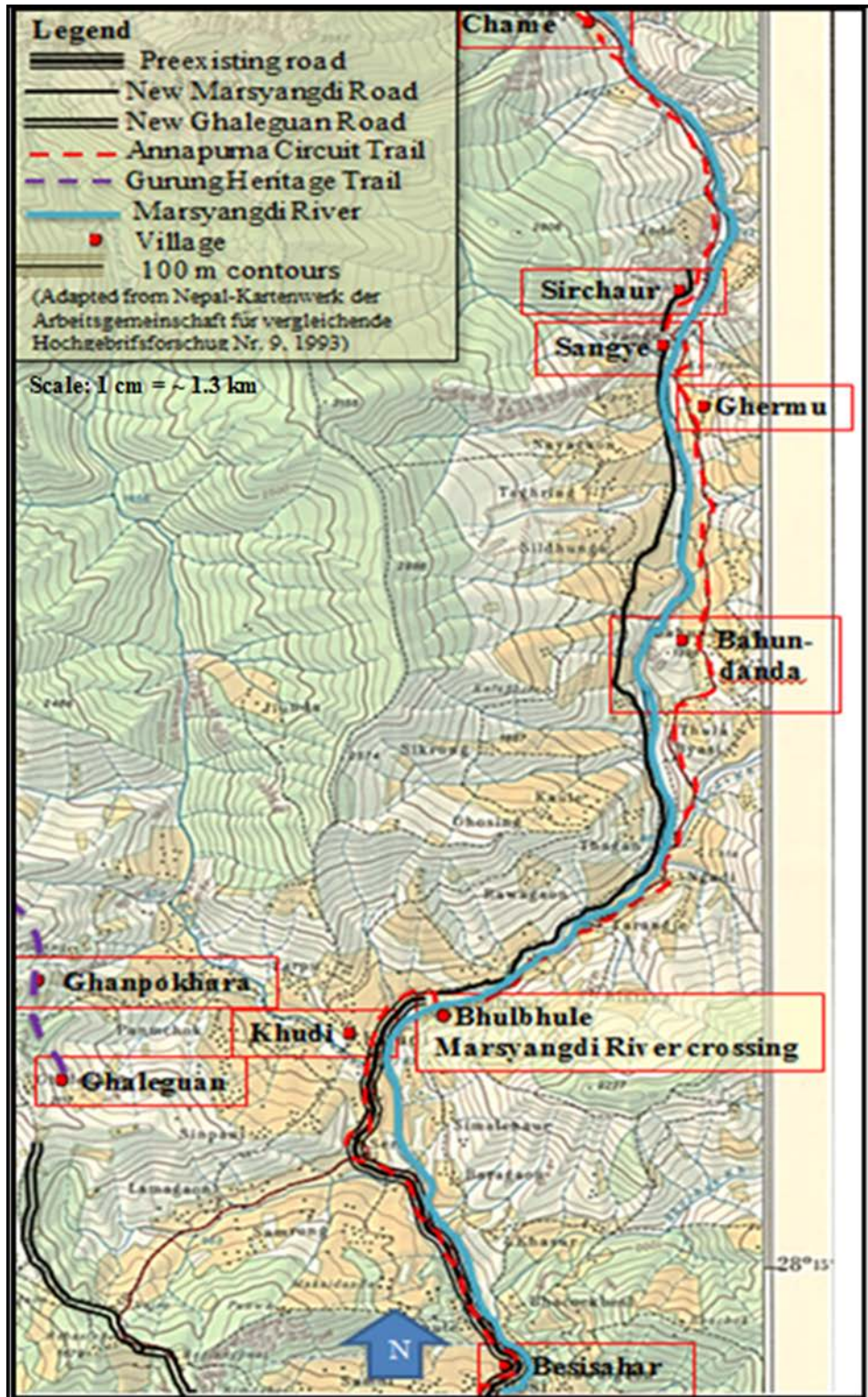


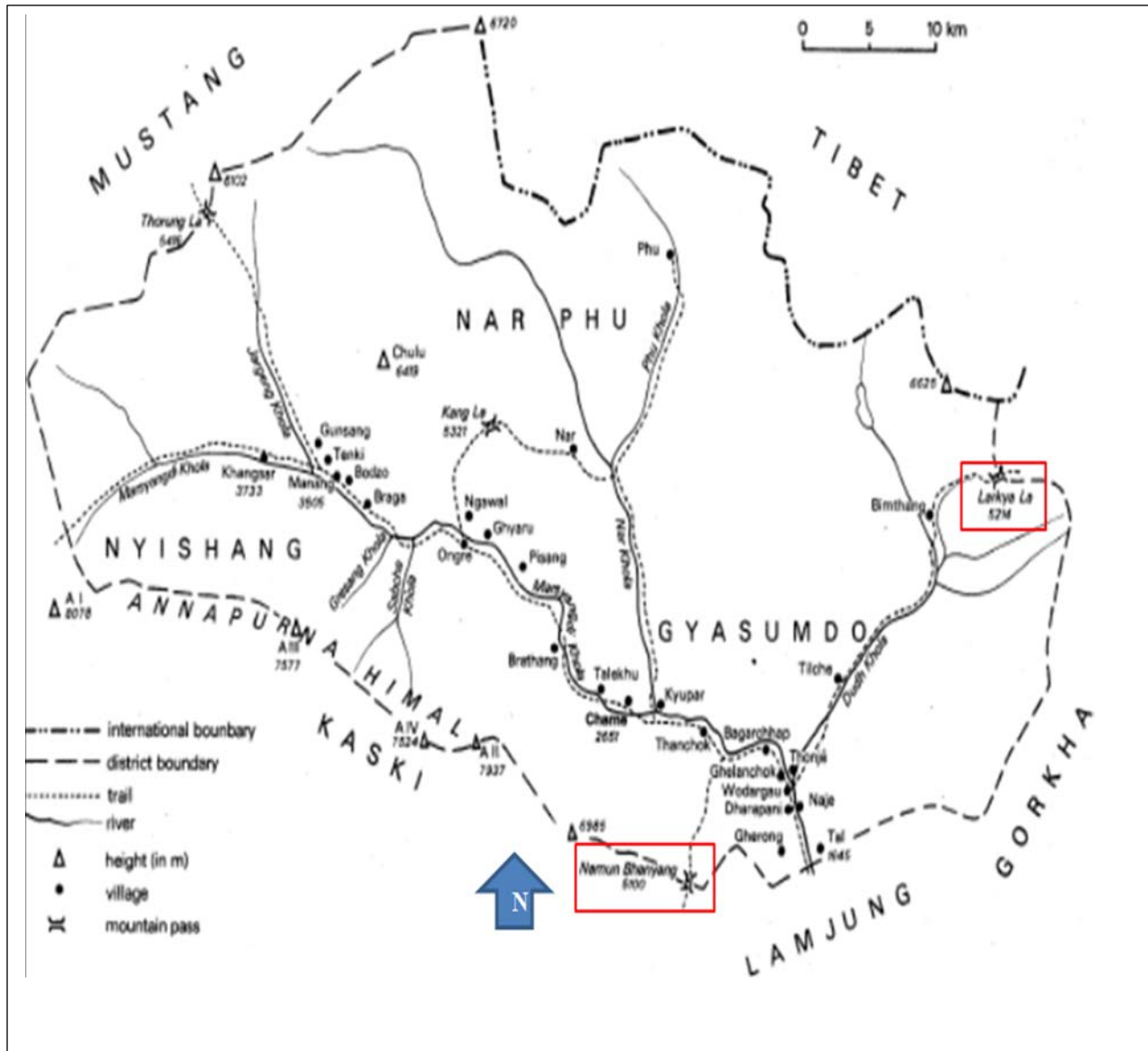
Figure 4.1 Map of Marsyangdi River Valley with trails and road

According to the latest Nepal census (2001) there are approximately 177,000 people living in the District. Hinduism is the predominant religion (58.5%) followed by Buddhism (41.8%) with the remainder consisting of Islam, Christian, Jain, Sikh, Baha'i, and other (HMGN/CBS 2001). Since the 15<sup>th</sup> Century, Hindu migrants from the west of Nepal, in what is now India and indigenous tribal groups intermingled in the Central Hills of Nepal, including Lamjung District (Gurung, H 2004b). The Hindu migrants brought with them the practice of field terracing and irrigated paddy cultivation, whereas the indigenous tribes practiced hunting, pastoralism, and swidden farming. In Lamjung, Hindus settled the valley bottoms where they could pursue paddy cultivation and the indigenous Gurung remained in the higher elevations.

It is not clear where the Gurungs' ancestors originated, but from their language and facial characteristics, it is highly likely they entered Nepal from the north, migrating either from the high mountains of western China or from Tibet through Mustang (Macfarlane 1989, Gurung, H 1980). Messerschmidt (1976) supports this view suggesting that several hundred years ago the Gurung practiced hunting, gathering, seasonal migration of livestock from lowland to highland or transhumance, swidden agriculture, and Trans Himalayan trade, all adaptations to alpine, subalpine, and high temperate forest ecosystems. Over time, the Gurung migrated down to the valleys and learned irrigated paddy farming from their Hindu neighbors (Messerschmidt 1976). Gurung communities in the hills now grow rice, while those who remained at higher elevation, such as in the Manang (a.k.a. Nyishang) Valley (**Figure 4.2**), still practice adaptive strategies developed for higher ecological zone (Chaudhary, Aase, and Vetaas 2007). Many cultural adaptations took place with ethnic tribal groups after Prithvi Narayan Shah consolidated the Gorkha Kingdom and declared Nepal a Hindu kingdom in the mid-16<sup>th</sup> Century. Some adaptations were for additional livelihood strategies, such as rice cultivation, and some were for social capital (Vinding 1998, Gurung, H 1997, Sharma 1977).

Gurung practice a mixture of Buddhism, Hinduism, and Bön, using Buddhist and Bön lamas for death rituals and Hindu Brahmins priests for birth ceremonies. This practice of using different priests varies geographically reflecting the various cultural influences, Buddhist lamas

and Bön shaman used more in the north and Brahmin priests used more in the south (Macfarlane 1990, Mumford 1990).



**Figure 4.2** Map of Manang District (adapted from Van Spengen 1987)

In many areas in Lamjung, farmers grow two crops per year. Summer crops that rely on the monsoon rains include rice, maize, and millet. The dry winter season crops include buckwheat, barley, wheat, and mustard seed for oil. Livestock are typically water buffalo, oxen, sheep, and goats (Trapp and Mool 1996, Goldstein and Messerschmidt 1980). Employment as soldiers in the Gurkha Division of Indian and British armies is a long-standing tradition for

Gurung and other ethnic groups in Lamjung since the 19<sup>th</sup> Century (Stringer 2011, Gurung, H 2004b). Migration to serve in the armed forces historically is the first large-scale migration of men from the hills in Nepal (Gill 2003).

Nepal opened its doors to foreigners in 1957, and initially mountaineering expeditions to the Annapurna and Everest regions were the bulk of arrivals. However, after Tenzin Norgay and Sir Edmund Hillary summated Mt. Everest in 1954 arrivals slowly increased in the 1960s. When trekkers started exploring Nepal's mountainous areas in large numbers in the 1970s, tourism became an important source of income for communities along the ACT, as well as in homestay villages such as Ghalegaun and other villages along the Gurung Heritage Trail, and the Sikles Eco Trail (see **Figure 3.2** in **Chapter 3**). While not all villagers have the funds to provide tourist facilities, some economic trickle-down does occur through employment of villagers as guides and porters, and by selling produce to tourist lodges.

The main trail (ACT), used by locals and trekkers to pass through the center of Lamjung District and on to Manang District, follows the Marsyangdi River Valley (see **Figure 4.2**). Written accounts of trade through this valley date to the mid-18<sup>th</sup> Century with a route linking the lowlands of Nepal with Tibet via the Larke La Pass (see **Figure 4.2**) (Messerschmidt 1995).

With the consolidation of Nepal in the 19<sup>th</sup> Century, the Gorkha Kingdom established military posts in the valley, and subsequent market centers to support these posts. As the government expanded its administrative centers further, growth occurred in the valley and in other areas, leading to the development of central towns in rural Nepal.

The completion of the Prithvi Rajmarg Road connecting Kathmandu with Pokhara in 1969 brought many changes to the area, including the establishment of Dumre, at the junction of the traditional trail (ACT) and the Prithvi Rajmarg Road, to serve as a market town for sale and distribution of goods. It also became the starting point for trekkers hiking the Annapurna Circuit Trail. When Besisahar (see **Figure 4.1**) became district headquarters for Lamjung major changes further up the valley took place. Messerschmidt (1995) in his analysis of these changes cites the importance of trade and transportation corridors in influencing development. Another major

event that changed the Marsyangdi Valley was the widening of the trail by the Nepalese Government in the 1970s. Previously the trail was very narrow and dangerous in spots where it traversed vertical cliffs on makeshift trails of bamboo ladders and planks. Anthropologists speculate that this is one reason the preferred salt trade route did not come directly up the Marsyangdi Valley on the present day trail, but instead came over the 5560 m Namun Bhyangjung Pass (see **Figure 4.2**) further west in Lamjung. Upon entering the Marsyangdi Valley, traders only had to travel a short distance before turning north to follow the Dudh Khola River to the Larke La and Gya La Passes into Tibet (Messerschmidt et al. 2004).

#### **4.2.2 Case Study 1: Roads as Coupled Systems (Lamjung District)**

**“Many tourists want to stay here because there is a good view of the Himalayas.”<sup>10</sup>**

This case study examines two villages, Ghalegaun and Ghanpokhara, and lays out the basic CHANS model of road impacts that I then apply to all of my case studies as an underlying template over which to examine specific impacts.

##### **4.2.2.1 Background**

Ghalegaun and Ghanpokhara are approximately 2 km apart, situated on a ridge high above the Marsyangdi River at an elevation of 2016 m (**Figure 4.3** and see **Figure 4.1**). The villages are not actually on the ACT, which begins in the valley below. The Annapurna Conservation Area Project (ACAP) is developing a homestay tourism project in this area along the Gurung Heritage Trail (see **Figure 4.1**) hoping it will be part of an alternate ACT. The ridge has a commanding panoramic view of the western Himalayas including Annapurna (6693 m), Annapurna II (7939 m), Annapurna IV (7525 m), Machhapuchhre (6693 m), Lamjung Himal (6932 m), Himalchuli (6747 m), and many other peaks.

In addition, the villages have retained their unique Gurung cultural traditions, such as the *ghumaune* – an unusual roundhouse construction (**Figure 4.4**), traditional Gurung song and dance, and rare Gurung food such as *sisnuko kolai* – a thick soup made from nettles. The

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<sup>10</sup> K. Gurung, homestay owner, personal communication, October, 23, 2009

combination of these attributes gives this area the potential to be a very popular tourist/trekking destination.



**Figure 4.3** The view from Ghaleguan looking toward Ghanpokhara (indicated by the blue arrow) (R. E. Beazley)

In 2000, ACAP in cooperation with the Nepal Tourism Board (NTB), the District Development Committee (DDC), and the Village Development Committee (VDC), started a homestay model of tourism in Ghalegaun (KMTNC 2004). Ghalegaun is now becoming very popular with Nepali tourists, with approximately 3500 visiting in 2008-09. Foreign tourists are also starting to discover this area off the main ACT. When I arrived in October 2009, 143 foreigners had visited the village in 2009 and locals' estimate about 300 foreigners per year visit Ghalegaun (Ram B. Gurung, ACAP official, personal communication, October 23, 2009). In Ghalegaun, homestay owners pride themselves on growing all their own food, including tea in a community tea plantation started by the villagers. Of the 150 households in Ghalegaun, 36 are

involved in the homestay program (Kumar Gurung, Director Ghaleguan Homestay Association, personal communication, October 23, 2009).



**Figure 4.4** Traditional Gurung roundhouse (*ghumaune*) (R.E. Beazley 2009)

A homestay committee determines who is eligible for the program. To be eligible a home must have either a separate bedroom in their house or a separate building for guests and an outside toilet/bathroom building, and the house must be clean and the owners must have some cooking experience. The homestays are on a rotational queue system ensuring that everyone involved gets an equal share of the business. When visitors arrive, they check in with the head of the homestay committee, who assigns them to the next house on the queue (Kumar Gurung, Director Ghaleguan Homestay Association, personal communication, October 23, 2009).

Various NGOs and the Government of Nepal have promoted this homestay model as a pro-poor tourism strategy. In theory, it is supposed to distribute income from tourism more equally throughout a community compared to private ownership of trekking lodges, which benefit a relative few. However, I found from my interviews, that in reality it is much more complicated than it appears, and does not really benefit the poorest households in the community. In fact, only households with the highest incomes can afford the renovations necessary to be included in the program. For example, most houses in Ghalegaun do not have a toilet. Villagers have traditionally used the local fields as their toilet. To build a toilet/shower

facility costs NRs (Nepalese Rupees) 50000-60000, which is equivalent to approximately US \$750 (US \$1 = ~ NRs 72). This amount is almost twice the gross national income per capita in Nepal, US \$440 (World Bank 2009).

The traditional livelihood strategies (see **Appendix H: Rural Mountain Livelihoods and Land Use in Nepal**) of the area are agriculture mixed with animal husbandry, and service in the Gurkha Regiment of the Indian and British Armies. Tourism has proven to be easier and more lucrative than farming and many people in the village would like to be involved in the homestay program. However, very few have the money to make the renovations. Those who have been able to do the renovations have either received a loan from friends or family, or had income from foreign remittance, such as from a son in the Indian Army, or offspring working as laborers in the Gulf countries.

The Hindu caste system complicates the situation further by relegating the *Damai*, an occupational caste group, to a separate section of the village. These caste groups provide valuable services to the community, such as blacksmithing, tailoring, and shoe-making, in exchange for food and other necessities. However, in the Hindu tradition they are the untouchable caste, which marginalizes them from mainstream community activities. Of the 150 households in Ghalegaun, 30 are *Damai*. One farmer in the homestay program told me that the *Damai* are not allowed to be part of the program because their houses are dirty, they drink a lot, use bad language, and “they maybe are not interested in it anyway” (Tarka Gurung, farmer/homestay owner, personal communication, October 22, 2009).

In 1997, road construction began from Besisahar toward Ghalegaun (see **Figure 4.1**). It was not until 2008 that jeeps could finally make it all the way to Ghalegaun on this road. Currently, the road is not good enough for buses to reach Ghalegaun, but there are plans to upgrade it in the future. Tourists walk from Besisahar to Ghalegaun or take a bus that will drop them closer to Ghalegaun, thereby saving several hours of walking. Many of the villagers I interviewed believe that when the new road is completed more tourists will start coming to their village.

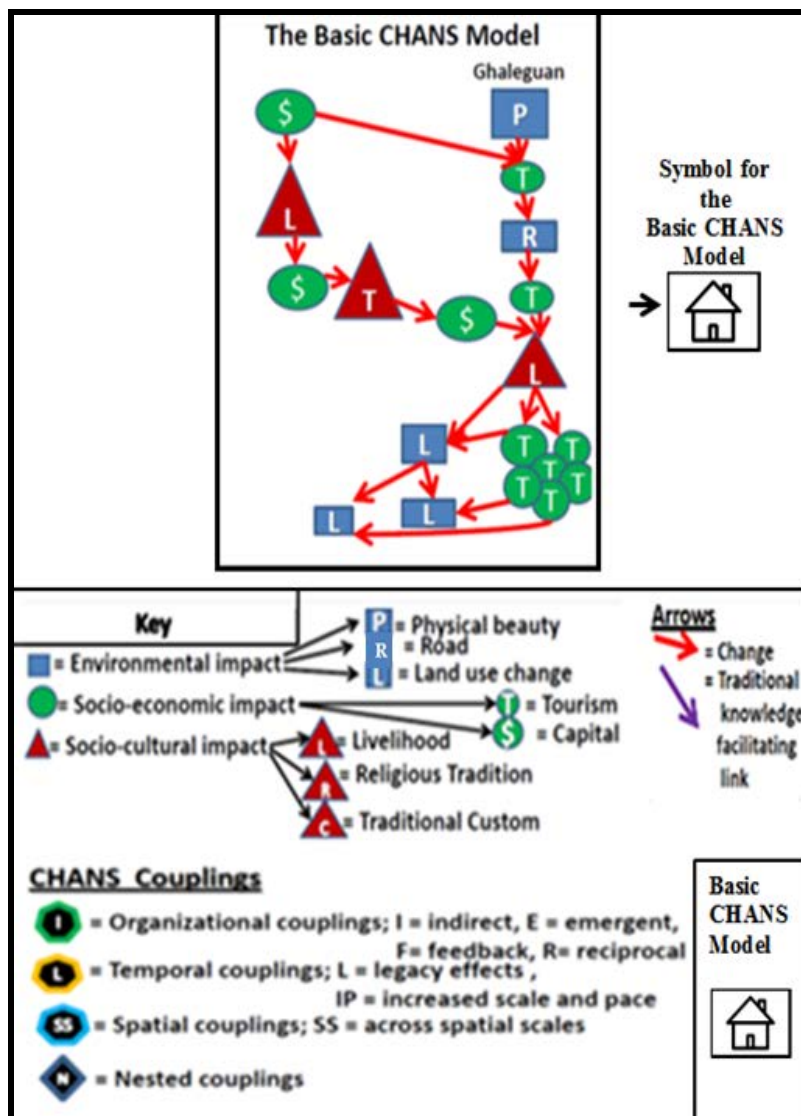
#### 4.2.2.2 Discussion

This analysis explains the basic CHANS couplings of road impacts on Ghalegaun and Ghanpokhara. I use this analysis to form a basic CHANS model of road impacts that I apply to all the other villages in the case studies. While not all these villages are identical to this analysis, the general model is informative of the overall process that occurs as the result of new road construction. I use abbreviations for the three interconnected links of environment (E), socioeconomic (SE), and sociocultural (SC) spheres. **Figure 4.5** illustrates the basic model for Ghalegaun. In the diagram, I color-coded each of these three links and labeled them with the letter that represents the particular kind of influence that is acting in each of the three categories. For example, a blue box with the letter P represents an environmental/physical factor, such as the physical beauty of a Himalayan mountain village setting. In addition, **Figure 4.5** serves as a key for the remaining figures in **Case Study 1** and their discussion.

The physical beauty surrounding Ghalegaun (an environmental [E-P] factor), lays the foundation for the potential to attract tourists (a socioeconomic [SE-T] factor). The beginning of the road into the area (E-R) enhances this opportunity. As tourists start to arrive, (SE-T) villagers shift traditional livelihoods strategies away from farming toward a new livelihood strategy in tourism (a sociocultural [SC-L] impact). However, this shift is only possible due to several previous traditional livelihood strategies (SC-L), migration for wage labor or service in the army, and social capital. In this way, traditional knowledge (SC-T) provides an enabling link to create a new adaptive strategy in that it supplies the capital (SE-\$) to make the changes necessary for a homestay.<sup>11</sup> This in turn leads to a change in land use (E-L), the construction of an outdoor toilet /shower facility and sleeping quarters.

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<sup>11</sup> Gurung have been migrating to serve in the Gurkha Regiment of the British and Indian Armies since the 17<sup>th</sup> Century, starting 400 years ago, which is approximately 20 generations of passing this tradition from father to son.



**Figure 4.5** Basic CHANS model and key for remaining figures in **Case Study 1**

This is both an environmental impact in the form of land use change, new structures built (E-L) and a sociocultural impact, which is a change from using the fields as a toilet to using an outhouse (SC-C) and adapting to accommodate foreigners and urban Nepalis in the village. As other villagers see the success of this program (SE), they want to become involved and start their own homestay (SC). In this way, the success of the program in Ghalegaun (SE) has influenced Ghanpokhara, 2 km away. Ghanpokhara is also beginning a homestay program (SC). This same model is applicable to Ghanpokhara, but there is an important environmental difference.

Ghalegaun is located first on both the trail, and on the new road alignment (E), and therefore more tourists stop in Ghalegaun first (SC).

The homestay committee, which I interviewed in Ghanpokhara, was working on a marketing plan (adaptive SE) to bring more tourists to Ghanpokhara. Several of the homestay organizers informed me that when more tourists start arriving (SE) they will stop their seasonal migration to the valley below to farm their fields in favor of staying in their village to operate homestays (SC). They see this as a positive change (SC) because tourism is easier than migrating up and down every season (SC, E), and it is more lucrative than farming (SE) (Ram B Gurung, farmer/ Ghanpokhara Homestay Committee member, Ghanpokhara, personal communication, October 23, 2009)

Another interesting part of this cycle is that the same socioeconomic incentive that produced the transition from farming to migration to seek additional income (including service in the Gurkha Regiment) has also contributed to the livelihood change from farming to tourism. In time, tourism may become a traditional livelihood strategy in this region as it has in some villages along the ACT (see **Case Study 5**).

Thus far, I have pointed out the interconnected linkages between environmental, socioeconomic, and sociocultural factors. This is just the bare framework over which I now describe the human and ecological couplings as described by Liu et al. (2007c:639).

The science of CHANS builds on but moves beyond previous work (e.g., human ecology, ecological anthropology, environmental geography). First, CHANS research focuses on the patterns and processes that link human and natural systems. Second, CHANS research, such as integrated assessment of climate change (22), emphasizes reciprocal interactions and feedbacks—both the effects of humans on the environment and the effects of the environment on humans. Third, understanding within-scale and cross-scale interactions between human and natural components (e.g., how large-scale phenomena emerge from local interactions of multiple agents and in turn influence local systems) is a major challenge for the science of CHANS. Although each of these three aspects has been addressed in some studies on human-environment interactions (23, 24), the science of CHANS promotes the integration of all these aspects.<sup>12</sup>

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<sup>12</sup> Footnotes in the quotation from Liu et al., 2007:

My goal in illuminating these couplings is to illustrate how road construction has an environmental impact that influences economic and cultural aspects of communities and how communities influence road construction due to these same economic and cultural influences. Liu et al., (2007c) categorize CHANS couplings in three major groups with specific couplings under each of these major groups (**Table 4.3**).

In the next sections, I use the terminology set forth by Liu et al. (2007c) (**Table 4.3**) to describe the specific CHANS couplings, nested in the three main couplings of organizational, spatial, and temporal, in the context of my research findings in Ghalegaun and Ghanpokhara.

#### **4.2.2.2.1 Spatial couplings**

Tourism is a good example of couplings across spatial scales. Tourism in Ghalegaun involves a combination of domestic and foreign travelers. Both are a result of global influences working their way through intermediate links to influence the local system. Foreign tourists are a global influence; they come from many cultures in diverse parts of the world. Global information sources such as the Internet influences the local level of family and community, which stimulates a desire to travel to Nepal. Intermediate links such as obtaining passports, visas, plane tickets, immunizations, and necessary essentials for the trip lead up to departure. The international flight passes through global links such as Los Angeles, Tokyo, and Bangkok (going west) or New York, Dubai, and Bangkok (going east) on the way to Nepal. Upon reaching Nepal, the local level has progressed through intermediate levels to have a global impact on the intermediate level of Kathmandu and then on to the local level when the international tourist treks to villages in the mountains. These links pass through not only physical space, but socioeconomic and sociocultural spaces as well. In 2010, tourists from 40 different nationalities came to Nepal (GoN/MTCA 2010).


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22. Intergovernmental Panel on Climate Change. 2006. (<http://www.ipcc.ch/>)

23. Stern, P.eE. 1993. A second environmental science: human-environment interactions. *Science* 260, 1897-1899.

24. Stem, P.C., .. Young, O.R. and Druckman, D. 1992. *Global Environmental Change: Understanding the Human Dimensions*. National Academy Press, Washington, DC.

**Table 4.3** Definition of Coupled Human and Natural Systems couplings

Organizational (O)	Spatial (S)	Temporal (T)
<p><b>Reciprocal effects and feedbacks:</b> People and nature interact reciprocally across diverse organizational boundaries and form complex webs of interaction that are embedded in each other</p>	<p><b>Couplings beyond boundaries:</b> A movement from a somewhat limited local scale of interactions to progressively larger scales</p>	<p><b>Rising natural impacts on humans:</b> Changes in natural systems also have increased human vulnerability in places and constrained options for human livelihoods</p>
<p><b>Indirect effects:</b> Many human nature interactions occur indirectly due to: 1) the use of human-made products (airplanes, automobiles, roads) ... all manufactured products ultimately come from natural systems and 2) alteration of ecosystem dynamics and services after use by humans</p>	<p><b>Couplings across spatial scales:</b> Global influences work their way through a series of cascading intermediate links to influence local systems and local influences can build their way to intermediate systems which in turn become global systems</p>	<p><b>Massive increases of human impacts on natural systems:</b> Over the past 50 yrs. humans have changed ecosystems more than in any other period of humans history and they have rapidly increased ecological footprints</p>
<p><b>Thresholds and resilience:</b> Transition points between alternate states or regimes</p>	<p><b>Heterogeneity:</b> Spatial couplings are not uniform, they exhibit a great deal of heterogeneity</p>	<p><b>Legacy effects:</b> The cumulative and evolving impacts of past interactions in CHANS on present and future</p>
<p><b>Vulnerability:</b> The degree of functionality of CHANS in response to changes in both internal and external variables</p>		<p><b>Time lags:</b> Varying intervals of time in between human and nature interactions and their ecological and socioeconomic effects</p>
<p><b>Emergent properties:</b> Properties which are not inherent in human and natural systems separately but emerge specifically from the interaction of the coupled systems</p>	<p><b>Escalating indirect effects:</b> Indirect interaction between human and natural systems have become more common and more pronounced due to rapid urbanization</p>	<p><b>Increased scale and pace:</b> Human nature interactions in the past were usually at the local level... they now occur increasingly at the regional, continental and global scales</p>
	<p>(adapted from Liu et al. 2007c)</p>	

I also argue that domestic Nepalese mountain tourists are a response to these same global influences. Tourism is largely a phenomenon of the middle and upper class. Until recently, there was no middle class in Nepal, and no domestic tourists other than the economically elite, whose destination is not rural mountain villages.

Global economic forces including tourism, trade, foreign investment, and remittance from labor in foreign countries helped develop a middle class in Nepal in the last 20 years (ADB 2010, Liechty 2005). This middle class now has the capital and interest to venture outside the city and explore mountain communities. In addition, I suggest that their interest stems from the international reputation Nepal garnered from mountaineering and foreign tourism. Therefore, both international and domestic tourists in Nepal are part of the spatial coupling of across spatial scales (SS) as depicted in **Figure 4.6**.

#### **4.2.2.2 Organizational and Temporal couplings**

Organizational couplings are involved in this cycle as well, including reciprocal effects and feedbacks, and indirect effects (see **Table 4.3**). The nature of tourism is very volatile and unpredictable because of economic and geopolitical influences in both the tourists' home country and the county of destination (Baral et al. 2008, Baral and Heinin 2006, Edmonds and Mak 2006, Bhattarai et al. 2005, Murphy et al. 2005). For example, tourism numbers in Nepal steadily increased from the time Nepal permitted foreigners to enter Nepal in the late 1950s, until 2001 when a combination of the Maoist People's War, the massacre of the Royal Family (June 2001) (see **Appendix E: A Brief Chronological History of Nepal**), and the events of September 11, 2001 ended that trend. However, tourist arrivals are increasing subsequent to the signing of the Peace Accord ending the Maoist People's War in 2006 (**Figure 4.7**).

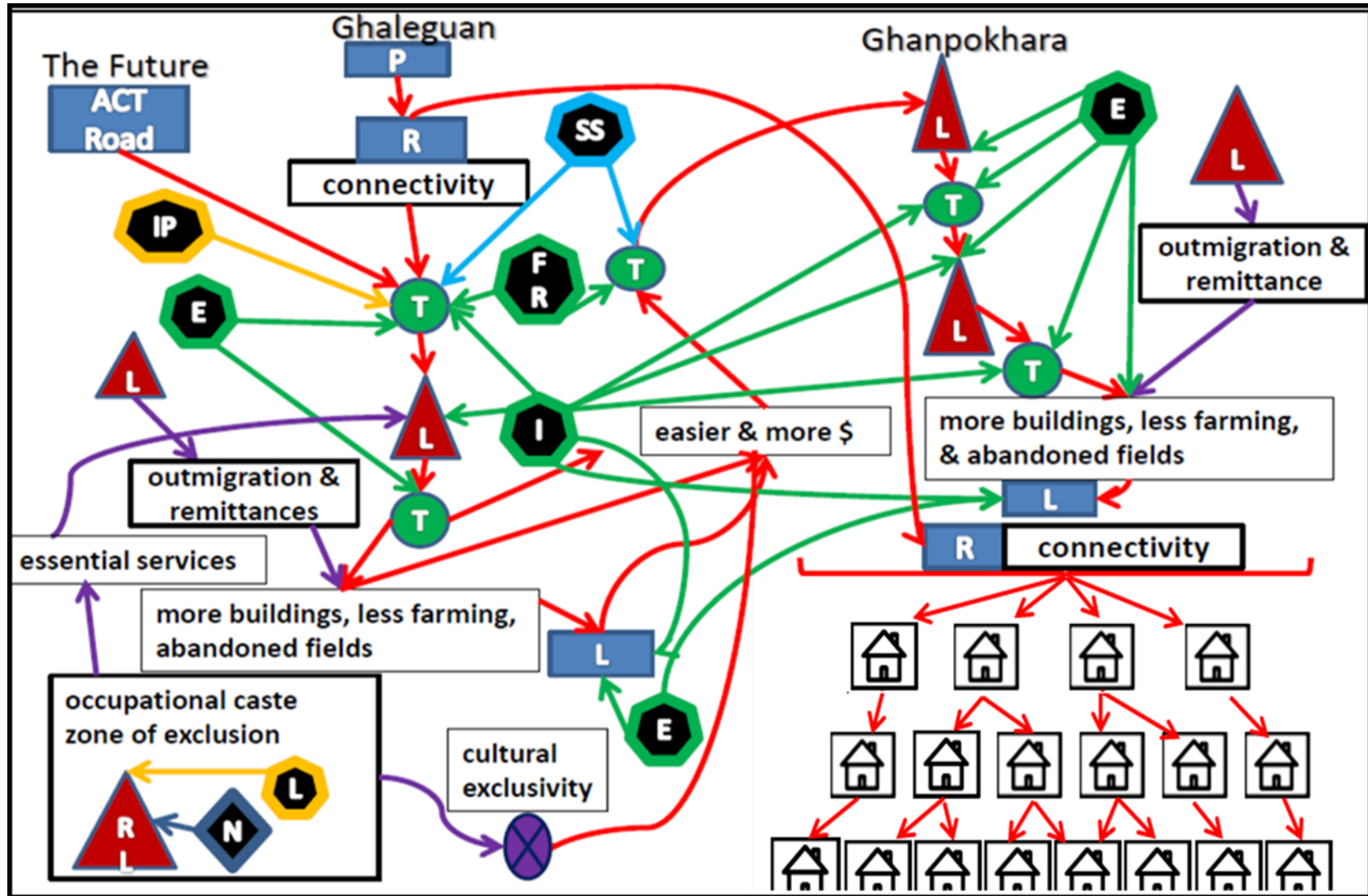
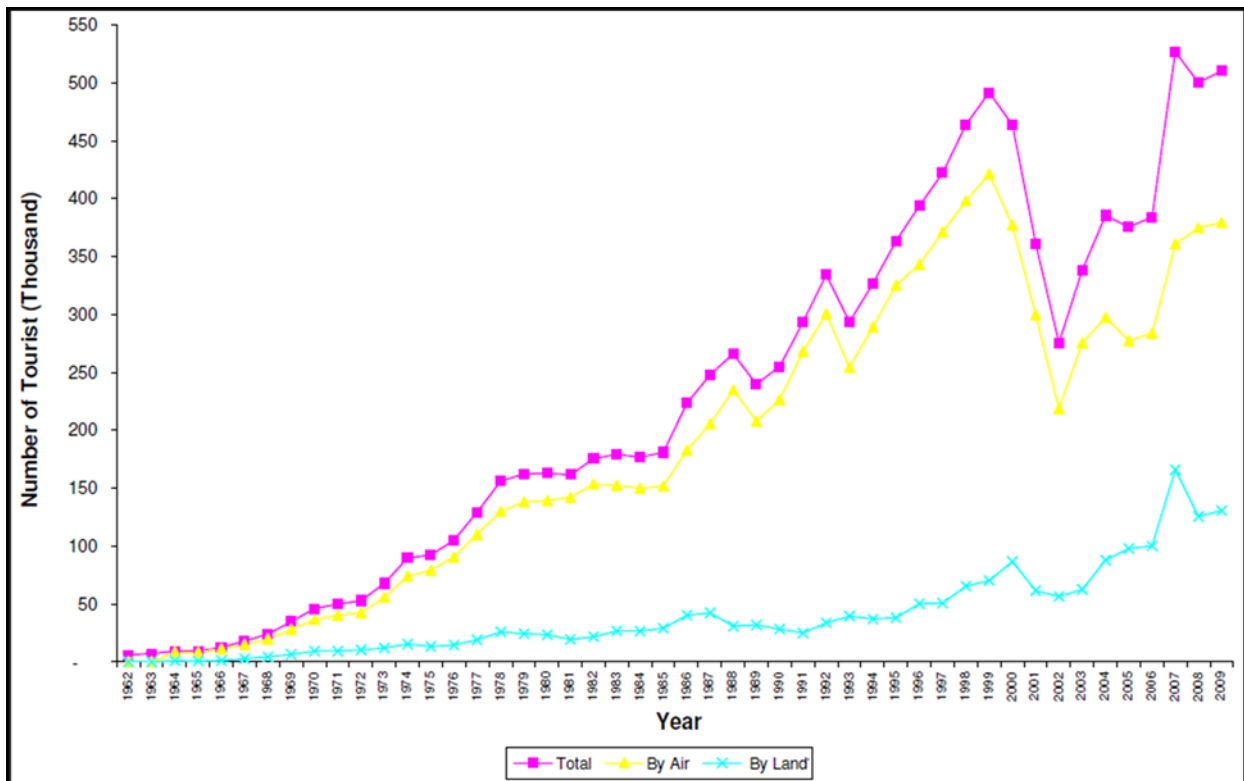


Figure 4.6 CHANS interconnected links and couplings in Ghaleguan and Ghanpokhara (see Figure 4.4 for key)

I argue that reciprocal effects and feedbacks couplings influenced this trend in complex human and ecological couplings in the following way. The Maoist People’s Liberation Army (MPLA) hiding in the mountains of Nepal waged guerilla warfare against the Monarchy and any institution associated with it, including the Nepal Police, the Royal Nepal Army (RNA), and protected areas under their jurisdiction such as ACAP. Using the forests and mountains as a safe haven, the MPLA destroyed bridges, bombed government installations, and attacked conservation offices, local police forces, and the RNA.



**Figure 4.7** Tourist arrivals in Nepal 1962 – 2009 (<http://www.tourism.gov.np/uploaded/statistics/2010.pdf>)

Just as quickly, they moved back onto the mountain trails to hide again in the forests. The MPLA used this tactic repeatedly as they moved from their base of operation in western Nepal toward Kathmandu in the east. The three government agencies that oversee conservation in Nepal, The Department of National Parks and Wildlife Conservation, The Department of

Forests, and the Department of Soil and Watershed Conservation were under attack by the MPLA. This included bombing of department headquarters, and harassment and assassination of conservation officers and security forces in protected areas (Baral and Heinin 2006). The MPLA emptied the forests of governmental forces and employees and in some places NGOs as well (Susan Jamon, C.O.O. Educate The Children Nepal, personal communication, October 2, 2009; Murphy et al. 2005). The insurgents took control of many villages in the mountains forcing the locals to provide food and shelter resulting in illegal tree cutting and creating an atmosphere of fear and insecurity. As a result, many Nepalis left their villages seeking safer places to live (Baral and Heinin 2006).

The MPLA presence in the protected areas of Nepal had a deleterious impact on the forests as well as the tourist economy. MPLA skirmishes with tourists including kidnapping, threats of violence, and requests for donations at gunpoint resulted in a steady decline in tourists' arrivals (see **Figure 4.7**). The revenues from tourist trekking visas and protected area entrance fees pay for the administration and policing of these protected areas. The combination of forcing conservation agencies out of the protected areas and removing their source of income by scaring away tourists left the MPLA effectively in control of Nepal's natural resources in areas of rich biodiversity (Baral and Heinin 2006). Hence, incidents of wildlife poaching, trade in endangered species, illegal tree cutting, and collection of endangered high value medicinal plants all increased during the Maoist People's War (Baral and Heinin 2006, Murphy et al. 2005).

This example highlights the complexity of CHANS in reciprocal and feedback couplings (see **Table 4.3**). However, this is only a snapshot during the 10-year period of the MPW (1996-2006). The couplings are much more complex when the analysis accounts for legacy effects and time lags that are involved in previous forest management policies (see **Appendix B: A Brief History of Community Forest Management in Nepal**)

#### **4.2.2.2.3 Nested couplings**

Nepalese society (SC) is nested (see **Table 4.3**) in the Hindu caste system (SC), it influences all aspects of Nepalese life. This nesting took place during the Shah consolidation of

Nepal in the mid-17<sup>th</sup> Century when Nepal became a Hindu kingdom. Historical, anthropological, and archaeological evidence suggest that the Gurung originally came from Tibet and practiced either Bön or Buddhism (Macfarlane 1990, Mumford 1990). To gain economic and political advantages they adapted to the norms of a Hindu kingdom through a process of acculturation termed “Sanskritization” (Stall 1963) or “Hunduization” (Whelpton 2005). Gurung now practice both Buddhism and Hinduism, and they adhere to the Hindu tradition of using the occupational castes to perform services considered impure, such as tailoring, shoe-making, and blacksmithing.

This in itself is a complex interrelated cycle. In order to enhance their lives (SE) the Gurung, through a process of acculturation (SC), were able to develop social capital (SC) with their Hindu neighbors. This helped them learn rice paddy cultivation (SC, SE) and grandfathered them into the Hindu caste system (SC), including employment of the Hindu occupational caste groups in Gurung villages (SC). In Ghalegaun, this has had a socioeconomic impact on the occupational castes by excluding them from the homestay program, while at the same time enhancing the Gurungs’ socioeconomic status. This complex coupling includes the legacy effects and time lags (see **Table 4.3**) of the evolution of both the ancient Hindu and Buddhist religious tradition as well as the present Gurung synthesis of Hinduism and Buddhism, and in some areas Bön (Mumford 1990).

The complex connections of environmental, socioeconomic, and sociocultural spheres and the CHANS couplings presented above (see **Figure 4.6**) is the simplest level of the diagram. If the full extent of couplings were drawn there would be so many connections that it would be impossible to interpret. For example, taking into account time lags and legacy effects (see **Table 4.3**) of the migration patterns of Hindu, Buddhist, and Bön practitioners to Nepal involves a highly complex matrix of environmental, socioeconomic, and sociocultural couplings (see Dhundup 2006, Whelpton 2005, Tamding 1998, Lewis 1994, Mumford 1990, Macfarlane 1989, Shaha 1988, Gurung, H 1980, Messerschmidt 1976, Hamilton 1819).

The main purpose of **Figure 4.6** is to point out the complexity and number of interconnected links that influence coupled systems. In this figure, I have also considered the possible future effects of not only the completed road to Ghalegaun, but also the main road that will take the place of the ACT in the Marsyangdi Valley. ACAP has proposed the trail to Ghalegaun as one of the alternate ACT trails. I suggest that once the Marsyangdi Road is complete, Ghalegaun will attract even more tourists. Furthermore, based on the pattern observed in other villages along the ACT that have capitalized on tourism, and on the migration trend (Lokshin et al. 2010) there will be a gradual increase in the abandonment of farmland. As the younger generation continues to migrate for work opportunities outside Nepal (Lokshin et al. 2010) and as the remaining villagers allocate more time to tourism related work they will either convert the farmland to homestays or abandon it as a source for income. Usually the abandonment of fields occurs from the furthest away, slowly progressing toward the village. Therefore, I hypothesize that the villagers in Ghanpokhara will abandon the land in the valley that requires seasonal migration.

Location (E) along the trail/road is a very important element in terms of tourism business (SE) potential. The complex element in this location factor is that it is not static. Until the road is complete, all the villages' locations relative to the end of the road will be constantly changing. Ghalegaun is the first village the road is now close to reaching, but as the road continues to be developed, another village will become the first. This could mean Ghalegaun will lose business to another village further down the road and Ghanpokhara may benefit from tourists who do not want to be on a busy, dusty road, and therefore take the trail to Ghanpokhara rather than staying in Ghalegaun. However, it is also entirely possible that Ghalegaun will retain its popularity because of its location on a ridge with spectacular views of the Himalayas. This highlights the importance of place attributes (see **Case Study 7**) as a mitigating factor in the CHANS of road impacts on tourism.

### 4.2.2.3 Summary

I suggest that while specific outcomes of road construction in the rural mountains of Nepal are somewhat unpredictable and change over time, there is a predictable model for the initial stages (see **Figure 4.6**). This cycle begins with the environmental attribute of a beautiful mountain setting as a ‘pull factor’ for tourism, followed by another environmental impact, a road. The road brings tourists which leads to land use change from agricultural land to tourist facilities, another environmental impact, as well as the socioeconomic impact of increased income, and the sociocultural change in livelihood strategies. As the road continues into a new area, this cycle repeats. However, the position of a village in proximity to the road, as well as other mitigating factors including traditional knowledge, influences each other through the interconnected CHANS couplings to affect how this cycle evolves. Some of these mitigating factors form the bases of the remaining case studies. This case study therefore serves as an underlying template of the CHANS couplings for the remaining case studies (see **Figure 4.6**).

### 4.2.3 Case Study 2: Road Construction and Emergent Properties (Lamjung District) “The road is one percent good and 99 percent bad”<sup>13</sup>

This case study illustrates how road construction techniques couple with natural forces resulting in emergent properties in two villages on the west side of the Marsyangdi River, Bahundanda and Ghermu, and in two villages on the east side, Sangye and Sirchaur (see **Table 4.1** and **Figure 4.1**). This includes road alignment influences on traffic flow and how that in turn influences local communities through temporal couplings.

#### 4.2.3.1 Background

The east side of the Thorang La Pass provides more challenging problems for road construction than the west side. The recently constructed section from Besisahar to Sangye is the easiest section to build because it is relatively flat (see **Figure 4.1**). Road construction is continuing by hand labor (**Figure 4.8**) beyond Sangye at a very slow rate.

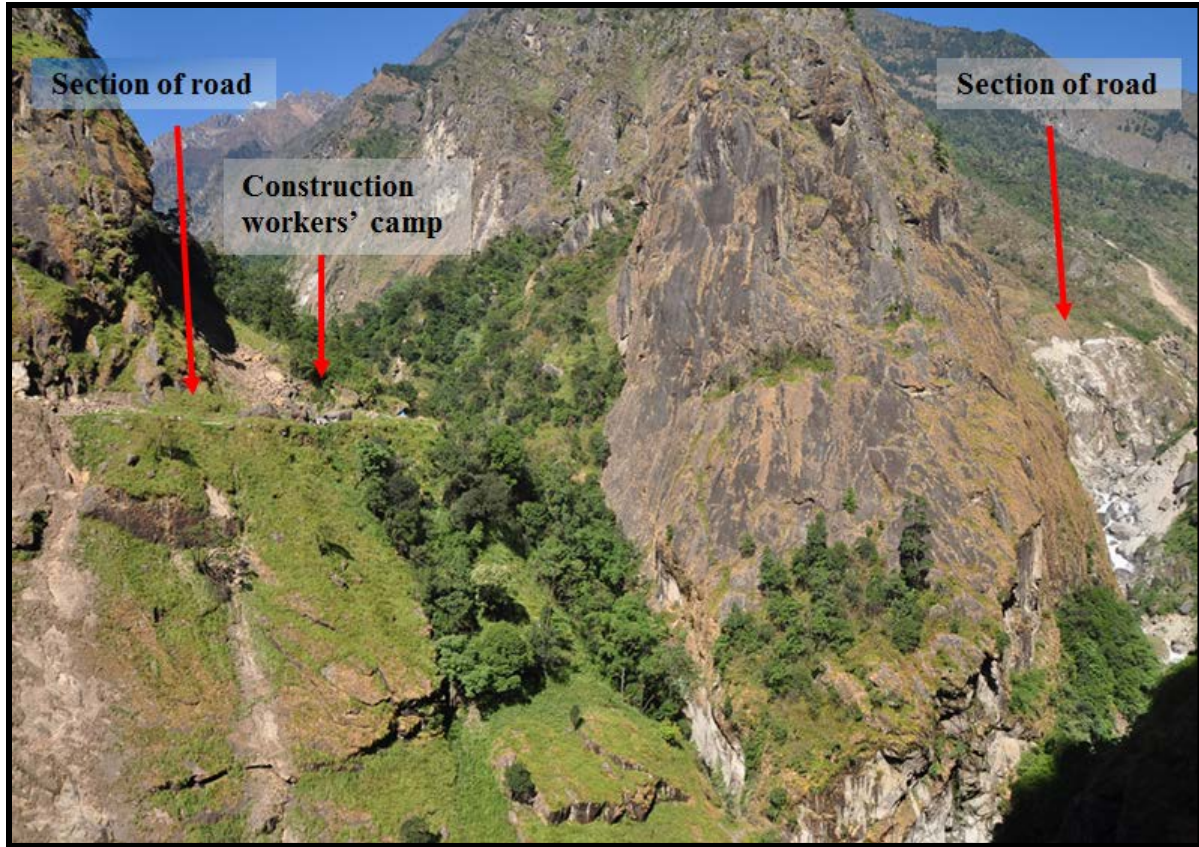
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<sup>13</sup> B. Ghimire, guesthouse owner, personal communication, October, 25, 2009



**Figure 4.8** Hand labor on the Marsyangdi Road past Sangye (R.E. Beazley 2009)

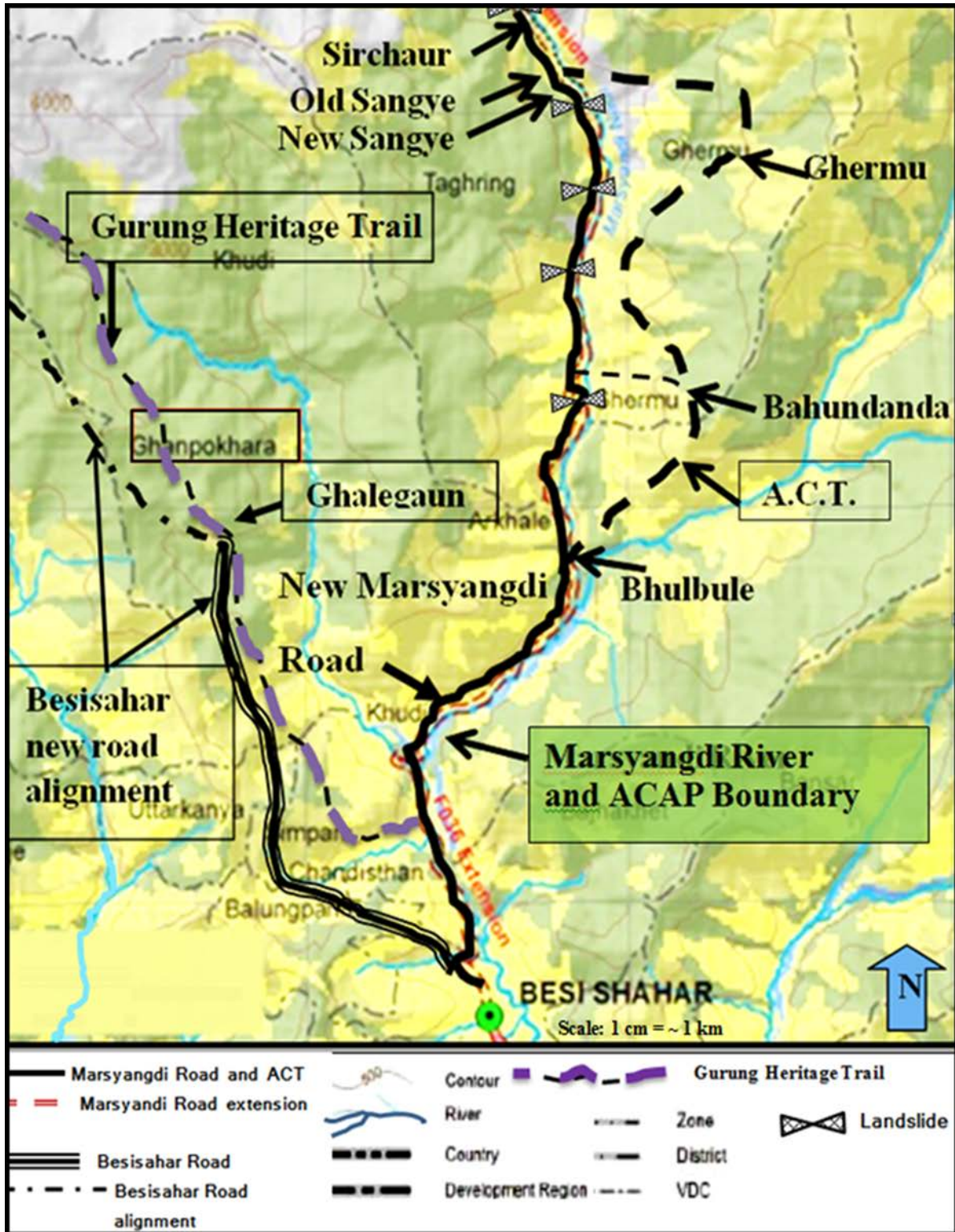
Above Sangye, are three vertical cliffs (**Figure 4.9**) that will require either blasting a ledge into the cliff face, which has already begun on one section, or going over the top of the mountain to complete the road. Due to the vertical nature of the valley on this side of the pass, there are significantly more signs of erosion and landslides. I observed numerous landslides (**Figure 4.10**) along both, the completed section of the road to Sangye, and the portion under construction past Sangye (**Figure 4.11**). Villagers reported that the road is not passable during the monsoon due to the frequent landslides. These landslides are not only a threat to personal safety, but often take valuable agricultural land with them as well. Erosion and landslides are good examples of the organizational coupling of emergent properties: “Properties which are not inherent in human and natural systems separately but emerge specifically from the interaction of the coupled systems” (Liu et al 2007c:631).



**Figure 4.9** One of several vertical cliffs slowing down construction of the Marsyangdi Road (R.E. Beazley 2009)



**Figure 4.10** One of numerous landslides along the Marsyangdi Road (R.E. Beazley 2009)



**Figure 4.11** Map of the new Marsyangdi Road, the new Besisahar - Ghalegaun Road, the Annapurna Circuit Trail (ACT), the Gurung Heritage Trail, and the villages where I conducted research for **Case Study 1 and 2** (Adapted from GoN/MPPW/DoR 2008a)

#### 4.2.3.2 Discussion

This emergent property of landslides along mountainous road cuts is well documented in Nepal (Hasegawa et al. 2009, Dahal et al. 2008, Petley et al. 2007, Dahal et al. 2006, Mertz et al. 2006, Mertz 2004, Hearn 2002, Upreti and Dital 1996, Deoja 1994, Carson, 1985), as well as in other places in Asia (Salick et al. 2005, Daming et al. 2004, Ives 2004, Hamilton and Bruijnzee 1997, Hewitt 1997, Deoja 1994, Karan and Iijima 1985), and elsewhere (Sidle et al. 2006).

In addition to the organizational coupling of emergent properties, reciprocal effects and feedbacks, indirect effects couplings are present as well. Several temporal coupling are also present. The time lag coupling emerges in the interplay between the time when the road construction takes place in the dry season and the time when the heavy monsoon rains trigger landslides along the poorly constructed road cuts. I further suggest that the temporal coupling of rising natural impacts on humans is also involved. Liu and colleagues (2007c:643) define rising natural impacts on humans as “Changes in natural systems have increased human vulnerability in places and constrained options for human livelihoods.” In Nepal, landslides and other forms of mass-wasting such as debris flows constrain options for villagers livelihoods by removing productive agricultural land and crops, killing livestock, destroying houses, trails, and roads, closing roads and trails for months, and causing accidental deaths.

Landslides and floods are the most common natural disasters in Nepal. From 1983-2005 there were 6984 deaths caused by floods and landslides averaging 303 per year and equaling a third of all the fatalities from all natural disasters (Upreti 2006). The true figures are substantially higher considering these are only the reported cases, and that the lack of communication networks in the rural mountainous areas of Nepal could account for many more. From 1983 to 2003, landslides and floods destroyed 143554 houses, averaging 7329 annually (Upreti, 2006). Again, these figures are misleading because they only take into account the houses destroyed at the time of the disaster. The time lag coupling of CHANS is evident because countless other houses sustain damage and destruction due to unstable land in the wake of the incident. The total cost of damage to infrastructure due to landslides and floods is approximately US \$20 million

per year in Nepal (Khanal 1996). One lodge owner told me that the Marsyangdi Road was dangerous due to landslides. He said there had been numerous injuries on the road including a jeep that rolled off the road plummeting to the river below, killing all those inside (Ram Devkota, Bahundanda lodge owner, personal communication, October 25, 2009).

Currently environmental guidelines as well as best practice techniques for road construction are not enforced and severe erosion, landslides, and mass-wasting will continue to be a problem in the future. Due to these difficult conditions, the construction of the road is moving very slowly. Consequently, the leap-frog and ribbon type of development described in the literature on road impacts is occurring, creating boom and bust towns, such as New Sangye, along this section of the road (**Figure 4.12**). This case study looks at how road alignment can create this type of development and how villagers along the route are adapting to it.

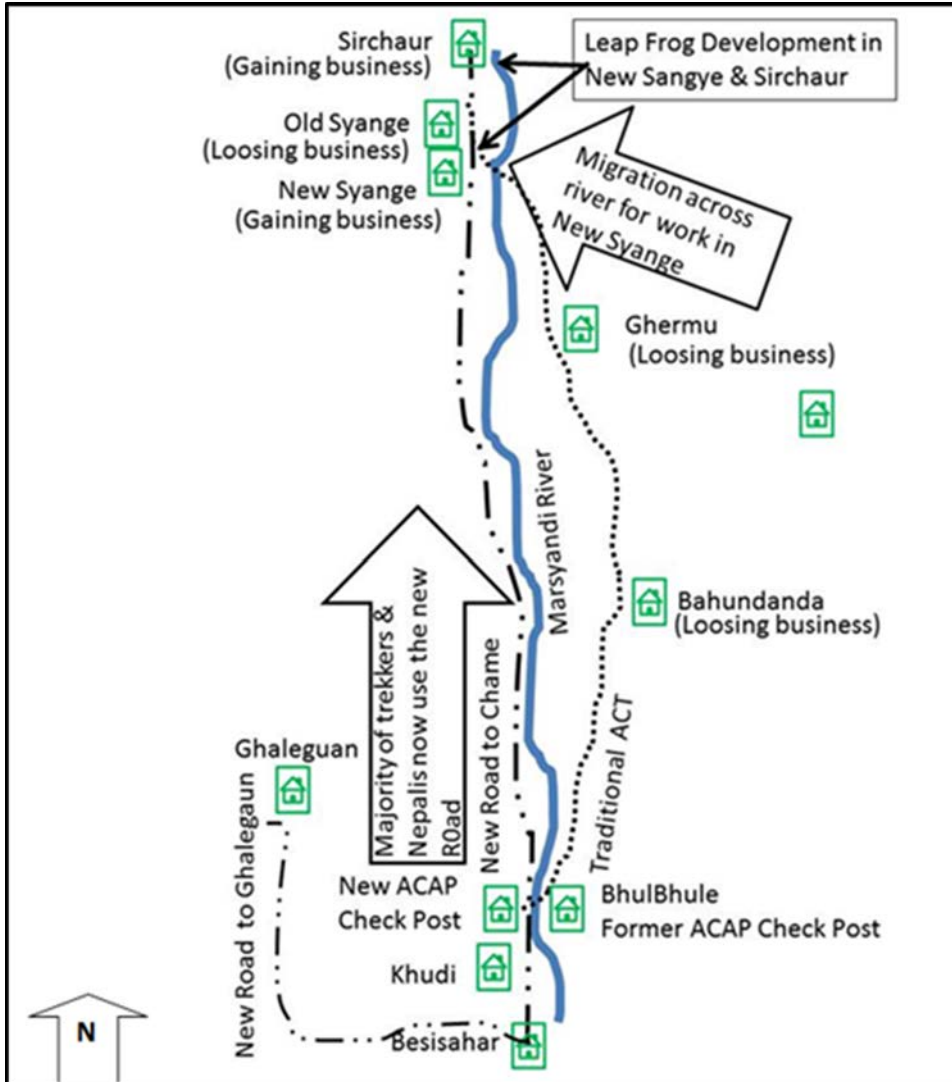
Until the road construction began, everyone going in or out of the Marsyangdi Valley followed the traditional trail (ACT). The trail crosses to the east side of the Marsyangdi River for the first time at Bhulbule (see **Figure 4.11**). It then climbs a long hill to the village of Bahundanda, and proceeds up river for about 10 km to Ghermu. After passing through Ghermu, the trail crosses back to the west side of the river again to the town of Syange and then continues up the Marsyangdi Valley. The new road however, stays on the west side of the river from Bhulbule to Sangye, bypassing Bahundanda and Ghermu completely (**Figure 4.12**). Nevertheless, it still helps the villagers of Bahundanda because they can use the road up to the point where they can cross the river on another foot trail directly across from Bahundanda.

#### **4.2.3.2.1 East side of Marsyangdi River (bypassed by the new road)**

##### **a. Bahundanda**

The walk from either of the ACT starting villages of Besisahar (in the 1980s) or Khudi (present), to Bahundanda is a full first day on the trail for most trekkers ( **Figure 4.12**). The trail

crosses to the east side of the Marsyandi River at Bhulbhule. In the past, after crossing the river, trekkers stopped at the old ACAP check post ( **Figure 4.12**) to show their trekking permit.



**Figure 4.12** Summary diagram of Case Study 2, the road alignment and the impacts on local villages.

Then, they climbed the long ascent to the town of Bahundanda, which can take several hours. However, upon reaching Bahundanda at the end of the day, the spectacular 360° panorama of the Himalayas made the climb worth the effort. For this reason, many trekkers

stayed in Bahundanda before the road reached Sangye. After the road arrived, the old ACAP check post was moved from the east side of the Marsyandi River to the Marsyangdi Road side (west) of the river. Currently, all trekkers must stop at the new check post, and then many decide to walk up the new road or take a jeep to the end of the road at Sangye rather than crossing the river and climbing the traditional ACT to Bahundanda. This makes for a much easier first day as the road is straight and climbs gently; hence trekkers can get further up the trail.

Many lodge owners in Bahundanda reported that their business is down due to the new road. Shop and restaurant owners whose clientele is both Nepalis and trekkers also confirmed this explaining that Nepalis choose to use the road for walking, for their mule trains carrying goods, or for a ride in a jeep, for the same reason as trekkers; it is flatter and easier than the trail. This change in the flow of traffic is hurting the shop owners business in Bahundanda, not only during the trekking season, but also in the off-season when they rely on income from Nepali customers. Several lodge owners maintained that the road caused them to lose 35-70% of their business. Most of the lodge owners agreed that they do not benefit at all from the road. They said that prices of goods and transportation have not gone down and it would be better if the road had never been built. Farmers interviewed all felt that the road was positive as it made their lives easier. Most of them claimed that prices of goods and transportation had gone down.

Lodge owners in Bahundanda are using several different adaptive strategies to mitigate the impacts of the road on their business. One lodge owner who claimed his business was down 50% said: "The road is 99% bad and 1% good, 99% of the people on this side of the river don't want the road" (Shiva Pudrai, lodge owner, Bahundanda, personal communication, November 26, 2009).

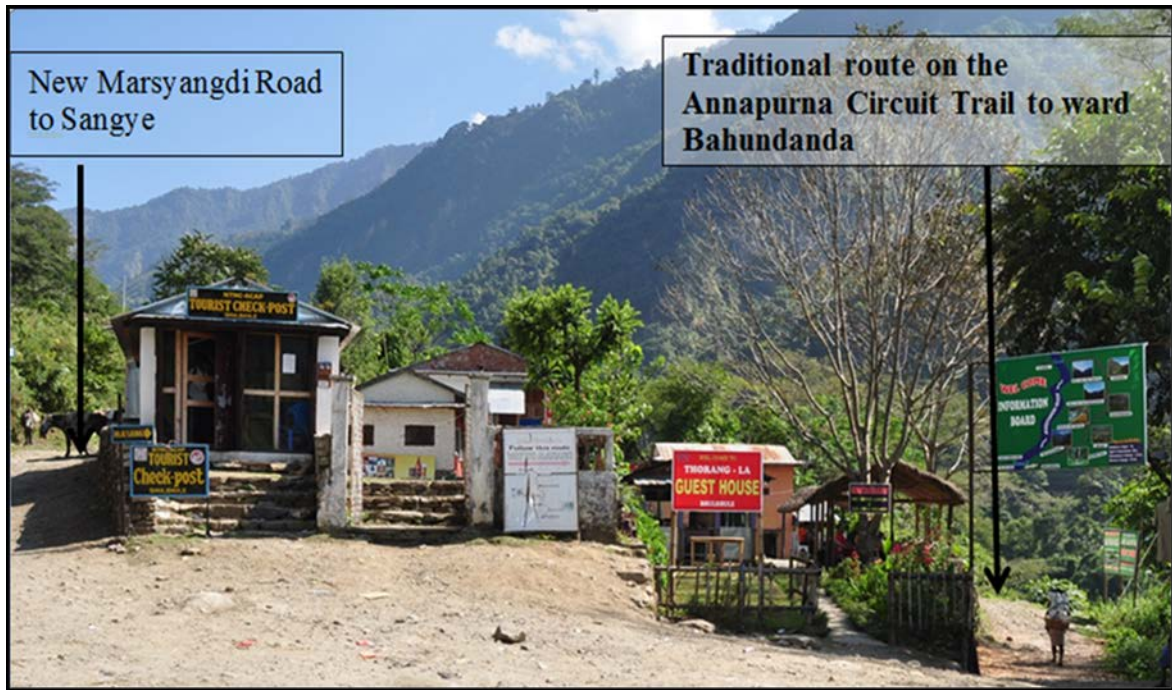
This contradicted several of the farmers and the health post officer, who all said they were very glad to have the road and added that if the road actually came right through Bahundanda, it would benefit them even more. Nonetheless, the lodge owner has put a sign in every room of his lodge explaining his views about the road. When I asked farmers about his statement that 99% of the people were against the road one farmer said: "Lodge owners are not

everybody, local people like the new road. It saves us time. It used to take 2 to 3 days to go to Kathmandu, now we can get there in one” (Vijay Baad, farmer, Bahundanda, personal communication, November 26, 2009). This is a sentiment that I heard from farmers in virtually every village I visited. Several lodge owners also made this point saying that villagers involved in tourism make up only 10-15% of the inhabitants and therefore the road is good for the majority.

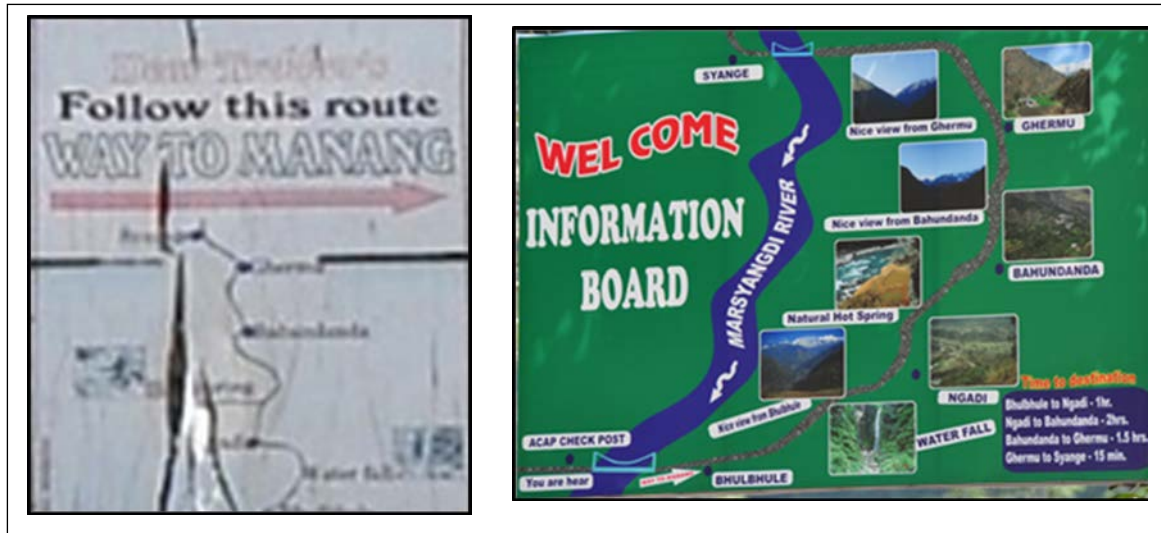
Lodge owners in Bahundanda have tried several other adaptive strategies. It is interesting to note that these are both reactive and proactive strategies. The lodge owners realize that there is no stopping the road at this point and consequently have tried several initiatives to influence trekkers to use the traditional trail through Bahundanda, including the following:

- Putting a sign at the new ACAP check post in Bhulebule pointing the way across the bridge to the traditional trail (ACT) that goes through Bahundanda (**Figures 4.13 and 4.14**).
- Putting a sign in guesthouse rooms about the road and why it is not fair.
- Requesting that the ACAP check post be relocated in Bahundanda so all trekkers will have to come to Bahundanda to have their trekking permits checked.
- Requesting that jeeps going up the road only take Nepali customers.

According to one lodge owner, the signs have not made any difference so far, and the other requests were denied (Khrisna Shrestha, lodge owner, Bahundanda, personal communication, November 26, 2009). The one proactive strategy was to request the Nepal Tourism Board to develop another trekking trail from Bahundanda to a nearby scenic lake in honor of the famous Nepali conservationist, Dr. Harka Gurung (<http://www.nepalitimes.com/issue/317/remembrance/12572>). Dr. Gurung grew up in Bahundanda and the lodge owners hope that the new trail would attract more trekkers because of his reputation.



**Figure 4.13** ACAP Checkpoint with signs pointing to Bahundanda (RE Beazley 2009)



**Figure 4.14** Enlargement of signs in **Figure 4.13** above pointing the way to Bahundanda (RE Beazley 2009)

These strategies highlight the fact that the communities on the east side of the Marsyangdi River cannot ask ACAP for help. Technically, they are just outside the ACAP boundary formed by the Marsyangdi River (see **Figures 4.11** and **4.12**). Many lodge owners in Bahundanda

complained about ACAP. They felt that ACAP capitalized on tourism by collecting ACAP entry fees for many years when the old check point was outside the ACAP boundary (on the east side of the river; see **Figure 4.12**). ACAP took the money and never did any community development projects in their village, or any other village on the east side of the river (Krishna Shrestha, lodge owner, Bahundanda, personal communication, November 26, 2009). The fee that ACAP collects from trekkers is supposed to go toward community development projects within ACAP, but technically ACAP does not have to use any of that money for projects in communities on the east side of the river because they are outside the ACAP boundary.

Farmers' adaptive strategies for taking advantage of the road in addition to the obvious ones of getting produce to market faster, cheaper, and easier were as follows:

- One farmer's son is a jeep driver in Besisahar and transports goods and people along the new road.
- One of the *Dami* (occupational caste) villagers who previously walked with loads of fruit on her head from Besisahar to Bahundanda (to sell to trekkers and others in Bahundanda) can now bring bigger loads to Bahundanda with less walking by taking a jeep to the trail opposite Bahundanda, making her life much easier.

There are several examples of nested couplings, reciprocal effects and feedbacks, indirect effects, and emergent properties in Bahundanda that display the complexity of coupled systems.

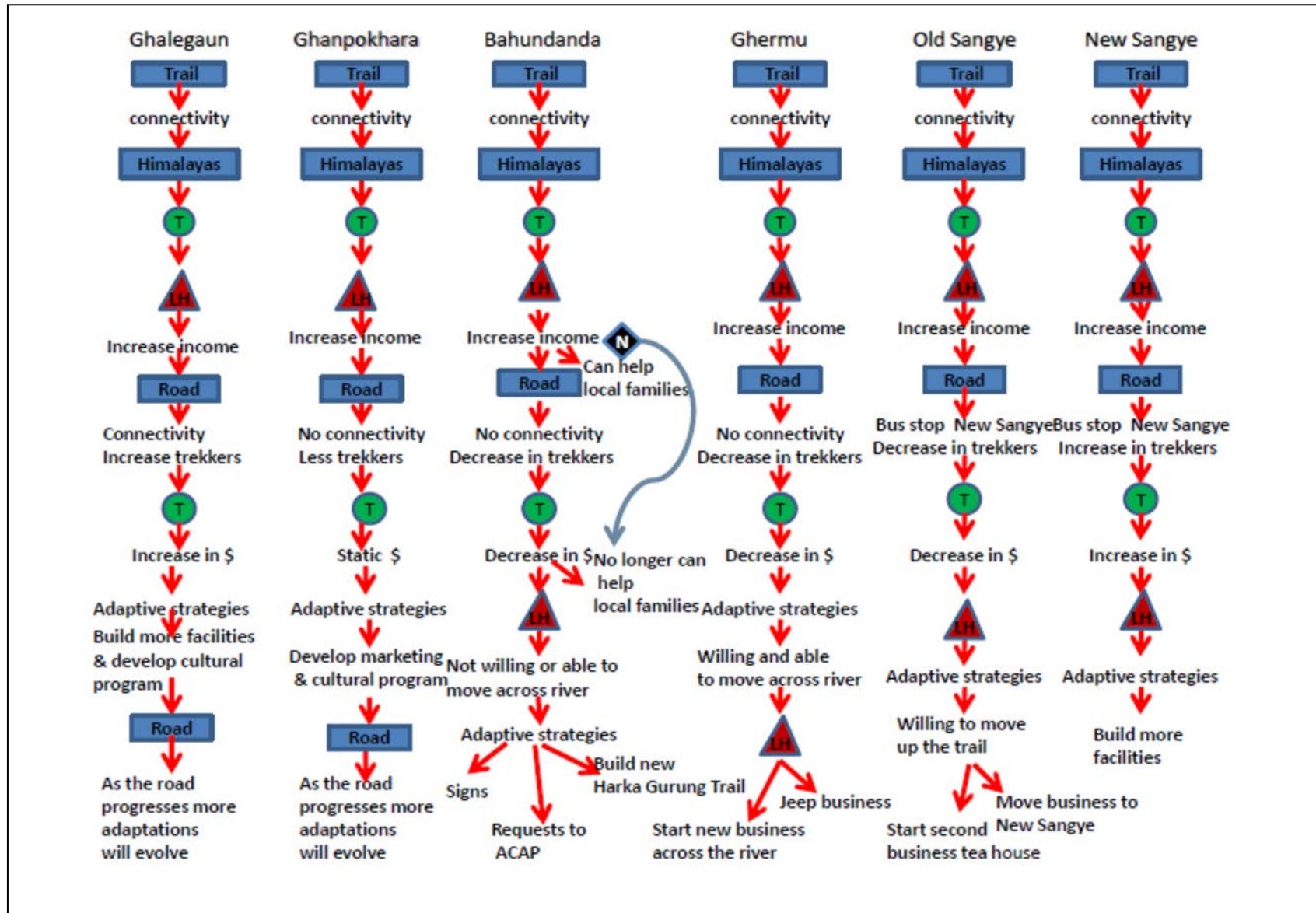
First, one of the lodge owners was helping several of the poorer families in Bahundanda. He employs the *Damai* fruit seller's daughter in his lodge as a cleaner. He is also helping a widow in the village by paying her daughter's school tuition. He is able to do this because he earns income from trekkers staying in his lodge. Due to the decline in trekkers since the road arrived, his business is down and he is uncertain how long he can continue to help these families (Kamal Paudal, lodge owner, Bahundanda, personal communication, November 26, 2009). In this way, the road has had an indirect impact, not only on the lodge owner, but on several of the

poor families as well. In the case of the *Damai* fruit seller, indirectly the road has threatened her daughter's potential to add to the family income, but at the same time, it has directly enhanced the mother's potential as a fruit seller by making it easier to get to market and buy fruit. Ironically even though it is easier for her now to get fruit, one of her main customers, trekkers, are decreasing due to the road, a good example of reciprocal effects and feedbacks, and nested couplings (**Figure 4.14**).

In a second example, the farmer whose son is now a jeep driver was able to relocate to Bahundanda from another district and buy a farm because her older son migrated to London for work and sends her remittances (Lakshmi Gurung, farmer, Bahundanda, personal communication, November 25, 2009). In this case, the road is helping in two ways, by giving her younger son the opportunity to start a new business as a jeep driver, and by making it easier, faster, and cheaper to get her produce to market.

#### **b. Ghermu**

Ghermu is the next major village approximately 10 km up the trail from Bahundanda (see **Figures 4.11** and **4.12**). It is smaller than Bahundanda and does not have Bahundanda's panoramic views, but it was popular with trekkers who wanted to go a little further than Bahundanda or, if the lodges in Bahundanda were full, it provided an alternative. There were no lodge owners in Ghermu to interview because most of them had decided to move their bases of operation to the west side of the river in Sangye, due to the decrease in business in Ghermu since the road arrived (**Figure 4.14**, see **Figure 4.12**). This is an adaptive strategy to take advantage of the opportunity the arrival of the road provided. All trekkers and Nepalis get off the bus at the end of the road in Sangye, which is the perfect location to start a trekking lodge, restaurant, or small store. More specifics on this will be discussed below in the New Sangye section.



**Figure 4.15** Diagram of comparison of adaptive strategies to road construction by villages in Case Study 1 and 2 showing the nested coupling in Bahundanda (see **Figure 4.4** for key).

#### 4.2.3.2.2 West Side of Marsyangdi River (new Marsyangdi Road side)

##### a. Sangye

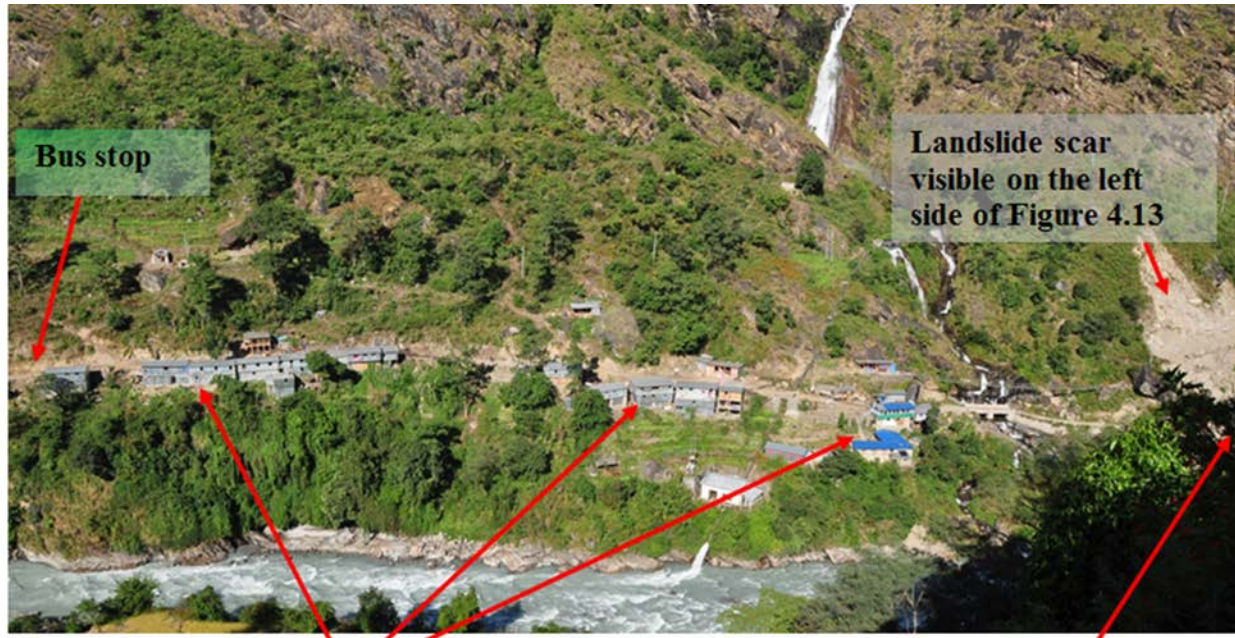
Sangye is approximately 10 km upstream of Bahundanda and on the opposite side of the Marsyangdi River (see **Figures 4.11** and **4.12**). It is strategically located at the end of the traditional ACT Bridge that crosses the river (**Figure 4.16**, see **Figure 4.12**). It is also the present terminus of the new road (2010), until construction resumes. The bus stop is half a kilometer downstream of this bridge. Local villagers have taken advantage of the bus stop area to start businesses that provide arriving trekkers and Nepalis with services. There is a completely new section of Sangye, which was built very quickly after the road arrived in 2007 (**Figure 4.17**, see **Figure 4.12**).



**Figure 4.16** The bridge crossing the Marsyangdi River on the original Annapurna Circuit Trail at Sangye (R.E. Beazley 2009)

New Sangye consists of three new guesthouses, two new restaurants, and a number of other new shops. Old Sangye has two guesthouses, in addition to a number of shops (**Figure 4.17**). The lodge owners in Old Sangye told me that since the road arrived their business has

gone down because the new guesthouses are the first ones people see as they get off the bus, so they either spend the night there or go further up the trail.



**Figure 4.17** Photo of New Sangye, which was built after the road arrived. To the right, out of the picture frame, is Old Syange where the original Annapurna Circuit Trail crosses a footbridge on the Marsyangdi River trekking from Ghermu and Bahundanda. (R.E. Beazley 2009)

was glad to have the road as it made getting in and out of the area easier. In order to make up for the lost business, she had plans to build a teahouse further up the trail hoping to sell cold drinks and Nepali *chiya* (tea) to trekkers. Previously she was a farmer as well as the manager of a *bhatti*. A *bhatti* is similar to a tavern; a common place for Nepalis to stop for food, the local alcohol called *raksi*, and lodging. Operating a *bhatti* has traditionally been one of the main additional livelihood strategies rural families use to supplement their incomes, especially during the non-farming season.

A vegetable shop owner, who has been in business for 28 years, said his business had not changed since the arrival of the road. However, this may be because he has the only vegetable shop in town. He thought everyone is happy with the road, as it has brought more development such as schools and electricity.

The new businesses in New Sangye (see **Figures 4.15** and **4.12**) are owned by a combination of people from Old Sangye and from the village of Ghermu across the river. Ghermu experienced the same decrease in trekkers as Bahundanda after the road arrived. One shop owner from Ghermu, who built a new shop in New Sangye, told me his business was even better in New Sangye than it was in Ghermu before the road arrived. Two other villagers from Ghermu also said that their businesses were doing well. One had started several businesses including a restaurant, a jeep transportation service, and a guesthouse. The second villager owned one of the guesthouses in Old Sangye and relocated to get better business. His younger brother now runs his previous lodge in Old Sangye. The older brother admitted that he was stealing a lot of business from his younger brother because his new lodge is located at the bus stop.

#### **b. Sirchaur**

Sirchaur is approximately two km further up the trail from Sangye. The road to Sirchaur is not improved enough for bus travel, so those arriving by bus get off at Syange. However, it is possible for jeeps to reach Sirchaur. Several Nepalis I encountered on the trail entering town told me there were two new guesthouses in Sirchaur (Ram Kumar and Krishna Gurung, Nepali trekkers, Sirchaur, personal communication, November 25, 2009). Although I did not have time to do in-depth interviews in Sirchaur, I did observe two new guesthouses (**Figures 4.17** and **4.18**). It was obvious both from the new signs, one of which read New Mongolian Guest House (**Figure 4.18**) and the new buildings that these guesthouse had been recently constructed. In addition, the makeshift New Mongolian Guesthouse Restaurant with a spray painted sign (**Figure 4.19**) is indication that it was built quickly to take advantage of the new business the road is bringing.



**Figure 4.18** One of the new guesthouses in Sirchaur (R. E. Beazley 2009)



**Figure 4.19** The New Mongolian Guesthouse, Sirchaur (R. E. Beazley 2009)



**Figure 4.20** The New Mongolian Guesthouse Restaurant, Sirchaur (R. E. Beazley 2009)

#### **4.2.3.3 Summary**

Organizational couplings, including reciprocal effects and feedback loops, indirect effects, and emergent properties, can be observed in all the villages in this case study. This case study also shows the importance of temporal couplings inherent in the CHANS of road construction. In this case, the time lag coupling emerges influencing a number of factors including leapfrog and ribbon development, which links with migration in order to take temporary advantage of an economic opportunity (see **Figure 4.12**). The lodge owners in Ghermu, unlike the business owners in Bahundanda, adapted to the economic impact of decreased business due to the road by relocating so that they are at the most advantageous spot for business, at the bus stop where the road currently ends (see **Figure 4.13**). Several people in Old Sangye have done this as well. Not only has this made up for their lost business in Ghermu,

but for some, business is actually better than it was before the road arrived. The most interesting aspect of this is that they all admitted that once the road is extended past their village they may lose a lot of the business they now have. This shows that they are aware that this is a dynamic process involving time lags and that adapting to change by quickly relocating once the road arrives is necessary to capture the temporary economic boom provided by the road currently ending in Sangye. Another interesting aspect is that although the bus stop is in New Sangye, the road is good enough for jeeps to continue on to the next village of Sirchaur, about 2 km further up the trail. This has stimulated the building of several new guesthouses. Both New Sangye and Sirchaur are good examples of one of the impacts of the time lags coupling of this type of slow road building, which leads to leapfrog and ribbon development in Nepal. I suggest that as the road continues to make its way slowly up the valley a series of boom and bust towns will develop.

Finally, I argue that the CHANS of improper cut and fill road construction techniques coupled with monsoon rains results in landslides, and that the organizational couplings of reciprocal effects and feedbacks, indirect effects, and emergent properties as well as the temporal couplings time lags, and rising natural impacts on humans are present (see **Section 4.2.3.1** and **4.2.3.2**).

#### **4.2.3.4 Comparison of Case Study 1 and 2**

It is informative to compare **Case Study 1** with **Case Study 2** (**Table 4.4** and see **Figure 4.13**) because they both have issues related to road alignment with villages that are on the main road and villages that are bypassed. They both exhibit examples of spatial and temporal couplings.

##### **4.2.3.4.1 Differences**

1) In Ghalegaun (**Case Study 1**), the road is seen by all villagers as being good for business. The road is coming toward the village, so it is actually helping both farmers and homestay owners, while in Bahundanda (**Case Study 2**) the road is going away from the

village and completely bypasses it on the other side of the river, effectively funneling people away from Bahundanda (see **Figures 4.11** and **4.12**).

2) The second interesting difference is in the tourism clientele. In Bahundanda, lodge owners rely mostly on western trekkers for business, whereas in Ghalegaun the homestay business is mostly from Nepali tourists. I argue that there is a big difference in perspective between these two groups of tourists. In general, western trekkers are seeking an experience in the Himalayas specifically to get away from vehicles and traffic. Nepali tourists mostly come from Kathmandu where they are accustomed to constant traffic jams and roadblocks (*bhanda*) and the general chaos of Kathmandu, which has to be experienced to be believed. They are not as concerned with the road issues as westerners because by comparison to Kathmandu the relatively few vehicles on rural mountain roads feels like “getting away from away it all” to them. One Nepali from Kathmandu who accompanied me on a 5-day trek to the famous scenic spot at Poon Hill said the views were great but she would not come to the area again until there was a road (Rhitu Shrestha, Nepali tourist, Poon Hill, personal communication, April 10, 2009)

3) Another very important difference is the influence of ACAP. Ghalegaun is within the ACAP Boundary formed by the Marsyangdi River (see **Figures 4.11** and **4.12**).and ACAP has been instrumental in the success of the homestay program in Ghalegaun. This is an example of a nested institutional coupling, which is also one of Ostrom’s (2000) eight design principles for successful community based natural resource management. In this instance, the human natural system coupling involves local villagers, coupled with ACAP’s 25 years of experience successfully operating a community managed protected area, and the environment.

**Table 4.4** Comparison of adaptive strategies to new road construction in **Case Study 1 and 2.**

Case Study /Town	Side of river	Km to road	Road impact			Adaptive strategies		
			E	SE	SC	E	SE	SC
<b>Case Study 1</b>								
Ghalegaun	W	2	On road alignment	Homestay increased income	Change in livelihood	Have built homestay	Use social capital to borrow money to build	Showcase Gurung culture
Ghanpokhara	W	4	Road alignment by- passes	Want homestays	Potential change in livelihood	Want to build homestay	Start marketing plan to attract tourists	Showcase Gurung culture
<b>Case Study 2</b>								
Bahundanda	E	5	Road bypasses on other side of river	Decreased income	May need to change livelihood	Request ACAP checkpoint moved, signs, & plan for new trail	Discount room prices, signs	Signs & request only Nepalis permitted to ride in jeeps
Ghermu	E	5	Road bypasses on other side of river	Decreased income	May need to change livelihood	Built new facilities across the river in New Sangye	Making up for lost income in Ghermu	Move across the river & start new livelihoods
New Sangye	W	0	Current end of the road	Increased income	Change in livelihood	Built facilities	Gaining income	Change in livelihood
Old Sangye	W	0.5	Just past the end of the road	Losing business	May have to change livelihood	Build a tea house up the trail	Hope to increase income	Change in livelihood
Sirchaur	W	3	Past the end of the road, jeep access	Gaining business	Change in livelihood to tourism	Build new guest house	Hope to increase income	Change in livelihood
<b>KEY:</b> E = Environmental, SE = Socioeconomic, SC = Sociocultural								

The result is a sustainable portfolio of ecosystem services, enhanced community projects such as clean water and more efficient stoves, and increased income for the villagers (Baral et al. 2010, Nepal 2002, Nepal 2003, Wells 1994).

4) Both Bahundanda and Ghermu are outside the ACAP Boundary formed by the Marsyangdi River (see **Figures 4.11** and **4.12**) and not part of any ACAP program and therefore receive none of the ACAP benefits. Sangye on the other hand is within ACAP boundaries, so the entrepreneurs who moved across the river from Ghermu to Sangye may gain some advantage. However, this remains to be seen.

#### **4.2.3.4.2 Shared qualities**

- 1) In both villages remittances from relatives who have migrated to find work has enabled diversification in livelihood strategies. In the case of Ghalegaun, a son's work in the Indian Army supplied the necessary cash to build a toilet/shower facility as well as a separate building for a homestay. In Bahundanda, remittance from a son in London enabled the family to relocate and buy a farm. This then placed them in the area of new road construction, which gave the other son the opportunity to start a jeep business.
- 2) Even though the road is having different effects in both cases, it is interesting to note that village location in relation to the road and road alignment is having a significant impact on the communities (see **Table 4.4**). In Bahundanda and Ghermu, the road is having negative impacts on lodge owners but positive impacts on everyone else. This is because the road alignment completely bypasses both communities and is on the other side of the river, funneling people away from them. In Ghalegaun, it is having positive impacts on everyone in the community because the road alignment is coming toward the village and their Nepali clientele do not see the road as negative. Ghanpokhara, further up the trail from Ghalegaun, is not on the road alignment so they are losing business to Ghalegaun, similar to Old Sangye losing business to New Sangye. I suggest that while the road to Ghalegaun is facilitating tourism now, once the road continues past Ghalegaun the

number of tourists may fluctuate as access to a new tourist area is opened. The lodge owners in New Sangye have already anticipated that this may also happen to them after the Marsyangdi Road continues further up the valley.

#### **4.2.3.4.3 Facilitating linkages**

In both of the above cases, traditional knowledge in the form of the traditional livelihood strategy of migration to seek wage labor and sending back remittances is the facilitating link (see **Table 4.4**). In Ghalegaun, it provided funds for a farmer to invest in building facilities to start a homestay. In Bahundanda, it contributed enough income for a family to move to Bahundanda from another less fertile district and buy a farm, which in turn led to one son starting a jeep business on the new Marsyangdi Road. The main difference in facilitating links is the help of ACAP for Ghalegaun and the lack of ACAP help for Bahundanda and Ghermu as described previously (see **Table 4.4**).

#### **4.2.3.4.4 Summary**

The complex interconnected links in both of these case studies are heavily influenced by the alignment of the road and the stage of road construction (see **Figures 4.11** and **4.12**). In **Case Study 2**, the environmental influence of aligning the road along the west side of the river has had a very large impact on the communities on both sides of the river. On the west side of the river, these impacts are seen as positive by the farmers and positive by the lodge owners in New Sangye, but negative by the lodge owners in Old Sangye. The communities that are on the east side of the river are completely bypassed; hence, shop and lodge owners are losing a lot of business from both westerners and Nepalis. The farmers, however, are grateful to have a road to get their produce to market. The two main communities along this section of the trail have employed different adaptive strategies to cope with the loss of business (see **Table 4.4** and **Figure 4.13**). The towns of New Sangye and Sirchaur are good examples of how slow road construction can lead to leapfrog and ribbon development.

In **Case Study 1** the alignment of the road, which will reach Ghalegaun but bypass Ghanpokhara, is having a similar effect. Ghalegaun benefits because it is closest to the new road where the buses stop, and because jeep passengers can make it all the way to Ghalegaun in the dry season. Ghanpokhara is losing business to Ghalegaun because it is another 2 km down the trail and not on the road. The homestay owners' strategy to capture more of this business from Ghalegaun is to develop a marketing campaign that will make tourists more aware of the uniqueness of their village. I suggest that as the road continues into this area the same type of leapfrog and ribbon development that is occurring in Sangye and Sirchaur will also develop along the Ghalegaun Road.

Both of these case studies are good examples of temporal couplings, including time lags and legacy effects. As the road construction progresses over time, the impacts in each of these villages will change. Time lag effects will continue to occur as the road moves past one village and on to the next. The legacy effects are present in Ghalegaun with the coupling of the cumulative knowledge of 25 years of ACAP's management of community based natural resource management. Legacy effects are present in Bahundanda and Ghermu with the evolution of trekking tourism from its first beginnings in the late 1970s, through the boom period of the 1990s, followed by the Maoist People's War to the present decline in business due to the road.

#### **4.2.4 Case Study 3 and 4: Impacts of Road Proximity (Manang District)**

**“The sooner the road gets here the better”<sup>14</sup>**

##### **4.2.4.1 Background**

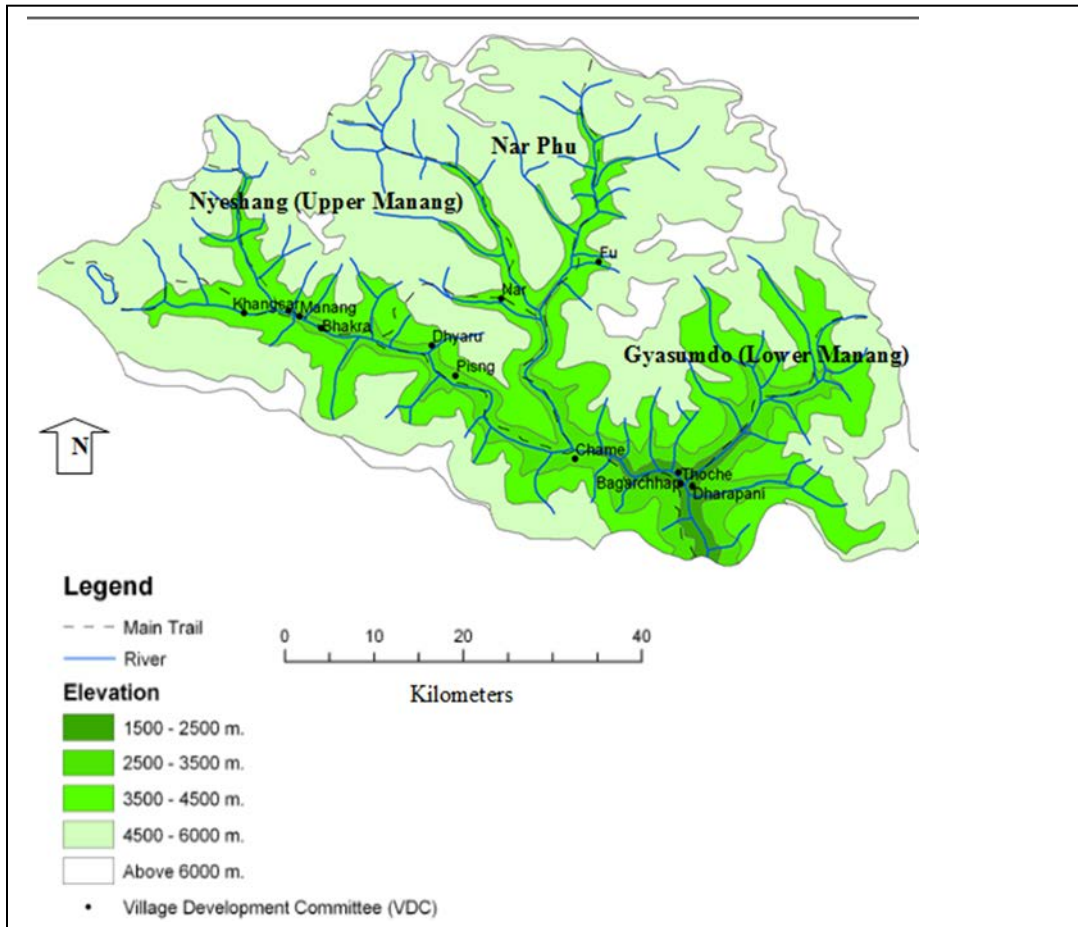
###### **4.2.4.1.1 Manang District**

Manang is the next district that the ACT enters after Lamjung District. Manang covers approximately 25% of the Annapurna area and is home to approximately 9500 people (2001)

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<sup>14</sup> Lama Kalsong, Tibetan Buddhist Lama, personal communication, November 17, 2009

making it the least populated district in Nepal (NTNC 2008a). Manang ranges in elevation from 1880 m to 8136 m and lies behind the Annapurna Massif (**Figure 4.20**).



**Figure 4.21** Map of Manang District with the three regions of Gyasumdo (Lower Manang), Nar Phu, and Nyeshang (Upper Manang) (Adapted from Digital Himalaya [http://himalaya.socanth.cam.ac.uk/collections/maps/nepalmaps/district\\_manang\\_everything.gif](http://himalaya.socanth.cam.ac.uk/collections/maps/nepalmaps/district_manang_everything.gif))

The geophysical characteristics of Manang are important in understanding the adaptations the people of Manang have made in order to survive. Manang has more sloped land than any of the other districts of Nepal. Of its total land area of 277,703 ha (Vaidya and Gautum 2008), more than 90%, is sloped at 30 degrees or more (Nepal District Profile cited in Rogers 2004). Over half the total land area is classified as snow (Vaidya and Gautum 2008), 83% hills and rocks (DDC 2002 cited in NTNC 2008a), and barely 1% is considered agricultural land (Vaidya and Gautum 2008). Due to additional characteristics such as the large range in elevation, extreme

temperature variations, and low rainfall in areas due to the rain shadow effect of the Annapurna Himal, Manang has the lowest percentage of land under cultivation of any of the 75 districts of Nepal (GoN/NPCS/CBS 2001a).

Manang also has the lowest ratio of cultivated land per person of any district, even though it is also the least populated (Zurick and Karan cited in Rogers 2004). It is quite diverse culturally with 17 different ethnic groups and 12 different languages (Gurung, H et al. 2006). Buddhism (74%) is the predominant religion practiced, followed by Hinduism (25%), and the remainder being Christian, Jain, Islam, Kirat, and other (HMGN/CBS 2001). The district, both ecologically and culturally, constitutes three areas, Gyasumdo (Lower Manang), Nyeshang (a.k.a. Nyishang or Upper Manang), and Nar Phu (see **Figure 4.20**).

The history of the origins of the people of Manang is uncertain, as there are no written documents with reference to the first settling of the area. Oral history indicates that the first Nyeshangba (this is the term local inhabitants refer to themselves by) to inhabit Upper Manang arrived around 600 B.C.E. While there are many references to the people of this area originally coming from Tibet, oral history suggests that Thongjeri, a regional king in Tibet, captured the area that is now Manang. Manang remained under Tibetan control for another five generations. In the 600s C.E., Tibetan King Songsten Gonpo married the daughter of one of the kings of the Kathmandu Valley. Subsequently, Songsten Gonpo, in deference to his new wife's father, freed Manang from Tibetan control (Messerschmidt et al. 2004).

Another migration from Tibet to Manang occurred when Buddhism came to Tibet (7<sup>th</sup>-8<sup>th</sup> Century). At that time, many Tibetans practiced the pre-Buddhist shamanistic tradition Bön, which involved animal sacrifices. As Buddhism became widespread in Tibet, many Bön practitioners left Tibet in search of places in the Himalayas to practice Bön without persecution (Messerschmidt et al. 2004). This explanation is probable, as there are Bön *gompas* (temple) in the Nar Phu area and there are still practitioners in both Manang District and neighboring Mustang District to the west (Fürer-Haimendorf 1983). In addition, Mumford (1990) writes that in Gyasmudo the Gurung practiced animal sacrifices, which over time they incorporated into

Buddhist practice, an indication that before Buddhism arrived Bön was the predominant practice in the area. This also fits with the local myth that the Buddhist adept Milarepa came to the Upper Manang valley in the 11<sup>th</sup> Century, meditated in a cave nearby, and converted a local hunter from Bön to Buddhism (Bagu Gurung, Braga lodge owner, personal communication, November 14, 2009).

At some point, the Ghale decedents of a Tibetan king arrived in Nyeshang (the Tibetan name of the Upper Manang Valley where the Nyeshangba live) where they established a kingdom subjugating the Gurung inhabitants. Local myth again holds that the Ghale established Buddhism as the main spiritual practice and banished the Bön shamanistic practitioners, who then migrated south to Gyasumdo (Messerschmidt et al. 2004). It is thought that the Kagyu sect of Tibetan Buddhism may have arrived with the Ghale who came from Tibet over the Nar La pass settling first in Nar Phu and eventually in Nyeshang (see **Figure 4.2**). There is a famous Kagyu *gompa* in Phu, Tashi Lhakang, which is said to have been built by a great Tibetan lama who also built another one in Nyeshang, the Bodzo *gompa* near Braga. The lama son of the fifth Ghale king of Ngawal had another *gompa* built, Braga *Gompa*, in Braga (see **Figure 4.2**). These three *gompas* were the center of Buddhist spiritual life in Nyeshang, which, at that time, included a large group of monks (Van Spengen 1987). Several of these *gompas* are 400-500 years old, including Tari Gompa in Khangsar (see **Figure 4.2**) further north in Nyeshang (Messerschmidt et al. 2004).

Van Spengen (1987) suggests that the Ghale influence on the area was more than just religious, and that they also effected a change in the agricultural practices. Using an extensive irrigation system they were able to grow buckwheat and barely along the Marsyangdi River in an area that received very little precipitation, less than 350 mm per year. This provided food security for over half the year in a high altitude environment that had previously not been cultivated in this way by the Gurung inhabitants.

There are three different regions of Manang: Gyasumdo, Nar Phu, and Nyeshang (see **Figure 4.2**).

Gyasumdo includes the area from Tal to Chame along the Marsyangdi River and the area a little to the north (see **Figure 4.2**). The town of Thonje (see **Figure 4.2**) at the confluence of the Dudh Khola and Marsyangdi Rivers used to be a minor center for trade with Tibet used by traders travelling the secondary salt trade route up the Dudh Khola and over the Larke La and Gya La Passes (see **Figure 4.2**). The importance of this trade route with Tibet was eclipsed by the much more heavily used Kali Ghandaki River corridor route to Tibet, on the Mustang (west) side of the Thorang La Pass to the west of Manang (see **Figure 4.2**).

The people of Gyasumdo are mostly Gurung, Ghale, and Lama ethnic groups, and Brahmin and Chhetri Hindu caste groups. The area north of the Marsyangdi River is inhabited mostly by Gurung, Ghale, and Tibetans, with the latter entering the area about 100 years ago (Mumford 1990). Religious practices vary with the different groups, Brahmin and Chhetri practicing Hinduism, Tibetans practicing Buddhism, and the Gurung a mixture of Hinduism, Buddhism, and Bön in some places, and further north a mixture of Gurung Shamanism called Khepre and Buddhism (Gurung, NJ 1976).

Along the Marsyangdi River from Tal to Chame, (see **Figure 4.2**) the environmental conditions are sufficient to grow two crops per year. However, the range of crops that can be grown is much less than in Lamjung due to the higher elevation, a cooler climate, and less rainfall. Consequently, rice is not a main crop as in Gyasumdo, except in the most favorable locations. Wheat, buckwheat, and barley are the main crops sown. Livestock are also somewhat different again due to the climate. Yaks are kept at higher elevations, as well as a yak-cattle hybrid called *dzo*. Sheep, goats, and water buffalo are also kept. Medicinal plants play an important role in the lives of Gyasumdo inhabitants with 40 species being used including yartsagumba (*Cordyceps sinensis*), ephedra (*Ephedra sinica*), and valerian (*Valeriana officinalis*) (NTNC 2008a). In addition to being used locally for medicine many of these plants also contribute to people's income through sale and trade (Ghimire et al. 1999).

The Gysamundo area ends where the Phu Khola River meets the Marsyangdi River near the town of Kyupar (see **Figure 4.2**). The Nar Phu region takes its name from the two rivers that

drain the area (Nar Khola and Phu Khola) and the two main villages of Nar and Phu (see **Figure 4.2**). The people of Nar Phu are mostly Lama, Ghale, and Gurung ethnic groups. They share similar Tibetan cultural traditions with many of the highlander groups along the northern border of Nepal. In particular, Fürer-Haimendorf (1983) claims they have a close cultural affinity to groups living in northern Dolpo District and the Limi area of Humla District in western Nepal (see **Figure 3.1**), and that their language belongs to the same Tibeto-Burman family as Tamang, Gurung, and Thakali.

Both Nar and Phu villages are much further north and at higher elevation than most of the other villages in Manang with Nar at 4100 m and Phu at 4080 m. The area is very arid, and rock and ice cover almost 80% of the total land area. Cultivable land is negligible and restricted to alluvial deposits along the rivers making up only 0.1% of the total area. Grazing land comprises almost 20%, and forest and shrub make up the remaining 2.5 % (Gurung, G and McVeigh 2000).

The main crops are barely and potatoes with wheat and buckwheat providing additional variety in limited amounts. Only one crop a year is possible consequently, animal husbandry is very important and yaks make up the bulk of the livestock. Yaks provide essential products for the local inhabitants as well as for sale or trade. It has been estimated that Nar village alone has over 1000 yaks owned by 43 households. In addition, *dzo*, sheep, goats, and horses are also raised (Gurung, G and McVeigh 2000).

Livestock rearing is extremely important for the people of Nar Phu and a large amount of time is spent in activities related to animal husbandry. Several pasture management systems are used to ensure the fertility of the grazing areas including transhumance, rotational grazing, and deferred grazing (Gurung, G and McVeigh 2000). Collecting medicinal plants is another important livelihood strategy for the people of Nar Phu as the highly valued caterpillar fungus called *yartsagumba* (*Cordyceps sinensis*) in Nepal is found in the area and sale of this and other high value medicinal plants contributes substantially to their yearly income (NTNC 2008a).

Nyeshang (a.k.a. Nyishang) is the Tibetan name for Upper Manang (see **Figure 4.2**), the largest of the three valleys in Manang District. The people of this area refer to themselves as

Nyeshangba. There are ten settlements in Nyeshang with the village of Manang being the largest. While Nyeshang is not as limited as Nar Phu in terms of agricultural production, only one crop a year during the summer season is possible for similar reasons, such as lack of rainfall and elevation. High altitude grains including buckwheat, barley, and wheat are grown and are the main staples. Crops such as rice, millet, and corn cannot survive. As in many other high mountain areas in Nepal, potatoes are the main vegetable that is cultivated. In addition, cauliflower, cabbage, onion, garlic, spinach, and carrot are grown in kitchen gardens.

Animal husbandry is an important part of the livelihood strategies in Nyeshang, providing valuable fertilizer for the fields in addition to animal products for consumption. Primary livestock include yak, oxen, sheep, horse, and goat (Chaudhary, Aase, and Vetaas 2007). Migration and trade have been important alternative sources of income for many people living in marginally productive agricultural areas in the mountains of Nepal. The people of Nyeshang have benefitted more than any other group in Nepal from trade, and their entrepreneurship is the subject of many books and articles (Chaudhary et al. 2007, Rogers 2004, Van Spengen 2000, Gurung, NJ 1976). However, their pattern of trade is unique in that they were not involved with the Trans Himalayan Salt Trade (THST) like many other Nepali Himalayan communities. While there were trans Himalayan trade routes on either side of Nyeshang, in Mustang and Gyasumdo, the people of Nyeshang benefitted very little from the THST because there were monopolies on the trade in both areas and there was no good route to Tibet directly from their valley (see **Figure 4.2**). Consequently, their trade developed south within Nepal and with India initially (Rogers 2004).

The beginning of the major trade period for the Nyeshang started in the 18<sup>th</sup> Century when King Rana Bahadur Shah granted the Nyeshang special privileges to travel and freedom to trade without having to pay custom taxes. Successive rulers continued this policy for several hundred years, by which time the Nyeshang were trading not only in Nepal and in India, but also further afield in Southeast Asia and Hong Kong (Rogers 2004).

During the long Himalayan winters many Nyeshangba migrated south for six months to escape the cold, reducing the stress on the already limited supply of food in the valley, and traveled long distances to conduct trade. The major rise in trade for the Nyeshangba occurred in the 1960s when the Nepalese government granted the Nyeshangba passports, thereby extending their trade options to a much greater extent. With the arrival of direct air links from Kathmandu to Bangkok and Hong Kong in the 1970s, many Nyeshangba began moving to Kathmandu. This trend continued to increase so that by the early 1990s the population of Nyeshang had decreased by 60% compared to 1971 (Rogers 2004).

By the time their trade privileges finally expired, the Nyeshangba had established themselves in Kathmandu as one of the most successful entrepreneurial success stories in Nepal. In addition to trade, their business skills helped them take advantage of the trekking business as the number of trekkers slowly increased from the late 1970s into the 1980s.

The combination of these three seasonal activities of agro-pastoralism, trade, and tourism (see **Appendix I: Manang Seasonal Round Diagram**) has helped the Nyeshangba to survive in a harsh mountain environment, or to move to a less harsh environment such as Kathmandu. After acquiring sufficient capital in Kathmandu, many Nyeshangba have recently returned to their valley to invest in tourism.

#### **4.2.4.1.2 Case Study 3 and 4**

I grouped these case studies in three parts to analyze how the road affects villages in relation their spatial proximity to the road. The villages in **Part 1 (Section 4.2.4.2)** are on the Marsyangdi Road alignment and will therefore be on the new road once it arrives. **Part 2 (Section 4.2.4.3)** looks at villages that are on alternate trails currently used by trekkers, but will not be on the new road and will be less than 10 km from the road. **Part 3 (Section 4.2.4.4)** analyzes villages that are on alternate trails that currently have restricted access to trekkers, will not be on the road, and will be greater than 10 km from the road. Therefore, villagers' perceptions of what will happen as the road progresses combined with narrative about current events form the basis of these case studies. Even though the road currently only reaches Sangye,

it is still having an influence on all of these villages, which in several cases are 70-80 km removed. Many of the CHANS couplings emerge in these two case studies and in particular spatial couplings.

#### **4.2.4.2 Villages on the ACT and the Marsyangdi Road Alignment**

This case study compares five villages that will be on the main Marsyangdi Road once it is complete: Pisang, Humde, Mugje, Braga, and Manang. I analyze how these villages are adapting to the impacts of the coming road (**Table 4.5**), which I then compare to villages not on the road alignment (**Sections 4.2.4.3 and 4.2.4.4**).

##### **4.2.4.2.1 Background**

It is informative to consider the evolution of trekkers' facilities along this section of the ACT because it gives the reader a sense of the importance of trails, and by extension roads, to people living in the Himalayas, and it also traces the land use and livelihood changes described in **Case Study 1**.

The Manang Valley (**Figure 4.22**) has always been very hard to travel to and from because of the steep vertical gorges extending 10-15 km before reaching Pisang. In the past, this section of the trail was treacherous, even for locals. In many places, the trail shifted from the ground to rickety bamboo walkways clinging to vertical cliff walls.

The famous explorer and mountain climber H.W. Tilman in his classic account of his travels in Nepal in the 1950s, *Nepal Himalaya* (1952:128), describes this section of the valley.

The track, having crossed the river by a bamboo bridge, which the rapidly rising river would soon demolish, embarked upon the passage of a series of cliffs. To overcome these builders of the road had exercised boldness and ingenuity, stringing wooden galleries across the face. Such structures, known as 'parri', are common in the Gilgit region where they are usually stout enough; in the Marsyangdi they were pretty frail, particularly the hand rails which were better left alone or at the most touched rather than grasped. They were seldom wider than a single plank and were reached by a stone staircase or up-ended logs with footholds cut in them.

**Table 4.5** Road impacts and Coupled Human and Natural Systems couplings of villages on the Annapurna Circuit Trail and Marsyangdi Road alignment (Section 4.1.4.2).

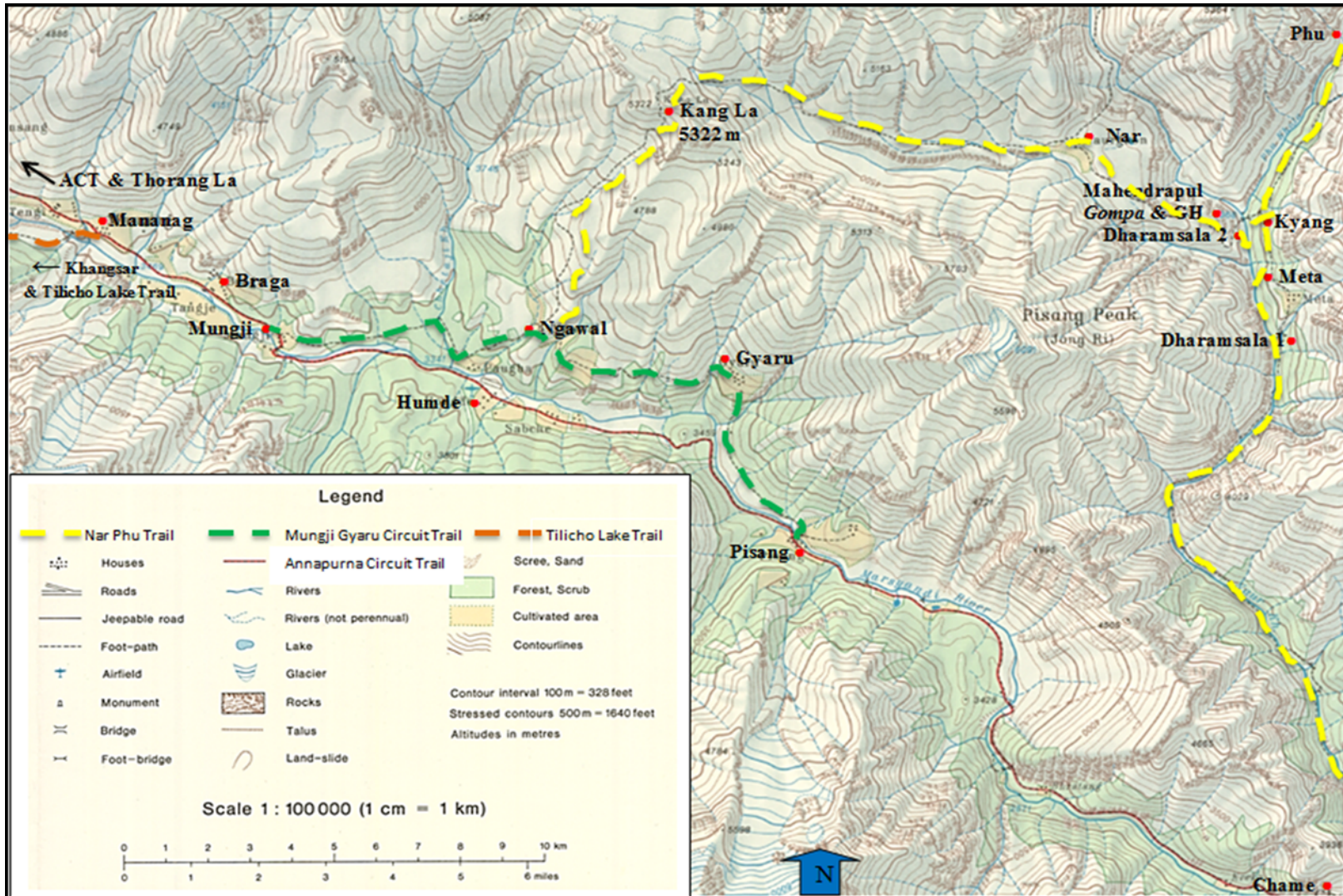
Trail/village	Km to current road	Km to finished road	Road impact	Impact sphere	Coupled Human and Natural Systems couplings
<b>ACT</b>					
Pisang	50	0	Aiding in Buddhist revival, new road will facilitate more pilgrims visiting sacred sites	E,SE, SC	EP, IE, REF, CBB, CSS,H LE,TL, ISP, EIE, MI
Humde	59	0	Stimulating airport runway extension = land use and land value change, new buildings = will use road to get to Manang	E,SE, SC	EP, IE, REF, CBB,CSS,H LE,TL, ISP, EIE, MI
Mugje	65	0	Aiding in Buddhist revival, new road will facilitate more pilgrims visiting sacred sites	E,SE, SC	EP, IE, REF, CBB, CSS,H LE,TL, ISP, EIE, MI
Braga	67	0	Aiding in the Destination Manang cultural revival, aiding in Buddhist revival	E,SE, SC	EP, IE, REF, CBB, CSS,H LE,TL, ISP, EIE, MI
Manang	69	0	Aiding in the Destination Manang cultural revival, stimulating trail widening	E,SE, SC	EP, IE, REF, CBB, CSS,H LE,TL, ISP, EIE, MI
<p><b>Key</b> Impact sphere – E= Economic, SE = Socioeconomic, SC = Sociocultural</p> <p><b>CHANS couplings –</b></p> <p><b>Organizational</b> - EP = Emergent properties, IE = Indirect effects, REF = Reciprocal effects and feedbacks,</p> <p><b>Spatial</b> - CBB = Couplings beyond boundaries, CSS = Couplings across spatial scales H = Heterogeneity</p> <p><b>Temporal</b> – LE = Legacy effects, TL= Time lags, ISP = Increased scale and pace, EIE = Escalating indirect effects, MI = Massive increases of human impacts on natural systems</p>					

However, by the late 1960s the government improved the trail to the point that adventurous trekkers could make their way up the valley and arrive at Pisang tired and scared, but still alive. There were no guesthouses in the Manang Valley at that time, so trekkers stayed in villagers' houses, ate local food with the families, and slept on their floors. As more trekkers began arriving, villagers started expanding their houses and eventually built lodges to accommodate them. The influx of trekkers over time had a profound effect on land use. Farmers in Pisang, Humde, Braga, and Manang converted pasture to guesthouses as they discovered they could make more money with the land as tourist facilities than as pasture (Kumar Binod, Nyeshang businessperson, Humde, personal communication, November 12, 2009). This cycle of land use change has evolved in many trekking destinations in Nepal.

Near Pisang (**Figure 4.21**), the trail enters a much wider, open section of the valley. Trekkers marvel at the incredible mountain scenery of this upper valley where the Annapurna Massif looks like it is within arm's reach. It has been compared to Switzerland in many guidebooks.

Pisang is made up of Upper Pisang on a hill on the east side of the Marsyangdi River and Lower Pisang in the flat land along the west side of the river. Lower Pisang developed after trekkers began arriving in the 1970s, and guesthouses and teashops now occupy land that was formerly a grazing area for livestock.

The next major village, Humde (see **Figure 4.22**) on the lower trail, has the only airstrip in the area. However, due to the short length of its runway only small STOL (Short Take Off and Landing) planes can use it. Consequently, flights are scheduled only twice a week. At the time of my research, the Government was extending the runway to accommodate larger planes with plans to increase the number of flights. Once the landing strip is completed, the number of tourists will increase substantially. Humde has undergone a land use change similar to Lower Pisang, with former pastureland being converted to trekking lodges, teahouses, and an airport, which is largely responsible for the existen



**Figure 4.22** Map of Annapurna Circuit Trail, Nar Phu Trail, Mungji Gyaru Circuit Trail, and the Tilicho Lake Trail (Adapted from Nepal-Kartenwerk der Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung Nr. 9, 1993)

Just before arriving in Manang, the ACT passes through the town of Braga (see **Figure 4.22**), a former pasture site for Manang. The original town occupies the area to the north of the trail on the hill surrounding the Braga *Gompa*. Guesthouses, a bakery, and restaurants took the place of the pasture right next to the trail. Braga is a popular spot to stay for those who want to avoid the relative hustle and bustle of Manang, a 15-minute walk further up the trail.

Manang (see **Figure 4.22**) is the largest village in the area. It has an excellent location near water sources for agriculture and, since the 1980s, it has been the logical place to take several acclimatization days before crossing the Thorang La Pass (5416 m) into Mustang District and the west side of the ACT. Due to its location as an acclimatization point, trekkers fill up the town taking time to rest and wait for favorable weather before attempting the Thorang La Pass. It offers all the comforts a trekker could want, including numerous large guesthouses, video parlors, internet cafes, bakeries, equipment shops, and a spectacular view of the Gangapurna Glacier and Gangapurna Lake, as well as numerous excellent day hikes.

Khangsar is a day's walk from Manang and sits on an alternate trail that leads to Tilicho Lake (see **Figure 4.22**), a two-day hike into a magnificent high altitude, sacred lake. Commercial trekking groups sometimes take this route to get to the west side of the ACT rather than crossing the Thorang La Pass as it is much less heavily traveled. However, the trail is more treacherous, there is an equally high pass to cross, and there are no guesthouses, so most individual trekkers prefer to stay on the ACT and cross the Thorang La Pass.

#### **4.2.4.2.2 Discussion**

##### **a. Upper and Lower Pisang (Main ACT)**

Both of these villages anticipate a growing tourist business once the Marsyangdi Road arrives because of the spectacular views of the Annapurna Massif. From the lodges in Pisang, the Annapurnas look close enough to touch (**Figure 4.23**), making Pisang one of the “must stop” villages on the way to Manang.



**Figure 4.23** The village of Pisang, adjacent to one of the most spectacular views of the Annapurna Massif on the ACT. Annapurna II and IV appear close enough to touch from guesthouses in Pisang (R. E. Beazley 2009)

The Buddhist *gompa* in Upper Manang is undergoing extensive renovation and the road to Syange makes getting materials to the site much faster and easier. These renovations have made it possible for more monks to return and reside in the *gompa* to provide spiritual leadership to the community (Tenzin Sherab, lodge owner, Manang, personal communication, November 11, 2009). The *gompa* makes for a magnificent sunset hike because it sits on the top of a hill directly across from Annapurna IV. This makes the *gompa* one of the most visited tourist spots in the two villages. A donation box at the door and the ever-friendly monks ensure that the *gompa* will also benefit from more tourists arriving.

#### **b. Humde**

Humde (see **Figure 4.22**) will obviously benefit from both the road and the expanded landing strip. More regularly scheduled flights mean more tourists' arrivals, and a road linking

the airport with Manang is crucial to get tourists to and from the airport. The combination of the two will result in more guesthouses as well as more shops, restaurants, and transportation services in Humde. One lodge owner I interviewed is building a second lodge in hopes of renting it to the airport staff that will come to Humde, after the runway extension is finished and the number of flights increase (Vijay Gurung, lodge owner, Humde, personal communication, November 9, 2009).

### **c. Braga**

Braga (see **Figure 4.22**) is in the perfect location for people who want to get away from the commercialization in Manang. It is only 1.5 km from Braga to Manang so tourists staying in Braga can easily walk or, once the road is complete, take a bus or taxi. There are numerous good day-hikes from Braga that include Buddhist monasteries, a nunnery, temples, the cave where the famous Tibetan Buddhist adept Milarepa lived, in addition to a sacred lake, and Buddhist ceremonial grounds. The lodge owners I interviewed in Braga were concerned that the road might decrease the number of trekkers, but were optimistic that it would increase the number of tourists (as opposed to trekkers) arriving. To help promote the cultural and scenic places of interest in the area, one lodge owner has put up a big wall size poster in the dining area with descriptions of each place. In addition, in the past the Destination Manang Festival (see below) has attracted tourists to Braga and should continue to do so in the future. The completion of the road will make this event even more popular.

### **d. Manang**

According to the Government of Nepal's development plan, the Marsyangdi Road is supposed to stop at the Manang District headquarters in Chame (see **Figure 4.22**). However, the plans have changed to extend the road to Manang because of pressure from wealthy, influential Nyeshangba in Kathmandu. This idea is also being touted by bureaucrats in the tourism sector who want to change the type of tourists that come to Manang, from budget trekkers to wealthier tourists who will spend more money. To attract this new type of tourist, plans are in the works to develop site-specific tourist attractions such as golf, theme parks, heli-skiing, and bungee

jumping. The senior foreign affairs advisor of Nepal explained the logic behind this plan in a newspaper interview (The Guardian, Sunday 17 August 2008): "After the construction of the road ... the number of trekkers will be reduced. We have a trade-off here between economic development and infrastructure and the effect on tourism and the environment. We need to create alternative attractions to just trekking." All the local villagers who are not involved in the trekking business are so eager to have a road that they have already widened and upgraded the trail to the point where you could now drive from Pisang to Manang, if vehicles were flown in by helicopter to Humde.

In 2004, wealthy Nyeshangba in Kathmandu revived an ancient dance drama with traditional costumes in Manang, the *Badhe*, as part of "Destination Manang" (<http://destinationmanang.updatenepal.info/program10.php>), which is held every three years to attract more tourists. This was the first time the *Badhe* took place following a 14-year hiatus attributed to a combination of Nyeshangba moving to Kathmandu, and the remaining villagers losing interest. There are many rich Nyeshangba in Kathmandu who are marketing and promoting "Destination Manang", as well as other tourist initiatives. Manang has a bank and other essential facilities, as well as the nicest guesthouses in the valley, so while it will lose some of its trekker business, tourists arriving by road or plane will make up for the loss. I suggest that Manang has the potential to be a major tourist destination after the road is completed.

#### 4.2.4.2.3 Summary

I argue that the road will have a positive impact on all of the villages mentioned above (see **Table 4.5**). Their location in Upper Manang (see **Figure 4.22**) where the valley opens with spectacular mountain scenery is the ultimate destination for tourists. The type of tourist will likely change from trekkers to families and people more interested in day-hikes and destination activities, however trekkers will still come to see this area, as well as to use the alternate trails.

Pisang will benefit from being the first village on the road after the valley opens with the best views of the Annapurna II, III, and IV (see **Figure 4.22**), in addition to being the jumping off spot for trekkers who want to travel on the alternate Gyaru-Mugje trail (**Section 4.1.4.3.1**).

Humde is in good position to benefit from the road once the new runway is complete. More tourists will be coming and going by both air and road. Humde will become like Jomsom (the district headquarters for Mustang, see **Case Study 7, Section 4.3.4.3 Jomsom**) with a proliferation of new guesthouses and businesses to accommodate the increase in tourists. Humde will also benefit from the road when business-people start transporting goods from Manang to the airport to ship to other destinations.

Braga has an excellent location within walking distance from Manang. It will retain its popularity as a place to avoid the commercialization of Manang in addition to offering numerous cultural attractions and first class day-hikes.

Manang will most certainly benefit as it is at the end of the road. Tourism will continue to grow and cultural festivals like “Destination Manang” will make Manang even more interesting to tourists. Given the nature of development along roads, I suggest that as more tourists arrive, the 1.5 km between Braga and Manang will become one long strip of tourist facilities with the two villages eventually merging.

The influence of the road is evident by the planning of the villagers who have widened the trail, built of new guesthouses, and revived cultural practices. In addition, it has aided in the recent surge in renovation of Buddhist *gompas*, by making the transport of materials increasingly easier. The materials can now be transported from Besisahar to Sirchaur by vehicle rather than by porter. The renovation of the *gompas* has made living conditions in the *gompas* much better than they previously were, which in term has led to monks moving from Kathmandu back to the *gompas* to provide spiritual sustenance to villagers

This case study provides good examples of the spatial couplings of heterogeneity, couplings across spatial scales, and couplings beyond boundaries, as well as the organizational couplings of reciprocal effects and feedbacks, indirect effects, and emergent properties (see **Table 4.5**).

### **4.2.4.3 Villages on alternate trails less than 10 km from the road alignment**

#### **4.2.4.3.1 Alternate Trail 1 Gyaru – Mugji Circuit Background**

The villages of Gyaru, Ngawal, and Mugji are on an alternate high trail that leaves the main ACT at Pisang and intersects it again at Mugji near Braga (see **Figure 4.22**). Trekkers who do not mind the steep climb from Upper Pisang to Gyaru (370 m) often take this trail as an alternative to walking on the low flat trail that goes through Humde and on to Manang.

##### **a. Gyaru and Ngawal**

The lodge owners in Gyaru and Ngawal (see **Figure 4.22**) are hoping that once the road is complete, more trekkers will use the alternate trail and stay in their villages to avoid traffic on the road. They have already had meetings to agree on a policy that will discourage any spur road building on their trail (**Table 4.6**). They are hoping to benefit from the road because trekkers will take their trail in order to avoid vehicles. In addition, they anticipate also benefitting from tourists who may want to do a day-hike on the alternate trail after arriving by road in Manang or plane in Humde (Kamal Gurung, lodge owner, Ghyaru, personal communication, November 12, 2009). In many ways, Ghyaru and Ngawal are in a position to benefit in both ways. Ngawal also stands to benefit from trekkers coming from the Nar Phu area over the Kang La Pass because the trail descends to their village and then on to Manang (see **Figure 4.22**).

##### **b. Mugji**

Mugji is the last village on this alternate trail and sits at the junction with the main ACT near Braga (see **Figure 4.2**). The Mugji nunnery is another Buddhist site that is under the patronage of Thrangu Rinpoche (also the Mahendrapul Gompa and Guest House, see **Section 4.2.4.4**). In Mugji (see **Figure 4.22**), Rinpoche has established this nunnery specifically for nuns to complete their *lho sum dha sum* or Great Retreat.

**Table 4.6** Road impacts and Coupled Human and Natural Systems couplings of villages not on the Annapurna Circuit Trail and Marsyangdi road alignment, and less than 10 km from the road alignment (Section 4.1.4.3)

Trail/Village	Km to current road	Km to finished road	Road impacts	Impact sphere	CHANS couplings
<b>Ghyaru-Muje Trail</b>					
Ghyaru	53	3	Intercommunity agreement = no spur road	E, SE, SC	EP, IE, REF, CBB, CSS, H, LE, TL, ISP, EIE, MI
Ngawal	55	5	Intercommunity agreement = no spur road	E, SE, SC	EP, IE, REF, CBB, CSS, H, LE, TL, ISP, EIE, MI
Mugje	65	0.5	Aiding Buddhist revival, new road will facilitate more pilgrims visiting sacred sites	SE, SC	EP, IE, REF, CBB, CSS, H, LE, TL, ISP, EIE, MI
<b>Tilicho Lake Trail</b>					
Khangsar	75	6	Spur road construction	E, Future SE, SC	EP, IE, REF, CBB, CSS, H, LE, TL, ISP, EIE, MI
Thare Gompa	76	7	Aiding in Buddhist revival, new road will facilitate more pilgrims visiting sacred sites	E, SE, SC	EP, IE, REF, CBB, CSS, H, LE, TL, ISP, EIE, MI
Tilicho Peak Hotel	77	8	May lead to spur road which will bring more tourists and pilgrims in the future	Future E, SE, SC	EP, IE, REF, CBB, CSS, H, LE, TL, ISP, EIE, MI
Tilicho Basecamp	81	12	May lead to spur road which will bring more tourists and pilgrims in the future	Future E, SE, SC	EP, IE, REF, CBB, CSS, H, LE, TL, ISP, EIE, MI
<p><b>Key</b> <b>Impact sphere</b> – E= Economic, SE = Socioeconomic, SC = Sociocultural</p> <p><b>CHANS couplings</b> –</p> <p><b>Organizational</b> - EP = Emergent properties, IE = Indirect effects, REF = Reciprocal effects and feedbacks,</p> <p><b>Spatial</b> - CBB = Couplings beyond boundaries, CSS = Couplings across spatial scales H = Heterogeneity</p> <p><b>Temporal</b> – LE = Legacy effects, TL= Time lags, ISP = Increased scale and pace, EIE = Escalating indirect effects, MI = Massive increases of human impacts on natural systems</p>					

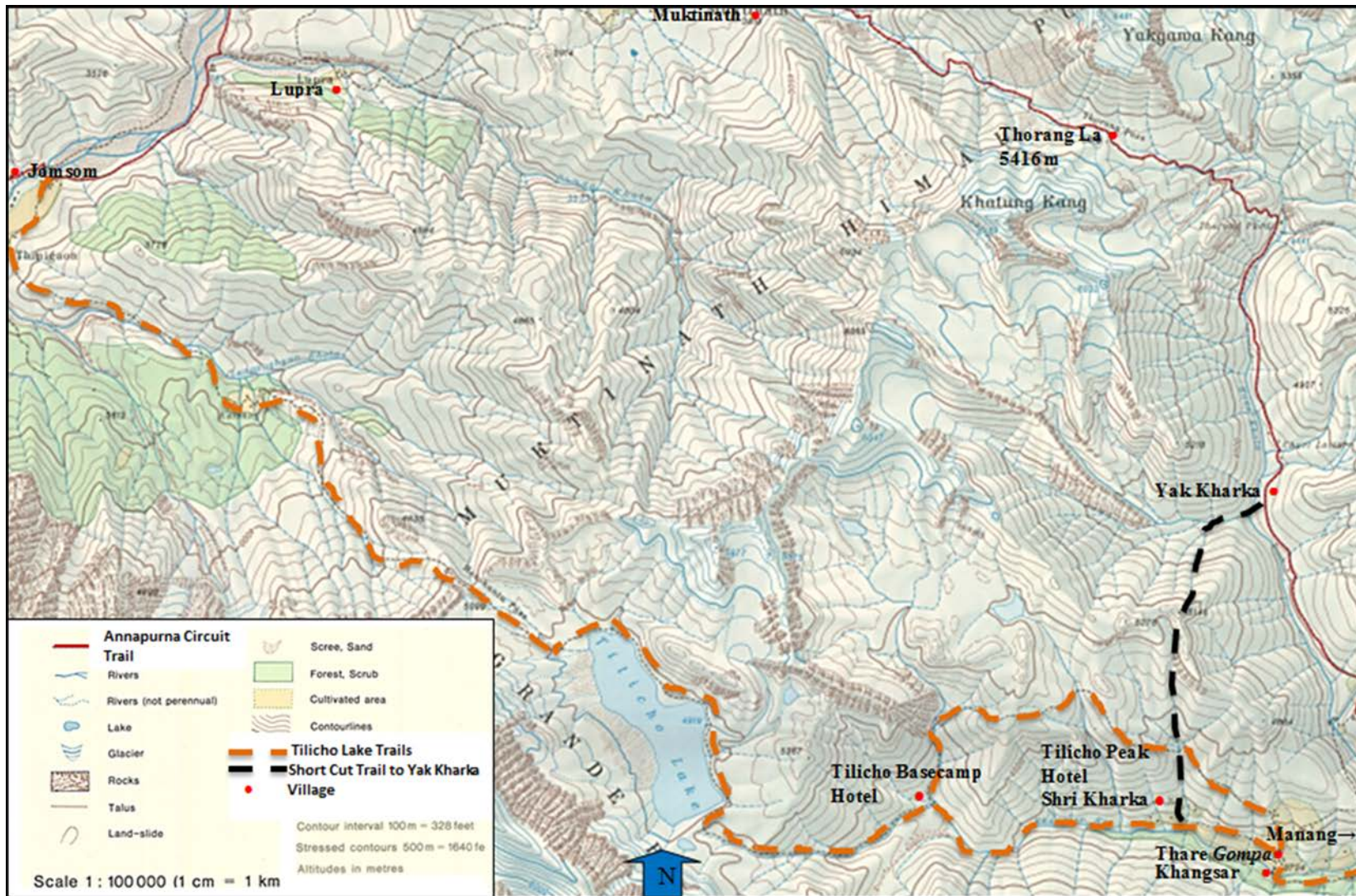
The *lho sum dha sum* (Great Retreat) in Tibetan Buddhism is the consummation of 12 to 14 years of intensive study in Tibetan Buddhist philosophy and practice, in which the lama or nun commits to a retreat lasting 3 years, 3 months, 3 weeks, and 3 days. The Marsyangdi Road to Sangye is aiding the renovation of this nunnery (**Table 4.6**) because vehicles can now bring materials to Sangye where they are transferred to mules or porters for the journey to Mugji. As with the other locations in Manang, the road is also helping nuns, monks, and Buddhist teachers to get in and out of the valley.

#### **4.2.4.3.2 Alternate Trail 2 Tilicho Lake**

The Tilicho Lake Trail veers off the main ACT at Manang and heads toward the village of Khangsar (**Figure 4.24**). Quite a few trekkers choose to use this trail for an acclimatization hike while waiting to cross the Thorong La Pass. It is also an alternate trail that trekking groups will take to get to the west side of the ACT rather than going over Thorang La Pass. It still requires going over a pass and camping gear because there are no guesthouses along the route once one leaves Tilicho Base Camp.

##### **a. Khangsar**

The Marsyangdi Road is now supposed to stop in Manang. However, the people of Khangsar have anticipated the road coming to Manang by building a spur road (see **Table 4.6**) from their village to Manang in hopes that once the construction crew arrives in Manang they will continue to Khangsar, which is just another 5 km. from Manang. If this spur road to Khangsar is built, I suggest that it will only be a matter of time until the road is continued toward Tilicho Lake (**Figure 4.24**). This would facilitate not only tourists reaching the lake, but religious pilgrims as well. In 2001, a group of wealthy religious pilgrims from India chartered helicopters to take them and their guru into Tilicho Lake for a weeklong retreat, a very expensive venture. If a road is extended to a location closer to the lake, many more pilgrims will be able to afford visiting it.



**Figure 4.24** Tilicho Lake Trails and short cut trail to Yak Kharka (Adapted from Nepal-Kartenwerk der Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung Nr. 9, 1993)

## **b. Thare Gompa**

One kilometer up the trail from Khangsar is Thare *Gompa* (see **Figure 4.24**), one of the oldest *gompas* in Manang District. Tenzin Sakya, the head of the Sakya clan of Tibetan Buddhism, sponsored the renovation of this *gompa*. The renovations will expand the *gompa* to include additional sleeping and eating quarters, and a kitchen. Once the renovations are complete, monks will be able live in Thare *Gompa* once again.

This is another example of the greater Buddhist revival occurring in the area. As with all the Tibetan Buddhist *gompas*, it was traditional for monks to live and practice in the *gompa* environs. However, many monks moved to Kathmandu to study with the Tibetan lamas who migrated to Kathmandu after the Chinese seized control of Tibet in 1959. During the last 10 years, Tibetan lamas in Kathmandu have begun the renovation of many *gompas* in the mountains. After the renovation of a *gompa*, lamas send their monks back to the *gompa* to provide spiritual sustenance to the villagers. New roads into the mountains of Nepal have facilitated this revival (see **Table 4.6**) by making it easier and cheaper to transport materials to renovation sites, as well as making it easier for monks to travel from Kathmandu to newly renovated *gompas*. There are renovations of Buddhist monasteries in several locations in Manang District, including Braga, Khangsar, Mahendrapul, Mugje, and Phu (see **Figures 4.22**). The Marsyangdi road is facilitating all these renovations, even though it is not yet complete.

## **c. Tilicho Peak Hotel and Tilicho Basecamp Hotel**

Twenty minutes after passing the Thare *Gompa* one arrives at the Tilicho Peak Hotel (see **Figure 4.24**), the only guesthouse on the trail until reaching Tilicho Basecamp (see **Figure 4.24**). The same businessperson who owns the Tilicho Peak Hotel also owns the Tilicho Basecamp Hotel. He built the former in a strategic location at Shri Kharka, the junction of the short-cut trail (see **Figure 4.24**) that goes from Tilicho Basecamp to the ACT at Yak Kharka (north of Manang), which then leads to the Thorang La Pass (see **Figure 4.24**). Trekkers who plan to hike over Thorang La Pass and into Mustang will often take a side trip from Manang to Tilicho Lake and on the return take this short-cut trail to Yak Kharka (see **Figure 4.24**) and the Throng La

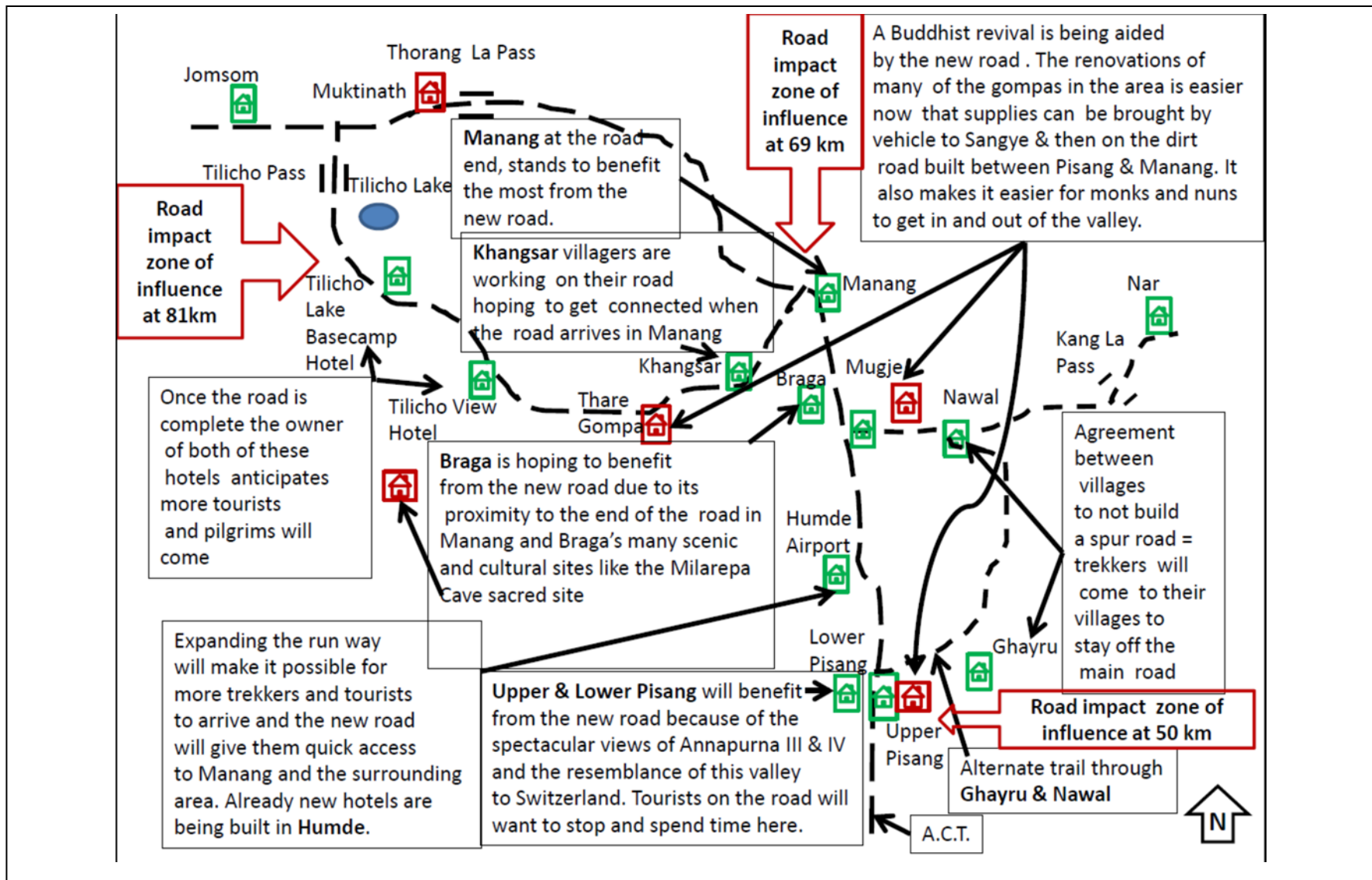
Pass, rather than walking all the way back to Manang. By the time trekkers reach the lodge they have had a long 2 days of hiking into the lake and back out at high altitude, so are they glad to stop and stay for the night.

There is only one facility at Tilicho Basecamp, the Tilicho Lake Hotel (see **Figure 4.24**). Virtually all trekkers stay here the night before attempting the strenuous 3-4 hour climb up to sacred Tilicho Lake (see **Figure 4.24**), which is one of the highest lakes in the world at 4919 m. With the coming of the road to Manang, the owner of both the hotels is convinced that there will be more trekkers and tourists because Tilicho Lake will provide an alternate route to the Thorang La Pass that has no vehicles. He feels his investment in both the Tilicho Basecamp Hotel and the Tilicho Peak Hotel will pay off after the road is complete and more trekkers, tourists, and pilgrims start arriving (Shiva Agarwal, hotel owner, Shri Kharka, personal communication, November 23, 2009) (see **Table 4.6**).

#### **4.2.4.3.3 Summary**

All the communities in this case study will eventually benefit from the road (**Figure 4.25**). Since Manang is at the end of the road, many tourists who arrive by road will want to explore the surrounding area. Both the alternate trail to Gyaru, Ngawal, and Mugji and the alternate trail to Tilicho Lake will experience more tourists after the road arrives. I expect that if the spur road to Khangsar is built, that in time the road will eventually reach Tilicho Lake.

This case illustrates how a road that is currently under construction is nonetheless affecting land use changes and land values, and aiding a Buddhist and cultural revival in villages 51 km (Gyaru) to 81 km (Tilicho Basecamp) away (**Figure 4.25**).



**Figure 4.25** Summary diagram of **Case Study 3** and **4 Section 4.1.4.2**: Villages on the road alignment, and **Section 4.1.4.3**: Villages less than 10 km from the road alignment, on alternate trails 1 and 2, with the zone of influence of road impacts over varying spatial scales in the Upper Manang Valley

This case study is a good example of the spatial couplings of heterogeneity, couplings across spatial scales, and couplings beyond boundaries, as well as the organizational couplings of reciprocal effects and feedbacks, indirect effects, and emergent properties (see **Table 4.6**).

Finally, I argue that roads have a zone of influence (see **Figure 4.25**) that is often much greater than the area adjacent to the road and vary over different spatial scales.

#### **4.2.4.4 Villages greater than 10 km from the road alignment**

##### **4.2.4.4.1 Background**

The trail leading to the Nar Phu area leaves the ACT near the town of Chame (see **Figure 4.22**), the district headquarters of Manang. Even though the distance from the trailhead to Phu is only approximately 40 km, when one considers all the altitude gain and loss on the trail the actual distance almost doubles. The trail is in a side valley that follows the Phu Khola River north toward Tibet. Many villagers in this area would like to be involved in the trekking business because it is easier and more profitable than farming. They know the road is coming up the Marsyangdi Valley because they use the main valley to get out of the mountains and into Kathmandu and other places. As they travel the main valley, they are well aware of the many guesthouses where trekkers stay along the ACT. Now that the Marsyangdi Road is progressing, they anticipate trekkers will leave the main trail and travel into the Nar Phu area to avoid vehicles and traffic. This trail has the potential to be part of a new ACT that does not involve walking on the road. It is feasible as an alternate route because, by crossing the Kang La Pass (5332 m) near Nar, trekkers can come back into the Manang Valley (see **Figure 4.22**). After crossing the Kang La the trail descends to the ACT near Ngawal, from there trekkers can follow the ACT over Thorang La Pass.

The Nar Phu area was closed to foreigners until 2000 when ACAP opened it on a special permit basis, for commercial trekking groups only. An ACAP official I interviewed gave several reasons why it is only open to commercial groups (Tarka Gurung, ACAP official, Manang, personal communication, November 15, 2009). First, ACAP has a tradition of opening a new area slowly, starting with commercial trekking groups, then after 10 years of success with

trekking groups they will consider opening it to individual trekkers. Second, there are currently very few guesthouses along the route and the distances between the villages is more than most trekkers want to travel in a day. Therefore, this trek is not suited to the average trekker because of the altitude and the long days between villages.

Commercial trekking groups have had very little impact on livelihoods in Nar Phu because they carry all their own equipment and food and therefore do not need to use local guesthouses. However, sometimes guesthouses will receive business from commercial groups on cold nights when clients prefer to sleep inside rather than in a tent, and by selling snacks. All the guesthouse owners I spoke with were in favor of ACAP allowing individual trekkers access to Nar Phu so that they would have more business. I argue that the Marsyangdi Road played a role in these guesthouses being built. The lodge owners in Nar Phu are familiar with the trekking economy due to their interaction with friends and relatives who live on the ACT. They know that lodge owners rely on individual trekkers for most of their business. Therefore, they built their guesthouses in anticipation of the Marsyangdi Road bringing more trekkers, not because they thought they could survive on business from trekking groups. They also knew that ACAP would allow individual trekkers into Nar Phu because the Marsyangdi Road would not only make access to Nar Phu easier, but also, by its very presence, would create the need for an alternative to trekking on the road.

#### **4.2.4.4.2 Discussion**

##### **a. Chame**

Chame is the district headquarters of Manang located on the ACT several kilometers past the Nar Phu trailhead (see **Figure 4.22**). It is included in this group of villages even though it will be on the road because the road is influencing people not only to think about how it will affect tourism in Chame, but along the Nar Phu Trail as well. Because Chame is the district headquarters, all the government offices and banks are in the middle of the town. Several lodge owners who have had good businesses in the past due to their locations at the beginning of town, are now concerned that they may start losing business after the road is complete because the

buses will stop in the center of town. This, they argue, means trekkers will either choose lodges near the bus stop or further on towards the opposite end of town. The other concern expressed is that trekkers may veer off the ACT before reaching Chame to visit the Nar Phu area to avoid being on the road (Narayan Lama, lodge owner, Chame, personal communication, November 1, 2009). In anticipation of this, one lodge owner, a Tibetan Buddhist lama, has been illegally cutting trees several kilometers up the Nar Phu Trail to build a guesthouse (Tenzin Drolkar, lodge owner, Chame, personal communication, November 1, 2009). The road has influenced this interesting sociocultural change; Tibetan Buddhist lama's vows do not condone illegal activities.

### **b. Dharamsala 1 and 2**

At two intermediary points on the Nar Phu Trail ACAP built small shelters (*dharamsalas*) with no facilities for use by trekking groups that need to camp before they reach the nearest village. For example, ACAP built *Dharamsala 1* at the base of a very long and hard 2-hour climb to the village of Meta because it is very hard to reach Meta in one day (see **Figure 4.22**). *Dharamsala 2* is located further north and west on the trail, near Mahendrapul (see **Figure 4.22**). ACAP built it at the beginning of another very long and strenuous climb to the village of Nar for the same reason; it is hard to reach Nar in one day from either Meta, or Phu.

In the case of *Dharamsala 1*, a woman from Nar saw an opportunity to provide food and basic lodging for trekkers and persuaded ACAP to rent the facility to her. She has enough supplies to cook simple food and allows trekkers to sleep on the floor. Her example spurred two other women in Nar to do the same thing at *Dharamsala 2*, and they have formed a women's lodging cooperative

### **c. Meta**

Meta sits at an ideal location at the junction of the trails to Nar and Phu (see **Figure 4.22**). Anyone travelling to either destination passes through Meta. It is also the furthest point most people can reach in one day from the trailhead. Several new guesthouses were under construction during my research period. Locals are confident that once the Marsyangdi Road reaches Chame and ACAP allows individual trekkers to visit the Nar Phu area, more trekkers

will visit their valley (Laxmi Gurung, lodge owner, Meta, personal communication, November 2, 2009). Because the current guesthouses are very basic, the two currently under construction are designed to provide more comfortable, up-scale accommodations. A woman from Phu is building the biggest and most elaborate new lodge (Tsering Dolkar, lodge owner, Meta, personal communication, November 2, 2009).

I argue that one of the indirect impacts of the Marsyangdi Road, in the case of *Dharamsala* 1 and 2, and the new guesthouse under construction in Meta, is that it influenced a sociocultural shift in gender roles and equality. While it is common in rural mountain villages in Nepal for women to manage guesthouses when their husbands are working in the fields or engaged in other businesses or trade, it is a break with tradition for women to engage in acquiring property, and initiating and overseeing construction of guesthouses. Traditional Nepalese norms exclude women from major decision-making regarding livelihoods, access to credit, and use of new technologies (ADB 2010). Roads in general have been instrumental in facilitating the process of globalization in Nepal, which in turn has affected gender roles and equality. In this specific case, in anticipation of more trekkers, arriving in Nar Phu after the Marsyangdi Road is complete, some women have transcended a traditional male role by engaging in the necessary steps to acquire a business and build a guesthouse.

This processes works its way through numerous CHANS couplings, including reciprocal effects and feedbacks, emergent properties, indirect effects, coupling across spatial scales, couplings beyond boundaries, couplings across spatial scales, legacy effects, increased scale and pace, escalating indirect effects, and time lags (**Table 4.7**).

#### **d. Kyang** (a.k.a., **Kyan**)

Kyang (see **Figure 4.22**) is a seasonal yak herder's settlement of small stone shelters. Several villagers from Nar have upgraded some of the shelters to provide food and lodging for trekkers. These accommodations are very basic, but due to Kyang's position as the only settlement between Meta and Phu, the villagers have taken advantage of its strategic location to supplement their incomes by providing services to trekkers (**Table 4.7**).

#### **e. Phu**

Phu (see **Figure 4.22**) is the last village on the trail north that trekkers visit. In Phu there is a small restaurant, camping facilities, and homestay options. There is only one lodge in Phu because not many trekkers come to Phu. Some groups prefer a shorter trek and therefore take the trail from Meta crossing the river at Mahendrapul to Nar rather than continuing up the valley to Phu. Villagers in Phu rent their farmland to commercial trekking groups for camping and there are several homestays for individual trekkers who manage to sneak into the area. As in the other communities I visited in Nar Phu, villagers in Phu believe that the Marsyangdi Road will lead to an increase in trekkers visiting their valley. Therefore, based on the building taking place in Meta, Nar, and Mahendrapul, I suggest that the people of Phu will begin building lodges soon. Another indirect impact of the Marsyangdi Road in Phu is the renovation of the famous Tashi Lhakang *Gompa* (see **Figure 4.22**), which has led to a group of monks from Kathmandu inhabiting the *gompa* (**Table 4.7**).

#### **f. Mahendrapul Monastery and Guesthouse**

The Marsyangdi Road is facilitating a Buddhist revival in Mahendrapul (see **Figure 4.22**) as well. A Tibetan lama in Kathmandu, Thrangu Rinpoche (Kagyu tradition), initiated the construction of a new monastery at Mahendrapul with a guesthouse for trekkers. The monks of the monastery will manage the guesthouse with the proceeds going to the monastery for daily living expenses. A monk I interviewed at the construction site said the Marsyangdi Road makes it easier to get building supplies to the trailhead at Chame in addition to making it easier for monks to get to Kathmandu (Sonam Wangbu, Tibetan Buddhist monk, Mahendrapul, personal communication, November 3, 2009) (see **Table 4.7**).

**Table 4.7** Road impacts and Coupled Human and Natural Systems couplings of villages not on the Annapurna Circuit Trail and the Marsyangdi Road alignment and greater than 10 km away from the alignment (Section 4.1.4.4).

Trail/Village	Km to current road	Km to finished road	Road impact	Impact sphere	CHANS couplings
<b>Nar Phu Trail</b>					
Trailhead-Koto	32	0			
Chame	34	0	Illegal tree cutting	E, SE, SC	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
Dharamsala 1	45	13	Change in gender roles and equality	SE, SC	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
Meta	47	15	Land use and land value change, change in gender roles and equality	E, SE, SC	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
Kyang	54	22	Land use and land value change	E, SE	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
Phu	72	40	Land use and land value change, aiding Buddhist revival	E, SE, SC	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
Dharamsala 2	49	17	Change in gender roles and equality	SE, SC	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
Mahendrapul Gumpa and GH	49.5	17.5	Land use and land value change, aiding Buddhist revival	E, SE, SC	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
Nar	53	21	Land use and land value change	E, SE, SC	EP, IE, REF, CBB, CSS, H LE, TL, ISP, EIE, MI
<p><b>Key</b> Impact sphere – E= Economic, SE = Socioeconomic, SC = Sociocultural</p> <p><b>CHANS couplings –</b></p> <p><b>Organizational</b> - EP = Emergent properties, IE = Indirect effects, REF = Reciprocal effects and feedbacks,</p> <p><b>Spatial</b> - CBB = Couplings beyond boundaries, CSS = Couplings across spatial scales H = Heterogeneity</p> <p><b>Temporal</b> – LE = Legacy effects, TL= Time lags, ISP = Increased scale and pace, EIE = Escalating indirect effects, MI = Massive increases of human impacts on natural systems</p>					

The location of this guesthouse, just before the big climb to Nar (see **Figure 4.22**), guarantees it will attract many trekkers, especially those that do not want to stay in the meager accommodations in *Dharamsala 2* just below. It also has the added attraction of the monastery, which many trekkers will visit. This pairing of a guesthouse and a monastery has proven to be successful at other monasteries because trekkers not only pay for food and lodging, but also leave donations in the *gompa* (personal observation on numerous occasions 1985-2007).

#### **g. Nar**

Of all the villages in the Nar Phu area, more trekkers stay in Nar (see **Figure 4.22**) than any other village because it is at the base of the 5315 m Kang La Pass (see **Figure 4.22**). All groups take at least one day to acclimatize and rest here before attempting the pass. There are no other villages for hours in either direction, so no matter which direction people are coming from, they stay at least one or two nights in Nar. It is obvious the residents of Nar are aware of this and see the potential for tourism development because there are five guesthouses in Nar that all have comfortable facilities, more guesthouses than in other village in Nar Phu. Commercial trekking groups set up tents in the Nar camping grounds, but it is common to see a few of these trekkers in the lodges trying to find a little more comfort. The lodge owners I interviewed were quite eager for individual trekkers to come because the number of commercial group trekkers who stay in their lodges now is low. After the road arrives at Chame and ACAP allows individual trekkers into the area, Nar has the potential to become quite prosperous.

#### **4.2.4.4.3 Summary**

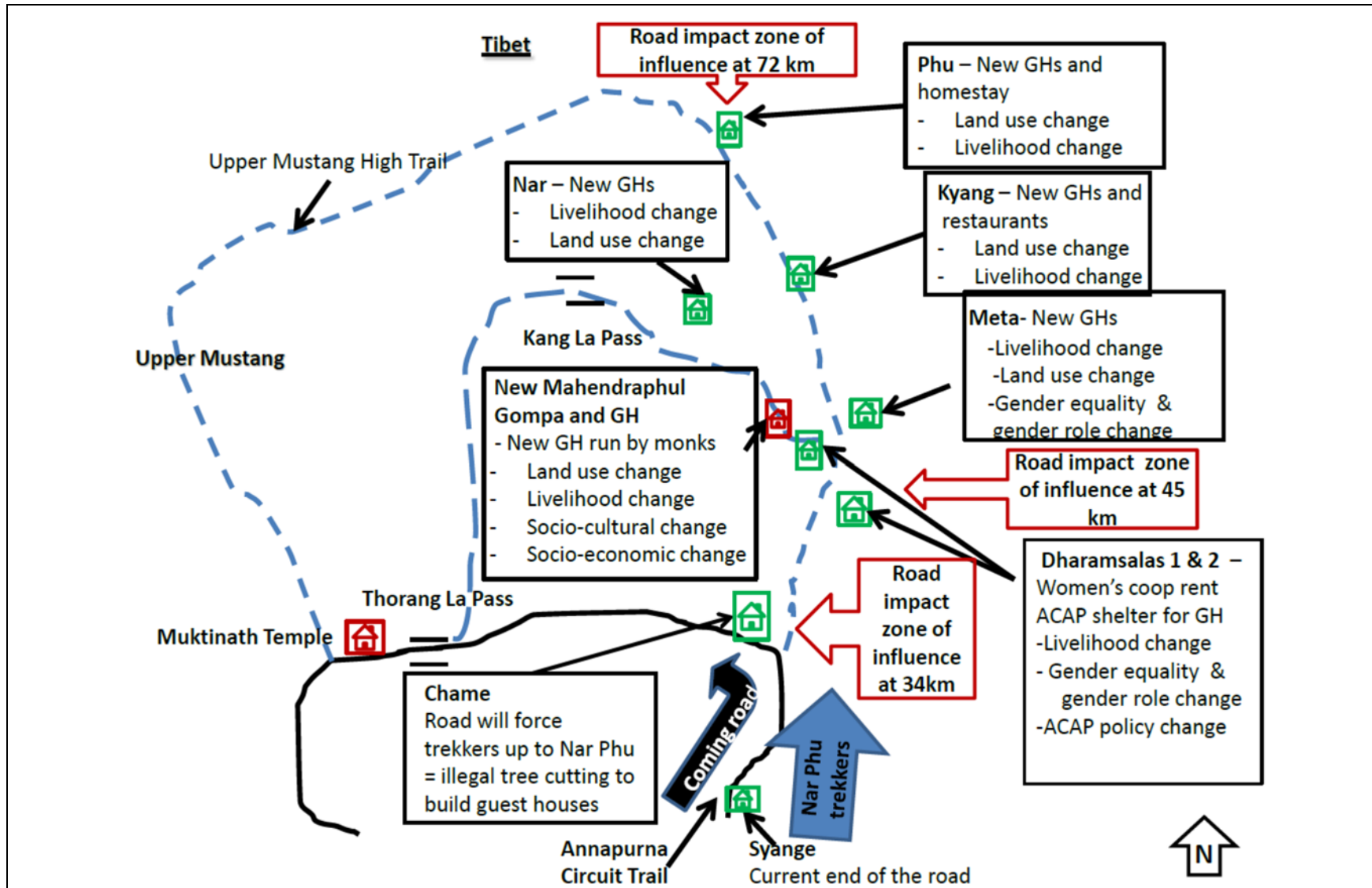
All the villages in this case study are currently at least 10 km from the new road alignment and will not be on the road after its completion. Nonetheless, the Marsyangdi Road, which is currently completed to Sangye, is stimulating building and subsequent land use and land value changes in many places far distant from the road (**Figure 4.26**). In Chame, anticipation of more trekkers arriving with the road has led to the illegal tree cutting to build a guesthouse along the Nar Phu Trail (**Figure 4.26** and see **Table 4.7**). In the same manner, the road has indirectly influenced a change in gender equality and gender roles with women acquiring rental of the two

*dharamsalas* and one woman building a new guesthouse in Meta (**Figure 4.26** and see **Table 4.7**). The road has also been influential in the building of the new *gompa* and guesthouse at Mahendrapul in addition to the renovation of the Phu *gompa* and facilitating travel for monks to and from Kathmandu (**Figure 4.26** and see **Table 4.7**). At Kyang, what used to be a yak herder enclave now has two little restaurants to serve trekkers. Local people in Phu are eager for more trekkers to come because they make very little money from the trekking groups that camp in town. Expectation of the Marsyangdi Road influencing more trekkers to visit Phu has led to the creation of homestays and talk of building guesthouses (**Figure 4.26** and see **Table 4.7**).

All of these cases illustrate how a road under construction in an adjacent valley at Sangye, and currently more than 34 km from the Nar Phu trail junction and 71 km from the furthest village (Phu), is nonetheless having an impact that is affecting land use change, land values, gender equality and gender roles, and aiding a Buddhist revival (**Figure 4.26** and see **Table 4.7**).

These case studies are a good example of the spatial couplings of heterogeneity, couplings across spatial scales, and couplings beyond boundaries, as well as the organizational couplings of reciprocal effects and feedbacks, indirect effects, and emergent properties (see **Table 4.7**).

Finally, as I argued previously, roads have a zone of influence that is often much greater than the area adjacent to the road and vary over different spatial scales (see **Figure 4.26** and **Table 4.7**).



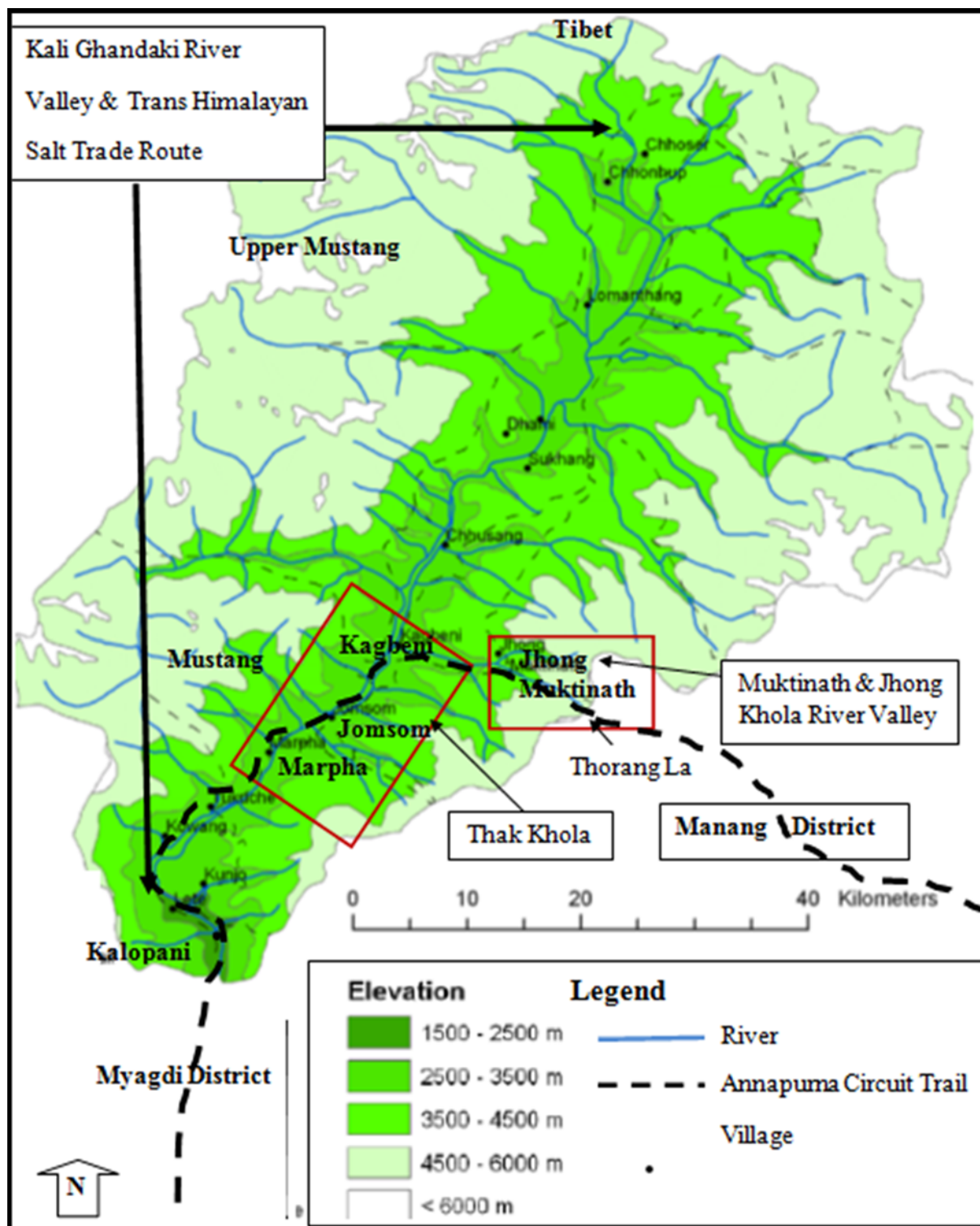
**Figure 4.26** Summary diagram of Case Study 3 and 4 (4.1.3.3) Villages more than 10 km from the road alignment, on the alternate Nar Phu Trail, with the zone of influence of road impacts over varying spatial scales in the Nar Phu Valley.

### **4.3 West Side of the ACT: Kali Ghandaki Road (Mustang, Myagdi, and Kaski Districts)**

#### **4.3.1 Background: Mustang District**

Mustang District is situated over the Thorang La Pass to the west of Manang (**Figure 4.27**). It makes up almost 50% of the ACAP and has a population of 14000 (2001) with a population density of 3.87 per km<sup>2</sup> making it the second least populated district in Nepal (NTNC 2008b). The district ranges in elevation from 2000 to 8168 m and includes two of the world's ten highest peaks with Dhaulagiri (8137 m) being the 7<sup>th</sup> highest and Annapurna (8161 m) the 10<sup>th</sup> highest. Temperature extremes vary from as high as 26° C in the summer to as low as -20° C in the winter. Lying in the rain shadow of the Himalayas it is very dry receiving less than 200 mm per year. Geographically the district is divided into two zones: Upper Mustang (from Kagbeni north to the Tibetan border) and Lower Mustang (from Kagbeni south to Ghasa). This delineation is mainly for tourism purposes, as Upper Mustang has a controlled tourist policy requiring a special, limited-time visa, an organized trekking agency group tour, and a much higher visa fee than the rest of the ACAP area. Three different climatic/ecological zones cover the region, cold temperate (2000-3000 m), alpine (3000-4500 m), and tundra (above 4500 m).

In addition, there are three geographic subzones. The northern area, which is almost all of Upper Mustang, is very dry and desert like. The rain shadow effect, lack of good irrigation systems, and cold climatic conditions make productive agriculture very difficult with only one crop per year possible. The central subzone has more rainfall than the north even though it still falls under the Himalayan rain shadow. Many communities in the central subzone are situated along the Kali Ghandaki River (see **Figure 4.27**) or in the hills near tributaries, providing better irrigation opportunities than in the north, which allows the production of two crops per year. The southern subzone receives the most rain and also grows two crops per year, however the central subzone is considered to have the best agricultural production (NTNC 2008b).



**Figure 4.27** Mustang District and the Kali Ghandaki River Valley with Trans Himalayan Salt Trade route and sacred site at Muktinath (Adapted from Digital Himalaya [http://himalaya.socanth.cam.ac.uk/collections/maps/nepalmaps/district\\_mustang\\_everything.gif](http://himalaya.socanth.cam.ac.uk/collections/maps/nepalmaps/district_mustang_everything.gif))

Livelihoods in Manang are typical of mountain communities in Nepal with 77% of the villagers involved in agriculture and animal husbandry. Major crops include barley, wheat, buckwheat, and potato, and where the climate permits, maize. Other important crops include mustard for oil, peas, and other vegetables. Lower Mustang has the best agricultural conditions and grows enough fresh vegetables for local consumption as well as apples for commercial sale. Livestock include yaks and yak hybrids called *jhopas*, cows, mules, donkeys, horses, and goats (NTNC 2008b).

Trade has always been a very important part of people's livelihoods in Mustang. The wide flat upper Kali Ghandaki River Valley leads to a relatively easy pass into Tibet (see **Figure 4.27**). These geo-physical characteristics made the Kali Ghandaki valley a major trade route between the highlands and lowlands of this area of Asia for hundreds of years. The Trans Himalayan Salt Trade (THST) (see **Figure 4.27**) flourished in this valley for several centuries until the Chinese closed the border in 1959.

In the late 1970s, the Government of Nepal opened the area to tourism to help compensate for the loss of income from the salt trade. Since then, providing food and lodging, guide services, portage, and other services for trekkers has become an important livelihood option for people living along the main trail in the Kali Ghandaki Valley. There are 28 guesthouses in Upper Mustang and 139 in lower Mustang, and 23226 trekkers visited Mustang in 2007 (NTNC 2008b). This trail is also an important pilgrimage route to Muktinath, a sacred site for both Hindu and Buddhists (Messerschmidt 1992). Consequently, some communities make additional income by providing the same type of tourist services for religious pilgrims.

Gurung and Thakali are the major ethnic groups comprising more than three quarters of the total population of Mustang. The remaining are made up of Sherpa, Tibetan, Bista, Magar, Tamang, and Newar ethnic groups and Brahmin, Chhetri, and Dalit Hindu caste groups (NTNC 2008b). The *Nepal Atlas of Ethnic and Caste Groups* list 24 ethnic groups and 17 languages in Mustang (Gurung, H et al. 2006). The majority of people practice Buddhism (74%), followed by Hinduism (25%), with the remainder composed of Christian, Jain, Islam, Kirat, and other

(HMGN/CBS 2001). Four separate and distinct regions delineate the differing ethnicities in Mustang. This reflects a colorful history of migration and trade over hundreds of years, and traditional villages tend to reflect the settlement pattern of distinct ethnic groups in each area.

*Lochhoden* is the local term for the area of Upper Mustang and *Loba* is the name of its people, however their surnames are often similar to other ethnic groups in the area, such as Gurung or Bista. In Lower Mustang, *Barangaunle* is the name of the local people, and they are culturally similar to their neighbors to the north, the *Lobas*. They also have similar surnames, including Gurung, Bista, and Thakuri. Moving north to south in Lower Mustang, the three remaining areas are Baragaon, Panchgaon, and Thaksatsae. Thakalis, who are made up of three endogenous groups, the *Yhulkasompaimhi*, the *Matwatan*, and the *Tamang* inhabit Panchgaon. They all have their own dialect of the main Thakali language, which belongs to the Tibeto-Burman languages (Vinding 1998). Thaksatsae is the area furthest south and is inhabited mostly by the *Tamang Thakali* group. In nontraditional villages such as Jomsom where the regional airport is located, and in other villages along the trekking trail, ethnicity tends to be more heterogeneous (NTNC 2008b).

Due to the cold, arid environment in Mustang archaeological excavations have found mummified bodies in caves and other remains dating to the first millennium B.C.E., possibly as early as 800 B.C.E. in the Muktinath Valley (Alt et al. 2003), and 1000 B.C.E. in the Kali Ghandaki Valley (Simons et al. 1994). The evidence from the mummified bodies in the Muktinath Valley suggests that the people probably came to Mustang from the Central Asian plains to the northwest, and that their ethnic ancestry is similar to the Mongolians (Alt et al. 2003). In addition, Kunter (1994 cited in Vinding 1998) determined by analysis of human skeletal remains that the Muktinath Valley, from the 8<sup>th</sup>-13<sup>th</sup> Century, was inhabited by a mongoloid race. Further evidence shows that they were well adapted to their environment and their livelihood strategies were very similar to today's inhabitants of Mustang. They combined agriculture with transhumance growing buckwheat and barley in alternation with two harvests per year (Knörzer 2000), and kept goats, sheep, and horses (Alt et al. 2003).

They lived at the intersection of two main historic trade routes, the east-west Muktinath Valley, and the north-south Kali Ghandaki Valley (see **Figure 4.27**) that connect India to Tibet and South Asia to Central Asia. Therefore, it is quite possible they were also involved in trade even in these prehistoric times (Knörzer 2000). The types of beads and baskets found indicate cultural links with Xinxiang, the area along the Yellow River considered one of the cradles of Chinese civilization. They also had finely woven fabrics of cotton, wool, and linen with sophisticated dying, weaving, and processing techniques (Alt et al. 2003). In addition, plant remains were found from over 50 taxa that also occur in Central Europe, even in prehistoric times, leading Knörzer (2000) to speculate about early trade between Central and East Asia, and Europe.

From evidence at another archaeological site in Mustang, Huttel (1995 cited in Vinding 1998) states that there was Tibetan presence and influence in the area from the 10<sup>th</sup> Century on. Most of the written historical texts about the area are in Tibetan and Vinding (1998) states that the Tibetan civilization was the main influence on the Mustang area until the 19<sup>th</sup> Century. While this may be true, it does mean that all the people living in Mustang came from the north. Schuh (1994) presents evidence from written documents from the 15<sup>th</sup> Century that some of the inhabitants belonged to a Tibeto-Burman group of non-Tibetan origin and may have come from India. He points out that in 1994, while twelve settlements in the Muktinath Valley were Tibetan they were "...surrounded by non-Tibetan settlements..." (Schuh 1994:11).

The Kali Ghandaki River Valley has historical significance as a migration corridor for the Trans Himalayan Salt Trade and as a pilgrimage trail to one of the most significance sacred sites for Hindus and Buddhists at Muktinath (Schuh 1994, Messerschmidt 1992).

Pilgrimage and trade intimately intertwine in the Himalayas (Van Spengen 2000). The trade route through the Kali Ghandaki River Valley is also a traditional pilgrimage route to many sacred sites in the valley for both Hindu and Buddhists. Muktinath is arguably the most famous and frequently visited sacred spot in the valley. It is sacred to Buddhists and Hindus (Messerschmidt 1992) and is situated in the Upper Jhong River Valley one day's walk east from

the main Kali Ghandaki trade route (see **Figure 4.27**). It is also one-day's walk below the Thorang La Pass that connects Mustang with Manang. This pass served as an east-west trade link between the two districts, as well as a link to numerous sacred sites in the Manang area, including several sacred lakes and caves and many Buddhist *gompas* in Manang, Nar Phu, and Gyasumdo.

Muktinath has three supernatural elements that have religious significance for both Hindus and Buddhists, in addition to legends of how Muktinath was graced by the presence of Gods or godlike deities from both religions. These three elements consist of sacred water, natural fire, and rock fossils, each with their own different sacred significance within the two traditions. Messerschmidt (1992) acknowledges the Hindu tradition as having the oldest association with Muktinath as it is mentioned by the name Salagrama as early as 300 B.C.E. in the *Mahabharata* and in the *Purana* legends (300-1000 C.E.), whereas the earliest Buddhist legends date to the 8<sup>th</sup> Century when tantric adept Padmasambhava visited the site on the way to Tibet (Ehrhard 1993).

Additionally, there is a traditional Tibetan Buddhist *kora* (circumambulation of sacred space) of six auspicious villages in the Muktinath Valley. *Chokhor* (“the scripture circuit”) is the local name for this *kora* because all 108 volumes of the Buddhist canon, the *Kangyur*, are carried around the valley to bless the space (Gutschow 1999). Some villages also practice this tradition around their agricultural fields to bless the fields and ensure a good harvest (Tenzin Wangmo, farmer, Kagbeni, personal communication, April 25, 2009).

#### **4.3.2 Case Study 5: Adaptive Livelihood Strategies in Mustang (Muktinath)**

**“The Indian pilgrims get out of the jeep and fall over”<sup>15</sup>**

In this section, first I first set the context of my analysis within a historical overview of the Trans Himalayan Salt Trade (THST) and the link between pilgrimage and trade. Next, I use a narrative from one of my research sites to describe the impacts of the road on the village of

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<sup>15</sup> K. Gurung, motorcycle taxi operator, personal communication, April 4, 2009

Muktinath and its environs, pointing out the adaptive livelihood strategies that have evolved in response. Then I show how these adaptations have their basis in the THST, and how traditional knowledge facilitated this adaptation. This case study requires the most in depth analyses of all the case studies because it involves analyzing the temporal couplings of time lags and legacy effects. Specifically, I argue that times lags and legacy effects have influenced the evolution of the new Kali Ghandaki Road and the subsequent socioeconomic and sociocultural impacts of the road on Muktinath and the surrounding area. In the case of Muktinath, the analysis of the time lag coupling and legacy effects necessitates a detailed analysis of economic, cultural, and environmental elements during a period spanning several hundred years with roots that extend back over thousands of years.

#### **4.3.2.1 The Trans Himalayan Salt Trade**

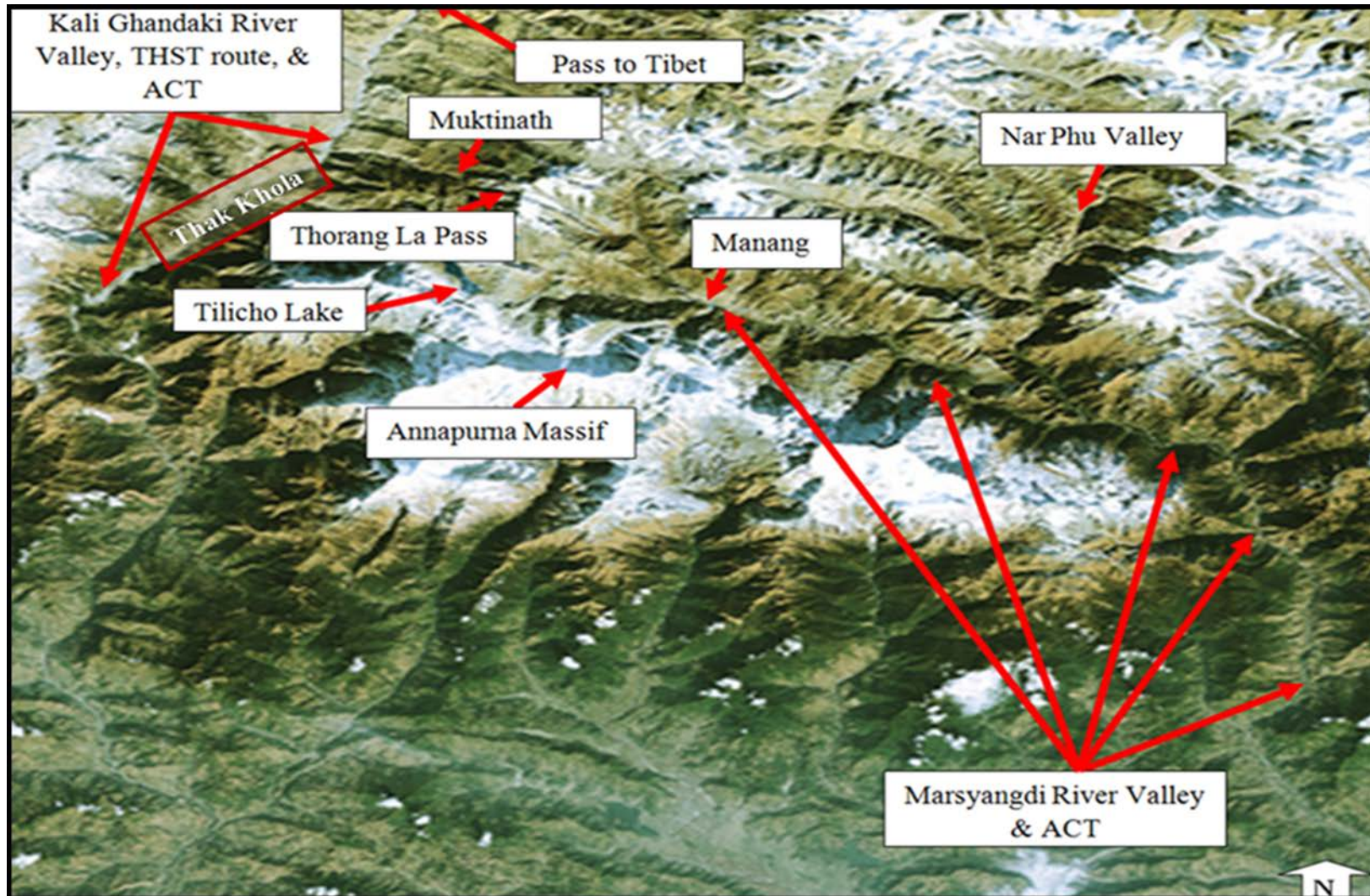
The Trans Himalayan Salt Trade was essential to the survival of food deficient villages in the Himalayas. The basic ingredients of TSHT were salt from Tibet traded for grains from southern Nepal and India (Fürer-Haimendorf 1975). The western Himalayan countries including Nepal, Sikkim, Bhutan, and Upper Assam had no significant internal sources of salt, but they did have access to grain, either within their own country or from India to the south. Grain is hard to grow in Tibet, where the climate and altitude limit the variety and amount of grain that will survive. Consequently, trade developed with the exchange of salt for grains, which included rice, barley, and wheat (Van Spengen 2000). Tibetan nomads collected salt in the many regional saline lakes in Tibet and transported it to villages, markets, and monasteries where it was further transported to numerous fairs and markets along Tibet's Himalayan border. Traders living in the Himalayan highlands south of the Tibetan border brought the rice to the middle hills area of Nepal where exchange for grain and other products from the south took place. It thus provided an important livelihood strategy for people living in the marginal agricultural areas of the Himalayas, where food security has always been a problem (Van Spengen 2000). Fürer-Haimendorf (1975:132) explains the importance of this activity in Nepal: "All along Nepal's

northern borders there are zones of high altitude inhabited by populations of Tibetan speech and Buddhist faith, who derive part of their subsistence from trans-Himalayan commerce.”

While salt and grain were the basic driving force behind the trade many other goods were also involved as Van Spengen (2000:12) explains.

Part of this trade was essentially local in character. Home-produced commodities like yaks, mules, and dairy products were bartered against domestic products from neighboring valleys. In addition, a few communities did become involved in the regional exchange of basic products between highly different ecozones. Within this system of exchange, grain from the subtropical middle hills moved northward through the Himalaya, while salt and wool were brought down from the cold and dry plateaus of southern Tibet. Next to this intermediate long-distance exchange of basic goods, there existed a truly long-distance trade in luxury goods between the Tibetan and Indian realms, centering on entrêpot markets in the middle Himalayan domain, and dealing in a wide range of low weight for value goods, such as gold, musk, precious stones, coral, pearls, copper, and fine cloth.

The importance of the THST varied from region to region in Nepal depending on several factors, one of the most important being the accessibility of a route that led to Tibet. The Upper Kali Ghandaki River Valley in Mustang District from Kalopani north is wide and flat with a relatively easy pass leading to Tibet, making it one of the most important trade routes between Tibet and Nepal (Fürer-Haimendorf 1975) (**Figure 4.28**). The section of the valley below Kalopani is narrow, steep, and hard to travel with animals during the monsoon. Northern salt traders arrived in the southern part of Mustang in the summer, during the monsoon. Unable to go further south due to the rain-soaked trail, traders would sell their salt in the Thak Khola area of southern Mustang (**Figure 4.28**). Grain traders from the south travelled to the same area of southern Mustang after fall harvest, arriving in the early winter. Travelling further north in the winter was too difficult so southern traders would also sell their grain in the Thak Khola. Consequently, the Thakali, who inhabit the Thak Khola, became the intermediaries without having to travel. Thakalis extracted a levy from the traders in exchange for safe passage through the valley and protection from robbery (Graffen 1997). Because of their location and the preferential trade agreements they held, some of them became quite wealthy, especially the



**Figure 4.28** Landsat TM satellite image of Annapurna region taken on 15 December 2000 (Adapted from [http://www.esa.int/esaMI/Eduspace\\_Earth\\_EN/SEMGY2XPXP\\_0.html](http://www.esa.int/esaMI/Eduspace_Earth_EN/SEMGY2XPXP_0.html))

Thakali customs contractors (Vinding 1998). Others in Mustang also benefitted from the trade because many found work in various aspects of the transport of goods.

The significance of the trade is evident from the amount of salt that arrived from Tibet, equaling 5000-10000 tons per year (Graafen and Seeber 1992-1993 cited in Graafen 1997). Trade items from the north, in addition to salt, included mules, horses, yak and yak hybrids, goats, sheep, fur, wool pelts, hides, cheese, and butter.

These items were traded for southern items such as rice, wheat, buckwheat, maize, barley, pulse, chilies, oil, spices, metal utensils, cotton and cotton cloth, Nepali paper, guns, and gun powder (Iijima 1977). While this trade had flourished for centuries, by the early 1960s the salt trade with Tibet was greatly diminished and virtually nonexistent in comparison to its heyday due to the closing of the border by the Chinese, and cheap Indian salt arriving from the south (Vinding 1998). Equally important was the flow of information that took place because of the trade. Essentially, it was the equivalent of the Internet today; with news, ideas, technology, philosophy, religion, and other information exchanged from far distant areas (Graafen 1997).

#### **4.3.2.1.1 Adaptation, pluralism, and acculturation**

These trade networks stretched over extensive distances and involved a multitude of actors including producers of goods, transporters, intermediaries, tax collectors, regulators, and buyers. Trade networks often involved multiple countries with many different commodities that changed hands numerous times before reaching their final destination. For example, silver in the form of Indian rupees garnered from trade with India paid for tea from Sichuan. After reaching Sichuan, the rupees changed hands again during trade with other non-Chinese traders who took the rupees to their country and melted them to make a universal currency (Giersch 2010).

In order for traders to maintain their existing routes and develop new routes for this transnational movement of goods, the process of adapting to the constantly changing cultural milieu through which they moved was crucial. Cross-cultural fluidity was essential, which meant adapting to others' dress, food, language, and religion, as well as creating institutions that enhanced contact within a pluralistic cultural setting (Rogers 2004, Vinding 1998, Fürer-

Haimendorf 1975). Successful traders were masters of knowing how to negotiate across cultures and consequently, often became powerful brokers, such as the Khampas in Tibet (Giersch 2010), the Nyeshang in Manang (Rogers 2004), and the Thakali in Mustang (Van Spengen 2000, Vinding 1998).

While the importance of the salt trade declined after the Chinese closed the border in 1959, trade did not completely stop. Many people living along the Tibetan border, such as the *Loba* in Upper Mustang, can still cross the border a limited distance to engage in trade. The weekly trade market at Namche Bazar in the Everest region still attracts Tibetans from across the border (personal observation, Namche Bazar, December 28, 2009). However, large-scale trade declined greatly and in Nepal, the trade shifted its focus to southern Nepal and India.

#### **4.3.2.1.2 Traditional ecological knowledge**

The term Traditional Ecological Knowledge is used as defined by Berkes (2012:7):

.a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living being (including humans) with one another and with their environment.

The seasonal patterns of this trade were embedded in traditional ecological knowledge as well as in traditional religious/cultural knowledge and practices, of which pilgrimage was primary. Traders in the Humla District of western Nepal are aware of the seasonal migratory patterns of ducks that come from Tibetan in the winter, flying south to India, and then returning in the summer. They find inspiration from the ducks during their long difficult journey on the trade route and sense the mutual seasonal migratory pattern of humans and birds (Lama 2002). This migration informs the basis of a wider worldview, which encompasses cultural and religious elements. In Nepal, Hindu myths describe how the God Shiva and his consort Parvati migrate from their summer home at Mt. Kailash in Tibet south to the Indian plains during the winter, and then return north again in the spring. Traders believe this yearly migration brings the annual change of seasons.

To ensure continued commerce between traders they engage a ritual friendship pact, consecrated by taking a vow to Mt. Kailash and Lake Manasarovar (in Tibet). The snow on Mt. Kailash and the water in Lake Manasarovar, as well as the union of Shiva and Parvati, serve as symbolic elements of the wish for lasting friendship and trade, bound by virtue of their vow. Mt. Kailash and nearby Lake Manasarovar are important pilgrimage sites for both Hindu and Buddhists because they are considered sacred by both religions. Taking a vow to these sites ensures that trade will be conducted in an ethical manner. Traditional ecological knowledge embeds in the ritual in a heap of rice representing Mt. Kailash and a vase of water representing Lake Manasarovar, which is set on a table in front of the participants (Lama 2002).

#### **4.3.2.2 Pilgrimage**

Of course, pilgrimage is often regarded as a physical counterpart to the spiritual way of life. Both require a special attitude, careful preparation, a determination not to give up whatever the cost, courage to overcome whatever obstacles get in the way, and caution in the face of danger. (H.H. Dalai Lama 2000)

- The object of pilgrimage is not rest and recreation-to get away from it all. To set out on a pilgrimage is to throw down a challenge to everyday life. Nothing matters but this adventure....After that there is a stony road to climb, on foot – a rough wild path, where everything is new. (Houston Smith in the forward of Cousineau 1998:xi)

Pilgrimage in the context of religion is an ancient tradition. According to Cousineau (1998), Abraham's pilgrimage into the desert to seek God 4000 years ago is the first written documentation of pilgrimage. Victor and Edith Turner, two renowned pilgrimage scholars, suggest that the practice of pilgrimage began long before recorded history saying: "...pilgrimages are probably of ancient origin and they were to be found even among populations that anthropologists call 'tribal', like the Huicol, the Lunda, and the Shona. However, institutionalized pilgrimage became of real importance with the advent of the great religions: Hinduism, Buddhism, Judaism, Christianity, and Islam" (Turner and Turner 1997 cited in Tomasi 2002:1). Pilgrimage routes are mentioned in the India epic the *Mahabharata*, which

dates to 200 B.C.E. to 200 C.E. (Singh 2004). It is a tradition shared by many religions and is cited in many of the holy books as a devout way to search for spiritual enlightenment.

One of the underlying motivations for pilgrimage is penance. Pilgrimage provides the opportunity to atone for one's sins through the penance of enduring physical hardship, pain, and suffering while on route to a sacred site (Preston 1992). It is also a test of one's devotion. In this sense, the journey is just as important, if not more so, than the destination. In Tibet, pilgrimage is part of the national identity. Buffetrille (2003:3) observes that Tibetan pilgrimage is a profound and deeply held commitment: "When the pilgrim begins his journey, he generally does not turn back. For to begin a pilgrimage is to take an implicit vow; to fail to complete the journey would mean to break the vow and to prevent the full realization of the meaning and purpose of the pilgrimage."

In Tibetan Buddhism the pain and hardship endured during pilgrimage helps the pilgrim remember the pain they have inflicted on others and the pain that all sentient beings experience, which cultivates a sense of compassion for all sentient beings. It is also a way to gain merit and erase negative karma. The lengths to which the devoted will go to endure these hardships are evident from Huber's (1999) description of the Rongo Chenmo Tsari pilgrimage to Pure Crystal Mountain in eastern Tibet along the northeastern Indian border.

The route led through densely forested tribal areas that were indefensible from ambush even with the protection of the rifle toting army escort. From the cover of the forest, pilgrims were easy targets to hit with poison arrows, rolling boulders, or surprise attacks. Pilgrims paid the tribes a tribute in exchange for an oath promising safe passage, but not all tribes took part in this exchange. Even if a group did take part, there was no guarantee they would keep their word. In 1944, a tribal group unsatisfied with their tribute massacred numerous pilgrims and wounded many others. In addition to these dangers, the trail in many places was narrow and dangerous crossing steep cliffs and wild rivers through dense subtropical jungle.

Frequent rains made for slippery footing on the makeshift bridges and ladders. Leaches found their way through the thick wool Tibetan dress, which was ill suited to the warm humid

subtropical area. There were very few places to camp and pilgrims would often sleep on the trail, in some cases tying themselves to a tree to prevent rolling off the narrow trail in the middle of the night. Everything for the journey was carried on the pilgrims' backs because the trail was too narrow for pack animals. The trip could take from two weeks to a month and pilgrims often ran out of food. Death from starvation, gastrointestinal ailments, infected wounds, falls, and attack was common.

A narrative by a Tibetan lama on the route in 1812 describes the conditions of hardship and the transformation he experienced (ZhKN cited in Huber 1999:145-46)

On the journey, I saw some people close to death due to illness, and also the corpses of some that had died. For them I offered assistance by way of blessings for a safe after-death journey and the transference of consciousness. I saw some who went on their way after abandoning their own sick friends, and the latter they wept since they were stuck and unable to carry on. I approached and consoled them saying, "The pilgrimage is not yet over. Rest for a few days and then continue when your strength is sufficient," and went on after leaving them medicine and provisions... When I saw that everyone suffered hardships compassion arose in me.

There are very similar concepts in Hindu pilgrimage that involve merit accrued from enduring hardship and sustained physical effort on route, appeasing a deity for sin, and holding vows (Harman 2004, Sandford 2004, Singh 2004). Messerschmitt's (1992:10) description of the pilgrimage route to Muktinath in Nepal highlights the elements of hardship and danger that Hindu pilgrims faced.

Getting to Muktinath has always been a formidable task... The ancient pilgrim track through the Kali Ghandaki gorge has provided a great mental and physical challenge for those who have braved its dangers century after century. Ancient trails, cut in the sheer cliff face, are still evident high above the more recently cut foot track. The old trails must have terrified pilgrims unused to mountain trekking, and more than a few surely died attempting to reach the upper valley of the Kali Ghandaki, beyond the gorge, during rains. It has been only in the past few decades that the track has been made relatively safe. Though, even now, the threat of landslide or the risk of simply falling off the precipice from the narrow and often slippery track, or from decaying bridges, is still very real.

### **4.3.2.3 Pilgrimage and trade**

The link between pilgrimage and trade is significant (Van Spengen 2000). Pilgrimage routes and trade routes are often on the same trail. Traditional pilgrimage frequently involved large numbers of people on the trail for long periods carrying a limited amount of resources. Along the Tibetan border areas of the Himalayas, trade fairs were staged, not only near important frontier towns but also often at pilgrimage sites, such as the annual prayer festival in Lhasa and at other important mountain pilgrimage sites including Mt. Kailas and Pure Crystal Mountain in Tsar (Huber 1999). Pilgrimage could sometimes take several years requiring pilgrims on route to engage in trade to survive.

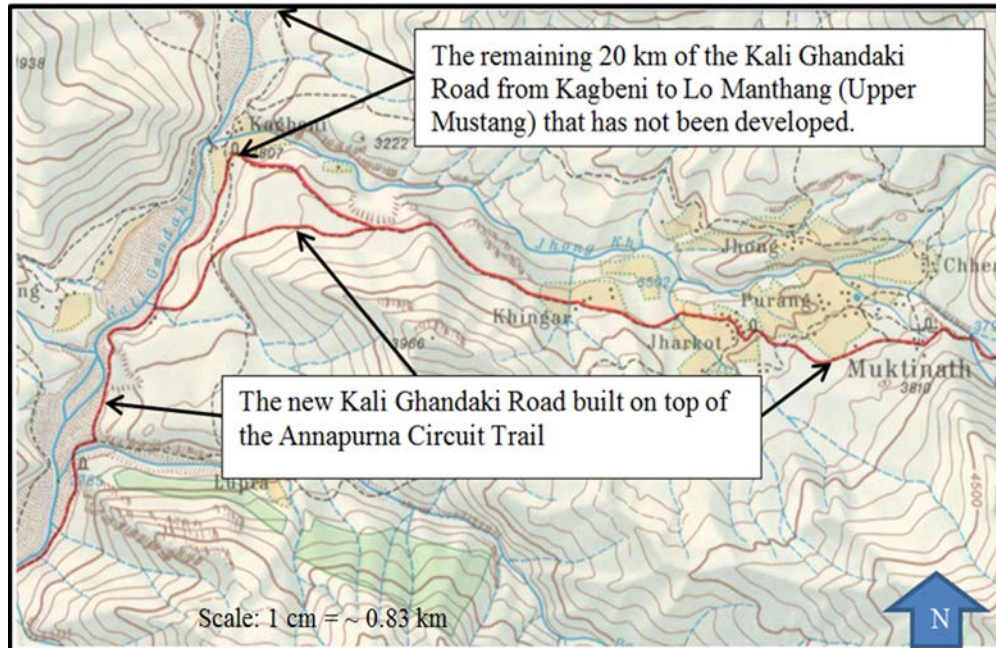
Seasonal gatherings of large groups of pilgrims at religious festivals created a market that drew traders from all over Asia (Van Spengen 2000). For example, in the auspicious Monkey Years of 1944 and 1956, the Rongpo Chenmo Tsari pilgrimage attracted more than 20000 pilgrims necessitating two hundred armed troops to protect them and help clear the trail (Huber 1999). In addition to the normal trade needed by such a large group to survive, the 'barbarian tribute' was an equally important trade for survival. It involved more than one hundred yaks loaded with barely, salt, sugar and other trade goods in exchange for an oath of safe passage from the tribal groups. In preparation for the trip, all the pilgrims would gather in one spot to wait for the official beginning of the procession and numerous traders would come to the camp to sell food and other items (Huber 1999). Tibetan Buddhist monasteries also conducted trade. They acted as storehouses for goods and, with a large, mostly male population; they were the perfect location for markets. Due to their power and influence, monasteries were able to monopolize movement of various trade items, such as the exporting gold dust and sheep and importing of tea (Giersch 2010).

Pilgrims from India also traveled north to engage in trade, sometimes traveling as far as Tibet. Clarke (1998) describes the Gosains, Indian Hindu ascetic trading pilgrims from the north of Bengal, who were instrumental in the trade between India and Tibet in the 18<sup>th</sup> and 19<sup>th</sup> Centuries. They traded coral, pearls, and other precious and semi-precious stones as well as silk

and other textiles in exchange for goods from Tibet such as musk, yak tails, and gold dust. They not only traded in the foothills of Nepal, but also travelled all the way to Lhasa often using the route along the Kali Ghandaki River in Mustang (Clarke 1998). They had numerous seasonal trading routes that connected to pilgrimage sites in India and Nepal. These seasonal trade routes coincided with seasonal pilgrimage cycles guaranteeing the Gosains large numbers of people with which to trade not only at gatherings but along the route as well. A British district administrator who was commissioner of an area with several pilgrimage sites observed that the sites were full of pilgrims and that the pilgrims "...generally manage to combine religion with a little business" (Clarke 1998:57).

#### 4.3.2.4 Analysis and Discussion: Sociocultural impacts of the Kali Ghandaki Road at Muktinath

After the construction of the new Kali Ghandaki Road in 2008, (**Figure 4.29**) the number of pilgrims arriving at the sacred site at Muktinath increased considerably.



**Figure 4.29** Section of the Kali Ghandaki Road still undeveloped from Kagbeni to Lo Manthang in Upper Mustang (Adapted from Nepal-Kartenwerk der Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung Nr. 9, 1993)

The head Hindu priest at the Muktinath temple said the numbers had increased “radically” by two to three times compared to before the road (Shiva Ram Shuba, Head Hindu priest, Muktinath, personal communication, November 27, 2009). The Buddhist nuns, who are the traditional caretakers of the temples at Muktinath, also said both Hindu and Buddhist pilgrims increased after the road reached Muktinath (Tezing Tsyeyang, Buddhist nun, Muktinath, personal communication, March 2010).

Several changes have occurred because of this increase. *Muktichettra* is the Sanskrit name used for Muktinath. In Sanskrit, *mukti* means salvation and *chettra* means field. *Chettra* can mean field in two ways. One is secular as in a field around commerce such as tourism and trade, and the other *chettra* is sacred, as in the spiritual field that encompasses sacred objects (Messerschmidt 1992). With the arrival of the road at Muktinath, there is now a steadily increasing overlap of these two *chettras*, with commercialization of the town and the temple area increasingly evident. This is due to the new road, which makes access to the sacred site easier for everyone. I argue that this has resulted in a fundamental cultural shift in values of pilgrims. In the traditional Himalayan pilgrimage, the journey is equally, if not more, important as the destination. The hardship of the journey is the means by which the pilgrim can experience a spiritual awakening that then transforms the pilgrim into a receptive vessel (Huber 1999). Once the pilgrim reaches the sacred site, due to this spiritual awakening in route, they are then empowered to engage with the sacred field and the blessing bestowed by its power, the power of the deities who inhabit it, and by their symbolic representations (Sax 1990). I argue that traveling by vehicle removes many of the challenges and hardships of the journey and therefore the destination becomes the goal. In this case, the pilgrim relegates the spiritual transformation to the external field and its objects rather than the catalytic internal transformation in conjunction with the external field. According to Bharati (1981:5-6 quoted in Sax 1990:492), the renowned Indian anthropologist and expert on Hindu pilgrimage:

in all Indian languages, Sanskritic or Dravidian, the word for pilgrimage contains the root for 'to go,' 'to move' (*lgam-*, *gaccha-*, *yam*, *yaccha-*, *yatra*).... [I]t was the motion, the effort of moving on and then up the steep mountain, the circumambulation and the various prostrations in and around the shrine...which must be seen as the key element in the whole undertaking .

This is not to say that all pilgrims enduring hardship experience a spiritual transformation or that pilgrims who come by vehicle do not experience a transformation, but it is a cultural shift in the traditional values and mode of pilgrimage in the Himalayas. Bleie (2002:177) states this succinctly, saying, "...the increasing use of mechanical transport to pilgrim sites in the Central Himalayas erodes the cultural notions that have underpinned the Himalayan pilgrimage for centuries." She (Bleie 2002:179) goes on to say:

Moreover, incipient transformation in the basic cultural categories of worship, place, and journeying of Nepalese and Indian pilgrims also blurs the boundary between pilgrimage and tourism. It is principally the pilgrims' use of modern means of transportation that spearheads this cultural change.

In terms of commercialization, it could be argued that commercialization of sacred sites is not a new phenomenon. In the Himalayas, the close historical link between pilgrimage, trade, and festivals near sacred sites undoubtedly led to a type of commercialization. The difference the road brings is a speeding up of the process and an increasing sophistication of the change. One of the significant changes is that previously only devout practitioners would undertake a strenuous journey by foot to a sacred site. With the ease and speed of vehicular travel, not just the devout take the journey. Various other actors with alterative motives arrive, such as thieves who want to steal sacred objects to sell on the black market and tourists who do not respect or understand the sacred space and are unaware that they create a market for defamers, charlatans, and voyeurs, which create an atmosphere of corruption. The difference in wealth between the tourists and the local inhabitants, including holy men and women, leads to temptations that ultimately erode traditional morals and ethics.

A long-term study of the Hindu sacred site at Manakamana, which sits on the top of a hill in central Nepal, credits the road in the valley below, which first arrived in 1976, for the

beginning of the “...large-scale commercialization of goods and services for pilgrims” (Bleie 2003:181). A cable car was built from the road to the temple in the late 1990s, eliminating the need to make the ‘arduous’ journey up the hill on foot and increasing the number of pilgrims even more. While the local community enjoyed a temporary economic benefit from the 250,000 visitors who came to Manakamana annually, the large increase in numbers created environmental problems that the villagers had not anticipated and were unprepared to deal with, such as the increased demand for wood for cooking, limited drinking water, and waste removal. Eventually, urban developers, including the cable car company, built larger, modern food and lodging facilities. This took a large piece of the locals’ share in the economic profits leaving the village with the entire burden and few benefits.

The local community experienced other unexpected consequences of the increase in pilgrims. In 1999, heavy monsoon rains resulted in water flooding into the temple courtyard damaging the foundation and almost inundating the inner shrine. Some villagers attributed this to the huge number of pilgrims whose nontraditional manner offended the temple Goddess, and they feared she might leave. Others blamed the construction of the cable car, as it had ruined the preexisting drainage system. Either way, the cable car was to blame as no one in the village could recall a time in the past when this calamity had occurred (Bleie 2003).

There are currently plans to build a cable car to the sacred site at Muktinath (Government of Nepal 2009, Pradhanag 2009, Right Honorable Speaker 2009, Bleie 2003). One can only guess what the impact will be. However, if it is anything like the changes at Manakamana, I believe that Muktinath will undergo a vast and profound transformation from an ancient sacred site to a commercial tourist attraction. In addition to the cable car there is a road planned to link the main road in the Kali Ghandaki River Valley, which currently leads to Muktinath, with the road that connects the Tibetan border to Lo Manthang in Upper Mustang (NTNC 2008b) (see **Figure 4.29**). With the completion of this section of road there will effectively be a road connecting Tibet with India through Nepal. This link existed a long time ago with the THST and, depending on the geopolitical climate, full-scale trade through the Kali Ghandaki River Valley

may begin again. If it does, the number of vehicles will increase substantially bringing more pollution and more people. There is already concern that the road will bring looters seeking artifacts from archaeological and sacred sites to sell on the black market (Turner 2010).

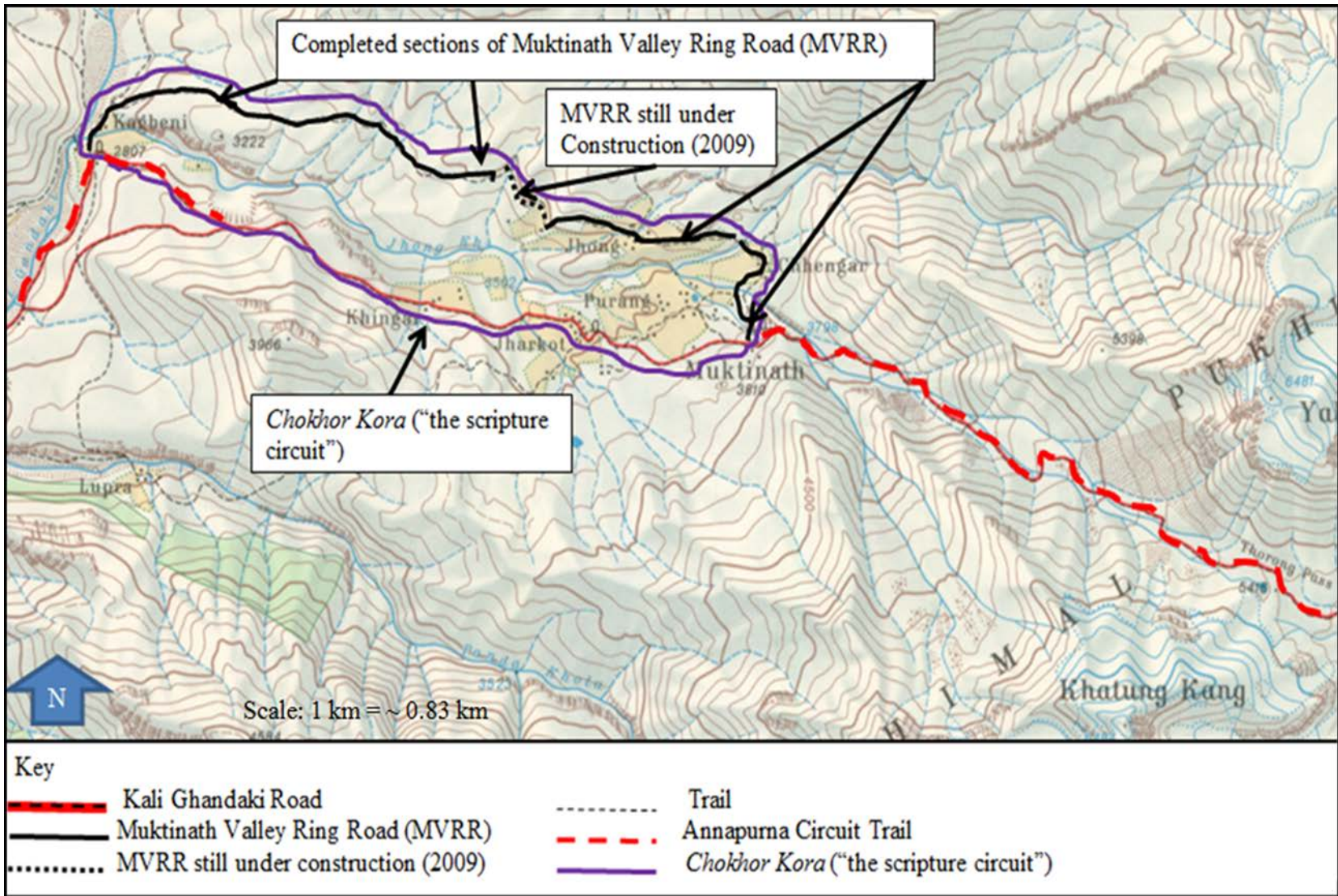
The positive side is the potential for the road to enable the local people to raise their standards of living with better access to a number of social and economic benefits, including access to markets and other job opportunities, schools, hospitals, and extended family members.

A similar sociocultural change may develop in the future after the Muktinath Valley Ring Road (MVRR) around the Muktinath Valley is completed (**Figure 4.30**). There is a traditional Tibetan Buddhist *kora* or circumambulation, of the six villages of the Muktinath Valley. This *kora* is called *Chokhor Kora* or the “the scripture circuit” because all 108 volumes of the Buddhist canon called the *Kangyur* are carried around the valley to bless the space (Gutschow 1999). This tradition is also practiced on an individual village basis to bless the fields and ensure a good harvest. Once the MVRR is complete, I suggest that this tradition will change from foot travel to vehicular travel.

This use of vehicles for pilgrimage is a growing trend in Tibetan areas, as more roads are constructed into areas where previously there were only trails (Buffetrille 2003). I observed this in July and August of 2009 in China, on the border of Northwest Yunnan and Tibet as described in **Appendix J: *Kha ba dkar po kora***.

#### **4.3.2.4.1 Traditional Ecological Knowledge as a facilitating link in Coupled Human and Natural Systems**

The most obvious change at Muktinath is the constant line of motorcycle taxis (**Figure 4.31**) that take pilgrims from where the jeeps stop, through the village and up the hill to the temples; a distance of about one kilometer. This situation is partially due to the fact that many pilgrims arrive at the high elevation of Muktinath (3800 m), from lower elevation locations, such as Pokhara (820 m), in one day, now that the road is complete.



**Figure 4.30** Map of Muktinath Valley with the Muktinath Valley Ring Road, the *Chokhor Kora*, and trails (Adapted from Nepal-Kartenwerk der Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung Nr. 9, 1993)

Consequently, they have not acclimatized to the altitude and have trouble walking the one-kilometer through the village and up the hill to the temple. As one interviewee put it, “The Indian pilgrims get out of the jeep, start walking, and fall over”. (Tserab Gurung, motorcycle taxi operator, Muktinath, personal communication, May1, 2009).



**Figure 4.31** Motorcycle taxis taking pilgrims to the temples at Muktinath (R.E. Beazley 2009)

The motorcycle taxi business is an adaptive strategy by the local young men to enhance their livelihoods by taking advantage of a situation created by the road. According to one of the motorcycle drivers interviewed, the motorcycle taxi business provides him enough money to travel to India for the winter, and enjoy himself for several months until the pilgrims begin to return in the spring (Tserab Gurung, motorcycle taxi operator, Muktinath, personal communication, May1, 2009). This adaptation links through traditional knowledge to trekking tourism, which in turn links to the Trans Himalayan Salt Trade (THST). This legacy effect of embedded previous CHANS facilitates adaptation to change.

The THST, and the connection between trade and pilgrimage, gave many people in the area facility in trade and commerce that passed from generation to generation. This business acumen facilitated the entrepreneurial transition to operating trekking lodges after the decline of the THST. The town of Muktinath is largely a product of the trekking economy, consisting mostly of guesthouses, souvenir shops, and restaurants. The current generation grew up in Muktinath in the middle of this trekking tourism adaptive phase and was involved in its day-to-day activities. Consequently, I argue that the speed with which these young men saw an opportunity to provide services and engage in trade (a ride for money) is a product of the evolution of adaptive strategies from the THST, in combination with the pilgrimage and trade link, through the trekking tourism adaptation, to the motorcycle taxi business. Traditional knowledge about trade and pilgrimage passed through many generations up to the present facilitated this evolution.

#### **4.3.2.5 Summary**

Legacy effects, "...the cumulative and evolving impacts of past interactions in CHANS on present and future conditions" (Liu et al. 2007c:643), are one of the main CHANS couplings involved in this case study. The CHANS of THST, pilgrimage, and trade evolved over hundreds of years of human influence on the environment along the THST route, as well as the environment's influence on humans. The Himalayas are a relatively new and dynamic mountain range that through thousands of years of geomorphic processes created a natural corridor connecting the lowlands of India and Nepal through the Himalayas to the Tibetan Plateau (see **Figure 4.28**) in what is now the Kali Ghandaki River Valley. These geomorphic processes operate across varying spatial scales, including global events such as the Little Ice Age, regional events such as periodic flooding of the Kali Ghandaki River, and local events such as mass-wasting of sections of the trail. Inhabitants of the Kali Ghandaki River Valley have adapted in various ways to this dynamic environment in order to survive.

One of the main adaptations was the THST, which increased food security by the exchange of salt from the highlands for grains from the lowlands. Bön, Buddhist, and Hindu

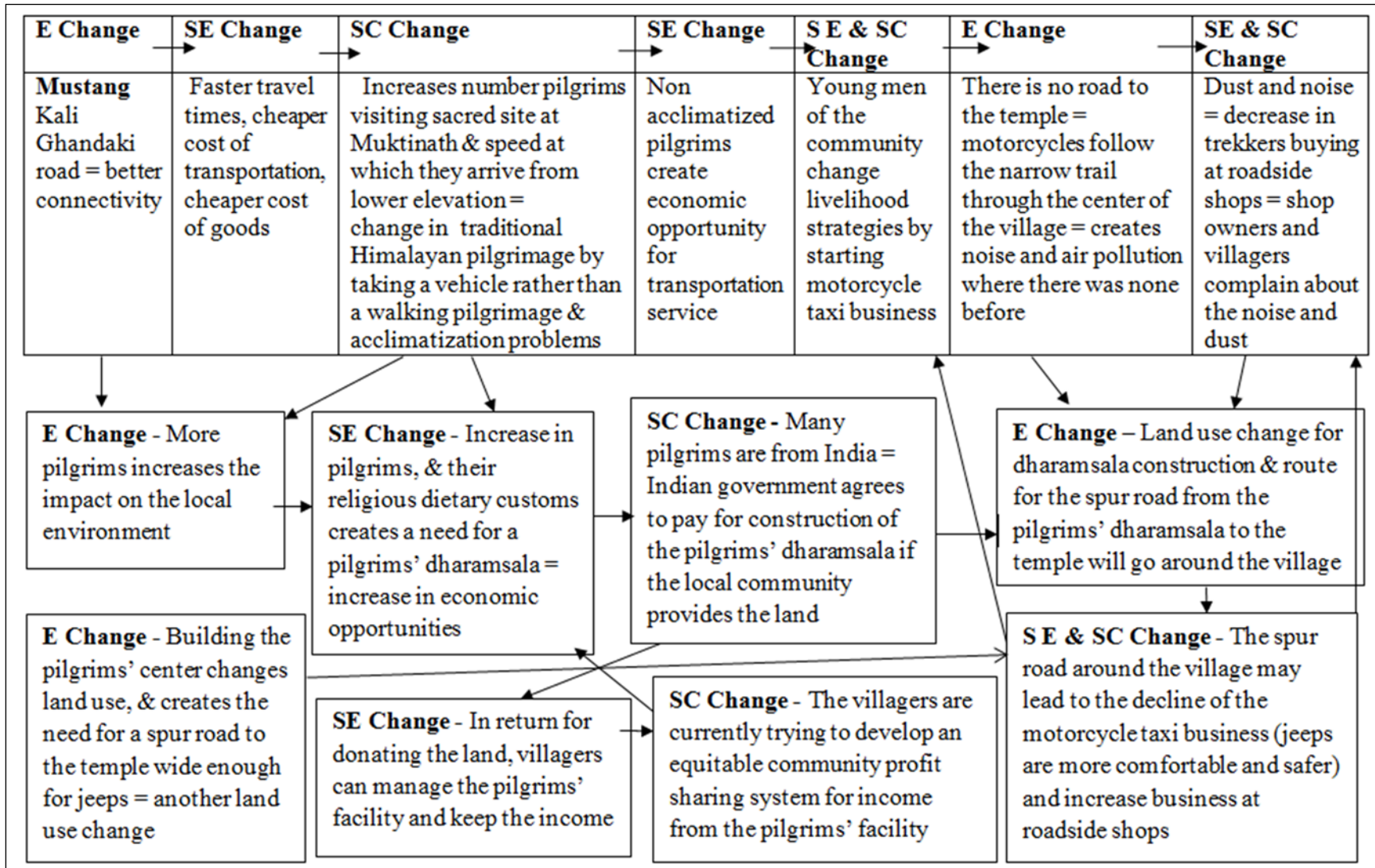
pilgrims also used this corridor to visit sacred sites. Both of these activities had an impact on the environment and other humans, not just locally, but over regional and global scales as well by linking far-flung trading areas and religious practices. The transformation of the physical landscape is evident from both the historical settlement pattern along the trade route and the temples erected for worship. The less obvious legacy effect is the sacred space, which I suggest, is just as influential on the present conditions. I argue that the Kali Ghandaki River Valley encompasses a vast sacred space that is formless. There are static physical representations of this space such as temples, meditation caves, and ritual objects. However, they are contained within a much larger psychological landscape that includes air, trees, mountains, rivers and other natural elements that gods and deities inhabit.

I illustrate the complex interaction of diverse elements and actors that are involved in the CHANS of transportation corridors (**Table 4.8**) by tracing the evolution of livelihoods. I start along the trajectory of the interaction between THST and the link between pilgrimage and trade to the emergence of the trekking lodge livelihood, to the construction of the new Kali Ghandaki Road, and now to the motorcycle taxi livelihood, all of which have an ecological base. In Muktinath, this evolution of CHANS in the form of a new road has many diverse impacts including sociocultural changes in values, norms, and traditions, socioeconomic changes leading to changes in livelihoods, and land use and land value change. I also suggest that several interesting couplings will take place in the future that I address in the conclusions (**Chapter 5**).

The interconnected influences are not strictly linear and there are multiple feedback loops. I suggest the road is not necessarily the beginning point, as it is part of a socioeconomic development project by the government. **Figure 4.32** illustrates the complex interconnectedness of the coupled human and natural systems by tracing the changes an environmental impact (the road) has on the socioeconomic and sociocultural spheres

**Table 4.8** The adaptive phases of Northern Himalayan (NH) and Southern Lowland (SL) livelihood strategies with the Traditional Ecological Knowledge (TEK) facilitating links in the sociocultural (SC), socioeconomic (SC), and Environmental (E) spheres

CHANS	→ Perturbation →	Adaptation →	Traditional Knowledge Adaptive Link		
			Socioeconomic →	Sociocultural →	Environmental
<b>NH</b> =Hunting and gathering, swidden ag., pastoralism, agro-pastoralism, transhumance <b>SL</b> = sedentary irrigated rice cultivation + crops, and animal husbandry ↓	<b>NH</b> =Limited food growing niche = food deficient + need other items not available locally <b>SL</b> = need for items not available in southern lowlands such as salt and wool, etc. ↓	<b>NH + SL</b> =THST exchange of goods and ideas, technologies, languages, customs, and religion between the different people involved in the trade and in the area ↓	<b>NH</b> =TEK of salt lakes- use of salt in Tibetan tea + TEK of trade items - medicinal plants, wool, horses, etc. <b>SL</b> = Knowledge of rice cultivation and items not found in mtn. areas - chilies, spices, etc. ↓	<b>NH</b> =dwellers always had to engage in trade to survive marginal conditions <b>SL</b> = dwellers also have traditionally engaged in trade to obtain commodities available only from highland areas ↓	<b>NH + SL</b> =passing knowledge of livelihoods strategies- ag., pastoralism, nomadism, animal husbandry, medicinal plants, recognition of weather patterns, seasonal changes, etc.,- all with an ecological base ↓
<b>Pilgrimage (THST+ Pilgrimage)</b> ↓	Pilgrimage= carrying limited supplies ↓	Engage in trade at sacred sites and festivals ↓	Mutually beneficial = ancient tradition ↓	Mutually beneficial = tradition ↓	Pilgrimage and trade have an ecological foundation ↓
<b>Mountain tourism (THST+ Pilgrimage+ mtn. tourism)</b> ↓	Decline of the THST after Chinese close Tibetan border 1959 ↓	Intensify trade south + services for trekkers- food, lodging, guiding, and portage ↓	THST + pilgrimage = transition to mtn. tourism + traditional lifestyle = pull for mtn. tourism ↓	Tradition of trade = easy transition to mtn. tourism ↓	TEK of Himalayas facilitates mtn. tourism=guiding, local food, TEK of weather, scenic and sacred sites, etc. ↓
<b>Motorcycle taxi</b>	Arrival of new road and resulting increase in pilgrims	Young men start motorcycle taxi business for pilgrims	TEK of trade, pilgrimage + mtn. tourism passed through many generations	TEK of trade, pilgrims, + mtn. tourism passed through generations	TEK of sacred space, environment, trade, and pilgrimage routes passed through many generations



**Figure 4.32** Diagram of the changes that an environmental (E) impact (the road) has on the socioeconomic (SE) and sociocultural (SC) spheres showing the complex interconnectedness of coupled human and natural systems

### 4.3.3 Case Study 6: Road impacts on Land Use and Value (Mustang District) “The whole village is planning to build many guesthouses on the hill”<sup>16</sup>

This case study shows how a road can influence both land use (see **Appendix H**: Rural Mountain Livelihoods and Land Use in Nepal) and land value in five different villages in Mustang District: Muktinath, Jharkot, Jhong, Chungkhar, and Putak. However it should be kept in mind that in Hinduism and Buddhism, land uses and values are not just associated with economic value but with spiritual values as well. “The sacred is a genuine land use for Tibetans” (Salick et al. 2005:319).

#### 4.3.3.1 Muktinath

The land use and land value changes occurring in Muktinath are because of the road, which provides a cheap and efficient way for pilgrims to visit the Muktinath temples. Since the Kali Ghandaki Road was completed to Muktinath in 2008 the number of pilgrims has increased by three times compared to before the road (Shiva Ram Shuba, Head Hindu priest Muktinath, personal communication, November 27, 2009). Now, a special facility is needed for pilgrims to cook their food according to their religious tradition and for lodging. In the Hindu religion, Brahmins have very particular ways in which their food should be prepared and served that guesthouses in Muktinath are not able to offer.

In response to the increase in pilgrims and the need for appropriate lodging and food preparation facilities, the governments of India and Nepal (**Figure 4.33**) are building a pilgrim’s *dharamsala* with lodging, personal cooking space, and a meditation - worship room. The government of India offered to finance the building of the *dharamsala* if the community would donate a piece of land. The villagers formed a community land organization and chose a piece of barren community land near the beginning of town to be the site for the *dharamsala*. They also negotiated an agreement with the Indian government to manage the *dharamsala* and distribute the income among the community (Krishna Shrestha, lodge owner, Muktinath, personal communication, November 28, 2009). In this way, the road has drastically changed the land use

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<sup>16</sup>P. Gurung, homestay owner, personal communication, April 27, 2009

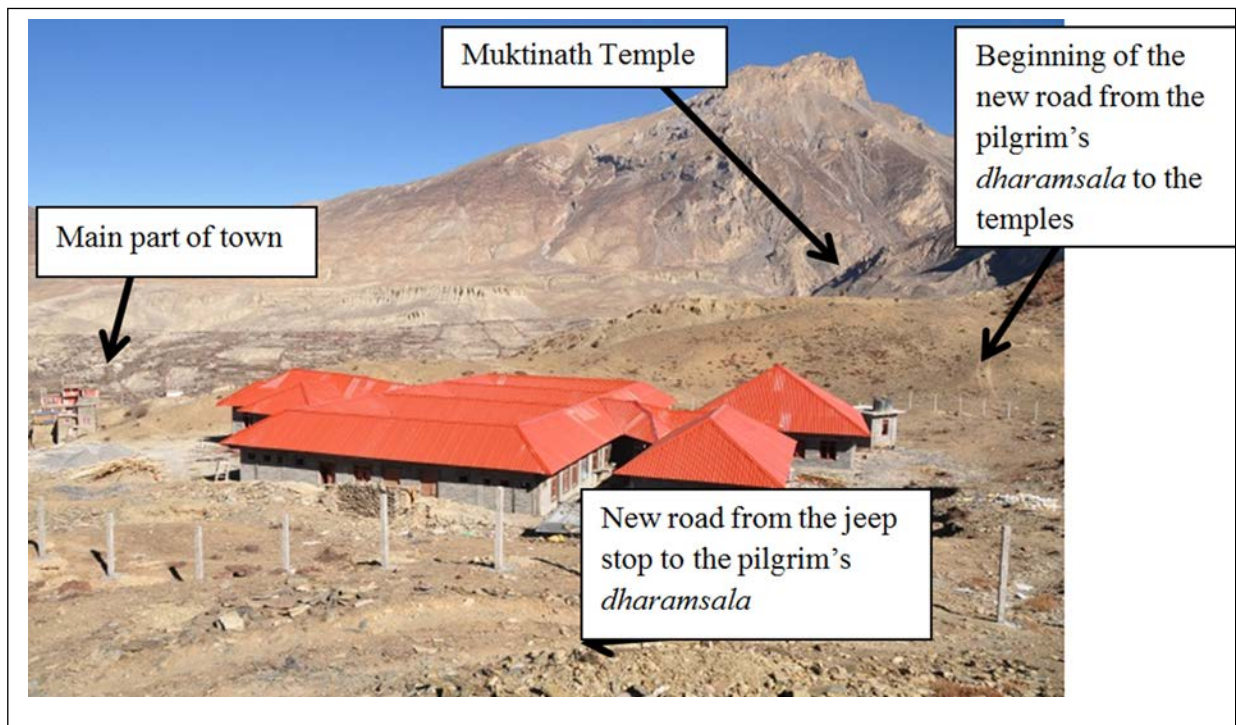
and land value of a piece of community land that was barren and unused. It is now a piece of land that will not only produce community income but create religious merit for the community as well.



**Figure 4.33** The sign at the site of the new *dharamsala* in Muktinath (R.E. Beazley 2009)

The construction of the *dharamsala* has led to another land use change. Construction has begun on a spur road, from the jeep stop at the beginning of town to the *dharamsala*, and then on to the temples on the hill (**Figure 4.34**). This will not only make it easier for pilgrims to get from the *dharamsala* to the temples, it will also reroute traffic around the town rather than right through the middle, which is the route that the motorcycle taxis presently use. Reciprocal effects and feedbacks, indirect effects, emergent properties, and increased scale and pace are the main couplings present, which then lead to the road influencing land use and land value as well as construction of additional roads. I argue this will eventually lead to a network of roads in this area (discussed below).

The other interesting land use/value change in Muktinath, stimulated by the road and the use of both motorcycle taxis and jeeps, is the construction of a ticket office with a parking area at the beginning of town. This also serves as a staging point for the motorcycle taxis that take tourists and pilgrims who arrive by jeep up to the temples.



**Figure 4.34** The new pilgrims' *dharamsala* (R.E. Beazley 2009)

### 4.3.3.2 Jharkot and Jhong

These two villages are located opposite each other in the Jhong Khola River Valley approximately 5 km downstream from Muktinath (**Figure 4.35**). They make a very interesting comparison in relation to the road construction because the road is complete on the Jharkot side of the valley whereas the Jhong side has no road, but it does have an alternate trail down the valley that trekkers are now starting to use to avoid walking on the road. There is a road planned to take the place of this trail and become part of a part of the Muktinath Valley Ring Road. In both villages, there is evidence that the road has influenced changes in land use and land value.

#### 4.3.3.2.1 Jharkot

Muktinath is the first village trekkers reach after coming over the Thorang La Pass from the east side (**Figure 4.35**).

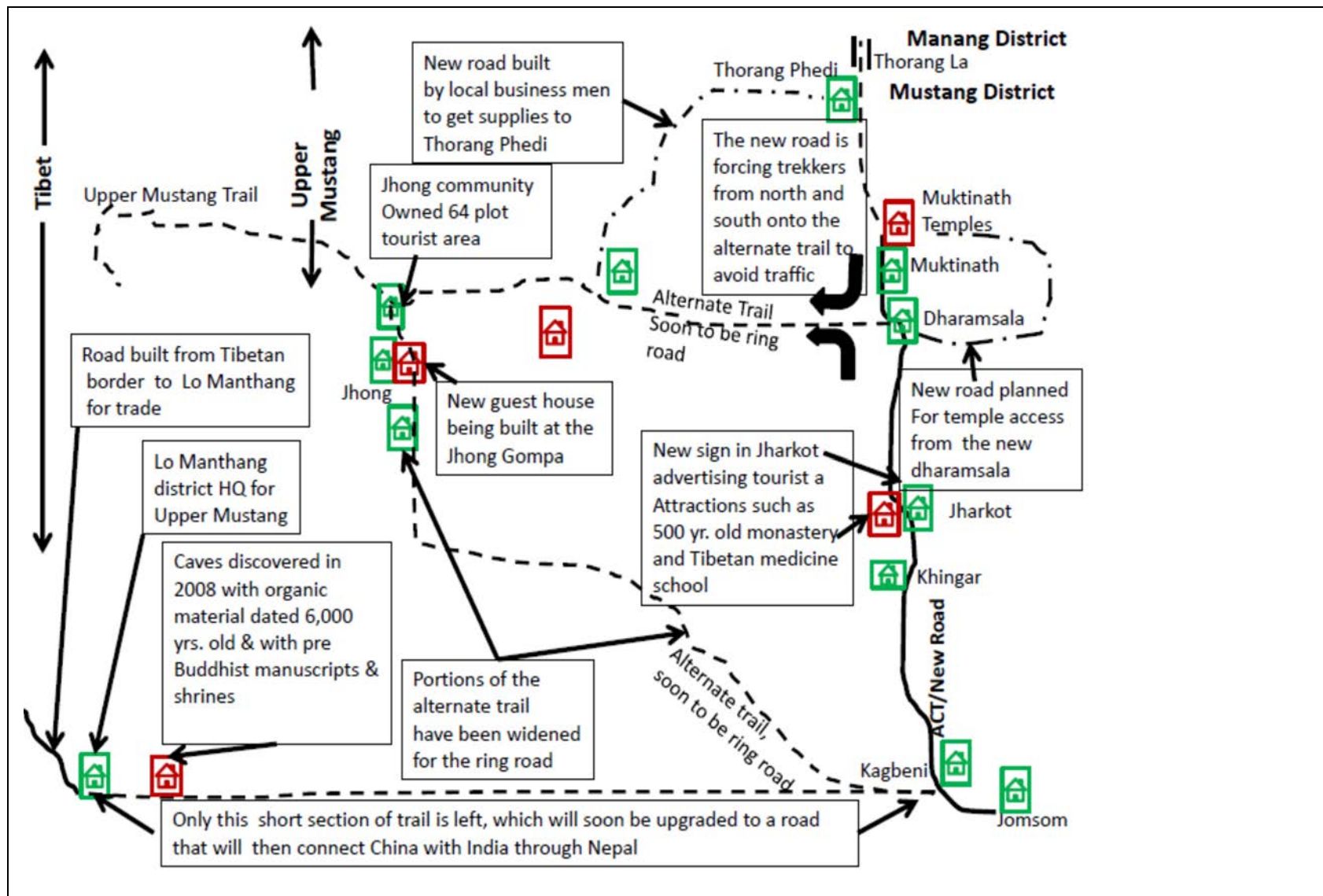


Figure 4.35 Summary diagram of Case Study 6

Exhausted trekkers coming down from the pass cannot wait to put up their feet and have a cold beer while listening to reggae in the Bob Marley Guest House. Jharkot is another 15 minutes down the trail and has quite a few nice modest guesthouses, an old monastery and a fortress. Jharkot has been a favorite of trekkers who do not want to deal with the hustle and bustle of Muktinath.

Guesthouse owners in Jharkot all agreed that the number of trekkers has decreased since the road was completed. One of the main reasons is that trekkers who are tired of hiking after crossing the Thorang La Pass can now hire a jeep in Muktinath to take them down the road rather than walking all the way to Jomsom on the road. The other reason is that trekkers do not want to walk on a dusty, noisy road.

The decrease in trekkers has led the lodge owners to seek additional livelihood options. Several of these options include collecting the caterpillar fungus *Cordyceps sinensis* known as *yartsagumba* (**Figure 4.36**), harvesting sea buckthorn (*Hippophae rhamnoides*) to make into juice, and expanding their fruit orchards.



**Figure 4.36** Caterpillar fungus (*Cordyceps sinensis*) known in Nepal as *yartsagumba*, highly valued in Chinese medicine (R.E. Beazley 2009)

The road has influenced their pursuit of these livelihoods in reciprocal effects and feedbacks coupling in that it has decreased their trekker business but at the same time increased their ability to pursue livelihood options that they could not before the road (see **Figure 4.35**). In

the past, it took five days by donkey to get produce to market, which meant most crops were only sold locally. With the road, farmers can now expand their present crops and grow other crops that were not economically viable before. Several guesthouse owners/farmers have made a land use change by expanding their fruit tree orchards now that they can use the road to get the fruit to market before it spoils. Other farmers can now get supplies from bigger distribution centers such as Pokhara easier, in addition to getting their produce to market faster and cheaper. This will eventually lead to mono-cropping based on market demand, one of the more predictable outcomes of rural road construction in agricultural areas (Salick et al. 2005; Allan 1986). Another predictable impact of rural road construction is the change from using animal fertilizer to the use of cheap chemical fertilizers. The road provides a link to fertilizer distribution centers and lowers the cost of the transportation, making the fertilizer affordable to farmers.

There are additional signs of land use changes being influenced by the road in Jharkot. In an attempt to attract more trekkers, villagers have erected signs describing some of the unique features of the village (see **Figure 4.35**). These signs did not exist during my first research visit six months before. This change of land use, while minimal compared to expanding an apple orchard or building a *dharamsala*, indicates the impact the road had over the short period I was away. One of the places of interest mentioned on the signs is the 500-year-old Buddhist *gompa* (see **Figure 4.35**) that tourists can tour with local guides who speak both English and French. Inside the *gompa* walls is a Traditional Tibetan Medicine School (see **Figure 4.35**), another tourist attraction mentioned on the sign. There is a famous traditional Tibetan medicine doctor (*amchi*) who gives classes in Tibetan medicine and who will give visitors a diagnosis if they wish.

Another land use change is the renovation of an old abandoned fortress that was in the process of falling down. The village development committee decided to repair and expand it to be a museum of local culture and a new community center. The road is aiding in this reconstruction by making building materials easier and cheaper to transport to the renovation site.

Even though all the lodge owners I interviewed said business was down, there was one new lodge under construction, an indication that some villagers think business will pick up again.

#### **4.3.3.2.2 Jhong**

Jhong (see **Figure 4.35**) technically lies in Upper Mustang District, but it is so close to the border of Mustang District that the locals have persuaded ACAP to allow trekkers to take the 45-minute hike across the valley to visit Jhong from either Jharkot or Muktinath. Curious trekkers, who still have energy after crossing the Thorang La Pass, sometimes cross the valley to visit Jhong on their way down the alternate trail (see **Figure 4.35**) that leads to Kagbeni. The new Muktinath road on the Jharkot side of the valley is influencing more trekkers to visit Jhong and to use the alternate trail rather than walking on the road.

The villagers of Jhong realize their potential to benefit from more trekkers who choose to cross the valley to the alternate trail and stay off the road. They are so optimistic about the trekking business increasing that they have divided a piece of community property into 64 plots for guesthouses and tourist facilities (see **Figure 4.35**). Now that the Muktinath Road is complete, Jhong has the perfect location to benefit from increased trekkers, not only because of the road influencing trekkers to cross from the other side of the valley, but also because they are situated on one of the trekking trails that comes down from Upper Mustang (see **Figure 4.35**). One of the tourist attractions in town is the Buddhist *gompa* (see **Figure 4.35**) high on a hill overlooking the valley. This *gompa* is being renovated, including the addition of a new guesthouse in the hopes that more trekkers and benefactors will come to visit now that the road is complete to Muktinath. When I visited Jhong there was only one guesthouse, testament to how few trekkers came through the area in the past. Now, that is changing because of the road.

#### **4.3.3.2.3 Comparison of Case Study 2 and Case Study 6**

At this point, it is informative to compare **Case Study 2** (see **Figure 4.12**) and **Case Study 6** (see **Figure 4.35**) because they have something in common. In both, a river separates two trails on opposite sides of the valley and the introduction of a road on one side of the river is affecting traffic flow, land use, and land value on both sides of the valley. In Case Study 6,

Jharkot is losing trekker business while Jhong is benefiting. This is very similar to the situation in Bahundanda and Sangye (**Case Study 2**). However, in **Case Study 2** trekkers prefer to stay on the road rather than take the trail to Bahundanda, whereas in **Case Study 6** trekkers prefer to avoid the road and cross the valley to Jhong on the alternate trail. I suggest in both cases this is for several reasons all of which are impacts from road construction, which I discuss below.

Bahundanda (**Case Study 2**) is at the beginning of the ACT (see **Figure 4.11**) and trekkers are eager to get up the valley and see the high mountains. However, they are not in good physical shape and therefore choose to use the road because it is easier and faster than crossing the river and climbing the hill to Bahundanda. This has led to changes in land uses and land values in New Sangye where a whole new town has emerged to service trekkers after the arrival of the road, which also has led to a decrease in business in Bahundanda (see **Figure 4.12**).

**Case Study 6** (see **Figure 4.35**) has the same diversion of trekkers from one area to another due to the road. However, in this case trekkers are deciding not to use the road. Jhong sits just below the Thorang La Pass on the downhill trail to Kagbeni. At this point trekkers have done the hardest part and feel they deserve some restful days exploring the new area. They are also physically in good shape and crossing the valley to stay off the road is worth the effort. In addition, trekkers are more open to exploring new areas that are off the main trail because they have had enough time to absorb the culture. This has created land use and land value changes in Jhong with the community designating 64 plots of community land for tourist services. All this may change relatively soon because the Muktinath Valley Ring Road under construction will allow tourists to circle the valley by vehicle (discussed below).

#### **4.3.3.3 Chungkhar**

Chungkhar (see **Figure 4.35**) is a small village located on the alternate trail between Muktinath and Jhong. The villagers interviewed in Chungkhar said they do not have many trekkers stay in their town because there are no guesthouses and their village is only an hour's walk from Muktinath, so most trekkers prefer to go on to Jhong. However, now that trekkers are starting to use the alternate trail through Chungkhar to Jhong one new guesthouse is under

construction. As the number of trekkers increases there will be more land use changes of this nature in Chungkhar, and once the ring road is completed it may become a popular stop for new tourists arriving by road. In addition, there is a Buddhist monastery being built near Chungkhar and, as in Jharkot, the road is helping get materials to the construction site.

#### **4.3.3.4 Putak**

Putak (see **Figure 4.35**) is a small enclave of houses one hour's walk down the valley from Jhong on the alternate trail. The beginning phases of the new the ring road (discussed below) has brought land use changes to Putak. The road alignment is routed above the town, rather than following the traditional trail through Putak. Agricultural land was lost to the road, and now the road bisects the remaining land. Currently, there are no guesthouses in Putak, however once the ring road is completed Putak has the potential to be another tourist destination in the valley. This would also potentially raise land values in Putak and create land use changes by converting agricultural fields to guesthouses (see **Appendix H: Rural Mountain Livelihoods and Land Use in Nepal**).

There are two new roads in the Muktinath Valley that developed in the six months between my two research periods. The alternate trail I hiked down-valley from Jhong to Kagbeni had been upgraded to rural road status by widening and leveling it with bulldozers (see **Figure 4.35**). Locals told me that this road would eventually connect to the Muktinath Road, essentially connecting the west side of the valley with the main road on the east side, making a ring road around the valley. Portions of this ring road were already passable by vehicles such as motorcycles and tractors.

The second new road is an extension of the ring road that leads from Chungar up the valley toward the Thorang La Pass, but stopping at Thorang Phedi, the last set of guesthouses before the pass (see **Figure 4.35**). A group of businesspersons built the road so that vehicles can supply the guesthouses.

#### 4.3.3.5 Discussion

Both of these roads have changed the land uses and the land values adjacent to the roads (see **Appendices A: A Brief History of Roads in Nepal** and **H: Rural Mountain Livelihoods and Land Use in Nepal**). The community plots in Jhong are substantially more valuable now that more trekkers are coming over from Muktinath to avoid the main road. In addition, once the ring road is completed (see **Figure 4.35**), Jhong will be the first village on the opposite side of the valley to have a substantial number of guesthouses and therefore will benefit in the same way that Ghalegaun has in **Case Study 1**. The trail leading up to the Thorang La Pass has changed due to the new section of road built to Thorang Phedi. Once the road is good enough to transport tourists to the guesthouses, there will be a spurt of new building creating land use and land value changes.

Kagbeni is the dividing line between Upper and Lower Mustang. Upper Mustang is only open to commercial trekking groups and requires a US \$500 visa. The Chinese built a road from the Tibetan border south to Lo Manthang (see **Figure 4.35**), the district headquarters of Upper Mustang. Now there is only 40 km of trail between Kagbeni and Lo Manthang that is not upgraded to rural road status (see **Figure 4.35**). This section of road is of prime interest to China, India, and Nepal because once it is upgraded there will be a road connecting the Chinese border through Nepal to the Indian border. The land value along this section of road will skyrocket once this last section of road is completed because of the extensive amount of trade that will ensue between all three nations. This will of course lead to land use changes as businesspersons build new facilities along the road, such as restaurants, gas stations, hotels, and shops.

There is also some concern that this road will affect cultural sites in Upper Mustang. Most of the buildings in the Upper Mustang use rammed earth construction methods. In Lo Manthang, the UNDP temporarily halted the construction of the road from the Tibetan border because the vibrations from vehicle noise near the rammed earth fortress walls around Lo Manthang and in the monasteries, threatened the integrity of these structures. After a thorough

study, the UNDP changed the road alignment so vehicles would be further away and not affect the fortress walls and monasteries (Edwards et al. 2002).

In 2008, a National Geographic expedition found caves with organic material dating back 6000 years in Upper Mustang, not far from the proposed road (see **Figure 4.35**). These caves are full of pre-Buddhist manuscripts as well as murals and numerous shrines. There is concern in some quarters that once the road is complete these caves will be victims of theft and vandalism (Turner 2009).

#### **4.3.3.6 Summary**

Road construction has influenced the land use and land value of the villages in this case study. In Muktinath, there has been a threefold increase in religious pilgrims since the road was built, which has led to building a new pilgrims *dharamsala* in addition to a spur road to the temples. In Jharkot, the road caused a decrease in the number of trekkers, but it also provided a means for farmers to get their produce to market. This has led to a land use change through the expansion of fruit orchards. In Jhong, trekkers coming from Muktinath, to stay off the road, have influenced the villagers to divide a piece of community land into 64 one-acre plots for tourist development (see **Figure 4.35**).

Two new roads were started in the six months between my research periods. One, built on the alternate trail from Jhong to Kagbeni is part of a ring road that will circle the valley. Once completed, this ring road will bring many more tourists to the valley and land values will go up. Land use will change with portions of agricultural fields being replaced by tourist facilities. The section of trail from Kagbeni north to Lo Manthang will eventually be up-graded to rural road status. Once that section is completed there will be a road connecting Tibet with India through Nepal. Hence, land values along this stretch of road will increase dramatically with the large volume of trade that will take place (see **Figure 4.35**). These land use and land value changes involve several CHANS couplings including reciprocal effects and feedbacks, indirect effects, emergent properties, increased impact of humans on natural systems, increased scale and pace, and impacts across spatial scales.

#### 4.3.4 Case Study 7: Road Impacts on Place Attributes and Tourism (Mustang District)

“The Government needs to let everyone know how beautiful it is here so people will come.”<sup>17</sup>

This case study looks at the temporal coupling of time lags and how this coupling interacts with place attributes to mitigate the impact of the Kali Ghandaki Road on tourism in Kagbeni, Jomsom, Marpha, the Namgayal Ling Tibetan Refugee Settlement (NLTRS) Larjung, and Lete.

##### 4.3.4.1 Background

The Kali Ghandaki Road follows the ACT directly through the center of Jomsom and Lete, but the road alignment either partially or completely bypasses the other villages. Marpha is unique in that the road goes directly through the center of the beginning of town, but then continues in a straight line rather than following the ACT through ‘Old Town’ Marpha. At Kagbeni, Tukche, and Larjung the road misses each village by less than 1 km and the NLTRS is on the opposite side of the river from the road (**Table 4.9**).

**Table 4.9** Road alignment and place attributes of village in Case Study 7

Village	0 km	Bypasses by		Place attributes	E	T
		> 1km	< 1 km			
Kagbeni		x		Location, Cultural, Infrastructure and services	x	3
Jomsom	x			Institutional, Infrastructure and services		2
Marpha	x			Location, Cultural		2
NLTRS			x	Cultural		1
Larjung		x		Location, Cultural		2
Lete		x		Location, Cultural	x	2

E = Enhanced place attributes, T = Total attributes, NLTRS = Namgayal Ling Tibetan Refugee Settlement

Now that the number of trekkers has declined, it is interesting to consider how the road will change the type of tourists coming to the area and where they will stay. I suggest that place attributes (**Table 4.10**) are an important characteristic that influences the number of tourists who visit each village, now that the road has taken the place of the trail. I argue that one of the

<sup>17</sup> L. Thakali, guesthouse owner, personal communication, April 20, 2009

impacts of the road, in the context of tourism, is that it increases the importance of place attributes. The number and type of place attributes influences the attractiveness of each village to tourists. However, it is not the place attributes alone that attract tourists, but whether the local communities enhance these attributes or not, and how they do it.

All these villages have their own unique characters and were popular with trekkers not only for their convenient locations on the trail, but also because of their unique place attributes. I have grouped these place attributes into five attribute categories: 1) Location /Aesthetic, 2) Cultural/Religious, 3) Social, 4) Infrastructure/Facilities, and 5) Institutional (**Table 4.10**)

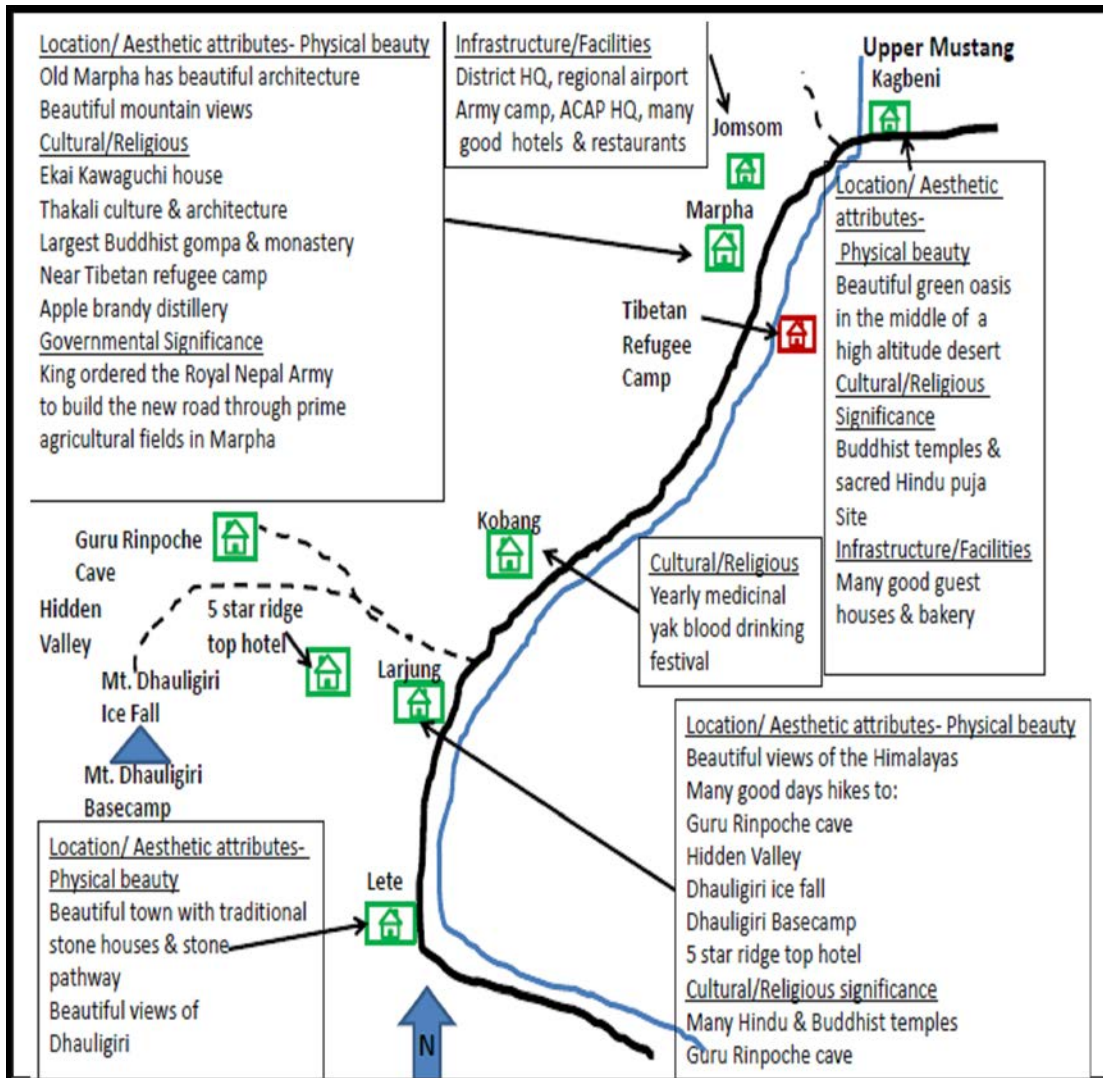
**Table 4.10** Place Attribute Characteristics

	<b>Place Attribute Characteristics</b>
<b>Location</b>	1. Access to aesthetic natural beauty: a) mountain views, b) hiking trails to mountain views or to places of intimate contact with mountains (e.g., Dhaulagiri Basecamp) 2. Proximity and access to interesting cultural sites and activities: a) Hindu/Buddhist/Bön temples, meditation caves, shrines, b) ceremonies and rituals (e.g., yak blood drinking festival)
<b>Cultural</b>	1. Lifestyle and livelihood 2. Birth and death rituals 3. Traditional ceremonies and festivals 4. Religious practices
<b>Social</b>	1. Friendliness to outsiders 2. English speaking ability 3. Understanding of foreign cultures and world events
<b>Infrastructure and services</b>	<u>Level of Services</u> 1. Household: a) clean and comfortable lodging, b) adequate bathing facilities, c) quality and style of meals, d) communication services 2. Community: a) transportation services, b) communication services, c) access to medical care, d) access to monetary institutions 3. Transportation services: a) airport, b) bus, c) jeep, d) motorcycle, e) horse
<b>Institutional</b>	1. District Headquarters 2. ACAP office 3. Police/army presence 4. Bank 5. Medical facility

### 4.3.4.2 Kagbeni

Road location (see **Table 4.9**): The road bypasses Kagbeni completely by turning 1 km before the town to follow the Jhong Khola River to Muktinath (**Figure 4.37**). This village sits in an oasis at the confluence of the Jhong Khola and Kali Ghandaki Rivers.

Location attributes (see **Table 4.10**): Kagbeni appears as a brilliant spot of green surrounded by mountainous desert scenery (**Figure 4.38**).



**Figure 4.37** Summary diagram of Case Study 7, with place attributes

It is the farthest point a trekker can go north, as it sits on the border of Mustang and Upper Mustang Districts. To enter Upper Mustang (see **Figure 4.37**) trekkers must buy a commercial trekking group package and pay a US \$500 permit fee. The Kali Ghandaki Road follows the traditional trail until one kilometer before Kagbeni, where it bypasses the town by making 90 degree to follow the Jhong Khola River up to Muktinath (see **Figure 4.37**). The contrast between the arid desert scenery and the green fields of Kagbeni is striking, and photographs of the village are often used in tourist brochures. The surrounding snowcapped Himalayas (**Figure 4.38**) add to the charm of this village making it a popular stop for trekkers even though it is now only one kilometer from the road (see **Table 4.9**).



**Figure 4.38** Kagbeni (R.E. Beazley 2009)

Cultural/Religious attributes (see **Table 4.10**): Kagbeni also is rich in cultural and religious attributes, including Bön, Buddhist, and Hindu sacred sites. Bön is an animistic religion that was predominant in Tibet before the rise of Buddhism. Bön made its way into Nepal during

several migrations of people from Tibet. The Kali Ghandaki Valley has many Bön sites including Kagbeni, which has some of the best-preserved statues of Bön protector deities (**Figure 4.39**). The Red House is known not only for its food and friendly staff, but also for its interesting Buddhist *gompa* as well. This *gompa* is inside the guesthouse and has a very old statue of the Buddha, which the owner claims has been in his family for 300 years (Tenzin Ghale, lodge owner, Kagbeni, personal communication, April 24, 2009) (**Figure 4.40**). There is also an old Buddhist monastery in town, which many trekkers visit to climb to the rooftop for the view.



**Figure 4.39** Bön protector deity at the north entrance to Kagbeni (R. E. Beazley 2009)



**Figure 4.40** Buddha statue in Red House *gumpa* room (R.E. Beazley 2009)

Kagbeni sits at the confluence of the Kali Ghandaki and the Jhong Khola Rivers (see **Figure 4.37**). These two rivers eventually merge with the most sacred river for Hindus, the Ganga. Consequently, Kagbeni holds special significance for Hindus. It is a traditional spot for Hindus to stop and do a puja called *shraddha* for their deceased relatives as they make their pilgrimage to Muktinath. Due to the religious significance of this spot (**Figure 4.41**), Nepali pilgrims going to Muktinath always stop here for a day to perform *shraddha*. During auspicious times, the number of pilgrims is so great that a *dharamsala* for cooking and sleeping was built in Kagbeni near the confluence temple where *shraddha* is performed.



**Figure 4.41** Confluence of the Jhong Khola and the Kali Ghandaki Rivers, the building in the foreground is where pilgrims perform *shraddha* (R.E. Beazley 2009)

Infrastructure and services (see **Table 4.10**): Capitalizing on its scenery and cultural attributes, villagers in Kagbeni have developed its infrastructure, services, and social attributes, including several famous guesthouses that trekkers recommend to other trekkers because they serve great food and have very friendly staff (see **Figure 4.37**). From the roof of one of the most popular, the Red House, there is an incredible view of the Kali Ghandaki Valley both upstream looking into Upper Mustang and downstream toward Jomsom. The Red House is renowned for its yak burgers. This I can attest to first hand as I spent five days at the Red House while doing interviews and had a yak burger (**Figure 4.42**) almost every night. Quite a few other guesthouses in town have a similar reputation. The owner of the Red House is a very friendly Thakali man who served as the mayor of Kagbeni for some time and is always eager to talk with his guests.



**Figure 4.42** The infamous Red House yak burger (R.E. Beazley 2009)

Enhancing place attributes (see **Table 4.9**): In order to enhance the place attributes of Kagbeni, the owner of the Red Guest House in conjunction with several other guesthouse owners has developed a tourist trail to a high viewpoint with a shelter (**Figure 4.43**) across the river from the community. They hope that tourists will be interested in staying in Kagbeni for several days so they can explore the village and hike the scenic trail. While I was in Kagbeni I talked to several groups who said the trip to the viewpoint was steep, but the view was well worth the effort.

Summary: The new road bypasses Kagbeni by turning up the Jhong Khola Valley one kilometer before the village, but due to Kagbeni's place attributes (see **Table 4.9**), it is not losing business. In fact, there was a new restaurant under construction when I was there indicating that business may actually be increasing due to the combination of the nearby road and Kagbeni's place attributes. In addition, the initiative of several villagers to build the scenic trail has enhanced Kagbeni's attributes even further.



**Figure 4.43** Scenic trail (see switchbacks on the right side of photo) and shelter developed by Kagbeni villagers to encourage trekkers to stay longer and explore the area (R.E. Beazley 2009)

#### **4.3.4.3 Jomsom**

Road location (see **Table 4.9**): The road follows the trail directly through the center of Jomsom.

Institutional attributes (see **Table 4.10**): Jomsom is the district headquarters for Mustang and has the only airstrip in the valley (see **Figure 4.37**). Before the road was completed, supplies had to come either on mules or by plane. Now, the road goes right through the middle of town. Jomsom currently serves as a transfer point for transportation operators on the new road. Buses can reach Jomsom, but can go no further up the valley due to the rough nature of the road. Therefore, anyone wanting to go to Kagbeni and Muktinath from Jomsom can now rent a seat in a jeep or go by motorcycle taxi. After the last section of road is completed to Lo Manthang, Jomsom will see even more business, as it is the district headquarters and controls the trade regulations for Mustang.

Infrastructure and services attributes (see **Table 4.10**): There are many nice guesthouses and banks in Jomsom because so many trekkers and government officials fly in and out of

Jomsom. Trekkers usually spend the night in town before their flight, or end up there for several nights waiting for suitable flying conditions (see **Figure 4.37**).

Summary: The place attributes of district headquarters, airport, and excellent facilities ensure that Jomsom will continue to attract trekkers and businesspeople, as well as religious pilgrims.

#### **4.3.4.4. Marpha**

Road location (see **Table 4.9**): The road follows the ACT through the first half of Marpha and then by passes Old Marpha to follow the Kali Ghandaki River (**Figure 4.44**).



**Figure 4.44** The conjunction of the Kali Ghandaki Road (left) and the ACT (right) on the north side of Marpha (R.E. Beazley 2009)

Location attributes (see **Table 4.10**)

1) Physical beauty: The outstanding characteristic of Marpha is the part called Old Marpha. The houses in Old Marpha are all painted white and attach to one another forming walls on either side of the old flag stone trail that leads through town (**Figure 4.45**). This part of Marpha is where most trekkers prefer to stay due to its unique Thakali architecture and because it is not on the road.



**Figure 4.45** Unique architecture of Old Marpha (R.E. Beazley 2009)

2) Agricultural significance: Marpha was chosen to be the location for an agricultural research station, ‘The Horticultural Farm’ (**Figure 4.46**), in 1966 due to a combination of its climate and fertile soil, which makes Marpha the best location in Nepal to grow apples. This project was started to help the local people compensate for the income they lost when the Trans Himalayan Salt Trade (THST) ended in 1959 (Morkel and Park, 2000). Before the road was constructed the only way to get apples to the nearest markets was a 3-5 day journey by mules or porters. This was not only expensive, but by the time the apples got to market they were often bruised and not fit for sale.

An interesting adaption to this situation took place. Through a combination of local initiative and foreign aid a distillery was built. This allowed apple growers to turn their apples into juice, wine, and brandy while the apples were still in good shape, thereby alleviating the problems of transportation. There are currently three distilleries in Marpha and the apple juice, wine, and brandy produced from these distilleries is famous throughout Nepal (**Figure 4.47**). Solar dehydrators have also been built to dry slices of apples to make apple ‘chips’.



Figure 4.46 Horticulture Center in Marpha (R.E. Beazley 2009)

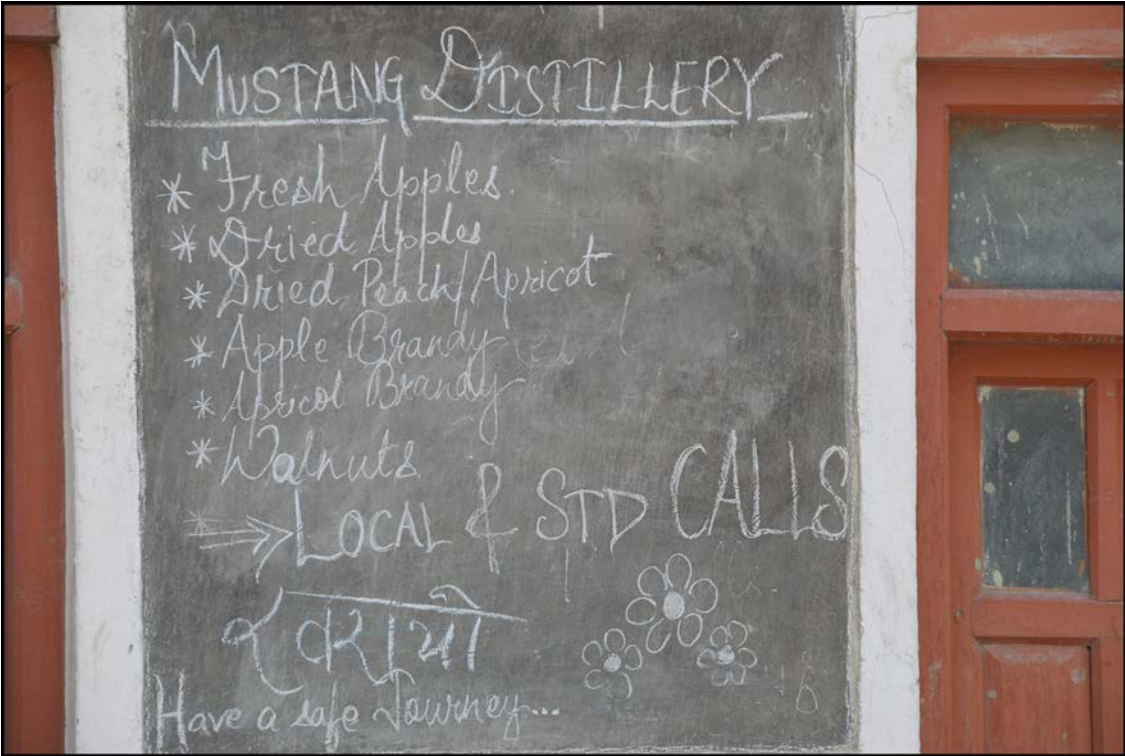


Figure 4.47 Distillery in Marpha (R.E. Beazley 2009)

All these products are popular with trekkers and Nepalis alike. Various types of apple pie, apple strudel, apple jam, and apple liquor are sold in Marpha guesthouses, making this section of the ACT popularly known as the ‘apple pie trek’.

Now, the road is having a significant impact on the apple growing business in Marpha as it not only reduces transportation cost, it also ensures that the apples get to market without damage. This is very important to the local growers because they have to compete with both Indian and Chinese apples, which before the road were always cheaper. None of the apple growers can survive by growing just apples, so many of the farmers are also own guesthouses. Several lodge owner/farmers I interviewed were expanding their apple orchards in addition to planting apricot trees and considering walnut trees as well. This is an interesting paradox for these farmers because they realize the road is hurting their trekking business, but at the same time, it is helping their apple growing business (Lama Ddundrop, lodge owner/apple farmer, Jharkot, personal communication, November 29, 2009).

Cultural attributes (see **Table 4.10**): A large population of the ethnic group of Tibetan origin called *Thakalis* inhabit Marpha. They became quite wealthy during the THST due to their business acumen and their ability to acculturate to the many different cultural and religious traditions of traders who came through the valley. Many trekkers come to Marpha to experience *Thakali* culture and to marvel at their architecture.

Religious attributes (see **Table 4.10**): In the 1800’s, Ehlih Qzono, a Buddhist monk from Japan famous for his travels throughout the Himalayas in search of Buddhist teachers, spent several years living in Marpha. The house where he lived was made into a shrine and museum in his honor. Many Japanese Buddhists come to Marpha specifically to visit his house and explore the museum. There is also a big Buddhist *gompa* in Old Marpha that many trekkers and pilgrims like to visit.

Institutional attributes (see **Table 4.10**): In 2006 during The People’s War, the King of Nepal declared a state of emergency giving him complete control of the military. One of his

orders to the army was to build the section of the road that goes through Marpha. The army was able to accomplish this section of road very quickly because they adhered to the dictum that ‘the shortest distance between two points is a straight line’ (Gotam Thakali, lodge owner, Marpha, personal communication, April 21, 2009). The main trail on entering Marpha goes straight through New Marpha and then curves towards the mountains to enter Old Town Marpha. The army decided to not go through Old Town Marpha and built the road in a straight line through some prime agricultural land. While the guesthouse owners in Old Marpha are happy that the road did not come through their part of town, they all agree that business has decreased considerably since the road was completed.

Summary: In this case study, even though Marpha has quite a few place attributes, it is currently suffering from a major decline in trekking business due to the road. However, the road is helping the agricultural businesses and once the road becomes paved, a new type of tourist will seek out Marpha due to its place attributes and tourist business will experience a revival.

#### **4.3.4.5 Namgayal Ling Tibetan Refugee Settlement, Tserok**

Road location (see **Table 4.9**): The Namgayal Ling Tibetan Refugee Settlement (NLTS) is on the opposite side of the river from the road, so the road completely by passes it.

Cultural attributes (see **Table 4.10**): The NLTS is four miles downstream on the opposite side of the river from Marpha. Although the settlement is across the river from the road, the inhabitants are still influenced by it because they do their business in Marpha. Tibetan refugees are not Nepali citizens and cannot own land in Nepal. The government donated the land their refugee camp occupies and while it is in a nice, quiet location across the river from the road, unlike Marpha, it does not have good agricultural land. For this reason most of the Tibetan refugees rent shops in Marpha to sell Tibetan souvenirs to trekkers. This has become their main source of income. Many of them are quite desperate now that fewer trekkers are coming to the area (Tenzin Gyermu, Tibetan Refugee souvenir seller, Marpha, personal communication, April

22, 2009). Some have started putting their displays on the roadside at either end of town hoping to sell their souvenirs to any potential buyers traveling on the road (**Figure 4.48**).



**Figure 4.48** Tibetans selling souvenirs along the roadside north of Marpha (R.E. Beazley 2009)

Trekkers coming through Marpha often hear about the refugee settlement, are curious about Tibetans, and so go to visit it and several projects in the settlement have been started by westerners who visited the settlement and wanted to help (**Figure 4.49**).

Summary: The new road is currently hurting trekking business thereby reducing the main source of income for the Tibetan refugees. However, once the road is paved and more tourists start arriving by vehicle, there will no doubt be resurgence in the Tibetan souvenir business in Marpha. Until then, the Tibetan refugees will have to find additional sources of income to make up for the lost in trekker business. The Tibetan cultural attribute is the main reason the refugees are able to eke out a living selling souvenirs. It is also the reason that some westerners visit the settlement and have started projects such as rebuilding the Chhairo *Gompa* (**Figure 4.50**).



**Figure 4.49** Solar cooker project started by a trekker at the Namgayal Ling Tibetan Refugee Settlement, Tserok, (R.E. Beazley 2009)



**Figure 4.50** Chhairo *Gompa* Restoration Project at the Namgayal Ling Tibetan Refugee Settlement, Tserok, started by westerners (R.E. Beazley 2009)

#### 4.3.4.6 Larjung

Road location (see **Table 4.9**): The road follows the trail directly through the center of Larjung.

Location attributes (see **Table 4.10**): Larjung does not possess the outstanding physical beauty in comparison to places such as Marpha or Jharkot (see **Case Study 6**), but it is located where trails to several beautiful side-hikes begin. One trail leads to three spectacular sites of natural beauty, the Dhaulagiri Ice Fall, Dhaulagiri Basecamp, and the Hidden Valley. Dhaulagiri is the 8<sup>th</sup> highest peak in the world and from the first ridge above Larjung the views of Dhaulagiri are breath taking. The other trail leads to a cave where the Buddhist adept Guru Rinpoche meditated on his way to Tibet in the 8<sup>th</sup> Century (Ehrhard 1993). This trail continues on to another town off the main trail, which trekkers visit to see a Nepali village that tourism has not affected.

Due to this location in proximity to such excellent hiking, a Nepali entrepreneur built a 5-star hotel on the ridge above town. From the ridge, the hotel has a commanding view of Dhaulagiri and Annapurna I. This hotel is not experiencing a loss of business due to the road because its clientele, affluent Japanese tourists, fly in by helicopter. Larjung village benefits from this because it is within short walking distance of the hotel and Japanese tourists staying in the hotel often hike to Larjung to buy snacks, sample local food, and look around. This has led to several Japanese tourists sponsoring local children to go to boarding school.

Cultural/Religious attributes (see **Table 4.10**): Larjung is the southern extent of the Tibetan Buddhist influence and has both Buddhist and Hindu *gompas*. It is fascinating to explore the numerous Buddhist and Hindu temples in the area, which is a good example of how the Buddhist and Hindu influences met in Larjung and adapted to each other in peaceful coexistence. During my research period, a tourist trail was being developed to two Hindu temples that are side-by-side. These two temples are particularly interesting because they represent two different

clans in the village. The cave in which Guru Rinpoche meditated, is considered very auspicious by Tibetan Buddhist and is a drawing card for pilgrims and tourists interested in Buddhism.

Enhancing place attributes (see **Table 4.10**): Larjung has attempted to enhance its place attributes in several ways. One is the sign at the entrance of town, which shows all the different day hike trails and temples. The other initiative is building a tourist trail to the Hindu temples on the hill.

Summary: Even though Larjung is currently loosing trekking business because of the road, in the future it will be a stopping point for tourists traveling by vehicle because it is a good jumping off point for both excellent day-hikes and visiting Buddhist and Hindu sacred sites.

#### **4.3.4.7 Lete**

Road location (see **Table 4.9**): The road follows the trail directly through the center of Lete.

Location attributes (see **Table 4.10**): Lete is blessed with a near perfect location for several reasons. Traveling up the Kali Ghandaki Valley, it is the first village to get good views of Dhaulagiri and Annapurna. In addition, it is still in the temperate forest ecozone, so it is surrounded by beautiful forests, unlike many of the villages further up the trail that are in the high desert ecozone. Massive, old flagstones cover the trail through town, but vehicles now drive over the flagstones because the road goes right through the center of the village. It is obvious that vehicular traffic is destroying the flagstones and eventually they will be gone unless something is done to preserve them.

Infrastructure and services attributes (see **Table 4.10**): All the houses and guesthouses in Larjung are very tastefully constructed in a similar traditional style. Many trekkers feel as if they have wandered into a Swiss mountain village upon arriving in Larjung.

Cultural/Religious attributes (see **Table 4.10**): Larjung is home to one of the most unique festivals in the valley. Every spring the locals, as well as visitors from other villages, trek into the high altitude meadows to find their yaks. They then spend a day partying and drinking fresh yak blood. This ritual is based in traditional ecological knowledge that has been passed down for generations. One of the veins in the neck of the yak is opened with a knife and the blood then spurts into cups, which are passed among the participants. The locals know that each yak can contribute four cups of blood safely, after which they smear the opening with yak dung. The cut then heals leaving the yak unharmed. The blood has medicinal qualities because the yaks eat in high altitude meadows, which are full of various high value medicinal plants such as the caterpillar fungus (*Cordyceps sinensis*, a.k.a. *yartsagumba*, see **Figure 4.35**). The locals claim that after you drink fresh yak blood you will not have any intestinal problems for five years (Vijay Shestra, lodge owner, personal communication, Tatopani, December 1, 2009).

Enhancing place attributes (see **Table 4.9**): The yak blood drinking festival is becoming better known because some villagers have contacted trekking agencies to advertise it as part of their trekking itinerary.

Summary: Currently the road goes right through the middle of Lete, so vehicles are contributing to air and noise pollution as well as destroying the flagstone path. However, once the road is paved, more tourists will arrive by vehicle and Lete will likely be one of the stopping points because it has many place attributes, including scenic beauty, interesting architecture, and interesting traditional customs.

#### **4.3.4.8 Overall Summary**

While most lodge owners admitted their business was down since the road was completed, those who are involved in agriculture also acknowledged that the road is helping them because of lower transportation costs and the speed and ease of transporting goods to markets. This advantage is especially felt in Marpha where apple growing is a substantial

business. Even though the road is currently hurting trekking business, the villages that have a variety of place attributes will continue to attract tourists and pilgrims. I suggest that in terms of tourism, the local populations' ability to enhance and market place attributes has a large influence on the impacts of expanding road networks. In addition, the short term-impact of a decrease in trekkers will continue until the road is upgraded to the point where tourist transportation is safe, comfortable, and efficient. After the road is paved, a completely new type of tourist will start visiting the area and at that point, place attributes will be extremely important in capturing this new business.

#### **4.3.5 Case Study 8: Impact of Expanding Road Networks (Myagdi and Kaski Districts)**

**“There is never just one road.”<sup>18</sup>**

This case study examines the impact that one road can have on the development of spur roads, which eventually leads to a network of interconnecting roads. The temporal couplings of massive increases of human impact on natural systems is analyzed in the villages of Tatopani, Berrubowa, Dahundanda, and Shikha in Myagdi District, and Ghorepani, Syauli Bazar, Birenthanti, and Annapurna Basecamp in Kaski District.

##### **4.3.5.1 Background**

###### **4.3.5.1.1 Myagdi District**

Beni Bazaar is the District headquarters for Myagdi District (**Figure 4.51**). The Kali Ghandaki Road, which was completed in 2007, was begun near Beni Bazar (see **Figure 4.51**) where the pre-existing road stopped. Myagdi District lies to the south of Mustang having a land area of 2297 km<sup>2</sup> and elevation in the district ranges from 915 to 8157 m with land use of 31% rock and snow, 30 % forested, 22% shrub, 10% bare and only 7.2% agricultural land (Vaidya and Gautum 2008). With the large range in elevation climate can vary significantly in the district. In general, there are three different climatic zones, subtropical, temperate, and alpine.

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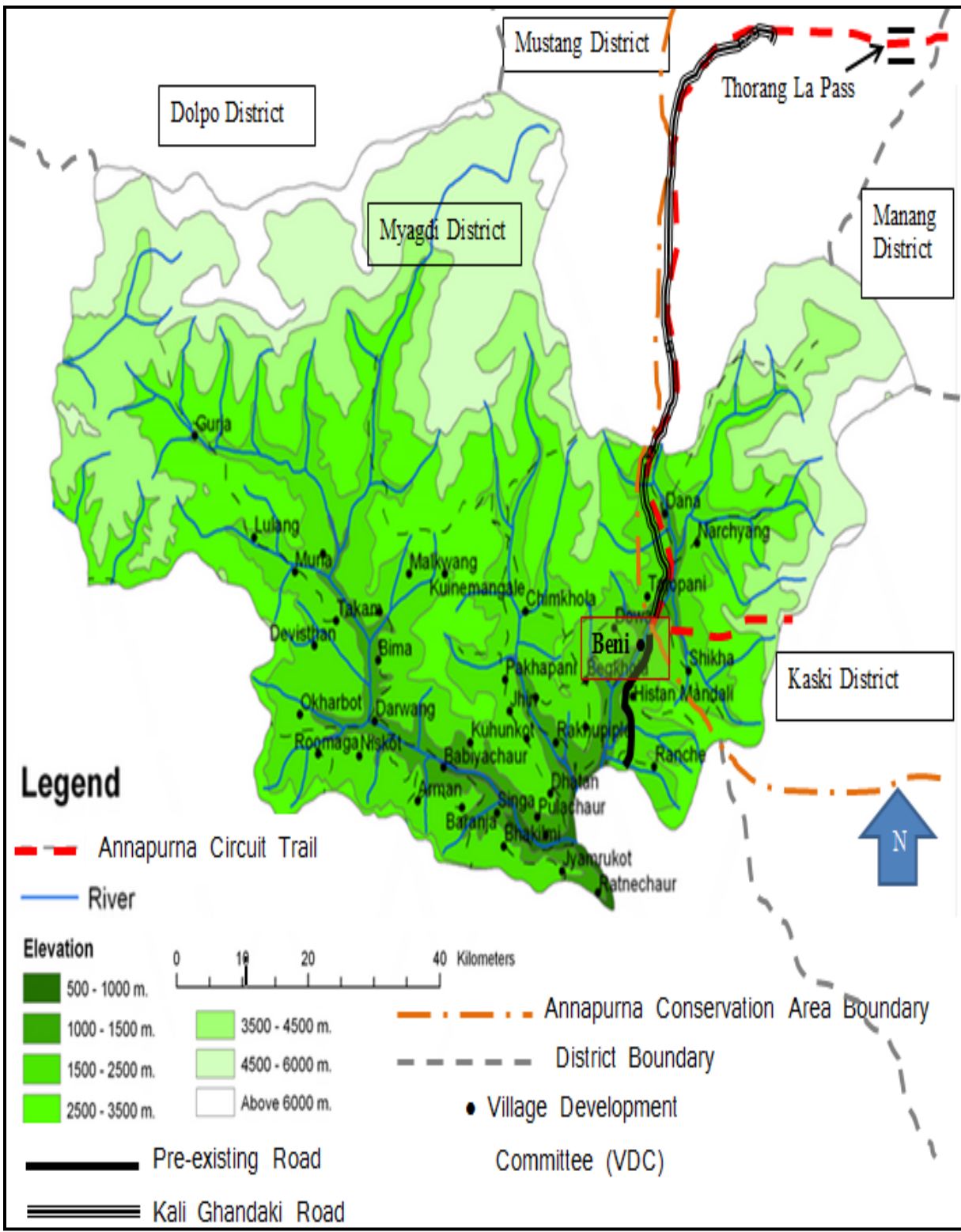
<sup>18</sup> R. Beazley, graduate student, Cornell University, March 10, 2011

Precipitation can also vary greatly from a minimum average of 407 to 2960 mm per year during the monsoon (Poudel 2006).

The population of the district is 114,447 of which 75% are Hindu and 24.5% Buddhist. The remainders are Christian, Muslim, Kirat, Sikh, Bahai, and other (HMGN/CBS 2001). According to Gurung, H et al (2006), Myagdi has 26 ethnic/caste groups and 13 languages. The Magar ethnic group is the majority at 42%, followed by Chhettri (16%), and Hindu cast groups of Kami (13%), Brahmin (8%), Damai (4.5%), and remaining groups of Chhantyal, Sarki, Thakuri, Newar, Dalit, Thakali, Gurung, and others (GoN/NPCS/CBS 2001b). The Magar are a Tibeto-Burman group who make up the largest minority group in Nepal. They live in many other areas of Nepal and those that live in northern areas often practice Buddhism and dress in Tibetan fashion while those that live in southern areas practice Hinduism (Bista 1987).

There is some concern that a small ethnic group in Myagdi, the Chantyal, may lose their native language. They speak a Tibeto-Burmese language in the Chantyal-Gurung-Manang-Tamang-Thakali [CGMTT] language group of Nepal (Noonan 2001). The Chantyal are estimated to be 8000-9000 individuals, and have two distinct populations, one in Myagdi District, and the other in neighboring Baglung District. The Baglung Chantyal stopped using their language sometime in the 1900's, replacing it with the national language, Nepali. The Myagdi Chantyal have managed to retain their indigenous language as well as learning Nepali, however the number of people who still speak Chantyal has been decreasing. The Myagdi Chantyal have managed to retain their indigenous language as well as learning Nepali, however the number of people who still speak Chantyal has been decreasing.

There are several Chantyal villages in Myagdi where the language is no longer spoken, and it is estimated that only 2000 still speak Chantyal. The decline of the language is thought to be the result of the Chantyal migrating from western Nepal into Baglung and Myagdi Districts, where they became a minority. As their villages became assimilated with Hindu caste groups and other Nepali speakers, they were forced to speak Nepali to communicate.



**Figure 4.51** Myagdi District elevation, trail, and road map (adapted from Digital Himalaya [http://himalaya.socanth.cam.ac.uk/collections/maps/nepalmaps/district\\_myagdi\\_everything.gif](http://himalaya.socanth.cam.ac.uk/collections/maps/nepalmaps/district_myagdi_everything.gif))

This has resulted in the Chantyal language being modified in several ways, such as losing its tonal quality to match the non-tonal quality of Nepali. In the extreme case, there are villages where Chantyal is no longer spoken, although some older people can still understand it. There is also one community where the upper part of the village speaks Chantyal, but the lower village speaks only Nepali. Noonan (2001) argues that, due to a combination of incentives including socioeconomic, educational, and technological, the Chantyal language will continue to decline and eventually die.

Livelihoods in Myagdi district are primarily agriculturally based with some villages practicing transhumance. Typical crops include millet, buckwheat, barley, maize, and potatoes (Messerschmidt 1986). Livestock are an integral part of the farming system providing food, fertilizer, labor, and income from sale to others. Sheep, goats, cows, oxen, and water buffalo are typical to this area (Metz 1990).

Tourism has become an important source of income for some communities along the Annapurna Circuit Trail and other trekking trails in ACAP that fall within Myagdi District. As in many of the districts in Nepal a large percent of the population depends on remittances from family members who have migrated abroad for work. In Myagdi, agriculture only contributes 31% to the GDP of the district where as foreign employment contributes 45.5% (Poudel 2006).

#### **4.3.5.1.2 Kaski District**

Kaski District (**Figure 4.52**) has a land area of 2017 km<sup>2</sup> and has 43 village development committees (VDC). It also has one of the most popular tourist destinations, the sub-metropolitan city of Pokhara, which serves as the district headquarters for Kaski. Elevation in Kaski ranges from the slopes of the tenth highest peak in the world, Annapurna I (8090 m) to Phewa Lake (827 m) in Pokhara (**Figure 4.52**). The popularity of Pokhara with tourists is due to a combination of views from the lake side hotels, which have a spectacular view of numerous Himalayan peaks including Annapurna I (8090 m), Annapurna II (7937 m), and Machhapuchhre (6992 m) (**Figure 4.53**), and access to many excellent outdoor activity options including hiking trails, whitewater rafting, hot air ballooning, golf, and ultra-light flights.



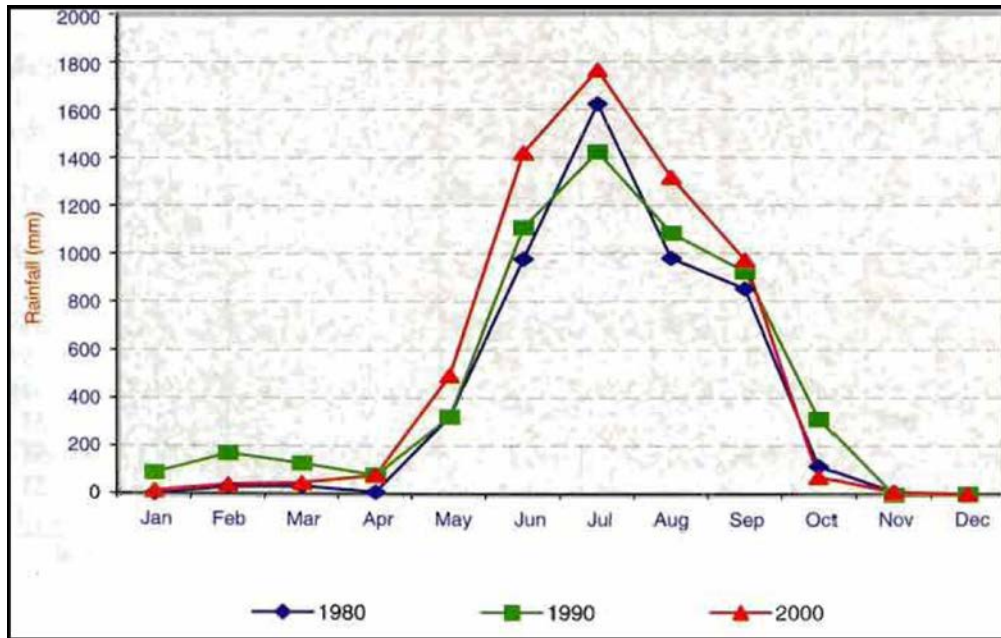


**Figure 4.53** View of the Himalayas from Phewa Lake in Pokhara. The pointed peak in the center of the picture is Machhapuchhre (6992 m) (<http://www.freeskihimalaya.com/>)

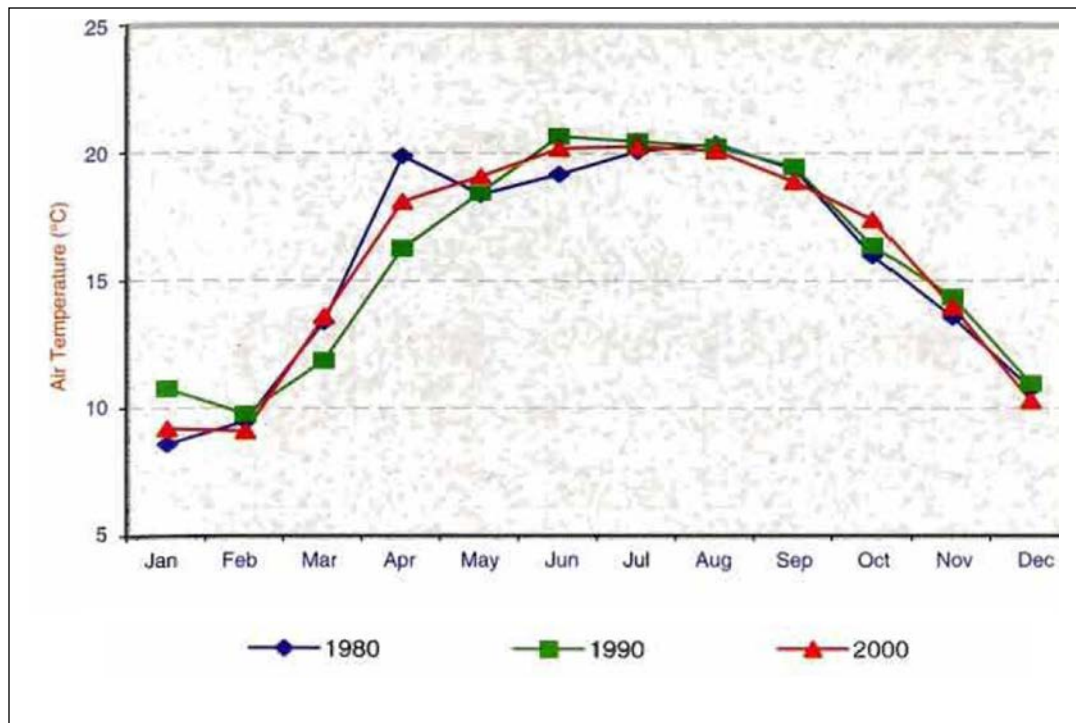
The Annapurna massif forces the monsoon rain clouds from the Bay of Bengal to drop large amounts of precipitation in Kaski, with 70% typically coming during a three-month period from July to September (**Figure 4.54**). The amount is so great that Kaski ranks first in rainfall of all 75 districts of Nepal. The temperature range at the Lumle weather station (1500 m) in Kaski is quite moderate ranging from 5° to 22° C (**Figure 4.55**) (Ahmad et al. 2003).

Kaski has three climatic zones: subtropical, temperate, and alpine. The range in elevation combined with heavy rainfall produces a large diversity in vegetation. *Castanopsis indica* (*Marki sal*) and *Schima wallichii* (*Hingori*) forests characterize the subtropical zone (1000-1800 m) (see **Figure 4.52**), in addition to beech, teak, maple, alder, and birch.

The temperate zone (1800-4000 m) (see **Figure 4.52**) forests contain spruce, larch, fir, and pine trees. This is also the zone where several varieties of rhododendron are found including, *Rhododendron barbatum* and *R. arboretum* (red tree rhododendron).



**Figure 4.54** Annual rainfall at the Lumle weather station (1500 m) in Kaski District in 1980, 1990, and 2000 (Ahmad et al. 2003)



**Figure 4.55** Monthly temperature range at Lumle weather station (1500 m) in Kaski District 1980, 1990, and 2000 (Ahmad et al. 2003)

The alpine zone (3500-5000 m) (see **Figure 4.52**) also has several varieties of rhododendron including *R. anthopogon* and *R. lepidotum*, in addition to *Ephedra gerardiana*, *Cordyialis juncea*, *Delphinium roylei*, and *Aquilegia nivalis* (Ahmad et al. 2003). The total forested area of Kaski is 89087 km<sup>2</sup> and 384 of its forests are managed by community forest user groups (CFUG) (Pokharel and Suvedi 2007).

The wealth of flowering plants makes excellent bee habitat and Kaski is home to several bee species including the unusual *Apis laboriosa*, also known as the Himalayan cliff bee because it builds a single comb on cliff faces from altitudes ranging from 1200 to 3600 m (Joshi et al. 2004). *A. laboriosa* is the largest honeybee in the world, an adaptation providing more muscle mass to survive in the cold, low oxygen environment of the Himalayas. They measure up to 3 cm long and have one of the widest foraging ranges of any honeybee, flying up to a 3 km radius (Ahmad et al. 2003). Underwood (1986) claims that *A. laboriosa* travel more than 5 km from their nest, can traverse at least 670 m of elevation change, and are the only honeybee that is not found in the tropics.

According to the latest census data available (GoN/CBS 2001) Kaski has a population of 380,527. There are 28 caste and ethnic groups in Kaski, which speak 29 different languages (Gurung, H et al. 2006). Some of the major caste and ethnic groups include Brahmin and Chhetri (41%), and Gurung (17%), with the remainder being Magar, Tamang, Kami, and Dalit. Hinduism (76%) and Buddhism (13%) are the main religious traditions practiced. Agriculture and animal husbandry are the main livelihood strategy in addition to seasonal trade, tourism, and industry around the Pokhara area. The main crops cultivated are rice, millet, maize, and wheat.

In areas of Kaski near *A. laboriosa* habitat (**Figure 4.57**), gathering honey is an important source of income. The honey is harvested twice a year (March/April and October/November). The people who collect the *A. laboriosa* honey have become known as the 'Honey Hunters of Nepal'. To collect the honey a rope ladder is tied to a tree at the top of a cliff, which is then hung down the cliff face so that the climbers, or *kuiche* (**Figures 4.57**), can access the comb.

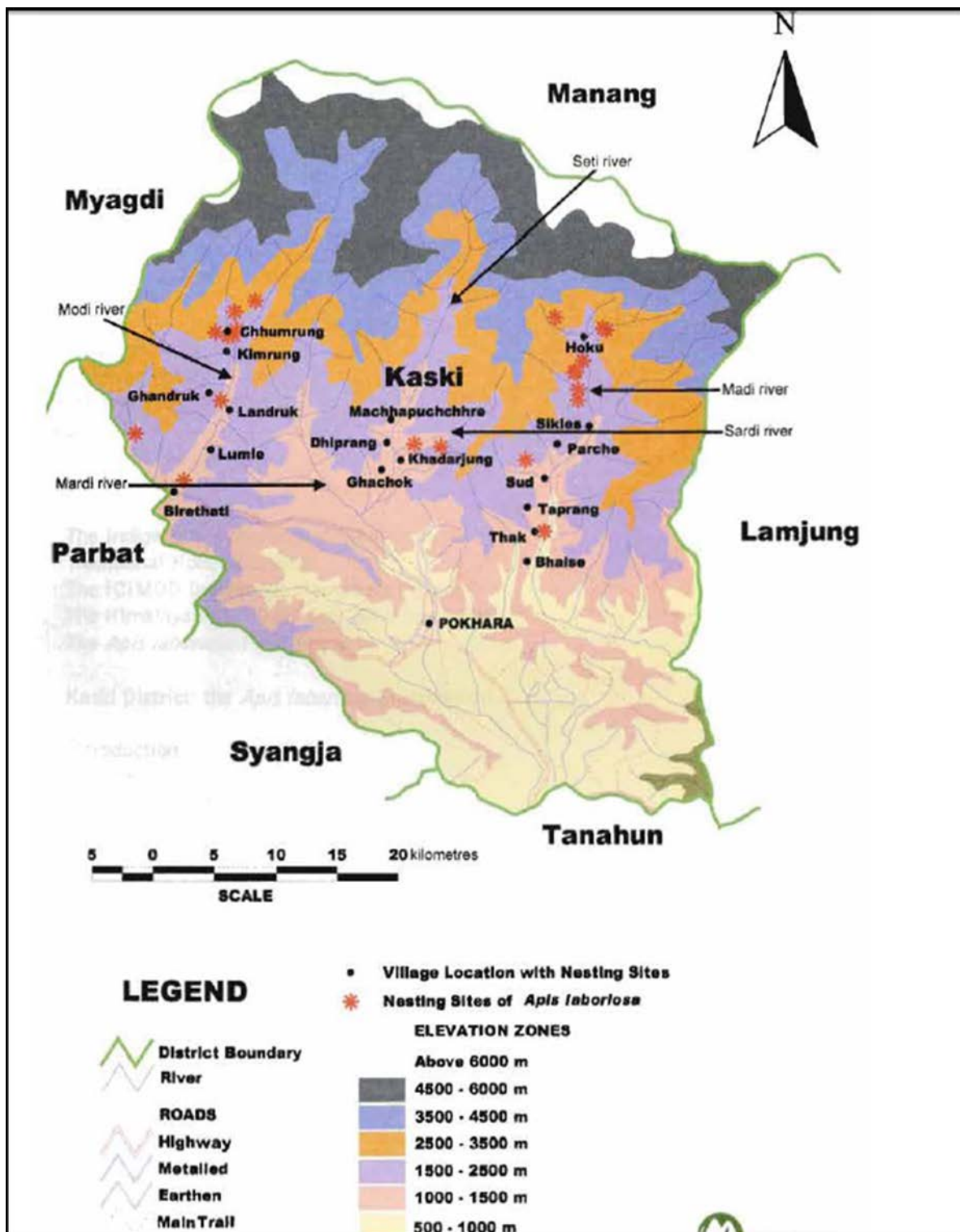


Figure 4.56 Map of *Apis laboriosa* sites in Kaski District (Ahmad et al. 2003)



**Figure 4.57** *Kuiche* climbing rope ladders to harvest the *Apis laboriosa* honey ([http://www.draperbee.com/info/photo%20album/photo\\_album2.htm](http://www.draperbee.com/info/photo%20album/photo_album2.htm))

*A. laboriosa* build a single comb in overhanging areas of a cliff face. To harvest the comb requires very dangerous climbing techniques on the part of the *kuiche*, not to mention the danger of numerous bee stings. The hunters who remain on the ground build fires to smoke out the bees in hopes of decreasing the amount of bee stings, and position themselves to collect the honey that is released after the comb is cut with a special pole called a *tango* (**Figure 4.58**). The smoke further endangers the climbers as it engulfs them in a cloud (**Figure 4.59**) making respiration and vision difficult. In some cases where the comb is very high on the cliff face, a smoking bundle attached to a rope is hauled up and down to placate the bees. The *kuiche* do not wear any special clothing to prevent bee stings other than a woven hooded shawl that looks like a burlap potato sack (see **Figure 4.57**) (personal observation November 23, 1998).



**Figure 4.58** The special pole or *tango* used to cut the comb.  
([http://www.draperbee.com/info/photo%20album/photo\\_album2.htm](http://www.draperbee.com/info/photo%20album/photo_album2.htm))



**Figure 4.59** A *kuiche* engulfed in a cloud of smoke  
([http://www.draperbee.com/info/photo%20album/photo\\_album2.htm](http://www.draperbee.com/info/photo%20album/photo_album2.htm))

Due to this very unusual harvesting technique, the ‘Honey Hunters of Nepal’ have become the subject of several books (Crane 1999, Valli 1998a, Valli and Summers 1988a) and National Geographic articles (Roach 1998, Valli 1998b, Valli and Summers 1988b). In the words

of Ahmad et al. (2004:31), “The *kuichhe* is the most important actor. He needs to have sufficient confidence and concentration to remain sitting safely on the rope ladder whilst operating the poles and shouting instructions to the rope controllers above. The *kuiche* works without any protective clothing. Their work demands great courage and total concentration.” Due to this media exposure and the honey hunters’ reputation, tourist operators are offering tours of honey hunting events. This has proven to be much more lucrative for the communities than the actual sale of the honey, with tourists’ payments of US \$1000-1500 to attend the event going to the village. However, the increased human traffic in the area around the hives has led to a decline in the number of honeybees (Ahmad et al. 2003), an example of reciprocal effects and feedback loops in this complex coupled human and natural system. Unfortunately, this tradition of honey hunting, which has been passed down through generations of traditional knowledge, may be lost in the future, as the younger generation is more interested in working in the modern world for better wages.

The economic benefits of harvesting *A. laboriosa* honey vary throughout Kaski District. This is due to a complex coupled system that involves the traditional local cliff ownership rules of each community. This has been further complicated in other districts since 1990 when the Forest Department gradually started assuming control over some of the *A. laboriosa* cliffs. Under this relatively new system, the Forest Department allocates the right to harvest the honey to contractors. Contractors are required to pay a government tax of 10 rupees per kg of honey, which works as an incentive to the government to exploit the amount harvested and breaks with traditional practice. However, in Kaski District, ACAP has helped local communities understand their rights’, which has aided them in retaining control of their *A. laboriosa* cliffs (Ahmad et al. 2003).

In addition to *A. laboriosa*, several other varieties of wild bees including *Apis dorsata* (giant honeybee) and *Apis florea* (dwarf honeybee) produce honey in the wild that is harvested by honey hunters (Joshi et al. 2008). However, *A. laboriosa* honey is highly valued in some Asian countries and in particular Korea, because *A. laboriosa* produces a red honey that is

thought to be intoxicating and relaxing (Ahmad et al. 2003). Many households also cultivate non-wild honeybees such as *Apis cerana* (Asian hive bee), which has been a tradition for hundreds of years in Nepal. All four of these species are indigenous to Nepal (Kafle 1992).

There are several different types of beehives used for domestic honey production. Traditional types include log (**Figure 4.60**), wall, cavity, old trunk, and wooden box hives. Non-traditional hives include Indian, Godawari, African top bar, and Newton ‘A’ and a ‘B’ type hives (Maskey 1992).



**Figure 4.60** Traditional Gurung roundhouse with log beehive (red arrow) (R.E. Beazley 2009).

In addition to use as a food source, honey is also used for medicinal purposes treating many ailments including diarrhea, stomach ulcer, eye infection, burns, and high blood pressure (**Table 4.11**).

**Table 4.11** Different medicinal uses of honey in Nepal (Joshi et al. 2008)

Uses of honey	Method of application
Dressing for burns, cuts and wounds	<ul style="list-style-type: none"> <li>● Clean the cuts and wounds with lukewarm water and then apply pure unheated honey on affected area.</li> </ul>
Colds, coughs and ticklish throat	<ul style="list-style-type: none"> <li>● Add two tablespoons of honey, a lemon and ginger juice in a cup of hot milk and drink it before going to bed or</li> <li>● Add two tablespoons of honey, a lemon and peg of whisky in hot water and drink it as nightcap or</li> <li>● Add two tablespoons of honey, one of lemon, a tablespoon of glycerine and if possible 2-3 drops of menthol and eucalyptus oil to a glass of hot water and drink it</li> </ul>
Sore and irritated throats	<ul style="list-style-type: none"> <li>● Mix one quart of water, 125 gm honey and 25 gm alum and gargle. Try it for 2-3 days.</li> </ul>
Hay fever, breathing problems, nasal and sinus complaints	<ul style="list-style-type: none"> <li>● Eat raw honey daily. During infection chew honeycomb for fifteen minutes like chewing gum and throw away whatever remains in your mouth.</li> </ul>
Eye infection	<ul style="list-style-type: none"> <li>● Wash your hands and eyes with boiled clean water and then put a drop of pure filtered diluted honey into your eyes.</li> </ul>
Mouth thrush and other infection	<ul style="list-style-type: none"> <li>● Use paste made of 1 part of borax, ½ part of glycerine and 8 parts of honey.</li> </ul>
Diarrhoea and gastroenteritis	<ul style="list-style-type: none"> <li>● Take two tablespoons of honey a day regularly.</li> </ul>
Liver disorder	<ul style="list-style-type: none"> <li>● Drink honey and lemon tea regularly</li> </ul>
Rough skin and chaps on hands and face	<ul style="list-style-type: none"> <li>● Apply equal parts of honey and glycerine mixed together.</li> </ul>
Dry hands	<ul style="list-style-type: none"> <li>● Apply the paste made of the white of an egg, a teaspoonful of glycerine and an ounce of honey.</li> </ul>
Face cream	<ul style="list-style-type: none"> <li>● Make a paste of two parts of honey and one part of gram flour and apply it in your face.</li> </ul>
Weak digestion	<ul style="list-style-type: none"> <li>● Eat honey with raw fruits. Honey promotes the correct working of the digestive organs and acts as a natural laxative.</li> </ul>
Stomach ulcer	<ul style="list-style-type: none"> <li>● Take two spoonfuls of honey daily with your breakfast or before having breakfast.</li> </ul>
Child birthing	<ul style="list-style-type: none"> <li>● To ease child birthing eat 2-3 spoonful of honey. It gives fast energy required for that time.</li> </ul>
Refreshing	<ul style="list-style-type: none"> <li>● If you are tired drink a glass of cold water mixed with one of lemon and two tablespoons of honey.</li> </ul>
Urinary problems	<ul style="list-style-type: none"> <li>● Eat 3 tablespoons of honey everyday and drink as much water as you can.</li> </ul>
High blood pressure	<ul style="list-style-type: none"> <li>● Before having breakfast drink a glass of luke warm water mixed with 2 tablespoons of honey and one of lemon daily. Honey helps to dissolve cholesterol and increases the amount of haemoglobin in the blood.</li> </ul>

### 4.3.5.2 Case Study 8a (Myagdi District)

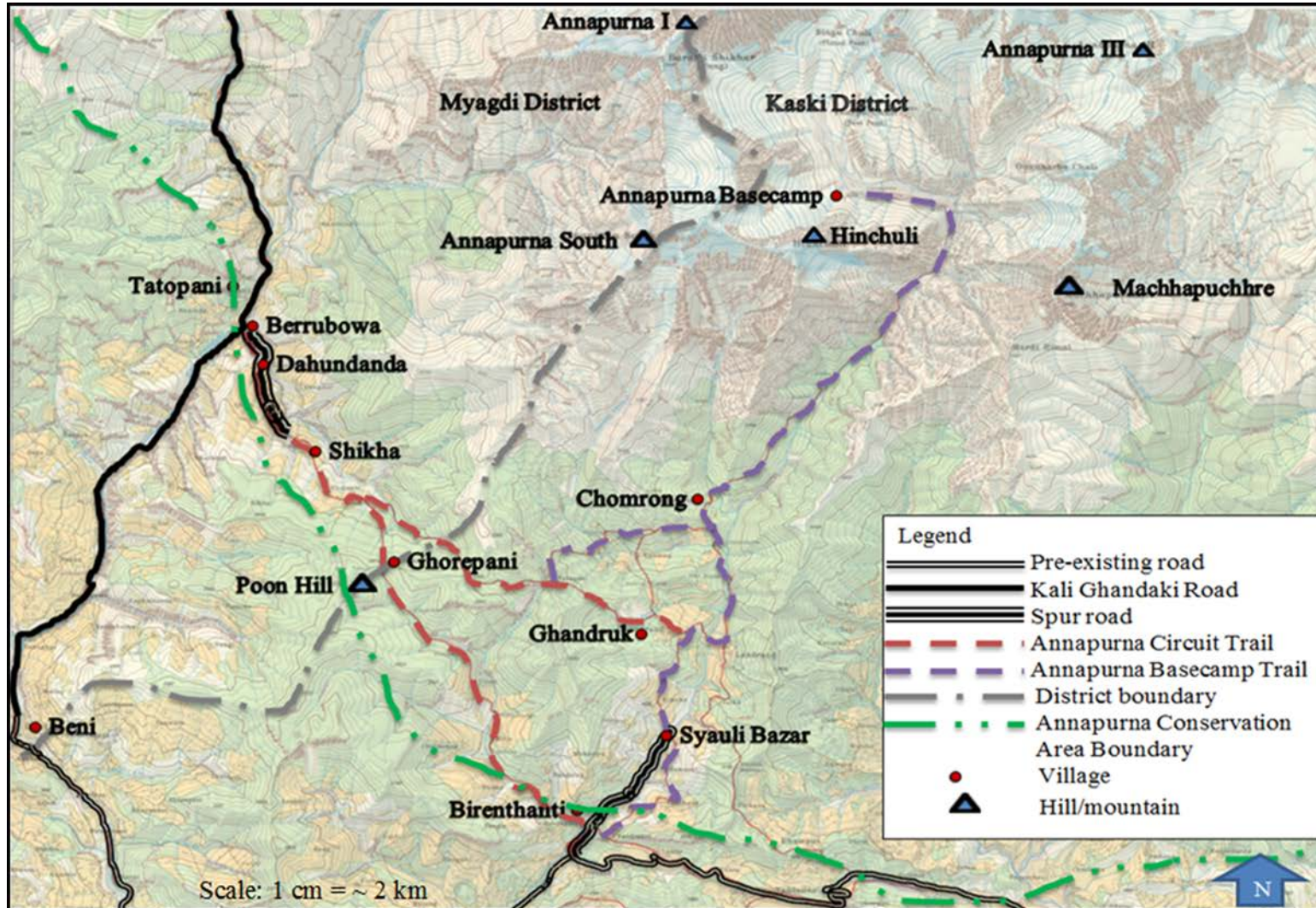
Once the Kali Ghandaki Road was finished, it opened up the possibility for other spur roads to be built. **Case Study 8a** examines one of these spur roads that leaves the main road near Tatopani where the ACT crosses the river at Berrubowa and then continues to the popular scenic spot at Poon Hill (**Figure 4.60**).

#### 4.3.5.2.1 Tatopani

Tatopani is on the new Kali Ghandaki Road 1 km upstream from where the ACT leaves the road and the Kali Ghandaki River Valley at Berrubowa (**Figure 4.60**). Berrubowa is the starting point for the new spur roads that continue to follow the ACT toward Poon Hill (**Figure 4.60**). During my first research period there was no road construction on this section of the trail. However, on my return six months later, a spur road had been built from the main road at Berrubowa along the ACT to the top of the first ridge, a distance of about 4 km.

Tatopani used to be a favorite stop for Nepalis and trekkers because of the natural geothermal hot springs. Upon reaching Tatopani trekkers looked forward to a soak in the naturally hot water. Guesthouses sprung up around the hot springs to provide trekkers with a place to stay and eat. The hot springs were also a popular spot for Nepalis and pilgrims on their way up the valley to Muktinath. The new Kali Ghandaki Road (**Figure 4.60**) was built on top of the old trail, so the hot springs are now immediately adjacent to the road.

Many of the trees that used to shade the area were cut down for the road right-of-way, changing what was an idyllic little oasis into a hot, dusty, noisy roadside attraction. The hot springs are leased on a yearly basis to concessionaires who bid for the right to manage them. The concessionaire I spoke with had been running the business for two years. He indicated that the number of both trekkers and Nepalis visiting his site had dropped significantly since the road was completed (K.C. Chhetri, lodge owner, Tatopani, personal communication, December 1, 2009).



**Figure 4.61** Map of Annapurna Conservation Area in Myagdi and Kaski Districts with roads, spur roads, and trails (Adapted from Nepal-Kartenwerk der Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung Nr. 9, 1993)

One of the lodge owners commented that his business was also down because of the road. To compensate for the lost income he opened a roadside restaurant. Location played in his favor because the buses and jeeps full of passengers stop at his restaurant for rest and food after the long, bumpy 8-10 hour journey down from Muktinath and Jomsom. Now, due to the flow of traffic on the road he is earning almost enough from the restaurant to make up for the losses at his guesthouse.

#### **4.3.5.2.2 Berrubowa**

Berrubowa (see **Figure 4.61**) is where the popular Poon Hill portion of the ACT intersects the Kali Ghandaki Road 1 km downstream from Tatopani. This was the furthest extent of the preexisting road from Beni Bazar and the starting point of the new Kali Ghandaki Road (see **Figure 4.61**). Supplies were routinely transferred at Berrubowa from truck to storage houses or to mules for further distribution. Now that the Kali Ghandaki Road is completed and construction of the spur road has started, goods can be taken much further by vehicle. Consequently, shop owners in Berrubowa are experiencing a decrease in business. The spur road is still under construction and at the point where it currently ends goods are transferred to mules, which transport the goods up the trail toward Ghorepani and Poon Hill. The spur road follows the old trail in places and veers off it in other places, until it reaches the top of the first ridge at Dahundanda (see **Figure 4.61**). During my initial research period in the spring of 2009, I hiked this section of the trail from Ghorepani to Berrubowa and then walked on the new Kali Ghandaki Road to Muktinath. At that time, there were no signs of a new spur road. However, over the six months between my research periods, a spur road was begun, which is now (November 2009) 10 km up the trail. There are numerous landslide scars all along this section of new road, mule trains, trekkers, porters, and villagers have to jockey for position amid the loose rock and dust every time a jeep comes along.

#### **4.3.5.2.3 Dahundanda**

Dahundanda (see **Figure 4.61**) was an excavation site when I visited it. The side of the mountain had been cut away to make way for the road. As I walked up the road, I could see a

portion of the old trail buried under cut material that was dumped over the side of the hill. While there are not a lot of guesthouses in Dahundanda it was obvious from the debris, the excavation scar, and dust that not many people wanted to stay there. The owners of the two guesthouses I interviewed reported a definite decline in trekker business. However, they were also glad to have a road to get their supplies in and out rather than having to carry them.

#### **4.3.5.2.4 Shikha**

The trail to Shikha (see **Figure 4.61**) is a steep, steady, 4-5 hour uphill hike from Dahundanda. The spur road extends several kilometers past Dahundanda and then fades into the traditional trail. Locals told me that work had stopped because it was harvest season and as soon as they were done harvesting, they would continue building the road through the winter. They estimated it would reach Shikha by spring and possibly another 10 km past to Shikha. One of the lodge owners I interviewed in Shikha expressed concern that as the road approached they would see fewer and fewer trekkers. She had already noticed a decline since the road had made it to Dahundanda. Local rumor has it that the road will eventually go all the way to Ghorepani (Lakshmi Bista, lodge owner, Shikha, personal communication, December 1, 2009).

#### **4.3.5.3 Case Study 8b (Kaski District)**

In **Case Study 8b**, I consider a hypothetical case based on what I have observed from the other roads that are spreading into ACAP. I suggest that due to the popularity and relative proximity of the Annapurna Base Camp (see **Figure 4.61**) to existing roads, and the spreading network of roads in this area (see **Figure 4.61**), that eventually there will be either a road or cable car access to ABC. Large groups of tourists who prefer travelling as a group are stimulating this development.

##### **4.3.5.3.1 Ghorepani**

Ghorepani (see **Figure 4.61**) sits on the top of a hill and has a commanding panoramic view of the Himalayas from Poon Hill, the highest point just above the village. This is an extremely popular trek and only requires a 3-5 day hike from the road at Birethanti. During the

fall trekking season, it can be hard to find a bed in town if you do not arrive early in the afternoon. Ghorepani is situated perfectly to benefit from the road, as it is the obvious destination for tourists and trekkers. While it may lose a lot of its trekkers business, it has the scenic pull factor to more than make up for that loss with tourists who arrive by road.

#### **4.2.5.3.2 Syauli Bazar**

Syauli Bazar (see **Figure 4.61**) is near the end of the ACT. At this point, the majority of the trek is over with only a few hours of walking until one reaches the main road at Birenthanti. A spur road has slowly been expanding from the main road at Birenthanti along the trail toward Syauli Bazar. Now, trekkers can actually take a taxi along this section of the trail if they wish. During the time I was there, the road was closed due to a flash flood that had destroyed a section of it. However, once that section of the road is rebuilt it will be extended further into the mountains, possibly toward Ghorepani or maybe even the Annapurna Sanctuary. Certainly, the people living in these villages would welcome a road.

#### **4.3.5.3.3 Birenthanti**

Birenthanti (see **Figure 4.52**) is the village at the trailhead where the ACT meets the main road to Pokhara. It is the beginning or ending point of the ACT depending on which direction one walks. Because of its location, Birenthanti has benefitted greatly from trekkers taking advantage of the lodging, food, and last minute essentials available in the multitude of shops that line the trail for the first kilometer. This is another example of ribbon development similar to what is taking place now at New Syange (see **Case Study 2**) on the east side of the ACT. Even though this is primarily a trail, it is usable by taxis, as mentioned above. Taxi drivers go both directions on this spur road either to pick up tired trekkers finishing the ACT near Syauli Bazar, or to drop off trekkers who are just beginning the ACT at the same spot. I suggest that in the future this spur road will reach Ghorepani. When it does, a cable car could easily be built to reach the top of Poon Hill so that tourists no longer have to make the strenuous two-hour hike to the top. Considering the spur road coming toward Ghorepani from Dahundanda, I hypothesize

that eventually these two spur roads will meet at Ghorepani, making it possible to arrive from either direction by road (see **Figure 4.61**)

#### **4.3.5.3.4 Annapurna Basecamp**

Annapurna Basecamp (ABC) (see **Figure 4.61**) is particularly interesting to consider in terms of the furthest extent of this web of expanding road networks and what impact the road from Birethanti will have if it is extended all the way into ABC. Anyone who has hiked into ABC would find it hard to imagine that a road could be built all the way in because the trail traverses through several river valleys with a series of elevation changes necessitated for river crossings. However, the panoramic beauty of ABC is unsurpassed and it has the advantage of being one of the few high-glaciated mountain areas in Nepal relatively near an existing road at Birethanti (see **Figure 4.61**). From the starting point of the ACT at Birethanti, if a trekker walks every day at a reasonable pace for 5-6 hours, ABC can be reached in 5-7 days. If roads continue to expand from the west at Dahundanda toward Ghorepani and from the south at Syauli Bazar toward Ghandruk, then Chomrong, and eventually ABC, are the next logical destinations (see **Figure 4.61**). One of the obstacles preventing this from happening is the terrain. Suspension bridges are rare in Nepal and crossing numerous river valleys poses a serious challenge to road construction along this section of the trail. However, due to the popularity of the ABC trek, I suggest that a road will eventually be constructed. This popularity is evident from the number of guesthouses that have been built at the ABC since I first visited in 1985. At that time, there was only one bamboo cottage in the ABC, now there are 15 concrete guesthouses, several of which can hold 30-40 people. In the fall of 2009 when I trekked into ABC, I passed numerous large trekking groups with as many as 30 people in their party. These groups come from regions as disparate as Australia and Taiwan. Now that China's economy is expanding there are more Chinese tourists coming to Nepal. Their propensity for traveling in large tourist groups is further stimulus to develop more roads and facilities that can handle large groups. With this kind of popularity, I predict that a cable car will be eventually constructed to transport trekking and tourist groups to ABC once the road is built within a reasonable distance.

The first step in putting a road into ABC is to extend the current road at Syauli Bazar to Ghandruk (**Figure 4.62**). Ghandruk is the flagship community of ACAP, where the first ACAP pilot project was started in 1985. It is obvious from construction work along the trail that the road is being pushed in from Syauli Bazar toward Ghandruk. I expect that there will be a road from Syauli Bazar to Ghandruk in the next 5 years and then from Ghandruk to Chomrong in the next 10 to 15 years.

If a road is constructed into this area the air and noise pollution would seriously affect the quality of life in the valleys the trail currently passes through. However, after asking numerous communities along the ACT about the negative consequences of a road versus the positives (ease of access to markets and social services), I am sure the overwhelming majority of the people living in these mountains are in favor of a modern transportation system. This sentiment was expressed well by the head lama of Manang when he said, “Yes we want roads, the sooner the better” (Lama Tendrup, Head Buddhist lama, Manang, personal communication, November 16, 2009).

#### **4.3.5.4 Summary**

I have highlighted two different aspects of road construction in this case study. First, after a road is built into an area it opens up the possibility of more roads being built. In this case study, two new sections of road from opposite ends of the trail have started from other roads (**Figure 4.62**). It is likely that these roads will continue into this area to link more villages and other spur roads will be built over time into adjacent areas.

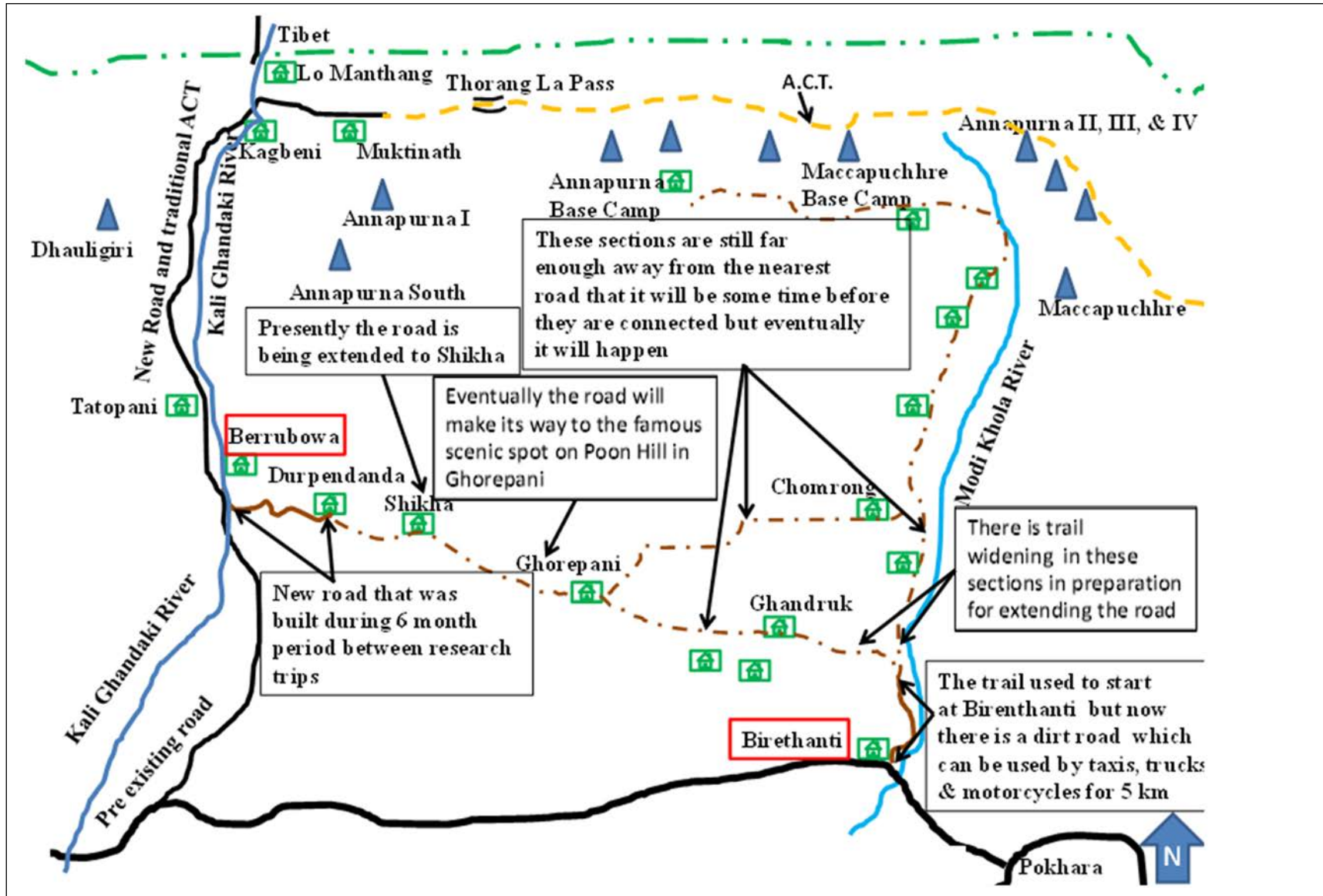


Figure 4.62 Summary diagram Case Study 8a and 8b

#### **4.4 East and West Side of the ACT (Myagdi and Manang Districts)**

In this section I first compare two villages, Tukche in Mustang District on the west side of the ACT, with Tal in Manang District on the east side of the ACT in **Case Study 9**. The purpose of this comparison is to analyze a unique unintended consequence of road building. I chose these two villages because they were the only two villages in my research area where this topic came out in the interviews. It is quite possible there were other villages where this happened, but I did not become aware of it during my research period.

**Case Study 10** looks at the whole ACT in addition to alternate trails that could be used to from a new ACT. In addition, I consider the Great Himalayan Trail, which has significant implications for my research area. Case Study 10 therefore is a synthesis of all the previous case studies.

##### **4.4.1 Case Study 9: Unintended Consequences of Road Development**

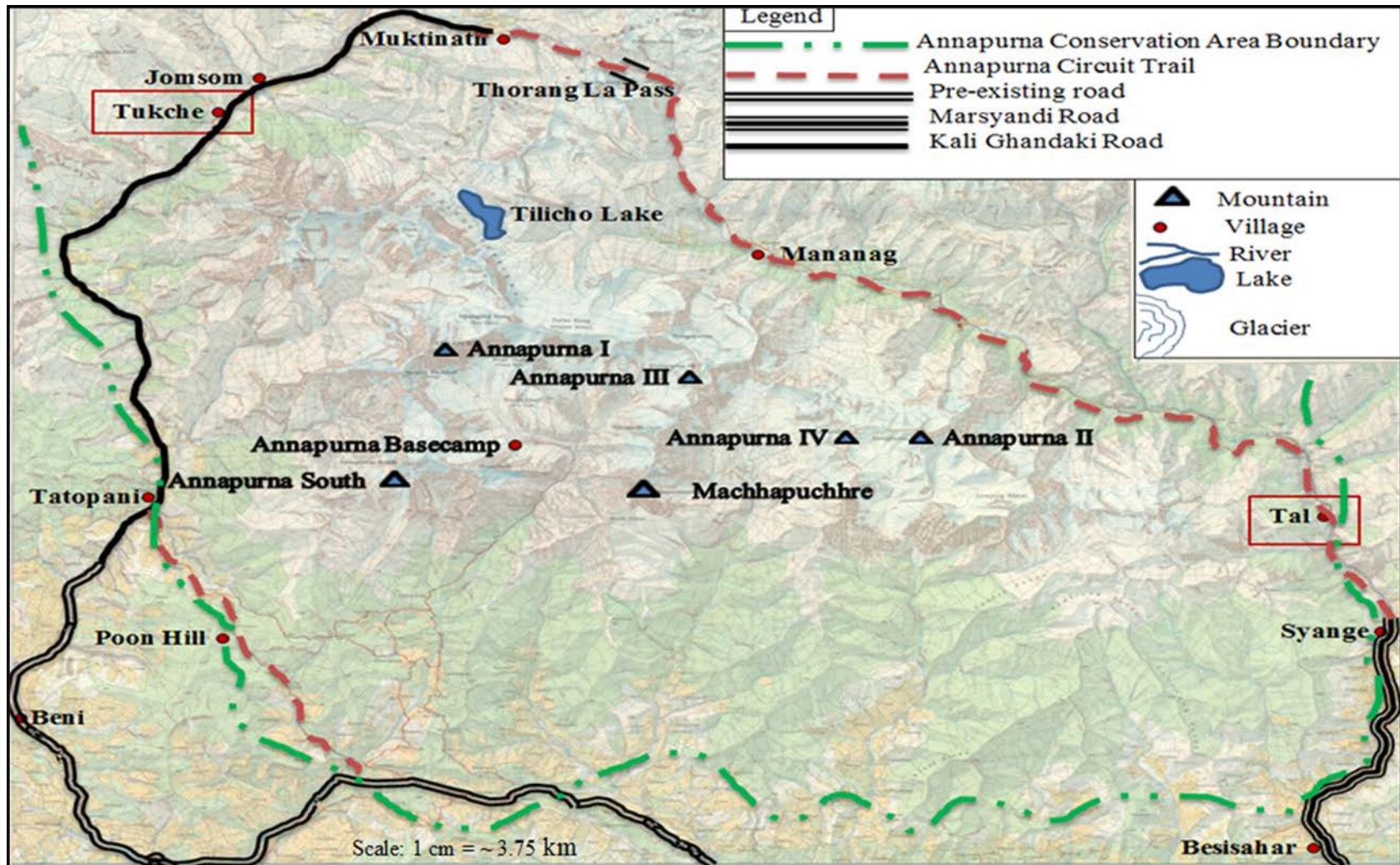
**“Rich people can buy jeep but poor people get no service.”<sup>19</sup>**

This case study considers two villages, Tal and Tukche, which share something in common in relation to the road even though they are spatially distant from each other, with the whole Annapurna Massif between them and are on different sides of the Thorang La Pass (**Figure 4.63**).

This case study highlights how roads can have an impact that is usually unanticipated by planners, policy makers, or government officials. It also illustrates another important point about roads – they can be used to both facilitate movement and to stop movement. The spatial coupling of heterogeneity and the organizational coupling of emergent properties figure predominantly in this case study.

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<sup>19</sup> K. Thakali, personal communication, November 30, 2009



**Figure 4.63** Map of Annapurna Circuit Trail with villages of Tal and Tukche (Adapted from Nepal-Kartenwerk der Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung Nr. 9, 1993)

#### 4.4.1.1 Background

Roads are often only thought of terms of economic development. However, in reality roads are an instrument of gaining and establishing control of an area. There have been many roads built specifically for security forces or military campaigns. As discussed earlier in this thesis, the section of the Kali Ghandaki Road built through Marpha (see **Case Study 7 Section 4.3.4.4. Marpha**), the Burma Road constructed during WW II (Tuckman 2001), and the Karakoram Highway (Kreutzman 2004b), and are but a few examples.

Kreutzman (2004b:204-205) points out that the strategy of blocking roads for political reasons has been used extensively in many mountainous areas: “Blockages of the Karakoram Highway have been used by inhabitants of Kohistan in May-June 1993 as a political tool to convince the public administration that timber exports from the few remaining, and rather depleted, natural forests should no longer be prohibited.” Blocking roads in mountainous areas is especially effective. Due to the terrain, there is often no alternate route to bypass the blockade. For centuries, military campaigns have effectively used roadblocks to lay siege to cities they wished to capture. Roads are also areas of vulnerability to attack from marauding bandits, thieves, terrorists, and counter insurgents.

In Nepal, strikes (*bhandas*) are the most popular form of protest. This usually involves blocking a road to traffic in some manner. *Bhandas* are extremely effective in Nepal because there are only a few roads that service the capital, Kathmandu (**Figure 4.64**). If one of the roads is blocked it can have a major influence on commerce in the city. When this happens the government is forced to take action to appease the protesters with some type of compromise. Consequently, *bhandas* have become an effective form of civil protest and negotiation for the public since the first pro-democracy People’s Movement demonstrations in 1990 (Shah 2008). During the People’s War (1995-2006), control of different sections of roads in Nepal was crucial in gaining control of an area for both the Royal Nepalese Army (RNA) and the Maoist People’s Liberation Army (MPLA).



**Figure 4.64** A *bhanda* on the road between Kathmandu and Pokhara. The villagers overturned a truck carrying potatoes to block the road in protest. (R.E. Beazley 2009)

As the Maoist moved from their headquarters in western Nepal east toward Kathmandu, they destroyed bridges and other infrastructure to disrupt the government and limit the movement of the RNA and police. After a bridge, section of road, or building was destroyed, the MPLA would flee the roads and into the mountains on trails. Unfortunately, this did not just affect the RNA but it also disrupted the lives of local people, making it dangerous and difficult to travel. The MPLA hid troops in ACAP where they carried out guerilla warfare tactics against ACAP and other institutions associated with the monarchy.

Security became an issue for anyone working and living in the remote mountainous areas, particularly in ACAP (Baral 2008). A bomb was detonated at ACAP headquarter in Pokhara and two ACAP officials were lynched in Ghandruk and the ACAP headquarters there was destroyed (Murphy et al. 2005). During this period many Nepalis left Ghandruk for safer areas and all the guesthouses were mostly empty. This was a feather in the cap of the Maoist because Ghandruk

was the first village established in ACAP as pilot project community and is ACAP's pride and joy. ACAP's connections to the monarchy ensured that this attack was viewed politically as a decisive victory for the Maoists. This is only one of the numerous incidents that happened during the People's War, not only in ACAP but also in many mountain communities across Nepal.

As a result of this escalating turmoil, King Gyaendra declared a state of emergency in 2006 giving him complete control of the RNA. He ordered the RNA to go up the Kali Ghandaki Valley and complete a section of the road near Marpha to take control of the area.

These incidents highlight one of the most important aspects of trails and by extension roads. Whoever controls a given section of a road or trail controls the people who are in the vicinity of that section of road and those that rely on the road for transport. This aspect of control is illuminated below by comparing two villages where locals blocked the trail/road to protest what they considered unfair treatment.

#### **4.4.1.2 Tukche (Mustang District)**

Just before I arrived in the Kali Ghandaki Valley in the spring of 2009 there had been a *bandha* (protest/roadblock) at Tukche (see **Figure 4.63**). In this case, the villagers to protest unfair bus and jeep ticket sales further up the valley in Jomsom put the *bandha* in place. The only airport in the area is located in Jomsom. Consequently, many tourists fly in and out of Jomsom. After the Kali Ghandaki Road was completed, trekkers began using trucks, jeeps and bus transportation to get out of the valley rather than flying or hiking out. Transport operators charge foreigners more for a seat than they charge Nepalis, so they prefer to take foreigners. As a result, many of the vehicles were full by the time they reached Tukche, about 20 km down valley from Jomsom. Ironically, even though the people of Tukche finally had road access to their village, it did them no good because the vehicles traveling the road were most often full and would not stop. The villagers decided to take matters into their own hands and tried negotiating with the transportation operators, but with no success. They realized that the only way to affect a change was to block the road to traffic. The *bandha* forced the transportation companies to compromise and agree not to sell all the seats in Jomsom and to arrive in Tukche at scheduled times

to pick up villagers (Laxmi Bista, lodge owner, Tukche, personal communication, November 30, 2009).

I also interviewed several guesthouse owners in this area who said their business had been down during The People's War. This was due to Maoist-led incidents, such as trekkers being asked for donation at gunpoint, kidnappings, and the closing of one sections of the Kali Ghandaki Road (see **Figure 4.63**), preventing trekkers and locals from traveling up and the down the valley (Sarita Gurung, lodge owner, Tukche, personal communication, November 30, 2009).

#### **4.4.1.3 Tal (Manang District)**

The case of Tal (see **Figure 4.63**) is similar to Tukche in that the villagers blocked the ACT to protest what they considered unfair treatment, in this case in terms of the road alignment. The road is not yet completed to Tal because the section of the Marsyangdi Valley leading up to Tal is vertical with numerous cliffs making road construction very difficult. The ACT is on the same side of the river as Tal, therefore anyone traveling on the trail goes through village. The current road alignment however, is planned to stay on the opposite of the river from Tal. The villagers are concerned that they will lose all their business because vehicles will completely bypass their village on the opposite side of the river. To address this issue they blocked the ACT on either end of their village, allowing only trekkers to pass. After a week, the government sent the Minister of Transport by helicopter to Tal to negotiate. The result was a promise by the government to build a spur road that would cross the river, pass through Tal, and then cross back to the main road (Ram Bahadur Raksilover, lodge owner, Tukche, personal communication, October 28, 2009). Whether this promise will ever be fulfilled is doubtful because at that time the Maoists were in power, but in 2009 the Maoist prime minister resigned and since then the government has been in turmoil.

There are also plans to build a dam and a hydroelectric plant not far from Tal. This, of course would necessitate a road because using helicopters to fly equipment and material to the site is too expensive. In anticipation of this project, several villagers are constructing new guesthouses in hopes of renting them on a semi-permanent basis to the construction company

(Ram Bahadur Raksilover, lodge owner, Tukche, personal communication, October 28, 2009). If the hydroelectric project does actually begin it is possible that Tal will have more than one road.

#### 4.4.1.4 Summary

I argue that an additional impact of road construction is the potential for them to become pawns in political struggles and civil rights issues. The state uses roads to extend its control and protect national boundaries. However, this is only true to the extent that the state has control of the roads. In Nepal, civil society and the MPLA have found that once they have control of a section of road they have power to leverage the state.

It is ironic that roads are originally designed to facilitate the flow of people and goods, but they can also be used to stop the flow of traffic in order to force a negotiation, such as in Tal and Tukche. I argue that power is a central issue with roads as demonstrated in this case study. Whoever controls a section of road to a large part also controls the people near the road. Gaining control of a road can be accomplished by blocking it to traffic, building a new road that connects to preexisting roads, or by destroying bridges and sections of road. When a road is constructed virtually all the adjacent vegetation is leveled, and in some cases just beyond this zone there are either trees or hills where groups or individuals wishing to attack travelers can hide. This land use change makes roads one of the most vulnerable spaces to attack and gain control.

In both Tukche and Tal (see **Figure 4.63**) road construction has led to a sociocultural change in the form of protest in which the villagers used the road as a political tool to fight for equality. It is instructive in the above case to notice that a socioeconomic motivation, the ability to use the road for commerce, led to a sociocultural change, protest, which may lead to another environmental change in the case of Tal if the spur road is ever built.

This case study is another example of the CHANS couplings of indirect effects, reciprocal effects and feedbacks, and emergent properties.

#### **4.4.2 Case Study 10: Synthesis** **“If you build it they will come”<sup>20</sup>**

In this case study I examine how the road building along the ACT is influencing land use change by creating the need for an alternate set of trails for trekkers to use to avoid vehicles. In addition, I examine how the road may affect poorer, more remote districts west of the Kali Ghandaki Valley, such as Dolpo, Mugu, and Humla, by increasing access to the Great Himalayan Trail. This case study emphasizes spatial couplings, in particular couplings beyond boundaries.

##### **4.4.2.1 Background**

ACAP has developed an alternate trail system in the Kali Ghandaki Valley on the east side of the ACT that can be connected to other existing trails on the west side of the ACT to make a new ACT that will allow trekkers to stay almost completely off the road (**Figure 4.65**).

##### **4.4.2.2 West side: ACAP Alternate Trails**

The ACAP set of alternate trails was created in direct response to the decrease in the number of trekkers using the ACT after the Kali Ghandaki Road was completed. This is part of an overall ACAP plan to keep trekkers interested in doing the ACT (Kumar Tapa, ACAP official, Jomsom, personal communication, November 29, 2009). This alternate trail system more or less parallels the old ACT, but on the opposite side of the Kali Ghandaki River, starting near Jomsom and continuing all the way down the valley to near Tatopani (see **Figure 4.65**). As with most of the trekking trails in Nepal, locals to get from village to village use these trails. To make them suitable for trekkers, ACAP has been widening them, putting in bridges to make crossing streams easier, and putting up signs to direct trekkers to the right trails. This type of land use change, while not very significant, opens up this area to trekkers. This will likely lead to the larger type of land use change examined in **Case Study 1**, such as agricultural fields being converted to trekking lodges, homes being renovated and expanded for homestays, and additional buildings being constructed for toilets and showers

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<sup>20</sup> Popular misquote from the movie “Field of Dreams” (Wikipedia)



Figure 4.65 Great Himalayan Trail and alternate Annapurna Circuit Trail (adapted from <http://www.thegreathimalayatrail.org>).

A recent story in the online journal *Republica* (May 4, 2011

[http://archives.myrepublica.com/portal/index.php?action=news\\_details&news\\_id=30948](http://archives.myrepublica.com/portal/index.php?action=news_details&news_id=30948))

confirms that this in fact happening. However, at the time of my research the trails were so new that none of the lodge owners on the old ACT had decided whether to move to the other side of the river. One lodge owner I interviewed said he would wait to see how popular the alternate trail became before he moved his business across the river (BJ Gurung, lodge owner, Jomsom, personal communication, November 30, 2009).

#### 4.4.2.3 East side and west side

The other alternate trail system that will link with the ACAP alternate trail system described above consists of several different sections on both sides of the Thorang La Pass. The complete circuit connects the following trails making one complete trail that completely circles the Annapurna range (see **Figure 4.65**).

Starting at almost the same place as the current ACT on the east side near Khudi, the alternate ACT begins on the Gurung Heritage Trail passing through Ghalegaun and then on to the Dudh Pokhari Trail, which travels north to intersect the old ACT at Timang. From here trekkers would have to use the old ACT for a short distance until reaching the Nar Phu Trail near Chame. The Nar Phu Trail crosses Kang La Pass and meets the old ACT at Ngawal. At this point, trekkers could either continue toward Manang or hike the Ngawal/Ghayru circuit to reach Manang. From Manang trekkers could either choose the traditional route over Thorang La Pass or take the lower route on the Tilicho Lake Trail (see **Figure 4.65**).

If trekkers decide to go over Thorang La Pass, after they reach the other side in Muktinath they have two choices to avoid being on the road. They could either take the alternate trail through Jhong on the opposite side of the valley (which will soon be part of the ring road) or choose the Lupra trail, which gives them the advantage of seeing a community where the Bön religion is still practiced. Either way, one ends up in Jomsom (see **Figure 4.65**). When I questioned the ACAP official in Jomsom about the fact that the ring road would eliminate the alternate trail from Jhong to Kagbeni he told me that ACAP was planning a new trail. The new

trail will parallel the current alternate trail, but lower in the Jong River Valley to ensure that trekkers do not have to walk on the ring road in the future (Kumar Tapa, ACAP official, Jomsom, personal communication, November 29, 2009).

From Jomsom trekkers can cross the Kali Ghandaki River and use the ACAP alternate trail system to walk down the valley to Tatopani. Just before reaching Tatopani there is another alternate trail, which would take trekkers to Poon Hill. From Poon Hill trekkers could do a side trip up to Annapurna Base Camp or continue along the old ACT to where it meets the Sikles Eco Trail. The Sikles Eco Trail connects with other local trails making it possible to get back to the Gurung Heritage Trail where one started (see **Figure 4.65**).

This system of trails would allow trekkers to completely circumambulate the Annapurna range and finish where they started (see **Figure 4.65**), something even the traditional ACT did not do.

It is interesting to consider in this overall picture of the trail systems that as a result of the roads being built on the ACT there is now a need for a new trail system. In some places, the new trail system is quite close to the old trail and in other cases, such as the Dudh Pokhari Trail (see **Figure 4.65**) the trails are in a totally new area. If these trails become popular, like the Gurung Heritage Trail (see **Figure 4.65**) has in the last ten years, then tourist services will need to be developed along these new trails. This would lead through the cycle of land value and land use change outlined in **Case Study 1** with similar impacts in all three socioeconomic, sociocultural, and environmental spheres. The nature of coupled systems almost guarantees that impacts will be felt in all these areas.

#### **4.4.2.4 The Great Himalayan Trail**

The Great Himalayan Trail (GHT) (see **Figure 4.65**) is an ambitious project to connect a series of trails in different countries stretching the whole length of the Himalayas making it possible for trekkers to do a traverse of the Himalayas from one end to the other. The Nepal sections of the trail are being actively promoted by several organizations that have started the Great Himalayan Trail Organization (see: <http://www.thegreathimalayatrail.org/>). The GHT

offers breath taking mountain scenery as it makes its way from Nepal's eastern border with Sikkim to its western border with India. It also goes through nine of Nepal's 17 protected areas, including Kachenjunga Conservation Area, Makalu Barun Conservation Area, Sagarmatha National Park, Langtang National Park, Manaslu Conservation Area, ACAP, Shey Phoksundo National Park, Ra Ra Lakes National Park, and Dharpatan Hunting Reserve (see **Figure 4.65**). National Geographic Adventure describes the GHT this way: "Nepal's mountains are minimally developed, but they offer a wealth of trade and pilgrimage routes. The GHT elegantly connects these existing paths without blazing a single new trail" (Vlahos 2009, <http://adventure.nationalgeographic.com/2009/11/nepal/hiking-great-himalaya-trail-text>).

There are two routes for the GHT in Nepal that pass through my research area. The high altitude route follows the Manaslu Trail from the east and intersects the ACT near Dharapani (see **Figure 4.65**). From there it continues on the ACT over Thorang La Pass to Kagbeni and then leaves the ACT as it goes west into Dolpo District. The lower elevation GHT joins the Gurung Heritage Trail near Besisahar and travels through Ghaleguan connecting with the Sikles Trail. It eventually connects with the Poon Hill trail paralleling the Upper GHT all the way to Tatopani and then continues west into Dolpo. The way all the trails link together is important in relation to my study in that both of the high and the low GHT cross the new Kali Ghandaki Road (see **Figure 4.65**). This has several interesting implications.

The Kali Ghandaki Road provides access to the GHT trails for trekkers who want to start from the Kali Ghandaki Valley and hike either east or west. The only other road that crosses the GHT at any other point in Nepal is the Friendship Highway, which links Kathmandu with the Tibet border at Kodari (see **Figure 4.65**). For those wanting to do just one portion of the GHT, the section from the Kali Ghandaki Valley to the Friendship Highway provides the best entry and exit points.

The section of the GHT east of the Kali Ghandaki Valley transverses most of the well-known trekking routes in Nepal including the ACT, Manaslu, Lang Tang, the Everest area, and Kanchenjunga (see **Figure 4.65**). The organizations involved in the GHT, including the

Government of Nepal and the International Center for Integrated Mountain Development, hope that extending the GHT west from the Kali Ghandaki Valley into new trekking areas will benefit the local villages along these sections of trail by giving them the opportunity to be involved in tourism services. In this case, the Kali Ghandaki Road will be instrumental in providing easy access to the western portion of the GHT. As more trekkers and tourists start visiting this lesser known area of western Nepal there is the potential for local villages along the trail to increase their income. This is especially true if the homestay and community managed model of tourism is adopted.

#### **4.4.2.5 Summary**

This case study is designed to give an overall view of how the new roads being built in ACAP are affecting local communities in the region. In addition, it points out how road building affects not only the local area, but also areas not immediately adjacent to the road as well. Thus, it is an abbreviated overview of my entire study.

The roads under construction on the ACT are having an impact on land use and eventually on land value as well as livelihood options by stimulating the opening up of new areas and trails to take the place of the portions of the ACT that now have roads. This will not only affect local people in the Annapurna Conservation Area, but also villages both east and west of this area due to the intersection of the Great Himalayan Trail with the Kali Ghandaki road in two places (see **Figure 4.65**). When more tourists and trekkers start coming to explore these alternate trails there will be a change in land use and land value as well as the sociocultural and socioeconomic impacts as outlined in **Case Study 1**. I suggest that after the Kali Ghandaki Highway is completed to Tibet, and major trade ensues, more spur roads will be built both east and west of the main road. This has already started at Berrubowa (see **Case Study 8a Section 4.3.5.2.2 Berrubowa**) and will continue in the future, because every community in the mountains wants a road.

## CHAPTER 5. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusions

My research shows that due to the complex couplings of human and natural systems the impacts of rural roads in Nepal:

- are dynamic and change over time;
- often have a lag effect;
- cross spatial boundaries impacting coupled systems not only in the immediate area, but also areas scales of magnitude distant;
- often have unintended and unforeseen impacts making predictions about their outcome largely speculative;
- have both positive and negative impacts in all three spheres of environmental, socio-economic, and sociocultural; and
- display short-, medium-, and long-term impacts.

Short-term impacts tend to be more predictable in Nepal because of the slow pace at which roads are constructed. This usually follows the pattern of a new temporary town developing wherever the road temporarily ends. Then, locals and entrepreneurs from outside the area see opportunities to start new businesses. However, as road building continues this new town will no longer be at the end of the road, and it may lose some or all of its business opportunities. Many factors interact to influence this process. As the road continues to move forward, spur roads are constructed, which open new areas, and the development process begins anew. Because human and natural systems are intimately linked, road construction projects affect not only the environment around the road, but also the economic and cultural aspects of communities near the road, and in some cases, far distant from it.

#### 5.1.1 Spatial Couplings - Living roads and zone of influence

Roads have a zone of influence that is often much greater than the area adjacent to the road and varies over different spatial scales. The ecological impacts of this ‘road effect zone’,

which is estimated to be 15 to 20 times greater than the paved portion (White and Ernst 2003), has been well documented in the literature on road ecology (Cui et al. 2007, Wang et al. 2007, Forman et al. 2002, Findlay and Bourdages 2000, Findlay and Houlihan 1997). The socioeconomic zone of influence has also been studied in depth (Lakshmanan 2010, Khandker et al. 2010, Karkee 2008, Shimokawa 2007; Grootaert et al. 2002, Van de Walle 2002, Jacoby 2000, Kreutzman 1991), but the magnitude, range, and dissemination of the economic effects are not well understood (Jacoby 2000). Road impact studies typically ignore sociocultural influences resulting in a paucity of literature on the subject.

My research shows that in Nepal, roads can have far ranging impacts in distant areas that do not have roads as described in **Case Study 3** (see **Tables 4.5, 4.6, and 4.7**, and **Figures 4.25 and 4.26**). Therefore, it is useful to think of roads as having their own ‘ecosystem’ that interacts and couples with both human and natural ecosystems. Part of this road ecosystem is a zone of influence that affects human and natural systems. The ecological ‘road effect zone’ can extend greater than 100 m from the road (Forman 2000). In **Case Studies 3 and 4**, I conclude that the human ‘road effect zone’ can extend greater than 80 km from the road. This zone of influence exhibits characteristics of the three spatial couplings: couplings across spatial scales, couplings beyond boundaries, and heterogeneity. I argue that due to coupled human and natural systems (CHANS) the impact of rural road projects should include an assessment of sociocultural impacts as well as socioeconomic and environmental impacts. Furthermore, the interaction of these impacts on each other through CHANS couplings, such as reciprocal effects and feedbacks, time lags, and emergent properties is fundamental to understanding how road impacts evolve. To my knowledge, this is the first study that has addressed the impacts of rural road as a coupled system.

### **5.1.2 Temporal Couplings – Pace of construction**

In Nepal, due to various factors, the pace at which roads are built is slow and inconsistent. As a result, I observed many of the predictable results of this type of construction that is documented in the literature, such as ribbon development and ‘leapfrog’ development that

creates boom and bust towns. Additionally, this *ad hoc* type of construction leads to poorly constructed roads, which are prone to seasonal mass-wasting during the monsoon season. This coupled system of slow pace construction, poor construction techniques, and seasonal monsoons exhibits characteristics of the temporal couplings of: massive increases of human impacts on natural systems, rising natural impacts on humans, legacy effects, time lags, increased scale and pace, and escalating indirect effects. Mass-wasting caused by road construction is a good example that contains many of these couplings (discussed in the next section).

Finally, the impacts I observed are short-term impacts and will continue to evolve over time. Medium- and long-term effects would make an interesting follow up study.

### **5.1.3 Organizational Couplings**

Organizational couplings are present in all the case studies because there are several fundamental organizational couplings that are present in all CHANS, such as feedback loops and reciprocal effects, indirect effects, and emergent properties. Mass-wasting is a good example of an emergent property that is unintended. During road construction, the removal of the vegetative rooting system and improper cut and fill techniques in combination with the seasonal monsoon rains create a situation that would not occur without anthropogenic influence. It is also an example of indirect effects, and reciprocal effects and feedbacks. Temporal couplings are also present. Time lags are often present because the mass-wasting does not occur immediately after road construction, which is predominantly in the dry season. In addition, rising natural impacts on humans occur because mass-wasting often removes valuable farmland killing livestock (and sometimes humans), and destroying houses. In addition, landslides often destroy and block sections of road for long periods, negatively affecting local livelihoods (see **Case Study 2 Section 4.2.3.2 Discussion**). Finally, legacy effects also play a part because these roads are built on pre-existing trails that had their own previous set of CHANS.

.This legacy effect has particular relevance for my research site in that both of the roads being constructed on the Annapurna Circuit Trail, which I studied, are placed on top of important past and current trade and pilgrimage routes. Within this context, I suggest that ‘globalization’ is

also an evolutionary process that is now being accelerated, in a large part, by the expansion of corridors and systems that facilitate rapid transportation. While much attention has been placed on the importance of modern communication systems, such as the Internet, for spreading globalization, if we trace the evolution of communication systems we can see that trails and roads were vital in establishing not only communication corridors, but also many other essential components of modernity, such as hydroelectric facilities and power lines. I further suggest that without roads, globalization, as we conceive of it today, would not have been possible. I extend this hypothesis to my research area in the context of the ability of these communities to adapt to change brought about by both globalization and climate change. I suggest that the human and ecological memory embedded in the landscape and human communities in this area, due to their proximity to major traditional trade and pilgrimage routes, has given them the potential for an adaptive advantage to change.

Looking at the evolution of roads, we see a progression from animal trails, to foot trails, to animal drawn cart trails, to widening of these trails to accommodate wheeled vehicles, to dirt roads, and eventually to paved surfaces and super highways. Many roads can be traced back to historical trade routes that existed before wheeled vehicles, such as the Amber Road in Europe, sections of the Silk Road in Asia, and portions of the Inca Trail in Latin and South America (Schreiber 1961), to name a few. Historically, another very important function of trails and roads was for military campaigns and nation-building. Often these campaigns followed existing trade routes and resulted in them being improved by the military. However, in other cases, certain roads were specifically built to either facilitate or obstruct military campaigns. Some modern examples are:

- The Burma Road (1937–1938) (Craw 1942)
- The Ledo Road (1942–1945, a.k.a. the Stillman Road) (Baldwin 2008, Tuchman 2001) built during WWII to connect to The Burma Road.
- The Alaska – Canadian Highway (1942) (Baldwin 2008) built during WWII.
- The Karakoram Highway (1959-1979) (Kreutzman 1991)

- The Sichuan-Tibet Highway and Qinghai-Tibet Highway, the first roads constructed into Tibet by the People's Liberation Army (1949 – 1954)

(<http://2007.tibetmagazine.net/en/20045-p12.htm>, Zheng 2011).

If one considers the cumulative environmental and human history that lies beneath many of our modern roads, I argue that roads are embedded with a coupled human and ecological memory that has become a fundamental component of the human psyche. For example, The Karakoram Highway was built over parts of the ancient Silk Road trading route to connect to The Grand Trunk Road (Kreutzman 1991). The Grand Trunk Road has one of the longest histories of human travel in the world. Gregson (1997:1) puts my argument into perspective in his very interesting historical account of the legacy of the Grand Trunk Road.

Well, for one thing, the Grand Trunk Road is one of the world's great historic thoroughfares. For more than two millennia it has served as the country's lifeline, drawing together peoples of different culture, religion and language. Over the centuries it has carried along its broad path countless pilgrims and scholars, ambassadors and merchants, soldiers and adventurers, some of whom left vivid accounts of the road itself and the cities that it passes through. As early as 1500 BC it was being used by the Aryan invaders from Central Asia. It is far older than the fabled Silk Road, or, for that matter, any of the other trans-continental trade routes. There may be stretches of modern highway in China, the Anatolia or the Peloponnese, that follow equally ancient roadways. But there is none in all the world that pursues the same route over so great a distance or has been in such constant use as the Grand Trunk Road.

The road was already there when Alexander the Great's armies crossed the Hindu Kush and descended into the Punjab's debilitating heat. The Greek ambassador Megasthenes travelled down it in the fourth century BC on his way to see the Emperor Chandragupta Maurya, who founded the greatest of India's home-grown dynasties. But perhaps his most enduring legacy was that he reconstructed this already ancient highway as the Royal Trunk Road. The reformist religions then emerging, Buddhism and Jainism, naturally spread along this central axis. While Europe was plunged into the Dark Ages, the same road was trodden in safety by Buddhist pilgrims from as far afield as China and Java.

Yet the Grand Trunk Road was never intended primarily as a trade or pilgrim route. A military road, its purpose was the maintenance of unity and empire. Ever since Chandragupta's time, all the dynasties which aspired to rule over northern India spread out from its central backbone. The road was rebuilt and furnished

with caravanserai during the Mogul period and again improved by the British as their armies advanced inland from Bengal.

As a symbol of unity and order imposed from above, there is nothing in the Indian subcontinent to equal the Grand Trunk Road. The abandoned cities and grandiose mausoleums scattered across the country may reflect the personal glory of former rulers; but the road represents the real sinews of power. It outlasted more than a dozen imperial dynasties. But when the last of these, the British Empire, finally quit India in August 1947, new borders sprang up. Now there were two countries, India and Pakistan. The Grand Trunk Road no longer served to unite the peoples of the subcontinent. The main artery had been cut.

## **5.2 Recommendations**

### **5.2.1 Context**

The results of my research have important policy implications. In Nepal where poverty alleviation is one of the main reasons for building roads, careful preplanning is a vital step in any road construction project. This should involve a comprehensive environmental impact statement combined with relevant socioeconomic and sociocultural survey information. An interdisciplinary team consisting of engineers, economists, and social scientist need to work together to use this information to design the project in the most beneficial way, taking into account the complexity of the CHANS model. While this is the ideal situation, the unfortunate reality of the political and economic situation in Nepal, both historically and currently, makes this proposition highly unrealistic.

For example, infrastructure projects in Nepal ground to a halt during the 10-year People's War from 1996 to 2006. Since then the government has changed hands at least three times and recently there were nationwide strikes called by the Maoist party that essentially shut down the country for almost a week (Nepali Times 2010). Even before the People's War, the instability of the government hampered many infrastructure projects. In addition, the current roads that were built in the Annapurna Conservation Area Project (ACAP) were financed in part by the local communities from funds they receive from the government for development (NTNC 2008b).

Therefore, various different parties were involved in the actual construction of the roads and consequently any consistency in road construction practice or policy was nonexistent.

Another example from 2006, before the King signed the peace agreement with the Maoist insurgents, he declared a state of emergency giving him total power. At that time he sent the Nepalese army to build a section of the Kali Ghandaki Road near Marpha (see **Case Study 7 Section 4.3.4.4 Marpha**). The army is often used for road construction in Nepal (<http://www.nepalarmy.mil.np/bpd.php>). It is doubtful whether the army has knowledge or experience of environmentally friendly road construction techniques and they are not following the mandatory road construction guidelines for ACAP (NTNC 2008, Binod Gurung, ACAP official, Jomsom, personal communication, November 29, 2009). From personal observation, it appears that the current spur road building off the main Kali Ghandaki Road in ACAP is being built the cheapest and quickest way possible. In addition, the road alignment is more the outcome of community politics than input from ACAP (Binod Gurung, ACAP official, Jomsom, personal communication, November 29, 2009).

This *ad hoc* approach to building roads seems unlikely to produce many positive results, even with the CHANS design for road construction mentioned above. At best they could be hit or miss and more than likely than not, miss. Nevertheless, some recommendations seem appropriate.

## **5.2.2 Policy Recommendations**

### **5.2.2.1 Road Construction**

In light of the information cited in this thesis it is recommended that road building, whether at the government or local level, should involve a multidisciplinary team consisting of social scientists, ecologists, geologists, and engineers. In the planning stages this team should meet to agree on a set of common goals that support and facilitate the objectives of each of the disciplinary teams in an attempt to mitigate negative impacts of the road construction.

Currently, environmental guidelines for building roads in ACAP are not being enforced. The ACAP officials I spoke with are aware of this problem and informed me that due to local

politics they had no authority to enforce these laws (Binod Gurung, ACAP official, Jomsom, personal communication, November 29, 2009). This situation must be addressed. While it is clear that the local communities in ACAP need roads and should not be prevented from building them, it should be done under environmentally friendly guidelines and within ACAP regulations. ACAP should work together with the local communities to draft a 10-year plan outlining road construction in ACAP. This plan should include:

- a biodiversity study targeting sensitive areas where roads should be considered off limits,
- a survey of the communities in terms of need for a road which then is compiled and prioritized as to where the most immediate needs are,
- based on the above prioritization draft a time table for the implementation and construction of the road projects for the next ten years,
- specific environmental guidelines need to be an integral part of the road network plan and enforced, and
- a multi-disciplinary study in the planning phases aimed at trying to mitigate negative impacts on sociocultural, socioeconomic, and environmental spheres (described above).

#### **5.2.2.2 Trekking Trails**

My recommendations for trekking trails concern the alternate trail system that should be open and used by trekkers who still want to do an Annapurna Circuit Trail (ACT) route. During my research period, I had the opportunity to hike most of these trails and, with my previous experience as a trekking guide in Nepal, I feel confident in my assessment of these routes as alternative options. By opening up these trekking routes trekkers would still be interested in coming to the area because they could, for the most part, stay off the roads and still do a trek similar to the original ACT route. While this would not solve the problem of lost income in most villages now on the trail, it would stimulate tourism business in adjacent areas and allow another group of people to benefit from it who have not previously.

### 5.2.2.3 West Side of ACT

#### 5.2.2.3.1 ACAP Alternate Trail System

I support the alternate trekking route that ACAP has developed in the Kali Ghandaki Valley on the west side of the ACT (**Figure 5.1**). The one area that still needs attention is the ring road that is being developed in the Jhong Kola Valley near Muktinath (see **Figure 4.30** in **Chapter 4**). Unfortunately, this road has been built on top of one of the existing alternate trails and when complete will circle the whole valley. I suggest three possible alternatives.

1. Develop the Lupra Trail (**Figure 5.1**), which would allow trekkers to stay off the road on the west side of the valley all the way from Jharkot to Jomsom, where trekkers could join the ACAP alternate trails.
2. Develop a lower trail on the north side of the Jong Khola Valley (**Figure 5.1**).
3. Allow trekkers to access the Upper Mustang Trail at Jhong, which would take them north out of the Jhong Kola Valley. However, upon reaching the intersection of the trail to Kagbeni they should turn south and join the ACAP alternate trails at Kagbeni. This last alternative is problematic due to the special permit required to enter Upper Mustang (**Figure 5.1**).

Therefore, I also suggest that ACAP should allow individual trekkers to enter Upper Mustang. Reports show that the current system of providing special permits only for camping groups does not help the local people. The money remains in the hands of the trekking agencies in Kathmandu. If individual trekkers were allowed into Upper Mustang the local communities could benefit by using either the homestay or community owned model. In addition, the US \$500 per person permit fees, which presently stay in the hands of the central government should be released and used like all other ACAP permit fees, to work on community development projects in ACAP.

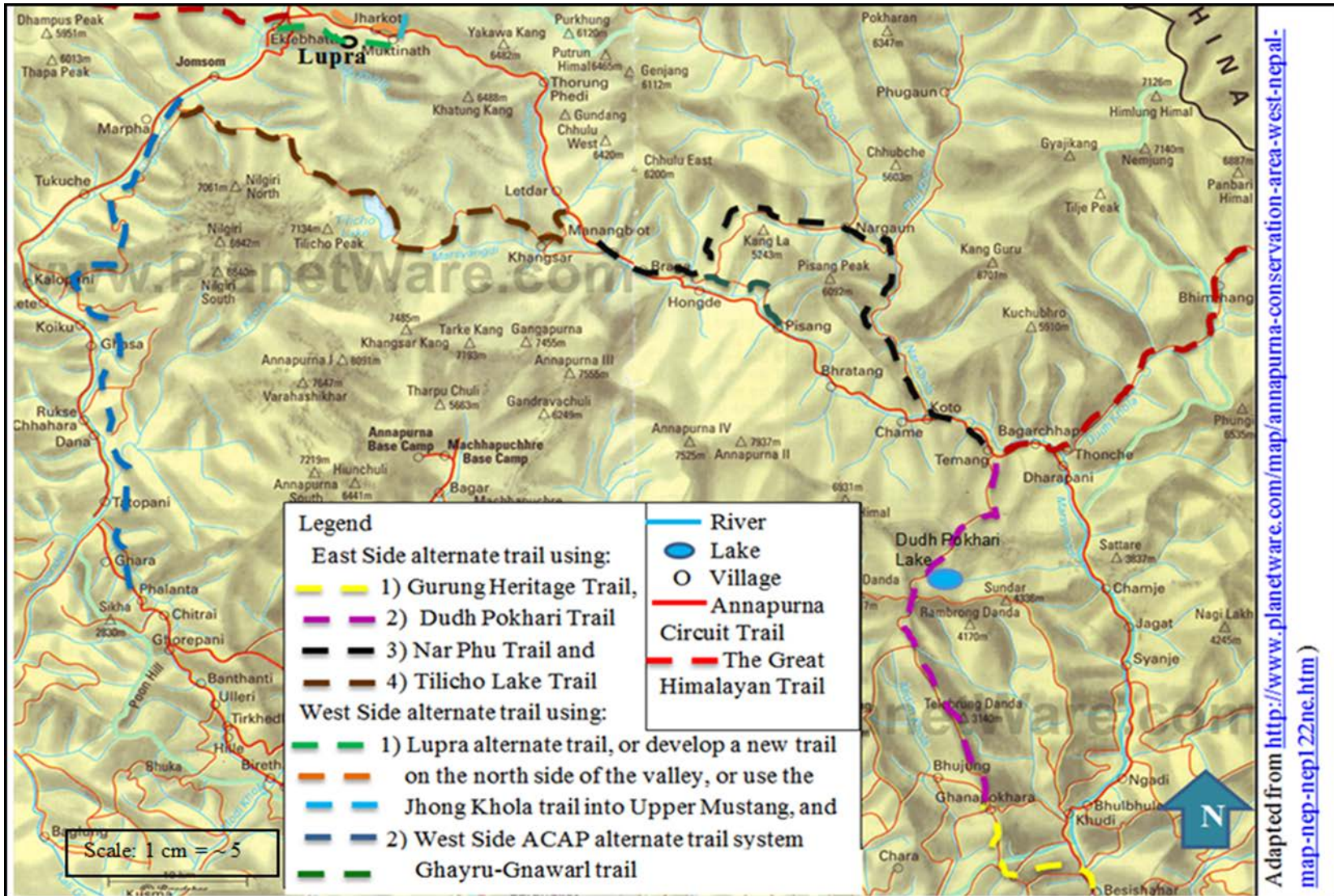


Figure 5.1 Alternate trails systems for both the east and west sides of the Annapurna Circuit Trail

If these fees were released, the overall fee could be lowered to be more appropriate for individual trekkers, in which case the increase in the volume of individual trekkers' fees would offset the US \$500 permit fee

#### **5.2.2.4 East Side of ACT**

I recommend that ACAP promote an alternate trail on the east side that uses the Gurung Heritage Trail to begin the trek (see **Figure 5.1**). This area is already under the homestay model in Ghaleguan and ACAP could help other villages do the same. The alternate trail would start at Basisahar or Khudi heading toward Ghaleguan where it intersects the Gurung Heritage Trail. Trekkers could follow the Gurung Heritage Trail until it intersects the Dudh Pokhari Trail (see **Figure 5.1**), where they would head north to the sacred lake and pilgrimage site at Dudh Pokhari, and then over the Namun Pass (5002 m) intersecting the traditional ACT trail at Temang (see **Figure 5.1**).

Presently there are no lodging facilities on the Dudh Pokhari Trail; therefore, trekkers should have experience and equipment to be self-sufficient for several days until reaching the original ACT at Temang. However, if ACAP promotes this trail and helps locals develop homestays and/or community owned lodges this route could eventually become as popular as the traditional route and provide income for the local communities. From Temang, trekkers could follow a trail above where the road is planned to go, until dropping down to the ACT at Koto. Here they could cross the river to the Nar Phu Trail, which will take them into a new less explored area and allow them to arrive in Manang by crossing the Kang La Pass (see **Figure 5.1**). However, for this to be feasible I recommend that ACAP open the Nar Phu area to individual trekkers. Until more facilities are completed in the valley it should be opened to only experienced trekkers with sufficient gear to bivouac in the event that they can make it to one of the villages. Another option from Temang is to continue along the ACT until reaching Pisang. From Pisang, trekkers could use the alternate Ghayru-Gnawarl Trail (see **Figure 5.1**) to reach Manang. This route would also keep trekkers off the road, for the most part, all the way to Manang.

Once in Manang, either the Annapurna Circuit Trail over the Thorang La Pass or the Tilicho Lake Trail (see **Figure 5.1**) could be used to cross to the west side of the trail. The Tilicho Lake Trail (see **Figure 5.1**) currently has no facilities and is not an option unless trekkers are with a camping group, or carry their own tent and food. However, once the road arrives in Manang, the spectacular beauty of the Tilicho Lake area will eventually attract more tourists and facilities will likely be developed (see **Figure 5.1**).

#### **5.2.2.5 Great Himalayan Trail**

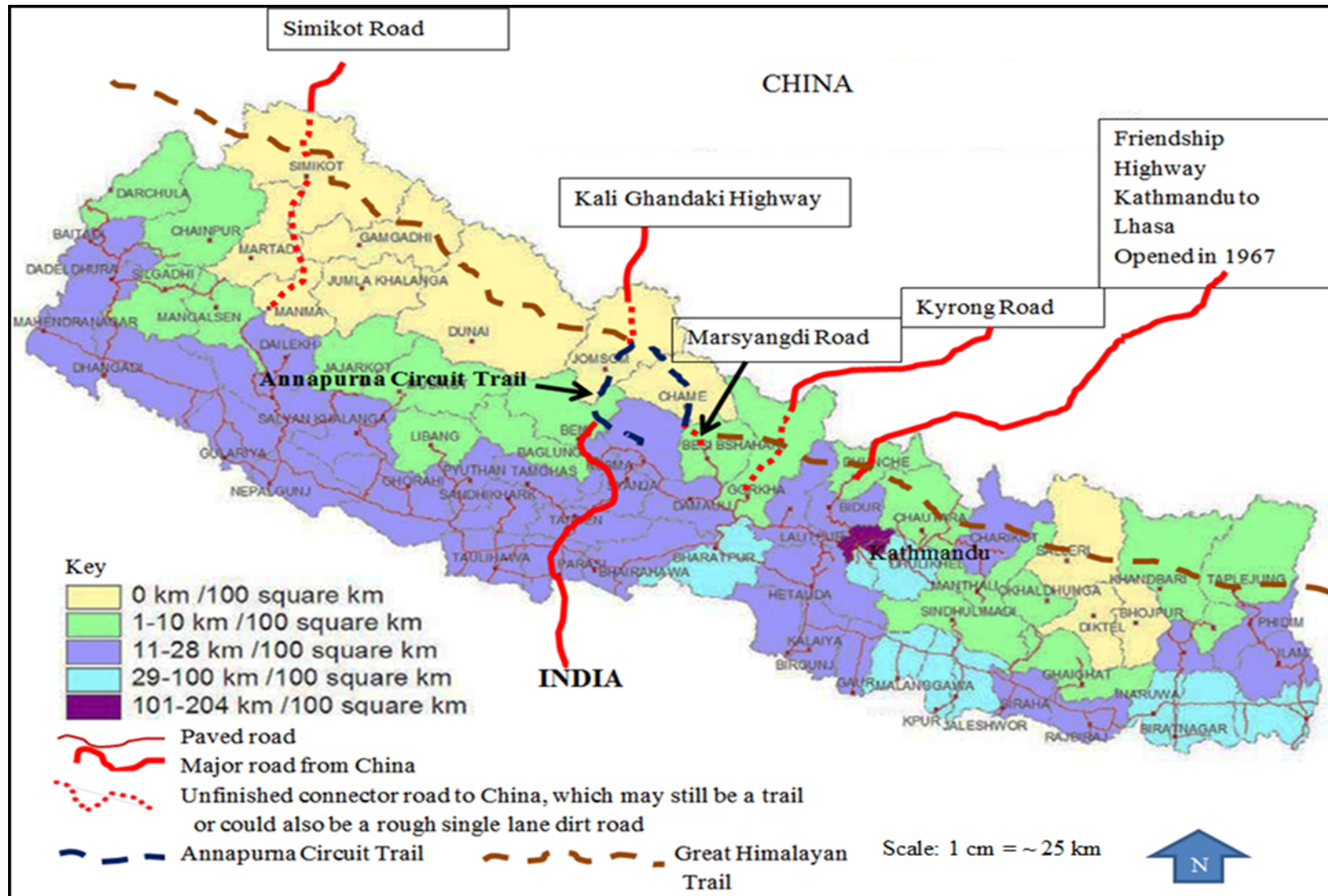
Now that the Kali Ghandaki Road is complete, there is an easy way to access the Great Himalayan Trail (GHT) to trek either east or west (see **Figure 5.1**). The portion of the GHT east of the Kali Ghandaki Valley is already well developed for tourism. I recommend that ACAP develop a plan to help local villages on the west side of the Kali Ghandaki Valley to start homestays and /or community owned trekking lodges on the GMT. This area is one of the poorest in Nepal and would benefit greatly from tourism if it is done using the homestay or community owned model.

### **5.3 Further Research**

**Figure 5.2** is a map showing the major roads currently under construction in Nepal that link with China. An examination of these roads would make a very interesting project for future research because all of them when finished will be major roads connecting China with India through Nepal.

#### **5.3.1 The roads for further research**

The pending impacts of both the Marsyangdi and Kali Ghandaki Roads provide a very interesting opportunity for future research. The Kali Ghandaki Road is slated to become the Kali Ghandaki Highway after the short uncompleted section between Kagbeni and Lo Manthang is finished (**Figure 5.2**). The Kali Ghandaki Highway will then be a major trade route from Tibet through Nepal to India. This will bring major changes to the area, which should be documented. After the Marsyangdi Road (**Figure 5.2**) reaches Manang there will be many interesting comparisons that could be made with the Kali Ghandaki Road.



**Figure 5.2:** Road density in Nepal with the four roads that enter Nepal from China including the Kali Ghandaki Highway, which follows the Annapurna Circuit Trail from Kagbeni to near Beni and then continues south to India (adapted from Pande 2006:2)

Another major trade road is under construction east of the Kali Ghandaki Highway that will connect Kathmandu to Tibet through the Upper Trishuli River Valley at Kyrong (**Figure 5.2**). Additionally, in Western Nepal work has begun to connect a road from Simikot (**Figure 5.2**) to a Chinese road that has been built to the Nepalese border. These two roads would make a very interesting comparative study to the roads examined in my study.

### **5.3.2 Solu Khumbu District**

The Solu Khumbu District in Eastern Nepal is famous for its numerous trekking trails that lead into Sagarmartha National Park, the home of Mt. Sagarmartha (a.k.a. Mt. Everest). When I first visited the area in 1985, there was a road from Kathmandu to Jiri (**Figure 5.3**), where trekkers began the hike toward Sagarmartha National Park. In following years, every time I arrived at Jiri I noticed that the road was slowly being developed further along the trekking trail. It currently has been extended to just beyond Shivalaya. Considering the popularity of the Everest area for tourism, I expect that roads will continue to make their way into the Everest area and will eventually reach Lukla and Namche Bazaar (a.k.a. Namche) (**Figure 5.3**).

Road development leading into the Everest area is possible not only from Jiri, but also from the Salleri Valley and the Arun Valley (**Figure 5.3**). The Salleri Valley has one of the few small airports in the area that has dirt road access. This road could be continued up the Junbesi Khola River and go north towards Ringmo and then up the Dudh Kosi River toward Namche or west toward Junbesi and possibly connect to the Jiri Road (**Figure 5.3**).

The Arun Valley (**Figure 5.3**) provides another alternate way to get in and out of the Everest area. Some trekkers choose to hike the Jiri Trail to Everest Basecamp and then use the Arun Valley Trail to exit the area, or it is also possible to trek in the opposite direction, starting at Tumlingtar, in the Arun Valley trekking to Namche and on to Everest Basecamp, and then finishing in Jiri (**Figure 5.3**). The Arun Valley was surveyed in the early 1990s for road access to the proposed Arun III hydroelectric project site (Forbes 1999, Inspection Panel (World Bank) 1994, Udall 1994, NEA 1993). There were two possible routes, one in the valley and one on the ridge tops. Plans were initiated for construction of the ridge top route and relocation people along

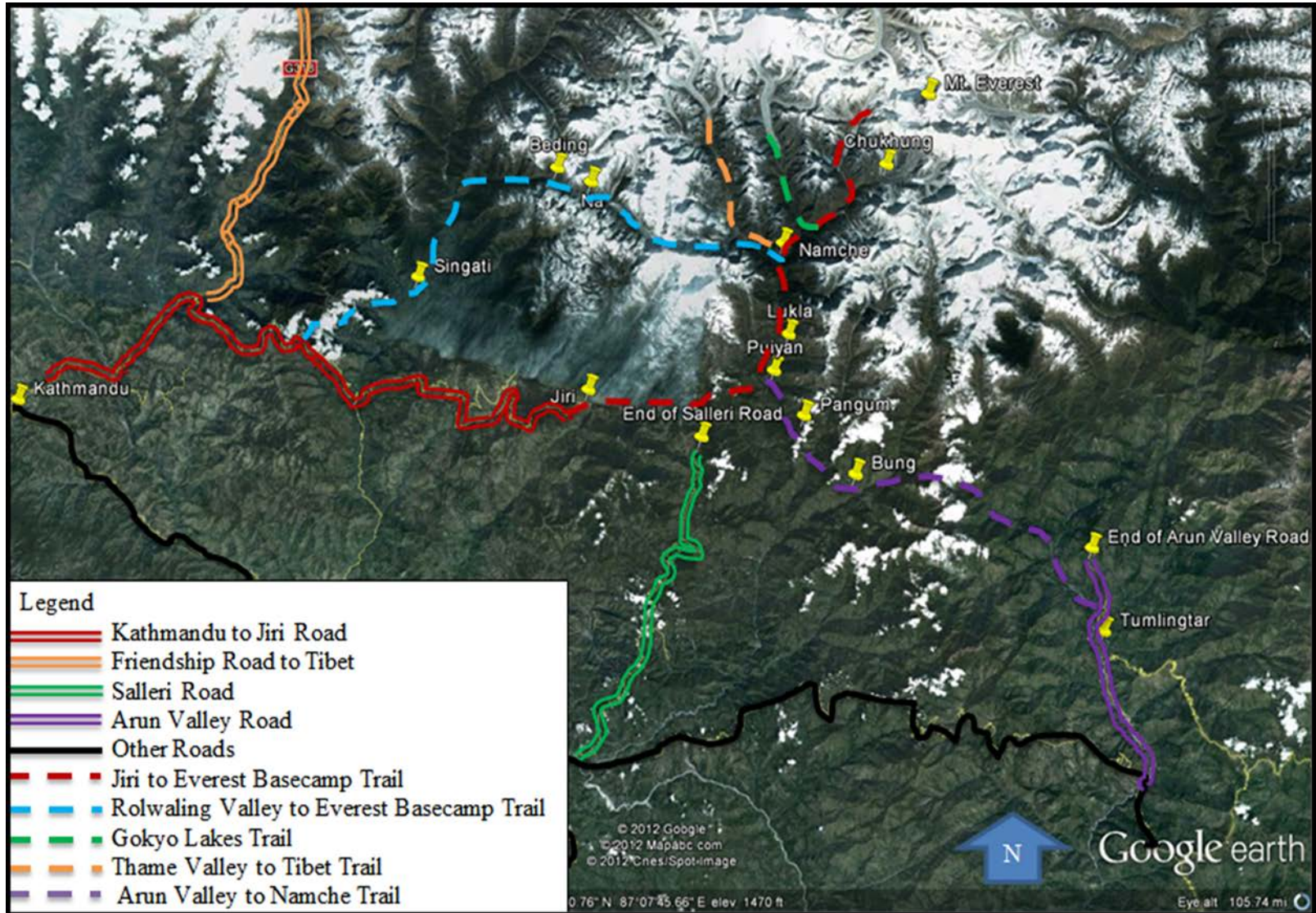
this route commenced. However, in 1992 the valley route was chosen because it would be cheaper to build and would displace fewer people. In the end neither the road nor the dam was built, leaving many locals angry that they did not get the road they were promised. Many had already been relocated, and more than 1600 families were affected by the plans to build the ridge top road alignment (Forbes 1999, Inspection Panel (World Bank) 1994, Udall 1994, NEA 1993).

Hydropower development is on the new government's agenda and there has been talk of reviving the Arun III project (Shrestha 2009). With two feasible road alignments already surveyed, it is likely a road will be built up the Arun Valley. Once there is a road in the Arun Valley, I expect that it will only be a matter of time until it reaches Namche.

It is clear from **Figure 5.3** that the three roads are heading very slowly toward Lukla and Namche by following the existing trails. If roads are developed they will affect not only the trekking lodges and communities along the Jiri Everest Basecamp Trail, but other regions in Solu Khumbu District where trekking is popular, such as:

- the Rolwaling Valley Trek ( **Figure 5.3**);
- the Numbur Cheese Circuit Trek ( **Figure 5.3**), which is also a traditional Hindu pilgrimage trail to the five sacred lakes, *Panch Pokhari* (**Figure 5.4**);
- the Gokyo Trek (**Figure 5.3**);
- the Everest Basecamp Trek (**Figure 5.3**); and
- the Thame Valley (**Figure 5.3**) trekking trail, which Tibetans use every Saturday to bring their goods to sell at the weekly market in Namche Bazar, which is also used by Buddhist pilgrims to visit the Thame and Laudo *Gompas* (**Figure 5.4**).

New roads in the Solu Khumbu will affect lodge owners in the same way as described in this thesis, with one important difference. The Everest Basecamp trek is not a circuit. Everyone on this trek travels up and down through Namche Bazar, spending at least one or two nights to acclimate to the altitude. This has resulted in many lodge owners and tourist operators becoming quite wealthy in Namche Bazar.



**Figure 5.3** Roads and trails leading to the Mt. Everest area (Adapted from Google Earth)

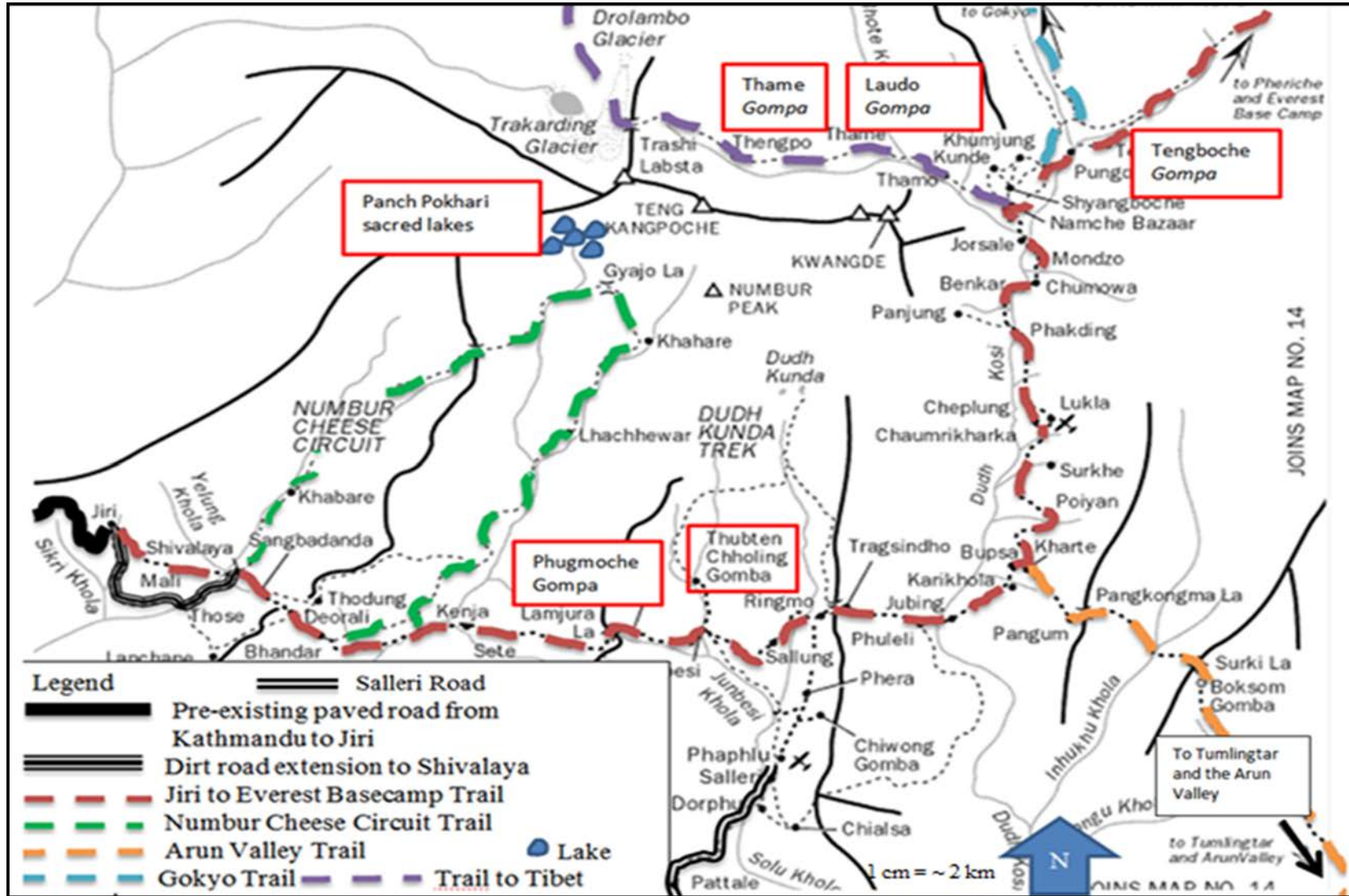


Figure 5.4 Trails and villages along the Jiri to Everest Basecamp trekking trail (Adapted from Bezruchka and Lyons 2011)

The Sherpas are the majority ethnic group in the Everest area and consequently they have benefitted the most from mountain tourists and mountain climbing expeditions. They will continue to do so whether there is road development or not due to the strategic location of Namche Bazar.

I hypothesize that porters from the valleys below Namche will be the group most negatively affected by new roads in the area, as jeeps, buses, and trucks will eventually replace them. Marginal lowland farmers near trekking areas rely on income from portering for trekking groups to get them through the winter, until agricultural production begins again in the spring (Tiwary 2005). As one resident of the Khumbu said (quoted in Price et al. 1999:28): “It was the poor people who first benefited from tourism, because they did not hesitate to carry loads for tourists. The rich were too proud to do this.” Building on my past work in the Annapurna Conservation Area, interesting future research could address how an expanding road network will affect porters, lodge owners, and tour operators in the Solu Khumbu District in Eastern Nepal.

I would be especially interested in examining how gender and age issues are impacted by road development. It is common in Nepal for both women and children to be employed as porters. While it is not common for women to be trekking lodge owners, it is common for women and their children to manage most of the activities involved in running a trekking lodge. The out-migration trend (see **Appendix C: Nepal Country Profile**) has increased the women’s workload in Nepal, as men are increasingly traveling to Gulf countries to find better paying jobs.

Road development will also affect traditional Himalayan pilgrimage in the Solu Khumbu District as I described in **Case Study 5** for the Annapurna Conservation Area. Hence, understanding the interplay between trekkers and pilgrims would prove interesting as it has in this study. There are numerous *gompas* and sacred sites in the district for both Hindu and Buddhist practitioners including,

- *Panch Pokhari* – Five sacred lakes north of Jiri (see **Figure 5.4**) that Hindu pilgrims visit during the *janai purnima* or changing of the sacred thread ceremony;

- Thubten Chholing *Gompa* (see **Figure 5.4**) founded by Trulshik Rinpoche, one of the most revered Buddhist lamas in the Nyingma Tradition of Tibetan Buddhism and teacher to HH Dalai Lama;
- Phugmoche *Gompa* (see **Figure 5.4**);
- Thame *Gompa* (see **Figure 5.4**);
- Laudo *Gompa* (see **Figure 5.4**); and
- Tengboche *Gompa* (see **Figure 5.4**), which Buddhist pilgrims and trekkers visit to see the annual *Mani Rimdu* masked lama dances.

When one of these roads does finally make its way to Lukla or Namche, the Rolwaling Valley Trek (see **Figure 5.3**) may become the alternate trail, just as other trails in the Annapurna Conservation Area are becoming alternate trails due to the roads encroaching on the Annapurna Conservation Area. The combination of the above factors makes the Solu Khumbu an excellent area for a comparison study based on findings reported in this thesis.

#### **5.4 Final Comments**

Roads are an essential part of human existence and will continue to be for a long time. The 20<sup>th</sup> Century saw the first rudimentary road constructed by humans on a surface other than the planet Earth. On Sunday July 20, 1969 at 4:17 pm (EST) Neil Armstrong landed the lunar module ‘Eagle’ in the Sea of Tranquility on the surface of the Moon. If roads start as trails, as I have argued previously, then humans began building roads on the Moon in 1969. Pictures of that historic mission show a trail leading to the lunar module, not just footprints (**Figure 5.3**).

Perhaps unwittingly Neil Armstrong and Buzz Aldren laid the foundation for future studies of the CHANS of road construction, after planet Earth has no more room for roads. If Armstrong did know, he surely would have changed his quote to: “That’s one small step for man, the beginning of one giant highway for mankind.” Indeed his first step led the way for many more footprints on the moon, with subsequent Apollo missions continuing to make more trails,

which connected to previous trails, setting the stage for an expanding network of roads on the moon.



**Figure 5.5** Astronaut Buzz Aldren building the first road on the moon while saluting the American flag in the ‘Sea of Tranquility’ July 20, 1969 (NASA Archives [http://spaceflight1.nasa.gov/gallery/images/apollo/apollo11/html/as11\\_40\\_5875.html](http://spaceflight1.nasa.gov/gallery/images/apollo/apollo11/html/as11_40_5875.html))

By April 21, 1972, work on the moon roads was well under way with the help of heavy equipment (**Figure 5.5**).<sup>21</sup> This legacy of galactic road building stretched through the NASA Apollo Space Program (1961-1972) and into the next generation. Including the historic first landing, there has been 12 men on the lunar surface and six of them drove a lunar rover each leaving a trail. James Lovell, the only astronaut to have flown two Apollo missions, Apollo 8 and 13, presumably would know more about the surface of the moon than anyone else would. His comment was, “The moon is essentially gray, no color. It looks like plaster of Paris, like

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<sup>21</sup> April 21, 1972 is a date I will always remember as it coincided with my 18<sup>th</sup> birthday. Roads have always been a passion for me ever since I got my first toy bulldozer at age five.

dirty beach sand with lots of footprints in it.” (<http://thinkexist.com/quotes/top/occupation/astronaut/2.html>).

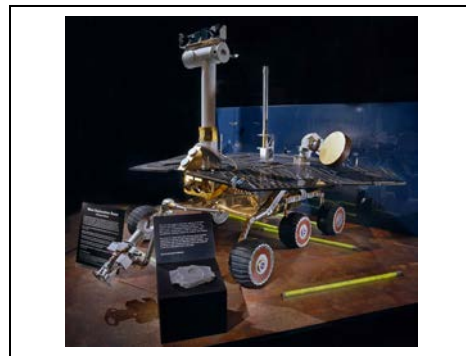


**Figure 5.6** The evolution from foot trail to road building on the Moon ("The Lunar Roving Vehicle (LRV) gets a speed workout by astronaut John W. Young in the "Grand Prix" run during the first Apollo 16 extravehicular activity (EVA) at the Descartes landing site." NASA Archives <http://spaceflight1.nasa.gov/gallery/images/apollo/apollo16/html/s72-37002.html>)

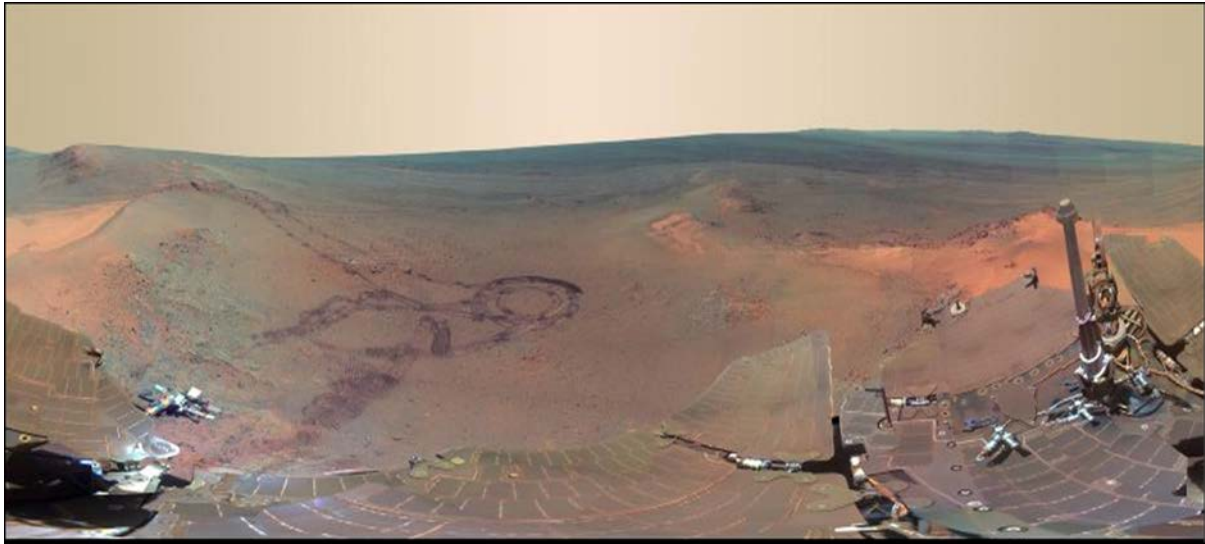
Not content with the Moon, humans have started to explore other planets on which to build roads such as Mars (**Figure 5.7**), thereby following the ancient human tradition of linking trade routes, in this case, the beginning of galactic trade routes. To that end, the institution to which I am submitting this thesis has been instrumental (**Figure 5.8**). Recent photos from the Mars rover Opportunity (**Figure 5.9**) photo show obvious signs of roads on Mars.



**Figure 5.7** Sojourner on Mars (7/23/97) with APXS instrument against the rock named "Yogi" rover in the Exploring the Planets gallery



**Figure 5.8** Full-scale model of MER (NASA/JPL) (Photo courtesy of Cornell University)



**Figure 5.9** “ 'Greeley Panorama' from Opportunity's Fifth Martian Winter. Opportunity's tracks can be seen extending from the south, with a turn-in-place and other maneuvers evident from activities to position the rover at Greeley Haven. The tracks in some locations have exposed darker underlying soils by disturbing a thin, bright dust cover”.

([http://www.nasa.gov/mission\\_pages/mer/multimedia/pia15689.html](http://www.nasa.gov/mission_pages/mer/multimedia/pia15689.html))

These comments are not meant to distract the reader from the main arguments of my thesis. On the contrary, they serve to emphasize that humans have a profound impact wherever they travel. The fact that James Lovell said that the moon surface looked “...like dirty beach sand with a lot of footprints in it” ((<http://thinkexist.com/quotes/top/occupation/astronaut/2.html>)), and the pictures of the Lunar Roving Vehicles kicking up dust on the lunar surface, speaks to the anthropocentric hubris with which humans continue to exploit natural environments without forethought about the complex connections within coupled human and natural systems. There is already concern about orbital debris (<http://orbitaldebris.jsc.nasa.gov/>) and talk of space colonies in orbit versus space colonies on planetary surfaces with estimates of this being “feasible within 20 years” (<http://www.permanent.com/space-colonization.html>).

The question is; are we doomed to repeat the same mistakes we have made on Earth as we explore space? Given that roads are here to stay, even in the long-term future, my research contributes substantially to the literature on road construction and road impacts. Roads are often

constructed in developing countries to ‘jump start’ economic development. However, as I pointed out in **Chapter 2**, there are substantial cases (e.g., Alaska Highway, BR-364 Highway in Brazil) where considerations of sociocultural elements were ignored, which resulted in significant negative impacts on indigenous populations, as well as social strife between indigenous and non-indigenous inhabitants and migrants. Hopefully, roads are built to help make the lives of people easier, which is not just limited to the economic purview. Quality of life issues must also be taken into account and I suggest that sociocultural constituents are the foundation of quality of life issues. If policy makers looked at road development in terms of Gross National Happiness (GNH), as in Bhutan (<http://www.grossnationalhappiness.com/>), rather than Gross National Product (GNP), then road projects would be designed much differently. While this may not be realistic, it speaks to the importance of the CHANS approach. We must consider socioeconomic, sociocultural, and the environmental spheres as complex systems that are intimately connected through dynamic couplings that influence each other. To the extent that we can do this in planning development projects, including road building, the greater chances we have of making the situation better rather than worse both here on Earth and elsewhere.

## APPENDIX A: A BRIEF HISTORY OF ROAD DEVELOPMENT IN NEPAL

On March 21, 1770, King Prithvi Narayan Shah declared Kathmandu the capital of Nepal. From that time until 1927, the only way in and out of the Kathmandu Valley was on trails by foot or animal. Transport of goods was done either by human portage or on the backs of mules or ponies. Starting in 1924 a plan was initiated to connect Kathmandu to India on its southern border by three interconnected transportation systems; ropeway (Figures A.1) from Kathmandu to Dhursing, roadway from Dhursing to Amlekhgunj, and railway from Amlekhgunj to Raxaul on the Nepal-India border.

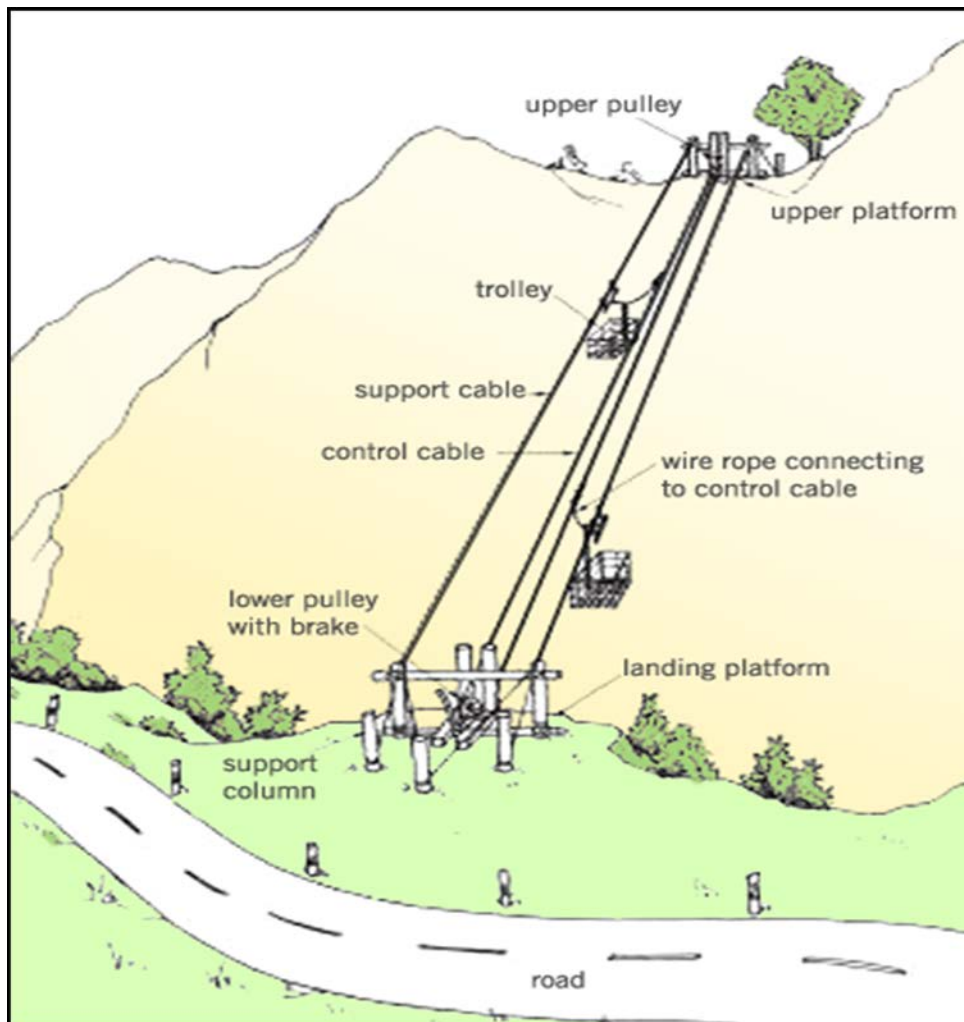


Figure A.1 Building plans for a ropeway in Nepal (<http://practicalaction.org/aerial-ropeway-1>)

Ropeways are one of the main ways Nepalis cross rivers and transport loads in mountainous areas (**Figures A.2**).



**Figure A.2** Ropeways in Nepal (clockwise starting left: <http://www.ekantipur.com>, <http://www.nepalitimes.com.np/issue/2010/02/26/Nation/16839>, <http://www.nepalitimes.com.np/issue/2010/02/26/Nation/16839>, <http://www.allvoices.com>)

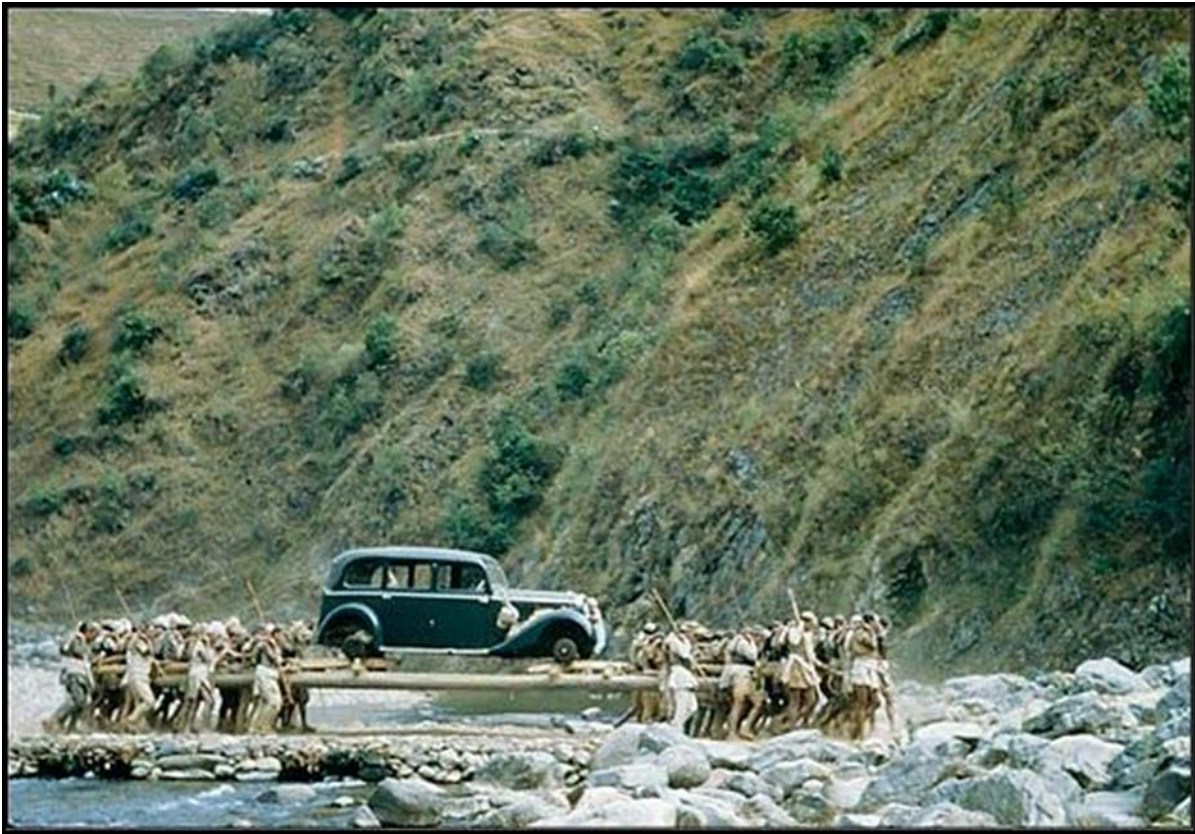
The first all-weather gravel road outside the Kathmandu Valley was constructed in 1929 and was only 42 km long (Shrestha 1980). There seems to be some debate over when the first automobile arrived in Kathmandu but until the 1950's, they were all carried over the hills and into the Kathmandu Valley on the backs of porters (**Figures A.3** and **A.4**).

One source cites 1916 (Bajracharya et al. 2006) which coincides with the era of the oldest car in Nepal's National Museum (**Figure A.5**), however it is doubtful there was any road to drive it on then. In 1934, another car arrived in Kathmandu for the exclusive use of King Tribhuvan on the one and only existing road in the Kathmandu Valley (SDC 2008). Nonetheless, before 1950

motorable roads in Nepal were virtually non-existent (Paudyal 1998). In 1949, air links were established between Kathmandu and India but it was not until 1956 that Kathmandu had a road usable by trucks that linked to the existing road in the flat Terai area connecting Kathmandu to the railhead and India. Consequently, for almost 30 years, from 1927 until the completion of this section of road, the only way to transport goods into or out of the Kathmandu Valley was by the ropeway, human porter, or animal (Shrestha 1980). This is highlighted by the fact that until 1956 there was only approximately 600 km of roads in and around the few main cities of Nepal and more than half were fair weather only roads (Shrestha cited in Paudyal 1998). In 1961, a section of road was completed from Amlekhgunj to Raxaul making the road link from India to Kathmandu complete (Shrestha 1980).



**Figure A.3** Porters carrying a car over the last ridge into Kathmandu. (<http://visitnepal-yogesh.blogspot.com/2012/02/100-years-ago-in-nepal.html>)



**Figure A.4** Porters carrying a car across a river heading to Kathmandu (Volkmar Wentzel <http://ngm.nationalgeographic.com/ngm/exploration/postcard06.html>).



**Figure A.5** Oldest in car Nepal in Nepal's National Museum (<http://www.gonomad.com/features/0803/nepal-trekking.html>)

The cars that did make it into Nepal before roads were intended for royalty and the upper class elites who used them in a very limited area of Kathmandu (Shrestha 1980). The presence of a Ford dealer in Lazimpath (**Figure A.6**), Kathmandu in the 1930's speaks to the wealth of the royal family and their upper class friends.



**Figure A.6** The caption reads, “Cars for the upper class the authorized Ford dealer in Lazimpath probably in the 1930s. Cars were carried over the mountain trails on bamboo cross-poles by teams of 64 porters” (<http://meropost.com/view/post:6727>)

While many different factors were involved in the overall plan to connect the capital of Nepal in the Kathmandu Valley to the Indian order, a distance of only 115 km, one factor that cannot be ignored is the difficulty and expense of building roads in mountainous areas. Both the road and rail sections of the links in the flat Terai area were complete by 1927, but it was another 30 years before there was a road connecting those links through the mountainous terrain and over

the pass into the Kathmandu Valley. This was the first road of national importance completed in Nepal as it directly connected the two major economic centers, the Kathmandu Valley and Raxaul and adjoining areas on the India border (Shrestha 1980). The same year the link was completed with India in the south plans were being made to connect Kathmandu with China in the north. In 1961, King Mahendra signed an agreement with the Chinese government in Peking to construct a road from Kathmandu to the Chinese border in Tibet at Kodari. The 114 km road was completed in 1966 and was quite controversial at the time because of the political implications of Kathmandu being connected by road to both India and China (Raj 1978).

Around the same time, to avoid having to cross into India, plans were made for an east-west transportation road network within Nepal. India, not wanting to lose its advantage from the existing road system, showed no interest in helping build the road until China began building a portion of it, at which point India agreed to take over building the remaining sections of it (Shaha cited in Blaikie et al. 1976). It has been suggested that all three of these roads, the first major roads in Nepal, received aid from India and China for strategic reasons (Shaha cited in Blaikie et al. 1976; Raj 1978) rather than purely as economic development aid. This an observation also made by Kreutzman (2000) concerning other road building in mountainous areas of Asia during the same period. The importance of road building from the mid-1960s through the mid-1970s is evident from the amount spent on road construction, which was greater than the total for all other projects (Blaikie et al. 1976). Over a twenty year period from 1956 when the First Five Year Plan was initiated to 1976 during the Fifth Five Year Plan, road length had expanded from 625 km (0.40 km per 100. km<sup>2</sup>) to 4136 km (<2.20 km per km<sup>2</sup>) (HMGN/MWT/DOR 1985; GON/MPPW/DOR 2008b) and effectively produced a north-south and east-west road network.

Nonetheless, accessibility for the average rural Nepali was still very limited especially in the hills and mountainous areas. The east-west road corridor was restricted to the flat Terai area in the south and the north-south corridor only ran through the Kathmandu area in the east. During the 1980-90s, the government targeted minimum transport facilities to rural areas as a priority giving grants to local governing bodies at the district and village level as one strategy to

help attain this goal. However, by the end of the 1990s, 20 out of 75 districts still lacked connection by vehicle roads (Paudyal 1998). As of 2007, there was almost 19000 km of roads (12.79 km per 100 .km<sup>2</sup>) but only 9399 km of that total is considered part of the Strategic Road Network (SRN), the remainder being local roads. Of the total SRN roads 45% are blacktop, 33% are earthen and 22% are gravel (GoN/MPPW/DoR 2008b). The SRN roads fall under the jurisdiction of the Department of Roads whereas the remaining approximately 10000 km of local roads are the responsibility of the Department of Local Infrastructure and Agricultural Roads (DoLIDAR).

Since the end of the People's War and the signing of the Peace Accord in 2006, Nepal has been undergoing a huge change in its government including the mandate to write a new constitution by May 2010. The deadline has been currently extended and the political situation is still unstable. Consequently, accurate information about the current administration's plans for road building is not available. However, from the information that is available the recent building of rural roads under DoLIDAR was planned and implemented according to the 2005 Integrated Rural Accessibility Planning Guidelines (HMGN/MLD/DoLIDAR 2005). Under the DoLIDAR plan, local Village Development Committees (VDC) work with the District Development Committees (DDC) to prepare a District Periodic Plan that covers the development needs of the district over a least a five-year period including a District Transport Master Plan (DTMP).

This process of decentralization to the village level has been an ongoing process in Nepal for some time with the recognition that the local inhabitants benefit more from projects that they identify and participate in than those planned from the top down. The most recent National Transport Policy available (2001) states this concept of decentralized governance and local development of transport as one of its three main strategies (HMGN/MPPW 2001). Consequently, the new IRAP Guideline (2005) was instituted to further this process by giving local governments even more involvement in infrastructure projects which stated (HMGN/MLD/DoLIDAR 2005: 16):

This policy covers infrastructure for local transportation, irrigation and river control, small hydro power and alternate energy, drinking water, sewerage and sanitation, housing, building and urban development, management of solid waste and social infrastructure including government offices, health, education etc.. The policy aims to increase the participation of local people in physical and social infrastructure development to enhance the social services, economic opportunities and mobilization of local resources.

Under this strategy, the goal is to provide access in rural areas to all-weather motorable roads within 4 hours walking distance in the hills and 2 hours in the Terai. It was estimated in 2007 that 39% of the population in the hills do not have access within 4 hours and 13% in the Terai do not have access within 2 hours (Shah 2007). In 2007, there were still 12 district headquarters, of a total 75, that did not have a road connection (GoN/MPPW/DoR 2008b). However, by 2009, that number had been cut in half with currently (2009) only six district headquarters remaining unconnected (Khanal 2009, Sitaula 2009). Funds for road construction come from several sources including the Central Government, the Roads Board, and donor agencies. Donor agencies such as the Asian Development Bank (ADB) and the World Bank (WB) contribute through multi-lateral loans and bi-lateral grants making up the majority of the contributions at 70% of the total (Pande 2006).

While significant progress has been made, road density still remains low compared to other south Asian countries at 12.1 km per 100 km<sup>2</sup> (**Figure A.7**) (UNDP 2006). Most recent estimates (2008) put the National Road Network at a total of 24000 km with 30% blacktop, 27% gravel, and 43% earthen. Of the total, 54.3% are local roads, 13% are urban and 32.5% are strategic (Sitaula 2009)



## **APPENDIX B: A BRIEF HISTORY OF COMMUNITY FOREST MANAGEMENT IN NEPAL**

The recent history of forest management in Nepal begins in 1942 when the Department of Forests was established to “scientifically manage” Nepal’s forest under state ownership by His Majesty’s Government of Nepal (HMGN). The management plan under this system was strongly protectionist providing little if any leeway for traditional livelihood usage by local community members (Kanel 2005). Nonetheless, numerous studies suggest that local communities actively used their forests in a sustainable way extracting what they needed for their livelihood (Fisher 1991, Gilmour 1991, Fischer 1990, Gautam 1987). In 1957, the Private Forest Nationalization Act took what had previously been private forests and nationalized them giving management of forests to the government. This act was the first concrete step in curtailing the old system instituted during the Rana Regime whereby large tracts of forest were given to the elite for their personal use (Chhetri 2006).

Large scale deforestation commenced in the period following the Private Forest Nationalization Act due to people feeling that, what was once their forest which they depended on to fulfill their basic needs had now been taken away from them (Gilmour et al. 1989, World Bank 1978). As a result of concern over the growing deforestation, the National Forest Plan was instituted in 1976 (Acharaya 2002). This plan was committed to involving people’s participation and subsequently led to sections of the government owned forest being handed over to the local political units called *Panchayats*. Community forestry management officially began in 1978 with the Panchayat Forest Rule and Panchayat Protected Forest Rule (Kanel 2005). This system proved equally ineffective for several reasons. One of the main reasons was that the officials who were given the authority to manage the forests were not local community members or forest users. This was rectified under the Master Plan for the Forestry Sector, which was approved in 1985 (Kanel 2005). This policy allowed the management of forests to be handed over from the Panchayat to the local forest user groups. It had several other provisions that strongly favored users groups. These recommendations became part of the Forest Act of 1993 and the Forest

Rules of 1995 (Kanel 2005). These two documents gave community forest user groups (CFUGs) substantial rights to manage their forests. For example, Kanel (2005:19-20) states that:

- “Any part of government forests can be handed over by the District Forest Office (DFO) to the communities who are traditional users of the resource. The right of forest management and use is transferred from the Forest Department to the users, not the ownership of land itself.”
- “CFUGs are recognized as independent and self-governing entities with perpetual succession.”
- “CFUGs are allowed to plant short-term cash crops including non-timber forest products such as medicinal herbs.”
- “CFUGs can accumulate their fund from grants received by HMG and other institutions, from the sale of CF products and money received from other sources such as fines.”
- “CFUGs can use funds in any kind of community development work”

Since 1993 community forestry management in Nepal has undergone many revisions. It is beyond the scope of this thesis to go into detail about these different revisions nonetheless, in the literature it is generally agreed that participatory community forest management has been highly successful in managing the forests of Nepal (McDougal et al. 2008, Kanel 2005, Adhikari et al. 2004, Acharaya 2002, Pokharel 2002, World Bank 2001). In 2005, it was estimated that about 1.2 million hectares (25%) of national forest lands had been handed over to more than 14000 local community forest user groups (CFUGs) and 1.6 million households or 35% of Nepal’s population were members (Kanel 2005). The different policies and their effects are summarized in **Table B.1**.

While many agree that the overall goals of preventing further deforestation and replanting have been successful, the hopes that community forestry would also help alleviate poverty have yet to be fully realized.

**Table B.1** Summary of the evolution of community forestry policies and their effects (Adapted from Shrestha and Nepal 2003).

Year	Policy/Legislation	Effect of Policy/Legislation
1957	Private Forest Nationalization Act	<ul style="list-style-type: none"> <li>• indiscriminate cutting of forests</li> <li>• conversion of Private forest into farm land in Terai</li> </ul>
1961	Forest Act	<ul style="list-style-type: none"> <li>• forest categorization</li> <li>• forestry officials empowered</li> </ul>
1967	Forest Protection Act , special provision	<ul style="list-style-type: none"> <li>• judicial power to forestry officials,</li> <li>• law enforcement power reinforced</li> </ul>
1976	National Forestry Plan	<ul style="list-style-type: none"> <li>• recognition of people's participation in forest management</li> <li>• concept of village Panchayat forest</li> </ul>
1977	Amendment in Forest Act	<ul style="list-style-type: none"> <li>• provision of Panchayat Forest and Panchayat Protected Forest</li> </ul>
1978	PF and PPF Rules	<ul style="list-style-type: none"> <li>• handing over of National Forest to village Panchayat (elected village body)</li> </ul>
1982	Decentralization Act	<ul style="list-style-type: none"> <li>• authority to District and Village Panchayat</li> <li>• promotion of User's Committee concept</li> </ul>
1987	Revision of PF and PPF Rules	<ul style="list-style-type: none"> <li>• provision of User's committees for forest management</li> </ul>
1989	Master Plan for the Forestry Sector	<ul style="list-style-type: none"> <li>• incorporated the concept of CFUG</li> <li>• priority given to community forestry</li> </ul>
1993	Forest Act	<ul style="list-style-type: none"> <li>• Users as managers of forests</li> <li>• CFUG empowered for forest management</li> </ul>
1995	Forest Rules	<ul style="list-style-type: none"> <li>• process of community forestry detailed</li> <li>• Forestry staff's role changed from custodial to facilitation</li> </ul>
1999	Revision of Forest Act	<ul style="list-style-type: none"> <li>• control mechanism brought for violation of operational plan</li> <li>• provision for spending 25% in forestry activities</li> </ul>
2000	Forest Policy 2000	<ul style="list-style-type: none"> <li>• degraded and scattered forest areas in Terai and Inner Terai can be managed as community forests,</li> <li>• CFUGs in Terai to give 40 % of their income from the sale of surplus timber to the government for program implementation (Until July 2003, CFUGs pay 40 % of their income to the government, which was reduced to 15 % from only two species through the financial bill enacted in July 2004).</li> </ul>

The current negative discourse surrounding community forestry centers on the inequality of access and economic benefits for various user groups in certain regions of Nepal. In general, studies in this area indicate that the wealthy and socially elite members of the community benefit the most and the poorest and socially marginalized benefit least (Pandit et al. 2008, Yadav et al.

2008, Ives 2006, Gyanendra 2006, SANDEE 2004). **Table B. 2** summarizes the different user groups, the area of forest holdings, and the number of households involved.

**Table B.2** Summary of user groups, area, and households involved (adapted from Kanel 2005)

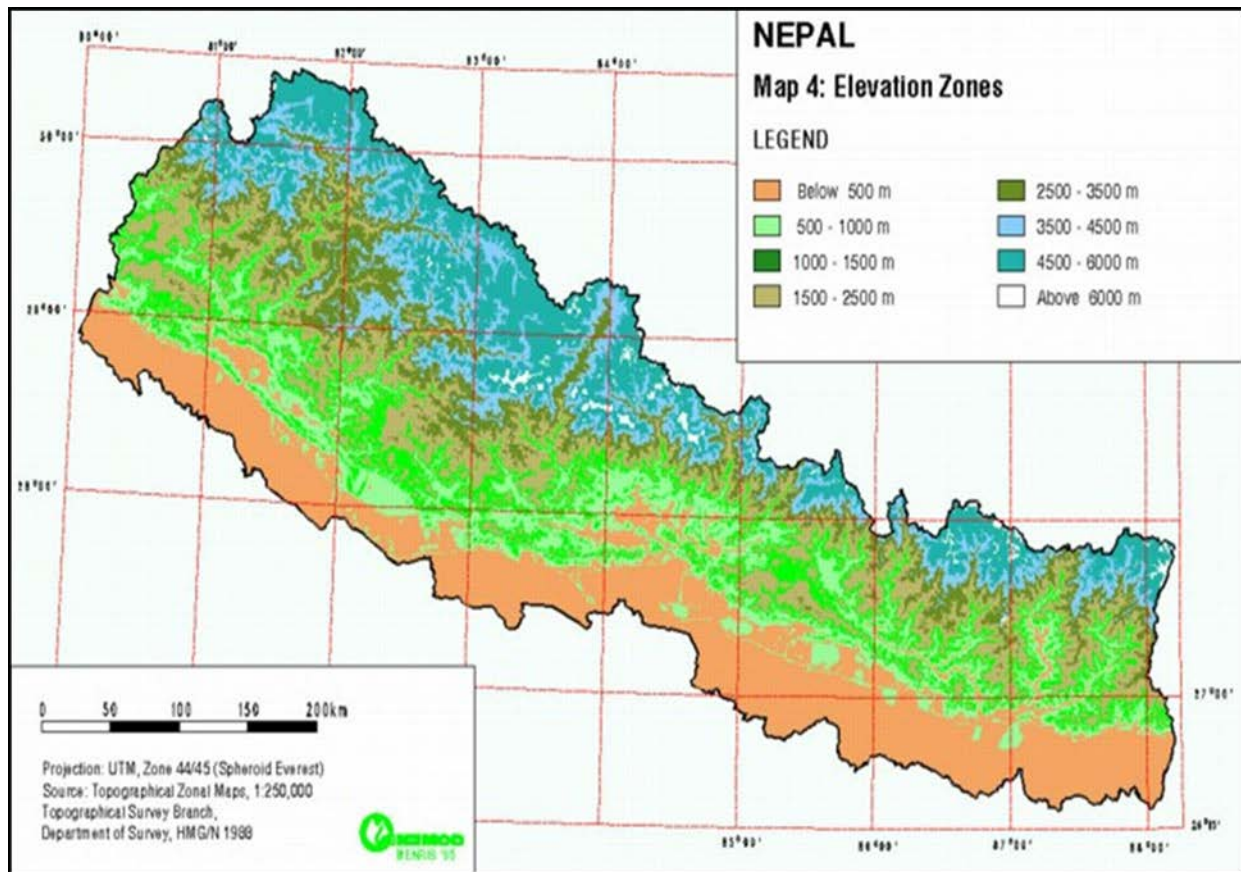
<b>Management models</b>	<b>User groups in number</b>	<b>Area in hectares</b>	<b>Households numbers</b>
Community Forests	14,258	1,187,000	1,640,239
Leasehold Forests	2,524	11,109	18,496
Buffer Zone Community Forests	57	15,924	19,362
Collaborative Forest Management	1	3,139	33,000
<b>Total</b>	<b>16,840</b>	<b>1,217,172</b>	<b>1,711,097</b>

## APPENDIX C: NEPAL COUNTRY PROFILE

### C.1 Physical Characteristics

#### C.1.1 Location and size

Nepal is famous for having eight of the ten highest peaks in the world, including the highest Mt. Everest (8850 m, 29035 ft), as well as the third highest, Mt. Kanchenjunga (8586 m, 28169 ft). It is located in South Asia on the southern slopes of the central Himalayas between 26° 22' N to 30° 27' N latitude and 80° 40' E to 88° 12' E longitude. Its land area is 147,181 km<sup>2</sup> stretching an average length of 885 km east to west and a mean width of 193 km north to south. It is landlocked between India on the south, east, and western borders, and Tibet Autonomous Region of China on the north (**Figure C.1**). Its elevation varies from 60 m in the south to 8,848 m at the summit of Mt. Everest, also called Sagarmatha. (**Figure C.1**)



**Figure C.1** Elevation zones of Nepal  
([http://www.apipnm.org/swlwpnr/reports/y\\_sa/z\\_np/npmp212.htm](http://www.apipnm.org/swlwpnr/reports/y_sa/z_np/npmp212.htm))

### **C.1.2 Physiography**

Nepal has been classified several different ways in terms of physiography. In general, four main zones, based on elevation and climate, are used. In addition, several distinct areas merit separate description, as the literature uses various versions of these terms depending on the author. Toni Hagen was one of the first foreign geologists to do an in depth, on the ground study of Nepal's geology and geography starting in 1950 (Hagen 1994). It is from his classifications that most others are derived (Ives 2004, Ives and Messerli 1989). He divides Nepal into seven zones from south to north. Starting in the flat plains on the Indian border they are the Terai, Siwalik Hills, Mahabharat Lekh, Midlands, Himalaya, Inner Himalaya, and Tibetan marginal mountains (Hagen 1998) (**Figure C.2**). The following descriptions of each zone refer to **Figure C.2** and **Table C.1**.

**Terai:** This is the flattest area of Nepal raising only 60-300 m above sea level and makes up 14% of Nepal's total land area. It consists of a narrow strip of alluvial Gangetic Plain that stretches no more than 45 km in width between the Indian border and the beginning of the foothills. Due to its rich soils, the Terai is the area of Nepal where agriculture is the most concentrated and productive.

**Siwalik Hills:** The hogback shaped Siwalik Hills make up 13% of the total land area and rise directly from the Gangetic Plain to an elevation of 700-1500 m. This zone is the southern limit of the hill region of Nepal and tapers in width from west to east. The geology of the area is made up of mostly large boulders and sedimentary rock. Much of this is debris washed down from the foothills during the monsoon, which has coalesced from a collection of boulders, stone, gravel, and sand. In some areas, broad fertile valleys separate the Siwalik Hills from the Mahabharat Lekh, and in other areas, the two ranges merge.

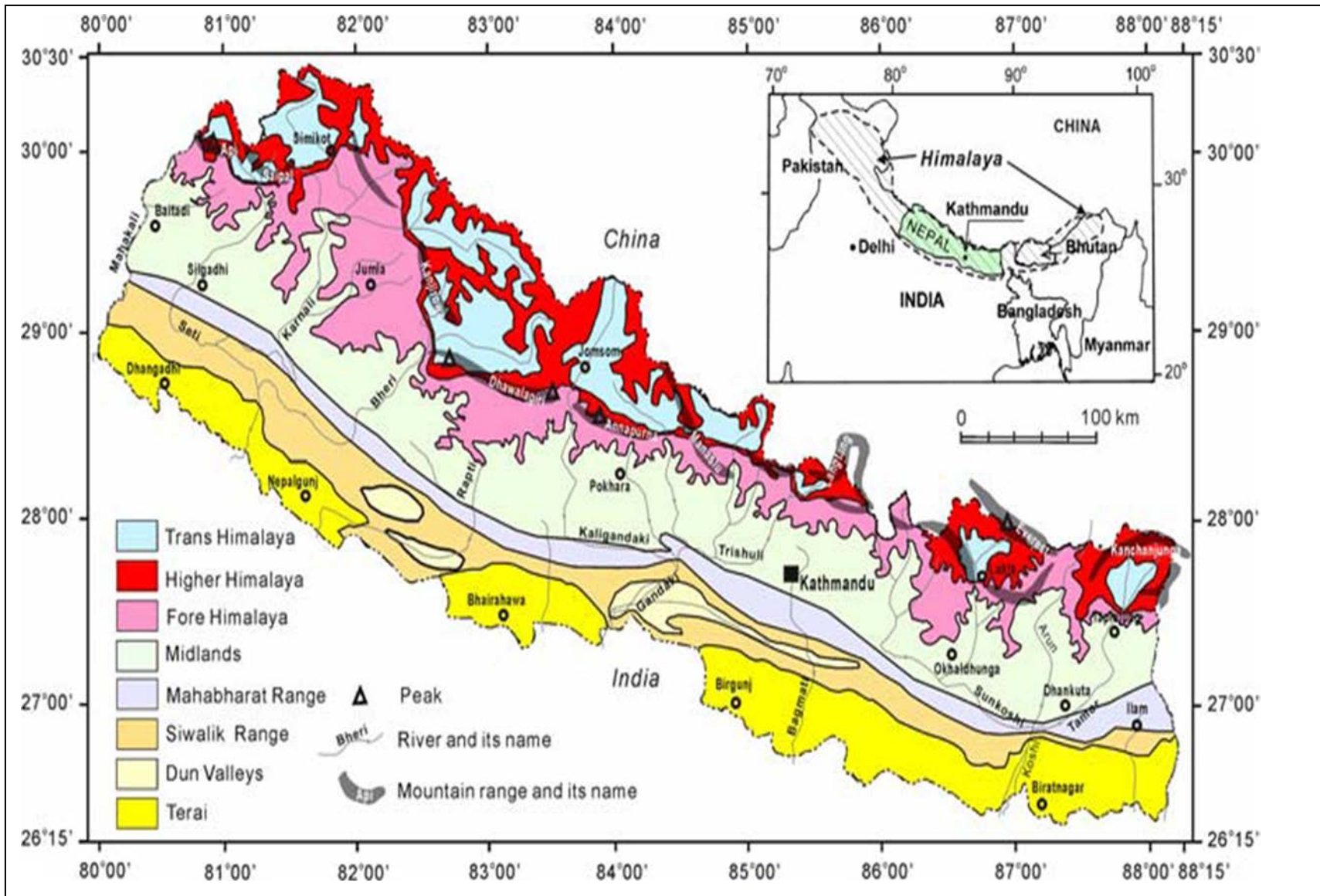


Figure C.2 Physiographic regions of Nepal (Hasegawa et al. 2009)

**Table C.1** Physiographic zones of Nepal (Chaudhary et al. 2009)

Physiographic Zone	Surface Area (%)	Elevation (m)	Climate
Lowlands (Tarai)	14	below 500	Hot monsoon/Tropical
Lowlands (Siwaliks)		500-1,000	Hot monsoon/Subtropical
Middle Mountains (Mahabharat)	29	2,000-3,000 1,000-2,000	Higher: Cool temperate monsoon Lower: Warm temperate monsoon
High Mountains	20	4,000-5,000	Alpine
		3,000-4,000	Subalpine
High Himalaya	24	above 5,000	Tundra type, Arctic

**Mahabharat Lekh:** The Mahabharat Lekh (a.k.a. Mahabharat Range) comprise 29% of the land a rising from 1500-2700 m between the Siwalik Hills and the Midlands. Made up of mostly metamorphic rocks like quartzite, there are also igneous granites, and some sedimentary limestone. This chain is not uniform across the country being more developed in the central and eastern part of Nepal then in the west. Major rivers that flow from this zone include the Rapti, Bagmati, and Babai Rivers.

**Midlands:** Ranging in elevation from 600-2000 m the Midlands (a.k.a. Midhills) lie north of the Mahabharat Lekh in the central portion of Nepal stretching over 20% of the land area. This elevation makes for a much more comfortable climate than the lower regions south, which accounts in part for the large population centers in some of these high valleys such as Kathmandu and Pokhara, the two biggest urban centers in the country. The agreeable climate has also made this area an intensive agriculture zone and much of the steep land has been terraced for rice paddies and other rain fed irrigated crops. Quartz and schist rocks predominate exposed in many places where the major rivers have cut through the area creating wide valleys. Some of these rivers include the Tamur, Arun, Sun Kosi, Trisuli, Seti, Karnali, Kali Ghandaki, and Bheri.

**Himalayas:** The northern part of Nepal is dominated by this massive range that takes up the largest percent of land area (25%). Rising from 4000 m to more than 8000 m both alpine and

subalpine zones are present and local people practice transhumance between these zones in accordance with the seasons. The Kali Ghandaki River cuts the deepest river valley in the world (1131 m) through this zone as it passes between Mt. Dhaulagiri (8156 m) and Mt. Annapurna I (8091 m) at a point where they are only 30 km apart (Nepal 2000, Lucas 1992). Winters in the Himalayas can produce heavy snowfalls with the permanent snowline being somewhere above 5500 m.

**Inner Himalayas:** The Inner Himalayas (a.k.a. Trans Himalaya) are a series of high valleys north of the main Himalayan range. These valleys lie in the rain shadow of the main range and consequently are quite dry forming a transitional zone between arid Tibetan Plateau and the north limit of the south Asian monsoon zone. They range in elevation from 2400-5000 m and tend to run east to west except for the Kali Ghandaki River valley. Rocks are a mixture of granites and gneisses and the rivers have carved wide valleys in the soft sediments between them.

**Tibetan Marginal Range:** North of the high peaks of the Himalayan Range, the Tibetan Marginal Range (a.k.a. Higher Himalaya) rises to lesser peak elevations topping out at 6000-7000 m. They form a range that is the southern extent of the Tibetan Plateau. This arid area has very few trees and scant vegetation (HMGN/MFSC 2002, Hagen 1998).

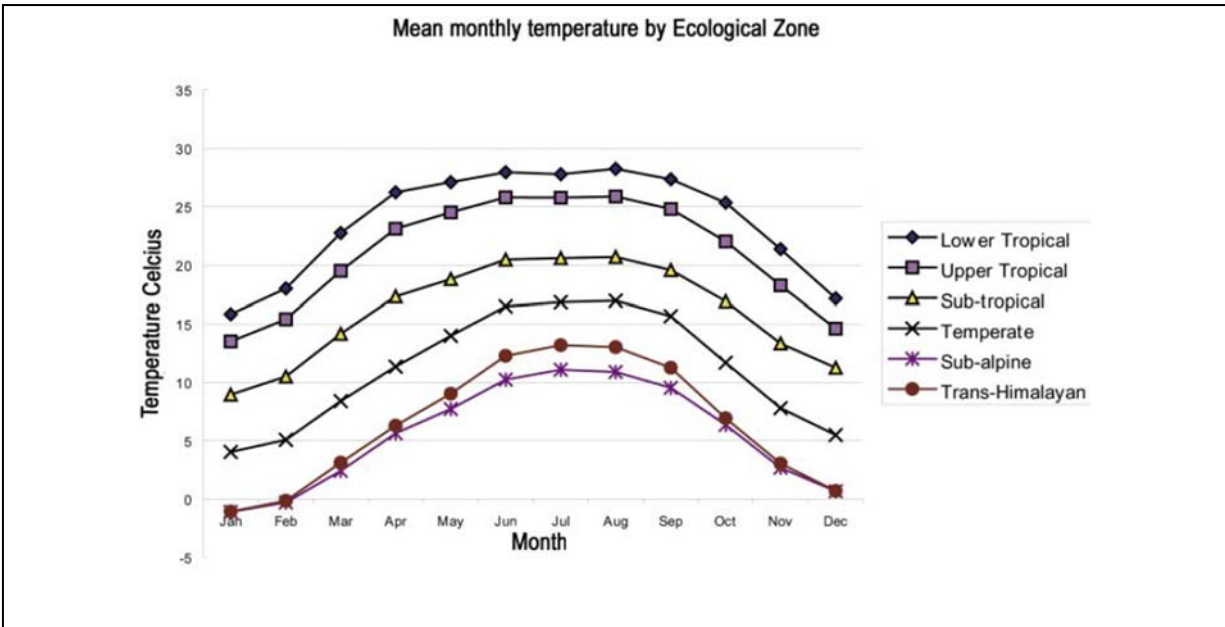
### **C.1. 3 Geology and Soils**

Soils are related to the different soil material in the physiological zone in which they are found. Starting in the south in the Terai the soil is derived from post Pleistocene alluvial deposits and tend to be fine to medium. In the Siwalik Hills sedimentary shale and semi-consolidate sandstone and conglomerate make for sandy textured soils. The Midlands are predominantly Precambrian granite, schist, phyllite, quartzite, and limestone making coarse-grained sand and gravel with light to medium texture. The High Mountains consist of Precambrian metamorphic

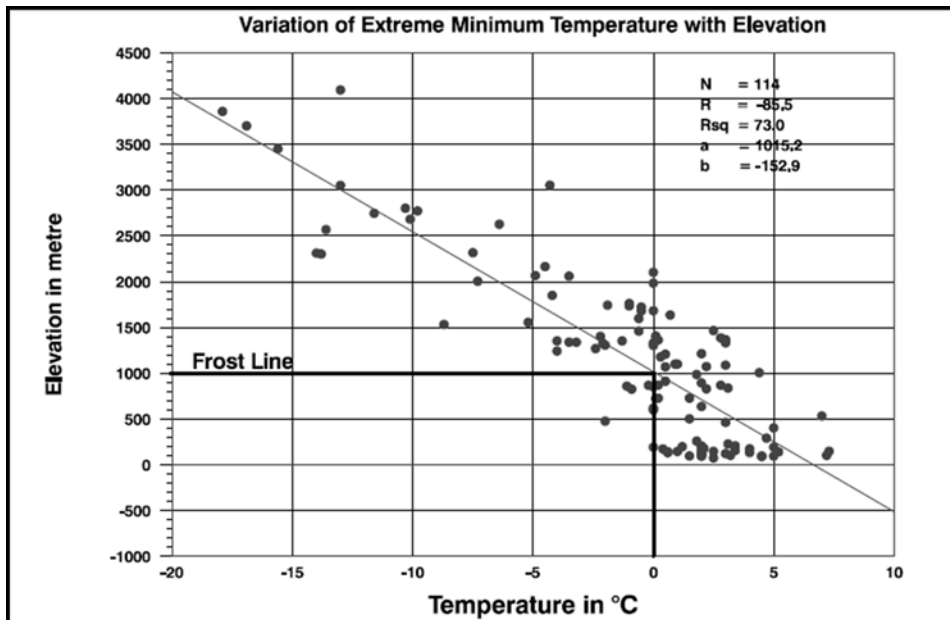
micaschist and gneisses making the soils shallow with stony glacial material. (Dijkshoorn et al. 2009, HMGN/MFSC 2002)

### C.1.4 Climate and Rainfall

The climate of Nepal varies considerable with changes in elevation and the seasonal monsoon. Climate can also be linked to the physiographic zones. In the Terai, the climate is classified as tropical hot monsoon with seasonal temperature variations between 22° to over 40° C. The Siwaliks are subtropical hot monsoon, while the Midlands, from 1000-2000 m, is warm temperate monsoon, and from 2000-3000 m cool temperate monsoon. The High Mountains from 3000-4000 m is subalpine, and from 3000-5000 m is alpine. In the Inner Himalayas, in addition to alpine and subalpine, there is arid steppe and mountain desert, and above 5000 m, arctic. The temperature varies considerably with changes in elevation with the maximum recorded summer temperature as high as 46° C and the lowest winter temperature recorded well below freezing at -26° C (**Figure C.3**) (LRMP 1986 cited in Chaudhary et al. 2009).



**Figure C.3** Mean monthly temperature by ecological zone in Nepal. (Lilleso et al. 2005)

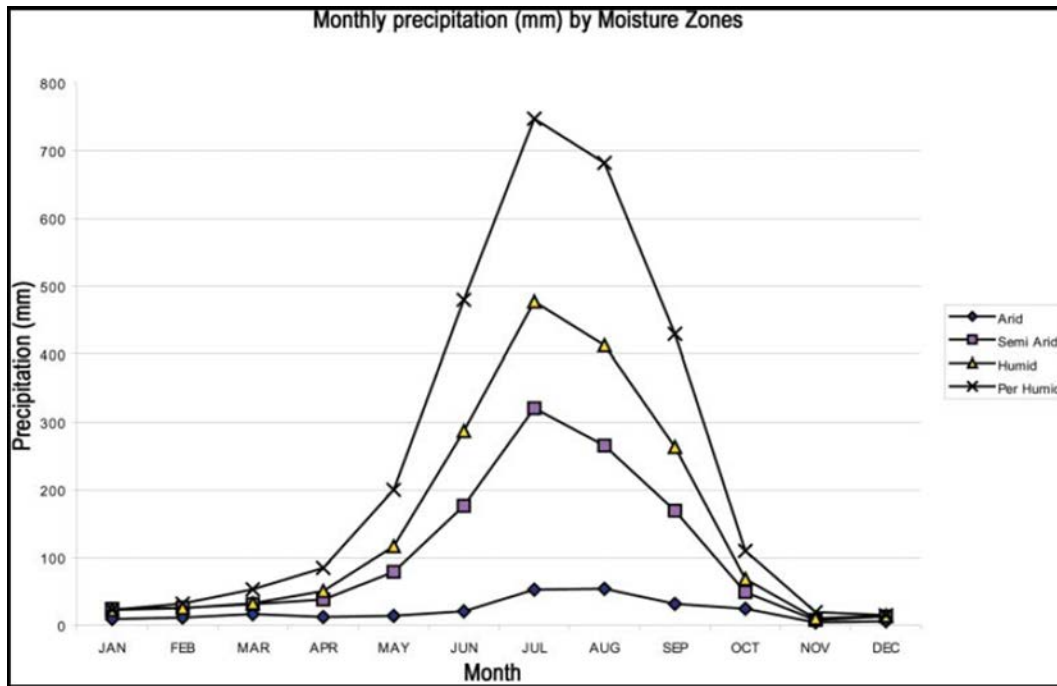


**Figure C.4** Variation of extreme minimum temperature with elevation in Nepal (Lilleso et al. 2005)

Rainfall in Nepal is heavily influenced by the summer monsoon (**Figure C.5**). The average annual rainfall is approximately 1600 mm, 80% of which comes during the summer monsoon from June to September, but this can vary considerably in each climatic zone. For example, the south slopes of the Himalayas can receive 4000 mm while the rain shadow area behind them can receive less than 250 mm. In general, it can be said that the eastern part of the country is wetter than the west and the southern part wetter than the north (Chaudhary et al. 2009, HMG/N/MFSC 2002).

### **C.1. 5 Vegetation and biodiversity**

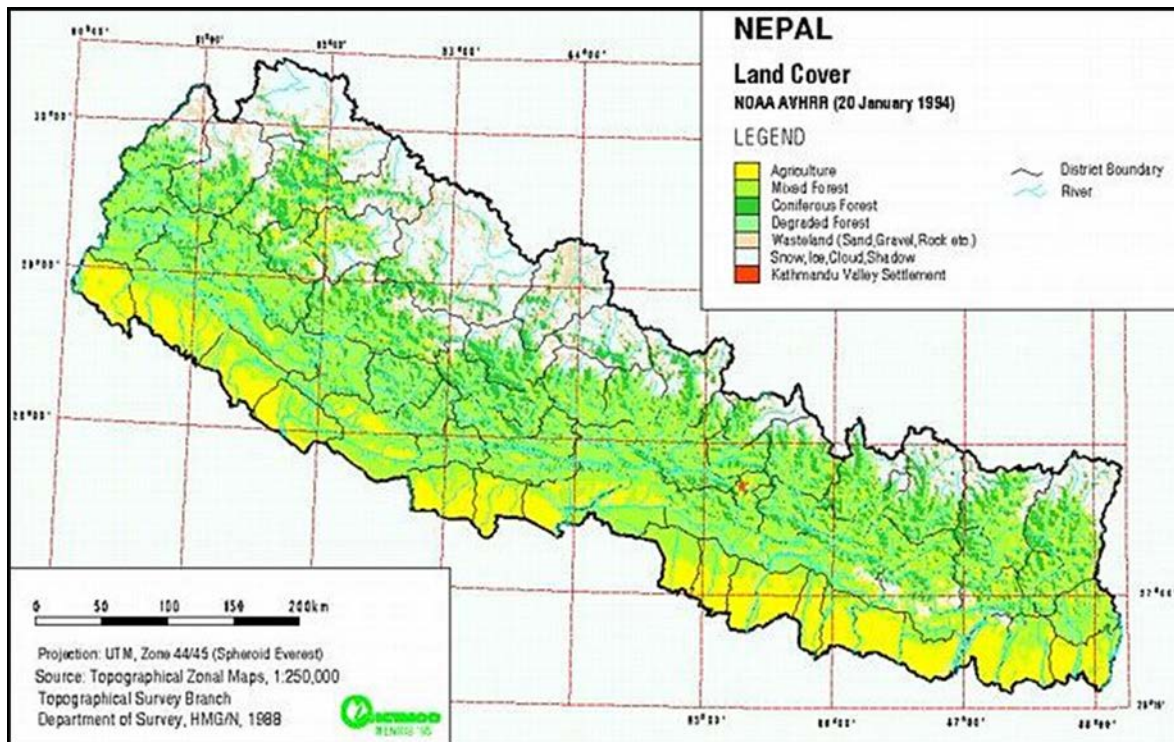
Nepal is considered one of the biodiversity hotspots in the Himalayan region (Chaudhary et al. 2009). Due to its extreme elevation variation and climatic pattern Nepal has a rich and complex biodiversity.



**Figure C.5** Monthly precipitation by moisture zone in Nepal (Lilleso et al. 2005)

Nepal is home to several biogeographic, zoogeographic, and floristic zones. The Palearctic and Palaetropic (Udvardy 1975 cited in Bhujju et al. 2007) biogeographic zones as well as the Palearctic and Indo-Malayan zoogeographic zones meet in Nepal in addition to six floristic regions. Consequently, while Nepal makes up only 0.1% of the earth’s total land area it has a surprisingly high richness of floral and faunal diversity at all levels making up six biomes and nine ecoregions. This high diversity is reflected in the 35 forest types, 59 vegetation types, and 118 ecosystems that have been classified according to vegetation, climatic zones, and elevation. Land use has resulted in land cover patterns that further influence the biodiversity (**Figure C.6**).

The 35 forest types can be organized into ten major groups reflecting the elevation and climatic zones they inhabit: 1) tropical, subtropical broad-leafed, 2) subtropical conifer, 3) lower temperate broad-leafed, 4) lower temperate mixed broad-leafed, 5) upper temperate broad-leafed, 6) upper temperate mixed broad-leafed, 7) temperate coniferous, 8) sub-alpine, and 9) and alpine scrub (HGN/MESC 2002) (**Figure C.6**).



**Figure C.6** Land cover, Nepal  
[http://www.apipnm.org/swlwpnr/reports/y\\_sa/z\\_np/npmp271.htm](http://www.apipnm.org/swlwpnr/reports/y_sa/z_np/npmp271.htm)

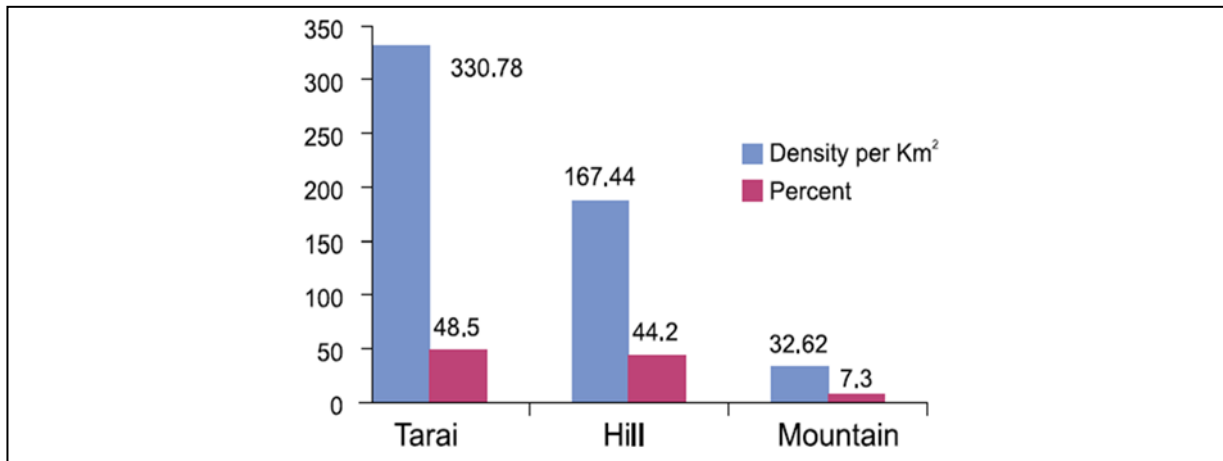
Nepal has approximately 7000 species of vascular plants (RBGE 2010), 181 species of mammals, 863 species of birds, 118 species of reptiles, 77 species of amphibians, and 182 species of fish, with 342 plant species and 160 animal species being endemic to Nepal (Chaudhary et al. 2009).

## C.2 Human Characteristics

### C.2.1 Nepalese way of Life

The last complete census of Nepal (2001) stated the population size of Nepal as approximately 23 million, and the latest projected figures are almost 27 million (GoN/NPCS/CBS 2008). Urban population makes up only 17% of the total population (2008) with a large majority, 83%, living in a rural setting but with a 4.9% annual rate of change to urbanization (2005-2010 est.) (CIA 2010). Population density on average is 157.73 km<sup>2</sup>. but the

population distribution is uneven with the highest density in the Terai 330.78 per km<sup>2</sup> (48.5%), 167.44 per km<sup>2</sup> in the hills (44.2%), and 32.62 per km<sup>2</sup> in the mountains (7.3%) (**Figure C.7**) (Chaudhary et al. 2009).



**Figure C.7** Density (per/km<sup>2</sup>) and population distribution (%) in different physiographic zones of Nepal (Chaudhary et al. 2009)

Population growth is 2.25% per annum with an average life expectancy (2008) of 63.6 for males and 64.5 for females. Median age in 2001 was 19.7 for males and 20.5 for females. The latest figures on infant mortality rate (2006) are 48 per 1000 live births and under 5 years old 61 per 1000 live births. The per capita GDP for 2006-07 was US \$390 (GoN/NPCS/CBS 2008). The World Bank per capita GDP estimate for 2009, is US \$470 making it the poorest country in South Asia (World Bank 2010). According to the CIA World Factbook (2010: <https://www.cia.gov/library/publications/the-world-factbook/geos/np.html>) “Nepal is among the poorest and least developed countries in the world, with almost one-quarter of its population living below the poverty line.”

### **C.2.2 Health and Education**

Health facilities (2007) consist of 87 hospitals, 676 health posts, 3000 sub health posts, 6 health centers, and 205 primary health centers. Health care professional include 1400 doctors, 12000 nurses, and 7500 health assistants in addition to village level health workers, and volunteers. According to the 2001 census, the literacy rate for males is 65.5% and females 42.8%

with the total literacy rate being 54.1%. Nepal has six main universities of which Tribhuvan University in Kathmandu accounts for 90% of total enrollment in addition to 485 private colleges (UNESCO 2007). In 2007, there were a total of 170,000 students enrolled in schools of higher education and 6.5 million enrolled in primary and secondary schools (GoN/NPCS/CBS 2008).

### **C.2.3 People, religion, and language**

The 2001 census recognizes 100 caste and ethnic groups in Nepal and 106 languages and dialects, of which 92 are mother tongues (**Figure C.8**) (Gurung, H et al. 2006, Pradhan and Shrestha 2005). These languages come from two language families; Tibeto-Burman languages make up 18.4% and Indo-Aryan languages make up 79.1%. The main religions practiced by the people of Nepal are Hinduism (80.6%), Buddhism (10.7%), Islam (4.2%), Kiranti (3.6 %) with the remaining 1% is made up from Christianity, Jainism, Sikhism, Bon Pö, and Animism. This mosaic encompasses many different cultural and religious traditions.

Various attempts have been made to organize all these groups into some type of categories. The 2001 census makes a distinction in terms of whether one's origins are in the hills and mountains, or in the Terai flatlands. *Pahadis* (*pahad* is a Nepali word that means hill) are people from the hills and mountains, including people from the high mountains who share a cultural affinity to Tibetan people, and make up 66.2% of the population. *Madhesis*, who make up at 28.4% of the population, are a group of native Nepalese who live along the southern border in the Terai in an area called Madhese, where three different religions are practiced; Hinduism, Islam, and Jainism. The remaining 5.4% are classified as 'others', which includes religious groups such as Sikhs and Muslims.

This description is very generalized and while it gives one a sense of the percentages of hill vs. flatland population, it does not describe the complexity of the overlapping cultural and religious systems. Two other groupings have been used to try to further elucidate the grouping categories.



The first, describes *janjatis* and *jats*. *Janjatis* are egalitarian ethnic groups that practice various different religions, and *jats* are those that fit into the Hindu hierarchical caste structure. *Janjatis* speak mainly Tibeto-Burman languages such as Tamang, Grurung, and Magar and practice Buddhism, Bön Po, Kiranti, and Animism, in addition to Hinduism in some areas. The *jats* practice Hinduism and speak Indo-European languages including Nepali, Bhojpuri, and Maithili.

The other attempt at grouping is made up of the two main hierarchical Hindu caste groups, the ritually ‘pure’ high caste including Brahmin, Chhetri and Kayastha, and the ritually ‘impure untouchable’ low castes called *Dalits* who make up the occupational groups in Nepal such as *Kami* (blacksmiths), *Dami* (tailors) and *Sarki* (shoemakers) (Pradhan and Shrestha 2005). While these groupings are useful to get an overall sense of the people of Nepal, there is a great diversity within each of these groups and many contain subgroups with their own distinct languages. Consequently, the diversity is much more complex than it appears. Pradhan and Shrestha (2005:4) give a brief historical account that helps us understand the roots of this diversity.

Modern day Nepal has been formed by the migration of diverse groups for over 2000 years. Ethnic groups, such as the Gurung, Limbu, and Sherpa, speaking Tibeto-Burman languages migrated at different times from regions across the Himalayas; the Newars, a Tibeto-Burman language speaking ethnic group, with adherents of both Hinduism and Buddhism, have lived in the Kathmandu Valley for over two millennia; and the Nepali-speaking Parbatiya migrated into Nepal from the west and south over several centuries. In the tarai plains, groups, such as the Tharu, have lived there for over two millennia, whereas others, such as the Maithili speakers of the eastern tarai, arrived later. These different groups, each with its own language, religion, and culture, settled in different parts of Nepal, establishing separate but fluid political units: mainly small chiefdoms and principalities, although there were also larger political units, such as the Lichhavi, and later the Malla kingdoms based in Kathmandu Valley, the Khas kingdom in the west, and the various confederations of ethnic groups such as the Magars and Gurungs in central, and the Limbus in eastern Nepal.

These diverse groups (see **Figure C.8**) were then influenced by the unification of Nepal as a Hindu kingdom in 1768 and later state laws and policies.

### C.2.4 Political System

The political system in Nepal has undergone many changes since the unification of Nepal as a kingdom in the mid-18<sup>th</sup> Century. In terms of modern day history, the year 1990 was pivotal in that the constitutional monarchy agreed to formation of a multi-party system after a series of public demonstration known as the *Jana Andolan I* or People's Movement I. In 1996, a group under the name of Maoist began a 10-year insurgency, which ended in 2006 with the signing of a peace agreement and an interim constitution. Before the signing of the peace agreement, a major event happened on Friday, June 1, 2001 that would change the course of political events (Thapa and Sharma 2009). The following report from the BBC (British Broadcasting Corporation) recounts that event ([http://news.bbc.co.uk/onthisday/hi/dates/stories/june/1/newsid\\_3987000/3987183.stm](http://news.bbc.co.uk/onthisday/hi/dates/stories/june/1/newsid_3987000/3987183.stm)).

The King and Queen of Nepal have been shot dead after the heir to the throne went on the rampage with a gun before turning it on himself. Eleven people died in the incident, which started when Crown Prince Dipendra allegedly had a dispute with his mother over his choice of bride. King Birendra, Queen Aishwarya and Prince Nirajan were among the victims of the tragedy at the royal palace in Nepal's capital, Kathmandu. The other victims included three of the King's children, his two sisters and one more member of the family by marriage.

As a result of the massacre, King Birendra's brother, [Gyanendra](#), became King of Nepal. In 2002, after the first peace sessions with the Maoists failed, Gyanendra decided to deploy the Royal Nepal Army in the Maoist conflict. Up to this point, the Nepal Police had been the main combatants (Cottle and Keys 2007). The decision to involve the army coincided with the then prime minister of Nepal's (Sher Bahadur Deuba) visit to Washington. Gobyn (2009:242) summarizes the outcome of that visit, "Since 2002, several high-level U.S. military and foreign ministry officials have visited the country to express the Bush administration's support in the Nepalese government's fight against the Maoists and the Pentagon has provided the Nepalese army with weapons, equipment, and training worth over US \$29 million between 2001 and 2004 alone."

Nonetheless, the unrest in Nepal continued to escalate as several more attempts at reconciliation failed. Finally, on February 1, 2005 King Gyanendra dissolved the government and assumed complete control of Nepal because of the government's inability to restore order. In his speech to the country after dissolution he said (Gyanendra Bir Bikram Shah Dev 2005:1); "Democracy and progress contradict one another. Focusing solely on power politics discredited multiparty democracy." Toward the end of his speech, he says (2005:3). "In pursuit of liberalism, we should never overlook an important aspect of our conduct, namely discipline."

The army then began to arrest senior political leaders, civil society leaders, journalists, trade unionist, and human rights activists, in addition to shutting down communication networks. In September of 2005, the Maoist called a cease-fire to negotiate with the former opposition government leaders to create a combined front to abolish the monarchy and establish a democracy. On April 5, 2006, as pro-democracy protests against the king spread, a series of strikes (*bhanda*) erupted in Kathmandu, and amid the protest and increasing violence; the authorities imposed a curfew from 10:00 pm to 9:00 am (Kathmandu time). The *bhanda* lasted 19 days and forced King Gyanendra to relinquish power, thereby ending the 240-year-old Hindu monarchy. This movement of popular pro-democracy protest is known as the *Jana Andolan II* or People's Movement II (Thapa and Sharma 2009).

After months of negotiations between the opposition party leaders and the Maoist, the Comprehensive Peace Accord was signed on November 21, 2006, allowing the Maoist to participate in the government. This paved the way for their participation in the interim parliament, which was formed in January 2007. The interim parliament subsequently wrote an interim constitution (Gobyn 2009). In August 2007, a 22-point constitutional amendment was drafted declaring Nepal a republic, establishment of full representation in elections, and integration of the Maoist People's Liberation Army with the Nepal Army. In 2008, the Constituent Assembly (CA) was formed after nationwide elections. Of the 54 represented, 25 were elected to the CA, with the Maoists or Communist Party of Nepal-Maoist (CPN-M) winning the majority with 220 seats. the Nepali Congress Party (NC) won the second most with 110 seats,

the Communist Party of Nepal Unified Marxist-Leninist (CPN-UML) won the third most with 103 seats, and the Madhesi Peoples' Right Forum (MJAF) was fourth with 52 seats. The NC, CPN-UML, and MJAF formed a coalition to try to defeat the CPN-M, but in the end, the CPN-M persuaded the MJAF and CPN-UML to join them. This led to the CPN-M leader Pushpa Kamal Dahal, who is often referred to by his *nom de guerre* Prachandra, becoming prime minister with full executive powers, and the NC candidate, Ram Baran Yadav, taking the position of head of state as president of Nepal (Thapa and Sharma 2009).

In May 2009, Prachandra dismissed the head of the Army of Nepal, General Rookmangud Katawal, who was known to be an anti-Maoist. President Yadav reinstated the general on the grounds that his dismissal was unconstitutional, because it had not been approved by him, the president of Nepal. The next day, Prachandra resigned his post of prime minister in protest, a decision that shocked the nation. On May 23, the CA responded by electing Madhav Kumar Nepal of the CPN-UML to fill Prachandra's vacancy as prime minister of Nepal (Lawoti 2010). Since Prachandra resigned, the government has switched hands three times, twice to the CPN-UML party and recently, back to CPN-M, which is now called the Unified Communist Party of Nepal (Maoist) (UCPN). On August 29, 2011, [Baburam Bhattarai](#) of the UCPN party was elected prime minister of Nepal (see **Appendix E: A Brief Chronological History of Nepal**).

As of January 2012, the government of Nepal was still in the process of writing a new constitution and had not yet been successful in fully integrating the People's Liberation Army (Maoists) into the Army of Nepal (Walsh 2012).

### **C.2.5 Administrative System**

Nepal is divided into 14 administrative zones, which are grouped into five geographic development regions across the country, called the East, Central, West, Mid-Western, and Far-Western Regions (**Figure C.9**). The 14 administrative zones have three levels of administrative units consisting of 75 District Development Committee (DDC), 58 Municipalities, and 3914 Village Development Committees (VDC) (UNFPA 2010).



**Figure C.9** Development regions, districts, and municipalities of Nepal (<http://reliefweb.int/sites/reliefweb.int/files/resources/BB60228AA2C8D1D18525774200545120-map.pdf>)

### **C.2.6 National Economy**

Nepal's estimated 2009 GDP is US \$12.47 billion and US \$33.25 billion GDP (purchasing power parity) ranking 102<sup>nd</sup> out of 227 countries. Her estimated GDP real growth rate for 2009 is 4.7% ranking, 30<sup>th</sup> out of 213 countries. The per capita GDP for 2006-07 was US \$390, (GoN/NPCS/CBS 2008). The World Bank per capita GDP estimate for 2009 is US \$470 making it the poorest country in South Asia (World Bank 2010).

The 2009 United Nations Development Programme (UNDP) Human Development Index Report gives Nepal a rating (2007) of 0.553 and a ranking of 144 out of 182 countries (UNDP 2009a). Several other UNDP indicators for Nepal are:

- Human Poverty Index (HPI) of 32.1 ranking 95 out of 135 countries ranked for HPI,
- an outmigration emigration rate of 3.9 % of which 95% is to other Asian countries, and
- foreign remittances inflows of US \$1734 million which averages to US \$61 per person as compared to the US \$33 per person average for South Asia (UNDP 2009b).

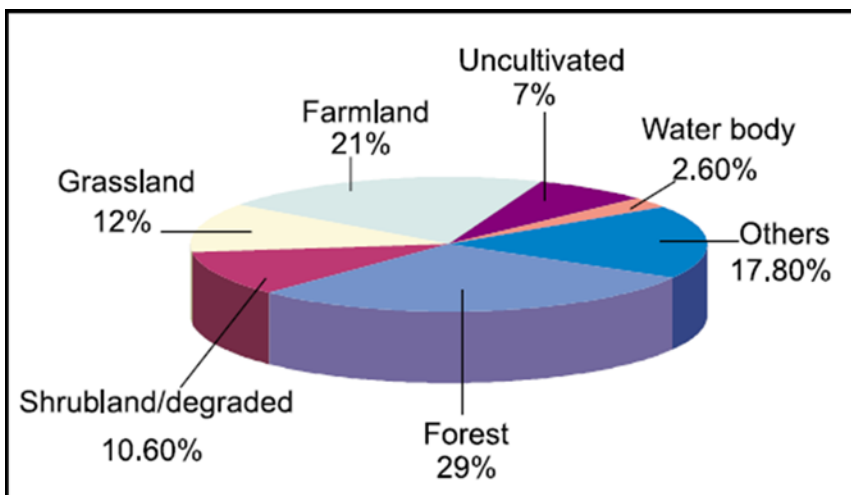
This last figure highlights the increasing trend in outmigration from Nepal to seek employment abroad.

While Nepal is considered one of the poorest countries in the world, it has made significant accomplishments in overcoming poverty, and improving health and education indicators. Over the eight-year period from 1996 to 2004, the headcount poverty rate fell from 42% to 31%. From 2002 to 2007, total enrollment in primary schools increased 9%. Over the ten-year period from 1996 to 2006, infant mortality rate dropped 30%, while maternal mortality rate dropped 50%, and immunization coverage increased 45% (CIA 2010).

The labor force by occupation is 76% agriculture, 18% services, and 6% industry (2004 est.) and the GDP composition by sector is 35% agriculture, 49% services, and 16% industry (2009 est.) (CIA 2010).

## C 2.7 Land Use

The most recent land use data shows that the largest land use percentage of Nepal's total land area is forest at 29% (4.27 million ha), followed by agriculture at 21% with 3.0 million ha of farmland, 12% grassland (1.7 million ha), 10.6% scrubland and degraded forest (1.56 million ha), 7% uncultivated land (1.0 million ha), 2.6% water bodies (0.38 million ha), and 17.8% others (2.61 million ha) (**Figure C.11**) (Chaudhary et al 2009)(see **Appendix H: Rural Mountain Livelihoods and Land Use in Nepal**). Forestlands have been decreasing at an estimated rate of 1.4% annually for the period 2000-2005 (Baral et al. 2008 cited in Chaudhary et al. 2009) (see **Appendix B: A Brief History of Community Forest Management in Nepal**). In terms of arable land there is 16.07% with 0.85% under permanent crops (2005) (CIA 2010).



**Figure C.10** Land use distribution in Nepal (Chaudhary et al 2009)

### C.2.7.1 Farming System

The backbone of the economy is agriculture, which contributes about 25% to the GDP. Over three quarters of population derive their livelihood from a combination of agriculture and animal husbandry (see **Appendix H: Rural Mountain Livelihoods and Land Use in Nepal**). Almost a third of Nepal's total land area is devoted to agriculture with one of the main crops being rice (45%), in addition to maize (20%), wheat (18%), millet (5%) and potatoes (3%). Crop

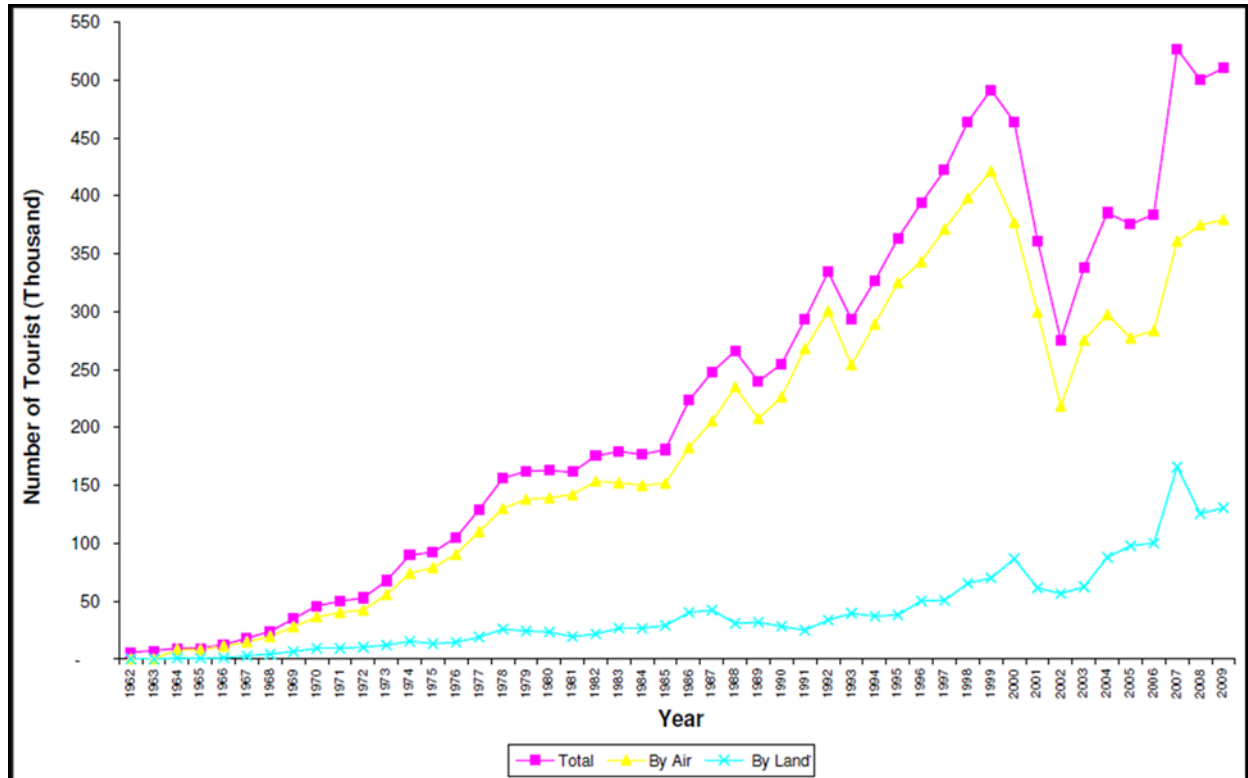
varieties and cropping systems vary greatly with elevation, climate, and ecological regions. Horticulture is another important segment of the overall agricultural matrix in Nepal. Various fruits, nuts, and vegetables have been introduced to Nepal and are cultivated in areas where the climate and soils suit them. Some of these include apples, pears, strawberries, avocado, coffee, pecan, and walnut.

### **C.2.7.2 Livestock**

Indigenous livestock breeds in Nepal are quite varied due to the extreme variability of elevation and climatic zones throughout Nepal. Overlapping this variability in physiographic zones are the various cultural traditions for animal husbandry of the different caste and ethnic groups. Livestock include cows, water buffalo, yak, sheep, pig, goat, horse, mule, and poultry. Twenty-four breeds of livestock have been identified so far in Nepal.

### **C.2.7.3 Industry and Services**

Tourism is the mainstay of the service industry, the biggest industry in Nepal, and an important source of income for the economy. It generates greater than US \$189 million per year accounting for 25% of the foreign exchange earnings, and 3.5% of the GDP while providing employment for more than 300,000 people (Bajracharya et al. 2008). Ever since Nepal opened its doors to tourism in 1951, it has seen spurts of growth. Numbers of arrival reached a peak in 1999 (**Figure C.12**) at 491,504 visitors. The period from 2000-2006 (**Figure C.12**) saw a decline as a result of several factors including the massacre of the Royal Family in 2000, the September 11, 2001 World Trade Center attacks, and the 10-year People's War. After the signing of the Peace Accord in 2006, tourist arrivals were back up again in 2007 (GoN/MCTCA 2008). During the 1990's, tourism was the third largest earner of foreign exchange currency (Bhattarai et al. 2005). By 1999, tourist arrival numbers reached 500,000 earning US \$168 million which contributed 3.6 % to the GDP and made up 15.9 % of the foreign exchange earnings (MoT 2000 cited in Nepal 2003).



**Figure C.11** Tourist arrivals in Nepal 1962–2009 (<http://www.tourism.gov.np/uploaded/statistics2010.pdf>)

Reasons for visiting Nepal vary but a large percentage comes to enjoy Nepal’s mountains. A recent Nepal Tourism Board report (2001) stated that 43% of the leisure tourists come to go trekking in Nepal. The 2008 Ministry of Tourism and Civil Aviation Tourism Statistics Report documents total 526,705 arrivals categorized by the following purposes: holiday/pleasure 29.6%, trekking and mountaineering 21.0%, pilgrimage 9.0%, business 4.6%, official 8.6%, conference 1.4%, other 19.9%, and not specified 5.9%.

The importance of tourism to the Nepalese economy became evident in the 1990s, when tourism was the third largest earner of foreign exchange currency (Bhattarai et al. 2005). By 1999, tourist arrival numbers reached 500,000 earning US \$168 million, which contributed 3.6% to the GDP and made up 15.9% of the foreign exchange earnings (MoT 2000 cited in Nepal, SK 2003:26). Reasons for visiting Nepal vary but a large percentage come to enjoy Nepal’s mountains. A 2001 Nepal Tourism Board (NTB 2001) report stated that 43% of the leisure

tourists come to go trekking in Nepal. The 2008 Ministry of Tourism and Civil Aviation Tourism Statistics Report (GoN/MTCA 2008) documents a total 526,705 arrivals categorized by the following purposes: holiday/pleasure 29.6%, trekking and mountaineering 21.0%, pilgrimage 9.0%, business 4.6%, official 8.6%, conference 1.4%, other 19.9%, and not specified 5.9%. Other important industries include carpet manufacturing, which was one of the most important industries in the early 1990s (Graner 2001), textiles, jute, bricks, cement, and cigarettes (CIA 2010).

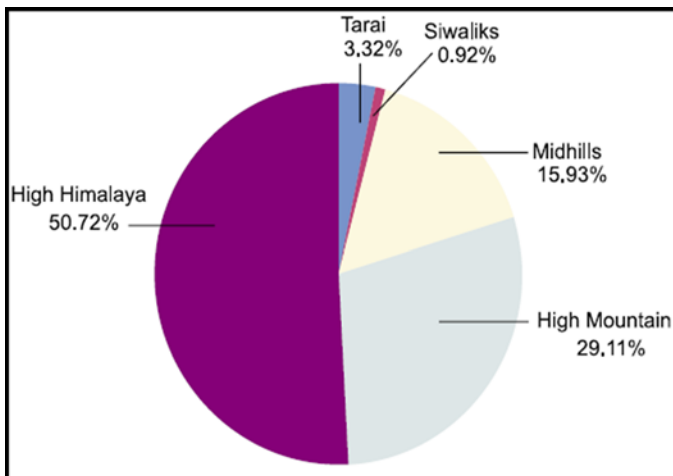
#### **C.2.7.4 Natural Resources**

Nepal is fortunate to have an abundant source of freshwater from its river systems many of which originate in the Himalayas and rely on the Himalayan glaciers as a major contributor to the water supply. It has been estimated that Nepal has the hydroelectric potential to generate up to 83000 MW of which only 550 MW, less than 1%, has currently be developed (Sovacool et al. 2011) and the potential to irrigate 90% of the cultivated land. Forests cover 29% of Nepal's land area, which is only a fraction of the original (HMGN/MFSC 2002). Increasing population has created a demand for more arable land to grow crops, which along with fuel wood consumption has led to a large amount of deforestation. Nonetheless, the implementation of community forest user groups (FUG) and protected areas has helped reduce the rate of deforestation, and aided in reforestation in some areas, in addition to a plantation forest program (FAO 2010, Chaudhary 2000).

Non-Wood Forest Products (NWFP) are an important component of Nepal's natural resources making up 4% of the total forestry products segment of the national economy. Some of these NWFPs include *sabai* grass, *sal* seed, *lokta*, and resins that make products such as turpentine. Other highly important NWFPs, especially in terms of livelihood sustainability for many people in rural areas of Nepal, include bamboo and cane. Collection and sale of high value medicinal and aromatic plants (HVMAP) provide substantial income for many rural people contributing up to 50% of annual household earnings in some areas (Vontomme et al. 2002). Some of these HVMAPs include the caterpillar fungus *yartsagumba* (*Cordyceps sinensis*),

*cheritta* (*Swertia chiraita*), and *somlata* (*Ephedra gerardiana*) (Chaudhary 2000). It has been estimated that Nepal has 2000 plants that have medicinal properties (Shestra and Shestra 1999 cited in Vontomme et al 2002).

Rangelands in Nepal (**Figure C.12**), of which 70% are located in the mid-western and western regions, include forest, grasslands, scrubland, and pasture with grasslands covering about 12% of the total land area.



**Figure C.12** Distribution of rangeland in Nepal (Chaudhary 2009)

These rangelands are spread throughout the physiological and climatic zones across a wide range of ecosystems including, subtropical savannahs, temperate grasslands, sub-alpine grasslands, alpine meadows, and arid steppes, resulting in a high level of biodiversity. While Nepal has relatively few wetlands they tend to be high in biodiversity ranging from high altitude glacial lakes to swamps and marshes with a total estimated area of 382,700 ha, including 34455 ha designated as Ramsar sites. Wetlands make up 2.6% of the total land area (Chaudhary et al. 2009). Many of the wetland areas are associated with lakes and rivers, in addition to the high number of terraced rain fed paddy fields and manmade reservoirs (Scott 1998).

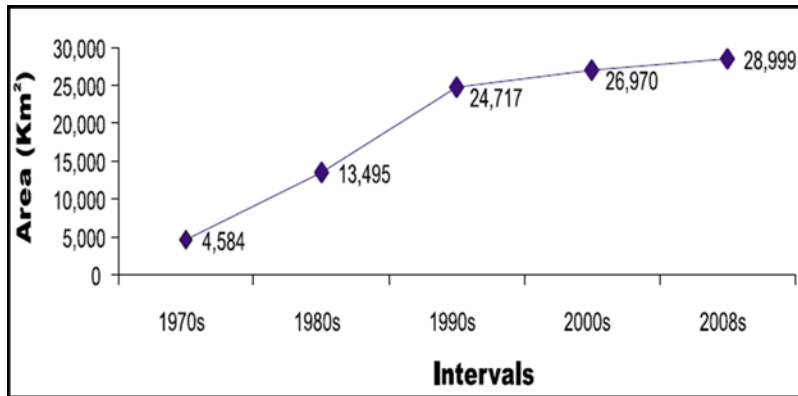
### **C.2.7.5 Conservation and Protected Areas**

In 1957, King Mahendra issued in the modern era of conservation in Nepal by signing the first wildlife law giving protection to the one-horned Asian rhinoceros (*Rhinoceros unicornis*) and their habitat. Following up on this law the first protected area (PA), a rhinoceros sanctuary, was created in 1964 by royal decree in part of the rhinoceros habitat in the southern Terai region near the Indian border. From these first steps the King, with the help of the United Nations Development Program (UNDP), and the Food and Agriculture Association (FAO), put in motion a long-term conservation strategy. In 1973, the National Parks and Wildlife Conservation Project was initiated with three broad goals; protect wildlife and their habitat, create a protected area system for Nepal of national parks and reserves, and develop an organization that would be responsible for management of the system called the Department of National Parks and Wildlife Conservation (DNPWC). The DNPWC was instrumental in implementing the first major conservation act of Nepal, written in 1973, the National Parks and Wildlife Conservation Act (Heinen and Kattel 1992). This law emphasized the need to establish PAs to help protect wildlife and their habitat, conserve nature, and preserve cultural heritage. DNPWC was the sole governmental organization in charge of PAs in Nepal until 1982.

In 1982, the King Mahendra Trust for Nature Conservation (KMTNC), now known as the National Trust for Nature Conservation (NTNC), was mandated by the Government of Nepal as a not for profit autonomous nongovernmental conservation organization. Because KMTNC was autonomous, it was able to work on conservation issues in Nepal without the cumbersome government bureaucracy of DNPWC, and also able raise money directly from outside Nepal (Wells and Sharma 1998). Over time it became the largest and most influential conservation organization in Nepal and is actively pursuing its goals currently under its new name the National Trust for Nature Conservation (NTNC). KMTNC was instrumental in shifting the emphasis of protected area management from top down government regulation, to bottom up community-based conservation and management with the Annapurna Conservation Area Project, begun in 1986. This Integrated Conservation and Development Project (ICDP) proved so

successful that several other conservation areas have been established since then based on the principles of ACAP.

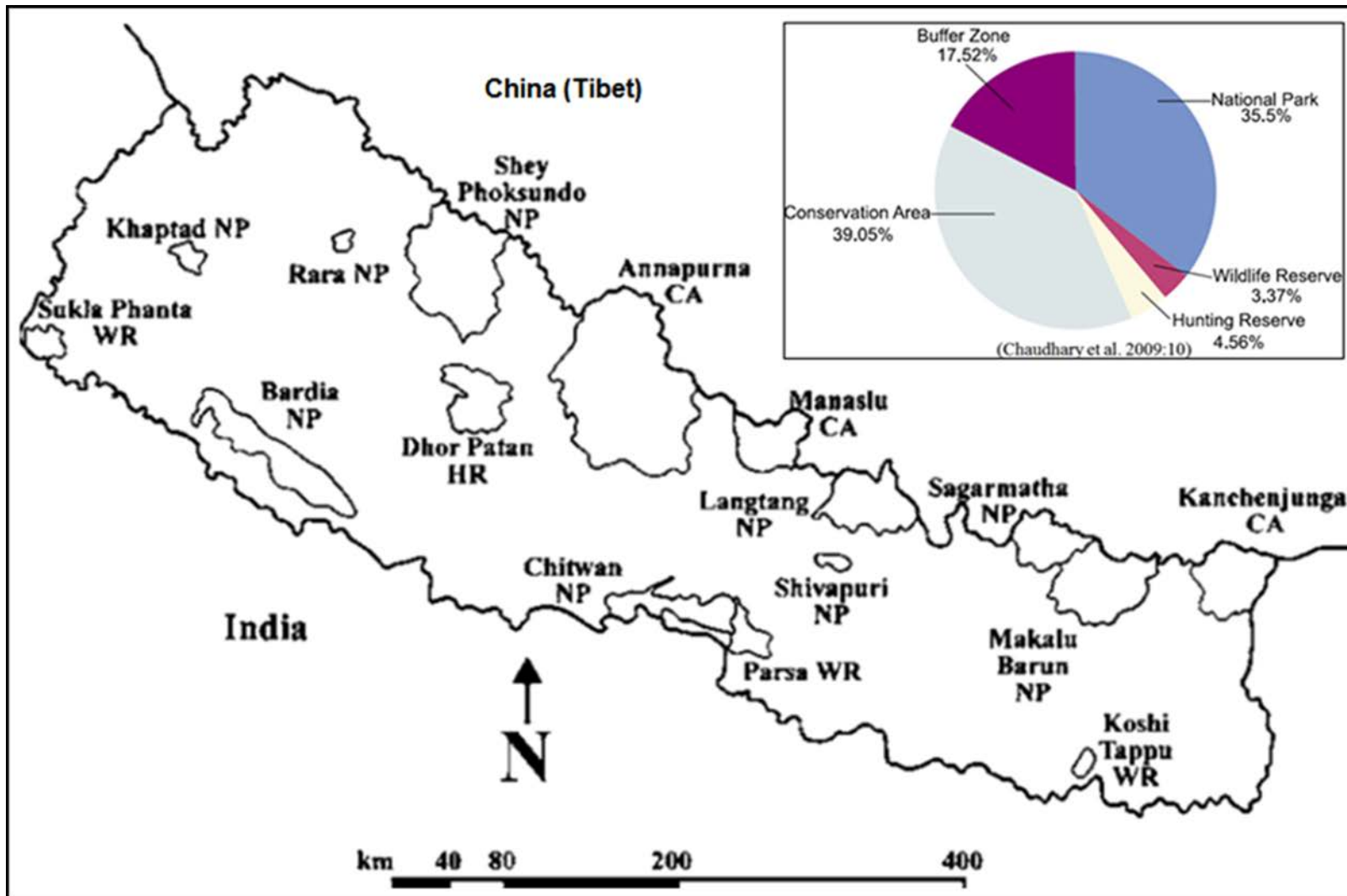
Since 1973, Nepal has created 16 PAs including nine national parks, three conservation areas, three wildlife reserves, and one hunting reserve (**Figure C.14**).



**Figure C.13** Increase in the size of Nepal's protected areas (Chaudhary 2009)

This combined area, including 11 buffer zones around the national parks, makes up 20% of Nepal's land area covering almost 29,000 km<sup>2</sup> (**Figure C.14**).

The first national park (NP), Chitwan NP was established in 1973, expanding the former rhinoceros reserve in Terai. Six more protected areas were created in 1976, including the famous Sagarmartha (a.k.a. Everest) NP. Six more were added in the 1980s, including the Annapurna Conservation Area (ACA). The last three, Makalu Barun National Park, Kanchenjunga Conservation Area, and Manaslu Conservation Area, were added in the 1990s (**Table C.2**) (Bhujju et al. 2007). As Ives (2004:183) says in *Himalayan Perceptions*: “On any world scale, Nepal must rank near the top, having declared almost a fifth of total territory as national park and nature reserve.”



**Figure C.14** Map of protected areas of Nepal. NP=National Park WR=Wildlife Reserve, CA=Conservation Area and HR=Hunting Reserve (adapted from Baral and Heinen 2007:229)

**Table C.2** Protected areas of Nepal (Chaudhary et al. 2009)

S.N.	Categories (Year of Establishment)	Area (km <sup>2</sup> ) and (%)	Altitude (m)
<b>National Parks (NP)</b>			
1.	Chitwan NP (1973)	932	150-815
2.	Bardia NP (1976/1988)	968	152-1,494
3.	Shivpuri NP (1984, NP in 2002)	144	1,366-2,732
4.	Khaptad NP (1984)	225	1,000-3,276
5.	Makalu Barun NP (1991)	1,500	435-8,463
6.	Sagarmatha NP (1976)	1,148	2,800-8,850
7.	Langtang NP (1976)	1,710	792-7,245
8.	Shey Phoksundo NP (1984)	3,555	2,000-6,885
9.	Rara NP (1976)	106	1,800-4,048
	Sub-total	10,288 (35.5%)	
<b>Wildlife Reserves (WR)</b>			
1.	Koshi Tappu WR (1976)	175	90
2.	Parsa WR (1984)	499	150-815
3.	Shuklaphanta WR (1976)	305	90-270
	Sub-total	979 (3.37%)	
<b>Hunting Reserves (HR)</b>			
1.	Dhorpatan HR (1987)	1,325	2,850-7,000
	Sub-total	1,325 (4.56%)	
<b>Conservation Areas (CA)</b>			
1.	Kanchenjunga CA (1997)	2,035	1,200-8,598
2.	Manaslu CA (1998)	1,663	1,360-8,163
3.	Annapurna CA (1986, 1992)	7,629	1,000-8,092
	Sub-total	11,327 (39.05%)	

### C.3 Important Recent and Historical Trends

There are many trends in Nepal that would be particularly interesting to inform background knowledge about the country. In terms of the scope of this thesis, and the analytical framework of a human ecological perspective, the following section will concentrate on adaptive livelihood strategies both historic and recent. These trends are influenced by the socio-political and economic climate, which provides the overall context of this discussion.

One of the most important distinctions to be made in considering these trends is that Nepal has always had a large agricultural labor force. Current figures estimate 76% of work force is involved in agriculture (CIA 2010). Migration to more suitable living environments has been a historical adaptive strategy all over the world. In Nepal, before the last decade, there was a migration to the hills from both the south and the north. From the south it was motivated by a

desire to escape the heat and malarial disease of the plains, and find arable land. From the north it was to escape harsh environmental conditions and seek better agricultural land. As the population continued to increase in the hills, the carrying capacity was reached in terms of cultivatable land. As result, for the last hundred years, there has been a general migration from the hills to the plains (Hrabovszky and Miyan 1987). This has increased even more since the late 1950s, when DDT was used to eradicate malarial mosquitoes in the Terai (Gill 2003).

Domestic seasonal migration is nothing new to farmers in the hills and mountains of Nepal, as they have been practicing transhumance for hundreds of years, an adaptive strategy that accommodates the seasons and the ecological restoration of the seasonal grazing areas. In the mountains the amount of cultivatable land is much less than in the hills and Terai, and the harsh climate and short growing season makes agriculture alone a very hard way to make a living. Many mountainous areas have both food deficits and high levels of poverty. This combination of poverty and food insecurity is the 'push' factor in the seasonal migration in Nepal, while the availability of labor in southern areas and India is the 'pull' factor.

Additional alternative livelihood strategies have been pursued for centuries in Nepal to fill the gap left by seasonal agriculture. This migration is advantageous in a number of ways. It reduces the number of family members that need to be fed on the farm (the push factor) and when the migrants return just before summer to begin the agricultural cycle again, they often bring food supplies with them, and if they were fortunate some savings (the pull factor).

Two other the main adaptive strategies, which are interrelated, are migration for temporary or seasonal job opportunities, and trade. In Nepal trade frequently involves temporary and often seasonal migration. This migration has taken many different forms, including the Trans Himalayan Salt Trade, and the shift in the salt trade to the south after the Tibetan border was closed in 1959. The Manangis phenomenal rise in the business world over several centuries (Rogers 2004) was due to trade and travel privileges.

Migration for job opportunities other than trade, such as the migration of Nepalese men to join the Gurkha regiment in British and Indian Gurkha Armies has a long history. Similar trends in migration and mercenary military employment have been documented in other mountainous areas of Asia, such as the Karakoram (Kreutzman 1991). In the late 1980s to early 1990s, the carpet-manufacturing boom stimulated a huge migration trend to the Kathmandu Valley (Graner 2001). A more recent trend that is having a large impact on Nepali society is the outmigration for jobs in the Gulf countries. Adhikari (2008:5) writes:

By 2007, it has become clear that remittances have been contributing significantly to the economy of the country, and in poverty reduction. Poverty is considered to have reduced from 42% in 1996/97 to 31% in 2003/04 (CBS 2006). The main reason for this reduction is the injection of remittances. The growing participation of the lower middle-class populations of rural areas in the migration to Gulf countries and Malaysia has been helping in the reduction of poverty. In fact, migration opportunities to these countries are generally considered as having a high impact on poverty reduction because people from lower middle class can also participate in this migration owing to low investment required for such migration. Moreover, these countries have been absorbing a large number of semi-skilled or unskilled people.

A recent study by Lokshin et al. (2010) stated that over one million adults (primarily male) in the peak production age category worked outside of Nepal. Studying World Bank figures from 1995 to 2003 they estimated that remittances from Nepalis living abroad grew by 30% per annum. Starting in 1995, remittances accounted for 3% of GDP and by 2003, they had reached about 15% of GDP. The report also stated that during that time period remittances contributed to a 20% reduction in poverty in Nepal.

The other important recent event that has affected livelihoods in Nepal is the 10-year Maoist Peoples' War (1996-2006), and its continuing effects. Since the 2006 Peace Accord and ensuing governmental changes in 2008 there has been a period of relative peace in Nepal. However, with the resignation of the Maoist prime minister in 2009, violence and strikes have begun again, including a recent nationwide shut down by the Maoist (Bhandari 2010.) To

understand the implications of this war it is important to have a little historical background on how it began. Seddon and Hussein (2002:viii) state:

A historical perspective reveals that a failure of development and of governance created the pre-conditions – poverty, inequality, social discrimination and lack of social justice and democracy for widespread discontent, and ultimately for the Maoist insurgency. Not only has the government been ineffective in providing for the needs of the poor, it is generally seen and experienced as corrupt, repressive and as working against, not for, the interests of ordinary people. International and national development agencies have also failed to strengthen the capacity and commitment of state structures or to change practices at local level to any marked degree.

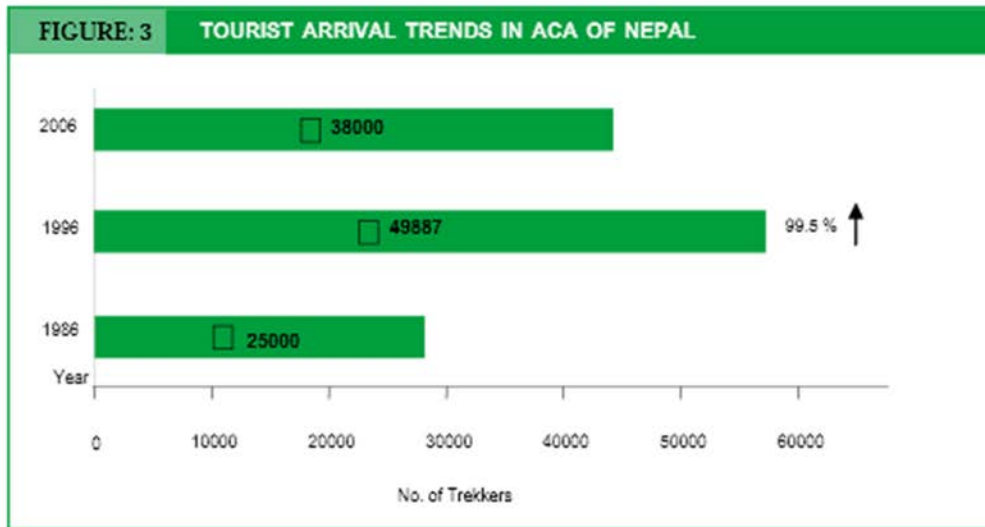
One of the main tactics of the Maoist is to call for a *bandh*, which means a shut down or strike. This usually involves stopping traffic by blockading roads, and shutting down businesses. The effect of this tactic has led to a general disruption of peoples' lives in both urban and rural areas. Curtailment of transportation, both public and commercial, reduction in transportation of goods, and the interruption of economic activities has made peoples' normal lives much more difficult, and led to food insecurity in some areas. Maoist cadres have also been known to enter poor remote villages and extract donations, food, and accommodation from families unable to meet even their own basic needs. Destruction of infrastructure such as bridges, power supplies, micro-hydro stations, communication networks, and drinking water systems by Maoist has placed even further hardship on Nepalese people. In addition, the war has reduced the confidence, and willingness of foreign investments, as well bringing foreign investment projects to a halt (McKay et al. 2007, Ives 2004, Seddon and Hussein 2002).

The general fear and insecurity created by this insurgency, and the government troops reaction to it, has led to an exodus from some remote rural areas by those who do not support the Maoist. In some cases, there has been forced migration. Some positive effects from the war have also been cited, such as redistribution of land and assets, and gender empowerment (Seddon and Hussein 2002). However, the long-term effects are still largely unknown and the current unstable political situation following the 2009 resignation of the Maoist prime minister has the potential

to lead to further violence, and a possible resumption of the conflict (Lawoti 2010) (see

**Appendix E: A Brief Chronological History of Nepal).**

One other interesting adaptive strategy that has historical roots is the acculturation process called ‘Sanskritization’ (Stall 1963) or ‘Hinduization’ (Whelpton 2005), of many groups in Nepal. Ever since the unification of Nepal in 1768 by Prithvi Narayan Shah and his declaration, “This is the pure land of the Hindus”, Nepal has been considered a Hindu kingdom. Before unification, Nepal had a long history of Hindu influence. The presence of the Hindu caste system can be traced to inscriptions from the Lichhavi period (5-8<sup>th</sup> C. E.). However, it was the *Muluki Ain* (National Legal Code) proclaimed by Prime Minister Jang Bhahadur in 1854 that put the Hindu caste system into law by imposing its rules on various ethnic groups (Gurung, H 1997). In a society dominated by Hindu castes in government, trade, and education becoming more Hindu and less Buddhist was an adaptive strategy that allowed certain non-Hindu groups to gain more privileges in Nepal, and get along better with their Hindu neighbors. This adaptive strategy has been documented in several other ethnic groups in Nepal, including the Gurung (Messerschmidt 1976) and the Thakali (Vinding 1998).



### Annapurna Conservation Area (ACA)

ACA is the first conservation area and the largest PA of Nepal (7,629 km<sup>2</sup>). It spreads over five districts with 57 Village Development Committees. It is exceptionally rich in natural heritage and biodiversity, stretching from the lowland sub-tropics of the middle hills to the permanent snow cover of the Himalayas, and beyond the alpine grasslands in the Trans-Himalayan region to the parts of the Tibetan plateau. Within a short span of 120 km, the altitude rises from less than 1,000m to over 8,000m. Such abrupt altitudinal variation with a diverse climate and geo-morphological conditions have created diverse ecological complexes and niches in ACA, which harbours 1,226 species of plants, 102 mammals, 485 birds, 41 reptiles and 23 amphibian species. This rich biodiversity has generated complex symbiotic relationships between plants, animals and humans.

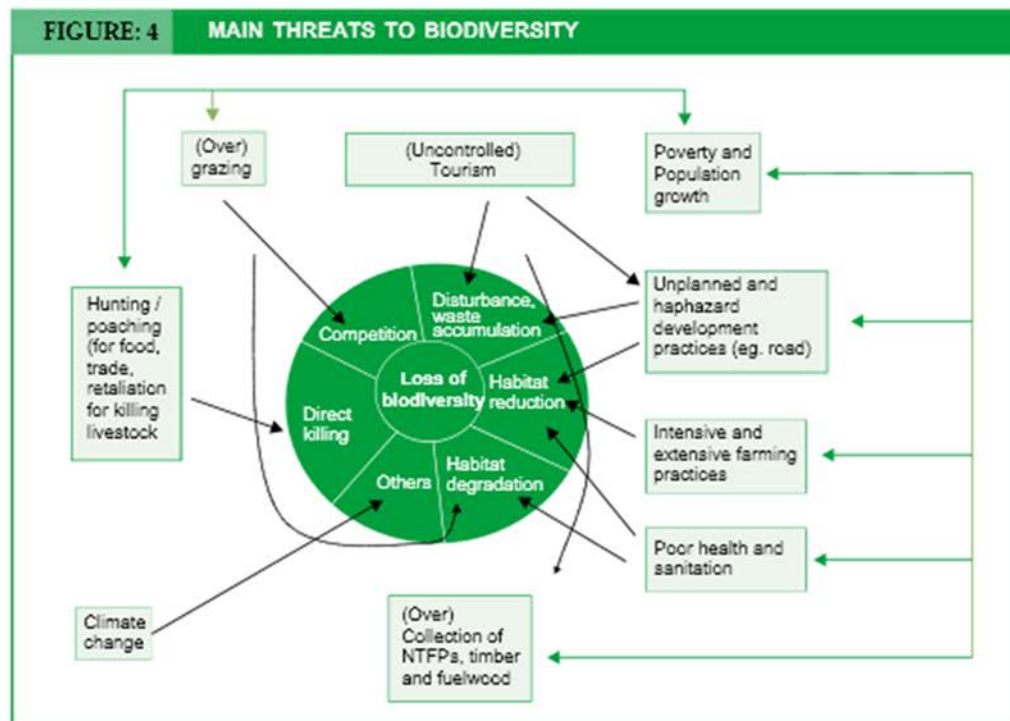
The fundamental driving forces shaping the environmental resource base within ACA are population growth, tourism and poverty. Owing to this reality the National Trust for Nature Conservation's Annapurna Conservation Area Project (NTNC-ACAP) has initiated an approach towards matching protection priorities more closely with human needs and aspirations. This has become increasingly accepted as an important element in PA management strategies of Nepal (Bajracharya, 2004). The objectives of meeting protection priorities and human needs have been achieved through the generation of financial resources from tourism and channelling the revenue back to manage ACA through conservation measures, sustainable development initiatives, appropriate information, interpretation and education programmes for visitors and residents. Additionally, tourism operations within ACA have been carefully planned, managed and monitored in order to ensure their long-term

(Bajracharya, S.B. and Dahal, N. (Eds.) 2008. *Shifting Paradigms in Protected Area Management*. NTNC, Kathmandu)

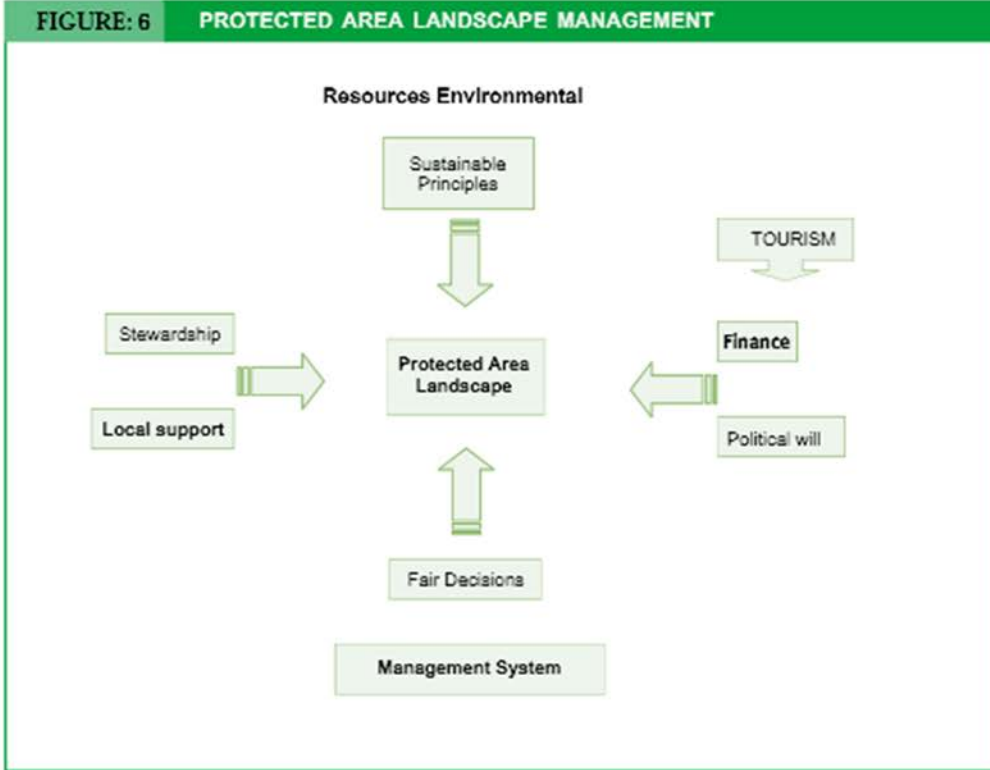
sustainability. ACA is the most popular trekking destination in the Nepalese Himalayas. The number of tourists visiting the area has increased steadily since the late 1980's, until the onset of a political conflict in the country, which has led to a sharp fluctuation in tourism since 2001. ACA was created partly in order to alleviate environmental degradation linked to trekking tourism (Sherpa, *et al.*, 1986; KMTNC, 1997; Pobocik and Butalla, 1998), and sustainable development of tourism is one of the principal goals of ACA management (KMTNC, 1997). Tourism management in ACA is considered globally to be a good example of community involvement (Cater, 1994). Moreover, the tourism revenues have helped to restore

degraded features of the natural and cultural environment in ACA (Gurung and DeCoursey, 1994).

In this regard, NTNC has made a unique contribution by designing and managing ACA, a new and innovative PA management system. Establishment of ACA was a paradigm shift in PA management and sustainable tourism development and management in Nepal. The management approach is based on a careful integration of conservation and development priorities, and incorporates all the key elements of the Category V protected landscape approach. For many years, ACA has been adopting



(Bajracharya, S.B. and Dahal, N. (Eds.) 2008. *Shifting Paradigms in Protected Area Management*. NTNC, Kathmandu)



integrated conservation concepts and is one of the best examples of protected landscape management in the developing world.

The unique conglomeration of diverse flora and fauna, and the complimentary geological and socio-cultural web of life have attracted hundred thousands of people, making ACA the 10 most popular trekking destinations in the world. Tourism in ACA has become the most important source of foreign exchange, a lucrative sector for generating income and employment opportunities for the people of ACA. More importantly, revenue from tourist income in

ACA has significantly reduced the funding gap to effectively manage the largest PA of Nepal. The recent analysis of average percentage ratio of the income from tourism revenue against annual budget of ACA by Bajracharya (2004) indicated that the revenue covers 85% of the annual budget. In an average, the annual budget of ACA is US \$1.4 million. Therefore, this revenue has become a major driving force in the overall conservation and development policy in ACA. This is a unique example of such a large PA being effectively managed through tourism revenue. More importantly, as a result of availability of resources from increased tourism

(Bajracharya, S.B. and Dahal, N. (Eds.) 2008. *Shifting Paradigms in Protected Area Management*. NTNC, Kathmandu)

revenue, management of ACA does not require the already scarce resources of the Government. By contrast, many park authorities and institutions both in Nepal and in other developing countries are still seeking a mechanism for durable funding of parks (Wilkie & Carpenter, 1999). Tourism development in ACA is considered a benchmark for the development of tourism in other areas of Nepal (Doggart and Doggart, 1996).

The experience of ACAP shows that if sustainable management of PA is to succeed, certain management characteristics must coexist. These include:

- ▶ A "Stewardship ethics" amongst all stakeholders
- ▶ Local support and their involvement in all stages of management
- ▶ Management system that promotes PA landscape approach based on fair decisions
- ▶ Tourism that facilitates long term revenue generation opportunities
- ▶ Government Policies and Acts aimed towards the promotion of sustainable tourism products/facilities within PA landscape
- ▶ Judicious utilization of the environmental resources for sustainable management of PA landscape

### Pioneering a New Approach for the Tourism Industry

NTNC is a pioneer conservation organization in Nepal that realized the early potential of tourism as a tool for conservation and development. The establishment of ACAP was an initiative to

introduce an innovative approach to long-term environmental conservation and short-term economic development thereby securing financial sustainability of the region. The basic principal behind ACAP is to collect entry fees from tourists and revenues from the users of the area's resources and to utilize these resources for the management of ACA. Two important approaches have been adopted in maximizing the economic impacts in ACA.

- ▶ **Minimize the cost** – ACAP approach focuses on community-based conservation. This provided an opportunity to reduce huge costs associated with conventional PA management.
- ▶ **Maximize the benefit** – Through ACAP, NTNC has been the pioneer NGO to initiate the idea of reinvesting all tourist entry fees into the Integrated Conservation and Development Projects (ICDP) in the area. In addition, local institutions such as CAMC have been authorized to collect and utilize certain fees and revenues, which is utilized as matching funds to ACAP's support, which comes from entry permit fees or sometimes from donor funding for specific projects.

In light of the present scenario of declining global and national spending on biodiversity conservation and PA system, sustainable financing of PAs is a crucial issue. The justification to protect PAs in developing countries like Nepal can be based on an economic rationale rather than primarily a social or environmental one. On the one hand, enhancing the revenue earning potential of PAs from tourism secures financial sustainability for

long term management of the PAs, and on the other hand provides benefits to appropriate set of stakeholders, thereby ensuring a balanced approach to long-term environmental conservation and short-term economic development.

The experience of NTNC in ACAP is evidence that tourism can be developed as a vehicle to transform local communities and nature conservation positively, and provide a more sustainable alternative. One of the most widely accepted principles in achieving this is through local community involvement in tourism planning and management. Community based sustainable tourism provides a realistic means of building strong and interdependent links between resource management, economic development, social welfare and environmental conservation. Economic impacts of tourism on local communities are generally considered to be positive. Income generation and employment from tourism enterprises such as running a lodge or a grocery shop, porters, cooks and guides are major economic benefits from tourism to local communities in ACA. Community involvement and control of tourism development will also ensure that maximum tourism revenue stays in the host communities. This will enhance livelihoods and generate a profitable source of income, empower and motivate local groups to adopt practices, which conserve, protect and preserve the natural environment.

### Challenges

Nepal's tourism has seen a varied growth and fall pattern. The fall in tourist arrivals is primarily

attributed to the political instability in the country resulting in damaging consequences for both the economy and tourism. Political instability within the past 10-11 years has also affected Nepal's PAs that have witnessed a fall in their resource base and revenue earning capacity. Besides the negative impact arising from a fall in total tourist arrival, the decline of the environment, along with the loss of species has hampered conservation initiatives, sustainable financing of PAs and disrupted the livelihood opportunities of local communities. Figure 7 indicates an outcome of the tourist arrival and revenue collection status of ACA before and after the conflict period in Nepal. As the ebb and flow of tourism arrivals in Nepal still very much depend on the status of the world economy and political/social stability in Nepal, the greatest challenges in this circumstance include:

- Build confidence amongst tourist community to visit Nepal
- Translate the attractiveness of Nepal as a premier tourist destination into increased tourist arrivals
- Develop new approaches for sustainable tourism development, which not only seek to minimize local environmental impact, increase tourist numbers but also give greater priority to development of quality tourism infrastructures (road connectivity, air connectivity, communication, IT enabled services, healthcare and human resource development) community participation and poverty alleviation by diversifying tourism product and increasing accessibility

## Areas for Further Improvement

### Participatory Management

One of the aggravating causes of environmental degradation in PAs is the poverty of local communities living in and around the PAs. In order to diminish destructive activities in PAs, management should make effort to involve all groups within the community in conservation and development projects. Priority needs to be given to providing access and benefit sharing with resource dependent communities. As a process of community-based conservation, devolving authority to plan, implementing and managing conservation activities to local communities are some ways to achieve the desired results. The results of the management will then be sound PA management with good relationships among multi-stakeholders and good governance with transparency, accountability and participation.

### Legal System

Community involvement and their traditional practices need to be given a greater legal recognition. Efficiency of such management would generally depend on a legal system to back it up with a strong commitment and cooperation from all stakeholders and management resources. The success of ACA management is primarily due to the participatory conservation approach backed up by certain degree of legal authority in deciding on the management of the resources. Once the community realizes that the protection of PA resources is beneficial to their livelihood, they will invest their resources back into its management, thereby securing the revenue earning potentiality of the PA for its long term management.

### Product Diversification

Tourism can become a diversifying and value-adding element for agricultural, forestry, horticulture and other sectors by adopting new models for collaboration approach between the private and public sector and between tourism, hospitality and travel sector, I/NGO's and local communities. Ways and means to diversify products and services should be sought to tap these opportunities.

### Funding Diversification

Financing PA is a thorny question the world over. Even countries that boast a long history of PA management is currently facing difficulties financing them adequately. Hence, innovative strategies to secure financial capacity through diversification of funding opportunities must be sought. Means of capturing ecosystem service values, public investment and donations, private sector initiatives (corporate social responsibility) etc. are some key initiatives to start with.

## Conclusion

Tourism can provide significant opportunities for long term conservation of biodiversity, community development and socioeconomic upliftment. Since its establishment, ACAP has emerged a leader in ecotourism promoting community based nature tourism, owned and managed locally. All of these have brought in much-needed jobs and income to the local communities while helping to conserve thousands of hectares of varied landscape, culture and biodiversity. None of this was easy. It is often a slow and cumbersome process to achieve successful ecotourism in practice, involving capacity building with local communities and

creating effective partnerships with the private sector, NGOs, local authorities and funding organizations.

Recently, tourism in Nepal has gone through a series of hardships and is still facing a crisis situation due to the absence of proper crisis handling mechanisms. While it is evident that tourism can thrive only in a situation of peace and stability, like other industries, enhancement of tourism depends on constructive vision, a strong

political will, trained manpower, effective and well planned marketing and promotional activities. Ensuring that tourism follows a truly sustainable path and that it contributes to the sustainable management of PAs, whether public or private, will require enhanced cooperation and concrete partnerships among the tourism industry, governments at all levels, local communities, PA managers and planners, and the tourists themselves.

## REFERENCES

- Adhikari, R. (2005). Building confidence in tourism through crisis management. Economic Policy Network Policy Paper 9. Kathmandu: Asian Development Bank.
- Bajracharya, S.B. 2004. *Community involvement in conservation: an assessment of impacts and implications in the Annapurna Conservation Area, Nepal*. PhD Thesis, University of Edinburgh, Edinburgh, Scotland: xviii+307 pp.
- Bajracharya, S. B., Furley, P., & Newton, A. (2005). Effectiveness of community involvement in delivering conservation benefits to the Annapurna Conservation area, Nepal. *Environmental Conservation* 32 (3): 239 - 247.
- Bajracharya, S. B., Furley, P. & Newton, A. (2006). Impacts of community-based conservation on local communities in the Annapurna Conservation Area, Nepal. *Biodiversity and Conservation* 15: 2765 - 2786.
- Baresford, M. (2003) Parks—PAs Programme. *International Journal for PA Managers*. World Commission on PAs (WCPA) and IUCN.
- Boyd, S. W. (2000). Tourism, national parks and sustainability. In R. W. Butler & S. W. Boyd (Eds.), *Tourism and National Parks: Issues and implications* (pp.161-186). Chichester: John Wiley and Sons, Ltd.
- Buckley, R. (2001). Environmental impacts. In D. B. Weaver (Ed.), *The Encyclopedia of Ecotourism* (pp. 379-394). Oxon, UK: CABI Publishing.
- Campbell, L. M. (1999). Ecotourism in rural developing communities. *Annals of Tourism Research* 26 (3): 531-553.
- Cater, E. (1994). *Ecotourism in the third world—Problems and prospects for sustainability*. In E. Cater & G. Lowman (Eds.), *Ecotourism: A sustainable option?* (pp. 177-194). Sussex: John Wiley and Sons Limited.
- Davenport, L., Brockelman, W. Y., et al. (2002). Ecotourism tools for parks. In J. Terborgh, C. V. Schaik, L. Davenport & M. Rao (Eds.), *Making Parks Work: Strategies for preserving tropical nature* (pp. 279-306). Washington: Island Press.
- De Lacy, T., Battig, M., Webb, J., Sofield, T., & Bauer, J. (1999 -2002) Conservation, Poverty Alleviation and Community Development through Tourism in Developing Countries. The International Programme of the CRC for Sustainable Tourism.
- Doggart, C. & Doggart, N. (1996). Environmental impact of tourism in developing countries. *Travel and Tourism Analyst* 2: 71-86.

(Bajracharya, S.B. and Dahal, N. (Eds.) 2008. *Shifting Paradigms in Protected Area Management*. NTNC, Kathmandu)

- Eagles, P. F. J. & McCool, S. F. (Eds). (2002). *Tourism in national parks and protected areas: Planning and management*. Oxon, UK: CABI Publisher.
- Gurung, C. P. & DeCoursey, M. A. (1994). The Annapurna conservation area project: A pioneering example of sustainable tourism? In E. Cater & G. Lowman (Eds.), *Ecotourism: A sustainable option?* Sussex: John Wiley and Sons Limited.
- KMTNC. (1997). *Annapurna conservation area: Management plan*. Kathmandu: King Mahendra Trust for Nature Conservation.
- McNeely, J. A. (1988). *Economics and biological diversity: Developing and using economic incentives to conserve biological resources*. Gland, Switzerland: IUCN.
- Mehta, J. N. & Kellert, S. R. (1998). Local attitudes toward community-based conservation policy and programmes in Nepal: A case study in the Makalu-Barun Conservation Area. *Environmental Conservation* 25(4): 320-333.
- Nepal, S. K. (2000). Tourism in protected areas: The Nepalese Himalaya. *Annals of Tourism Research* 27(3): 661 - 681.
- Nepal, S. K., Kohler, T. *et al.* (2002). *Great Himalayas: Tourism and the dynamics of changes in Nepal*. Switzerland: Zurich, Swiss Foundation for Alpine Research in collaboration with the Centre for Development and Environment, University of Berne.
- Nepal Tourism Board. (2008) Visitors Arrival in 2007 shows 27.1% increase. [www.welcomenepal.com/brand/mediacentrenews.asp](http://www.welcomenepal.com/brand/mediacentrenews.asp)
- Pobocik, M. & Butalla, C. (1998). Development in Nepal: The Annapurna Conservation Area Project. In C. M. Hall & A. A. Lew (Eds.), *Sustainable Tourism: A geographical perspective* (pp. 159-172). Essex: Longman Limited.
- Sharma, P. (2000). Mountains, tourism and development. In P. Sharma (Ed.) *Tourism as Development: Case Studies from the Himalaya* (pp. 1-19). Kathmandu, Nepal and Innsbruck, Austria: Himal Books and Studien Verlag.
- Sharma, S. (2006). Focusing on regional tourism markets: Prospects and challenge for Nepal. Economic Policy Network Policy Paper 28. Kathmandu: Asian Development Bank.
- Sherpa, M. N., Coburn, B. & Gurung, C. P. (1986). *Annapurna Conservation Area, Nepal: Operational plan*. Kathmandu: King Mahendra Trust for Nature Conservation and World Wildlife Fund.
- Thorsell, J. W. (1990). Research in tropical protected areas: Some guidelines for managers. *Environmental Conservation* 17(1): 14 - 18.
- Wilkie, D. S. & Carpenter, J. (1999). Can nature tourism help finance protected areas in the Congo basin. *Oryx* 33(4): 332-338.



## APPENDIX E: A BRIEF CHRONOLOGICAL HISTORY OF NEPAL

### E.1 Ancient Nepal

The ancient history of Nepal is sketchy, starting as early as the Neolithic period as described by Heitzman (1991: <http://countrystudies.us/nepal/4.htm>).

Neolithic tools found in the Kathmandu Valley indicate that people were living in the Himalayan region in the distant past, although their culture and artifacts are only slowly being explored. Written references to this region appeared only by the first millennium B.C. During that period, political or social groupings in Nepal became known in north India. The Mahabharata and other legendary Indian histories mention the Kiratas, who still inhabited eastern Nepal in 1991. Some legendary sources from the Kathmandu Valley also describe the Kiratas as early rulers there, taking over from earlier Gopals or Abhiras, both of whom may have been cowherding tribes. These sources agree that an original population, probably of Tibeto-Burman ethnicity, lived in Nepal 2,500 years ago, inhabiting small settlements with a relatively low degree of political centralization.

Monumental changes occurred when groups of tribes calling themselves the Arya migrated into northwest India between 2000 B.C. and 1500 B.C. By the first millennium B.C., their culture had spread throughout northern India. Their many small kingdoms were constantly at war amid the dynamic religious and cultural environment of early Hinduism). By 500 B.C., a cosmopolitan society was growing around urban sites linked by trade routes that stretched throughout South Asia and beyond. On the edges of the Gangetic Plain, in the Tarai Region, smaller kingdoms or confederations of tribes grew up, responding to dangers from larger kingdoms and opportunities for trade. It is probable that slow and steady migration of Khasa peoples speaking Indo-Aryan languages was occurring in western Nepal during this period; this movement of peoples would continue, in fact, until modern times and expand to include the eastern Tarai as well.

One of the early confederations of the Tarai was the Sakya clan, whose seat apparently was Kapilavastu, near Nepal's presentday border with India. Their most renowned son was Siddhartha Gautama (ca. 563-483 B.C.), a prince who rejected the world to search for the meaning of existence and became known as the Buddha, or the Enlightened One. The earliest stories of his life recount his wanderings in the area stretching from the Tarai to Banaras on the Ganges River and into modern Bihar State in India, where he found enlightenment at Gaya--still the site of one of the greatest Buddhist shrines. After his death and cremation, his ashes were distributed among some of the major kingdoms and confederations and were enshrined under mounds of earth or stone called stupas. Certainly, his religion was known at a very early date in Nepal through the Buddha's ministry and the activities of his disciples.

The political struggles and urbanization of north India culminated in the great Mauryan Empire, which at its height under Ashoka (reigned 268-31 B.C.) covered almost all of South Asia and stretched into Afghanistan in the west. There is no

proof that Nepal was ever included in the empire, although records of Ashoka are located at Lumbini, the Buddha's birthplace, in the Tarai. But the empire had important cultural and political consequences for Nepal. First, Ashoka himself embraced Buddhism, and during his time the religion must have become established in the Kathmandu Valley and throughout much of Nepal. Ashoka was known as a great builder of stupas, and his archaic style is preserved in four mounds on the outskirts of Patan (now often referred to as Lalitpur), which were locally called Ashok stupas, and possibly in the Swayambhunath (or Swayambhunath) stupa. Second, along with religion came an entire cultural style centered on the king as the upholder of dharma, or the cosmic law of the universe. This political concept of the king as the righteous center of the political system had a powerful impact on all later South Asian governments and continued to play a major role in modern Nepal.

The Mauryan Empire declined after the second century B.C., and north India entered a period of political disunity. The extended urban and commercial systems expanded to include much of Inner Asia, however, and close contacts were maintained with European merchants. Nepal was apparently a distant part of this commercial network because even Ptolemy and other Greek writers of the second century knew of the Kiratas as a people who lived near China. North India was united by the Gupta emperors again in the fourth century. Their capital was the old Mauryan center of Pataliputra (presentday Patna in Bihar State), during what Indian writers often describe as a golden age of artistic and cultural creativity. The greatest conqueror of this dynasty was Samudragupta (reigned ca. 353-73), who claimed that the "lord of Nepal" paid him taxes and tribute and obeyed his commands. It still is impossible to tell who this lord may have been, what area he ruled, and if he was really a subordinate of the Guptas. Some of the earliest examples of Nepalese art show that the culture of north India during Gupta times exercised a decisive influence on Nepali language, religion, and artistic expression.

## **E.2 Timeline of important events** (Heitzman (1991) <http://countrystudies.us/nepal/>)

**ca. 563 B.C.**-The Buddha born in Lumbini, in Tarai Region of Nepal

**268-31 B.C.** - Ashoka establishes empire in north India

**ca. A.D. 353-73** - Samudragupta establishes empire in north India

**400-750** - Licchavi kingdom in power in Kathmandu Valley

**750-1200** - "Transitional" kingdom in power in Kathmandu Valley

**1100-1484** - Khasa Malla kings rule in western Nepal

**1200-16** - Arimalla, first monarch of the Malla Dynasty, rules in Kathmandu Valley

**1312** - Khasa king Ripumalla leads raid in Kathmandu Valley

**1345-46** - Sultan Shams ud-din Ilyas of Bengal leads raid in Kathmandu Valley

**1382-95** - Jayasthitimalla rules as king of united Malla kingdom in Kathmandu Valley

**1428-82** - Yakshamalla reigns--height of united Malla kingdom

**1484** - Malla kingdom divided; three kingdoms of Kathmandu, Bhadgaon, and Patan expand

**1526** - Mughal Empire established in north India  
**1559** - Gorkha kingdom established  
**1606-33** - Ram Shah of Gorkha reigns; Gorkha kingdom experiences first expansion. 1728 Chinese influence established in Tibet  
**1743** - Prithvi Narayan Shah ascends to throne of Gorkha  
**1764** - British East India Company gains control of Bengal  
**1768-90** - Gorkha conquers Kathmandu and Patan, Bhadgaon, eastern Nepal, and western Nepal  
**1775** - Prithvi Narayan Shah dies, first king of united Nepal  
**1791-92** - Nepal defeated in war with China  
**1806** - Bhimsen Thapa becomes prime minister  
**1809** - Nepalese troops lay siege to Kangra, farthest extent of Gorkha empire  
**1814-16** - Anglo-Nepalese War waged; Nepal defeated  
**1837** - Bhimsen Thapa falls, beginning unstable period in court politics  
**1846** - Kot Massacre takes place; Jang Bahadur becomes prime minister  
**1855-56** - War waged with China  
**1856** - Royal decree gives absolute power to prime minister and his family  
**1857-58** - Sepoy Rebellion waged against British in north India; Nepal aids British  
**1858** - Jang Bahadur receives title of Rana  
**1877** - Jang Bahadur Rana dies  
**1885** - Ranoddip Singh Rana assassinated; Bir Shamser Rana becomes prime minister  
**1901** - Dev Shamsher Rana forced to abdicate; Chandra Shamsher Rana becomes prime minister  
**1914-18** - Thousands of Nepalese citizens fight as soldiers for British in World War I  
**1923** - Treaty of Friendship with Britain confirms independence of Nepal and special relationship with British Empire  
**1935** - Praja Parishad established, first political party in Nepal  
**1939 - 45** - Tens of thousands of Nepalese citizens fight as soldiers for British in World War II  
**1947** - Nepali National Congress established through merger of former All-India Nepali National Congress with Nepalese Society of Banaras and Gorkha Congress of Calcutta  
**1948** - Prime Minister Padma Shamsher Rana announces first constitution of Nepal, then resigns; his replacement, Mohan Shamsher Rana, represses opposition  
**1950** - Nepali National Congress absorbs Nepal Democratic Congress and becomes Nepali Congress Party; civil war breaks out  
**1950-51** - Ranas fall; King Tribhuvan regains control over army and administration; interim constitution enacted  
**1952** - King Mahendra Bir Bikram Shah Dev ascends throne  
**1955** - Nepal admitted to United Nations  
**1956** - First Five-Year Plan of economic development initiated  
**1959** - King Mahendra enacts new constitution; first general elections in Nepal bring to power Nepali Congress Party with B.P. Koirala as prime minister  
**1960** - King Mahendra dismisses the democratic government and imprisons B.P. Koirala and other leaders  
**1962** - War waged between India and China; new constitution sets up *panchayat* system  
**1963** - First elections held to National Panchayat  
**1972** - King Birendra Bir Bikram Shah Dev ascends throne  
**1980** - National Referendum supports *panchayat* system  
**1982** - B.P. Koirala, Nepali Congress Party leader, dies

**1986** - Second elections held to National Panchayat

**1989** - Failure to renegotiate trade and transit treaties with India disrupts economy

**1990** - New constitution promulgated as result of agitations and successes of Movement for the Restoration of Democracy

**1991** - Elections held to Parliament; first session of first multiparty Parliament held in thirty-two years

### **Political instability**

**1994** - Koirala's government defeated in no-confidence motion. New elections lead to formation of Communist government.

**1995** - Communist government dissolved.

**1995** - Start of Maoist revolt, which drags on for more than a decade and kills thousands. The rebels want the monarchy to be abolished.

**1997** - Prime Minister Sher Bahadur Deuba loses no-confidence vote, ushering in period of increased political instability, with frequent changes of prime minister.

**2000** - GP Koirala returns as prime minister, heading the ninth government in 10 years.

### **Palace killings**

**2001** 1 June - King Birendra, Queen Aishwarya, and other close relatives killed in shooting spree by drunken Crown Prince Dipendra, who then shoots himself.

**2001** - Prince Gyanendra crowned King.

**2001** July - Maoist rebels step up campaign of violence. Prime Minister GP Koirala quits over the violence; succeeded by Sher Bahadur Deuba.

**2001** November - Maoists end four-month old truce with government, declare peace talks with government failed. Launch coordinated attacks on army and police posts.

### **State of emergency**

**2001** November - State of emergency declared after more than 100 people are killed in four days of violence. King Gyanendra orders army to crush the Maoist rebels. Many hundreds are killed in rebel and government operations in the following months.

**2002** May - Parliament dissolved, fresh elections called amid political confrontation over extending the state of emergency. Sher Bahadur Deuba heads interim government, renews emergency.

**2002** October - King Gyanendra dismisses Deuba and indefinitely puts off elections set for November.

**2003** January - Rebels, government declare ceasefire.

### **End of truce**

**2003** August - Rebels pull out of peace talks with government and end seven-month truce. The following months see resurgence of violence and frequent clashes between students/activists and police.

**2004** April - Nepal joins the World Trade Organization (WTO).

**2004** May - Street protests by opposition groups demanding a return to democracy. Royalist Prime Minister Surya Bahadur Thapa quits.

### **Direct royal rule**

**2005** February - King Gyanendra assumes direct control and dismisses the government. He declares a state of emergency, citing the need to defeat Maoist rebels.

**2005** April - King lifts the state of emergency amid international pressure.

**2005** November - Maoist rebels and main opposition parties agree on a program intended to restore democracy.

**2006** April - King Gyanendra agrees to reinstate parliament following weeks of violent strikes and protests against direct royal rule. Maoist rebels call a three-month ceasefire.

**2006** May - Parliament votes unanimously to curtail the king's political powers.

The government and Maoist rebels begin peace talks, the first in nearly three years.

### **Peace deal**

**2006** November - Government and Maoists sign a peace accord - the Comprehensive Peace Agreement (CPA) - declaring a formal end to a 10-year rebel insurgency.

**2007** January - Maoist leaders enter parliament under the terms of a temporary constitution.

### **Maoists join government**

**2007** April - Maoists join interim government, a move that takes them into the political mainstream.

**2007** September - Three bombs hit Kathmandu in the first attack in the capital since the end of the Maoist insurgency.

Maoists quit interim government to press demand for monarchy to be scrapped. This forces the postponement of November's constituent assembly elections.

### **End of monarchy**

**2007** December - Parliament approves abolition of monarchy as part of peace deal with Maoists, who agree to re-join government.

**2008** January - A series of bomb blasts kill and injure dozens in the southern Terai plains, where activists have been demanding regional autonomy.

**2008** April - Former Maoist rebels win the largest bloc of seats in elections to the new Constituent Assembly (CA), but fail to achieve an outright majority.

**2008** May - Nepal becomes a republic.

**2008** June - Maoist ministers resign from the cabinet in a row over who should be the next head of state.

**2008** July - Ram Baran Yadav becomes Nepal's first president.

**2008** August - Maoist leader Prachanda forms coalition government, with Nepali Congress going into opposition.

### **Maoists leave government**

**2009** May - Prime Minister Prachanda resigns in a row with President Yadav. Maoists leave government after other parties oppose integration of former rebel fighters into national army. Veteran Communist leader Madhav Kumar Nepal named new prime minister.

Gurkha veterans with at least four years' service in the British army are given permission to settle in the UK.

**2009** December - Four people are killed during clashes triggered by Maoist-led land grab in far west of country, giving rise to fears over future of peace process.

**2010** May - Governing coalition and Maoist opposition agree to extend deadline for drafting of new constitution to May 2011.

**2010** June - PM Madhav Kumar Nepal quits under Maoist pressure.

**2011** January - UN peace monitoring mission ends.

**2011** February - Jhalnath Khanal elected premier, ending a seven-month stalemate during which Nepal had no effective government.

**2011** May - Constituent Assembly fails to meet 28 May deadline for drawing up new constitution.

**2011** August - PM Jhalnath Khanal resigns after government fails to reach compromise agreement with opposition on shape of new constitution and fate of former Maoist fighters. Parliament elects the Maoist party's Baburam Bhattari as prime minister. Mr Bhattarai vows to forge a cross-party consensus over the new constitution and the Maoist fighters' issue.





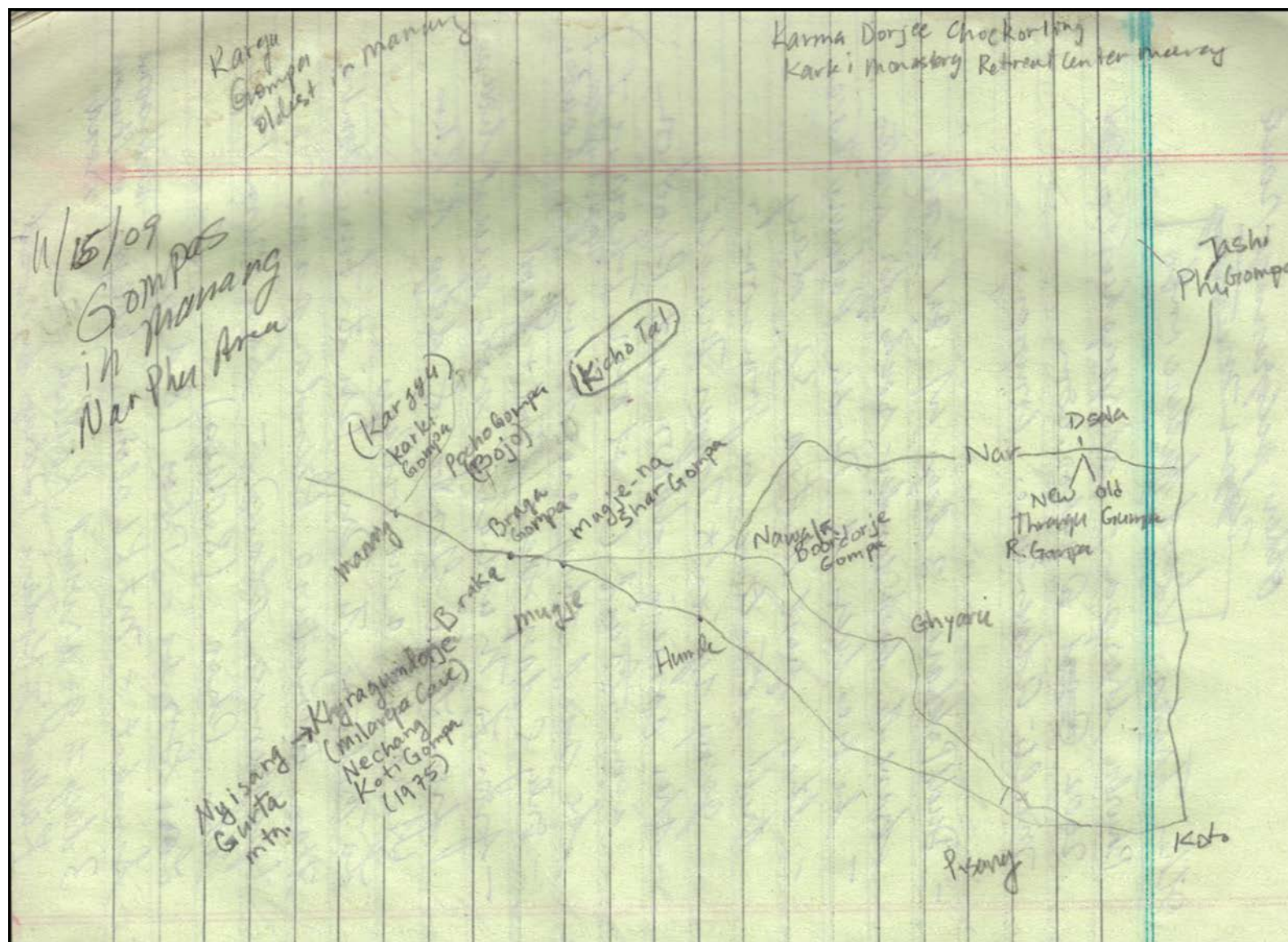


Figure F.3 Map of gompas in the Manang and Nar Phu area 11/15/09. (R.E. Beazley)



**9. Where are you from originally?**

**10. How long have you lived here?**

**11. What is your profession?**

**12. What did you do before?**

**13. What is your main source of income?**

**14. Are you the lodge owner? Y  N  If not who is?**

**15. Where does lodge/landlord owner live?**

**Nationality:**

**16. Do you rent the building Y  N ?**

**17. If yes how much is your rental payment?**

**18. Do you get enough income from your lodge to support your family? Y  N**

**19. Does your family live here with you? Y  N**

**20. How much of your income stays for family here:**

**outside family:**

**21. In addition to your trekking lodge what other types of work do you do and how much income does it generate annually? Total annual income:**

**Farming:**

**Livestock:**

**Trading:**

**Labor:**

**Collection of NTFP:**

**Home use:**

**Sales:**

**Medicinal Plants:**

**Home use:**

**Sales:**

**Business:**

**Tourism:**

**Other:**

**None**

**22. Additional sources of income and how much?**

**Foreign remittance:**

**Bank loan:**

**Other:**

**23. How did you finance your lodge?**

**Bank Loan:**

**Personal Savings:**

**Other:**

**24. Are you paying off a loan for your lodge? Y  N**

**25. If yes how much of your income per year?**

**26. How much of your income is spent on :**

**Food-Local food:**

**Imported food:**

**Fuel- Wood:**

**LPG:**

**Kerosene:**

**Other**

**fuel:**

**Maintenance:**

**Outside family members:**

**27. How many staff do employ?**

**from local area**

**salary:**

**outside local area**

**salary:**

**where from:**

**28. How many tourists stay at your lodge each year?**

**29. What kind of tourist services do you provide?**

- Food:            Lodging:            Transportation:            Guide: Porter:  
Tour:            Other:

**30. What types of stove do you use?**

- Wood burning:            LPG:            Electric rice cooker:  
Biogas:            Bijuli deki:            Kerosene:  
Solar cooker:            Micro hydro:            Other:

**31. What other sources of energy do you use?**

- Solar hot water:            Back burner hot water            Electric hot water  
Wood h. w. (direct):            Solar panels:            Other:

**32. What do you think of the new road and why?**

**33. Do you think the road is good, bad, or both and why?**

**33. After the road was built has transportation costs gone up or down and why?**

**34. After the road was built has the price of good gone up or down and why?**

**35. After the road was built was built has your business gone up or down and why?**

**37. Since the road was built has the number of trekkers gone up or down and why?**

**38. Is there anything else you would like to say?**

## **APPENDIX H: RURAL MOUNTAIN LIVELIHOODS AND LAND USE IN NEPAL**

In general traditional rural mountain livelihoods in Nepal are based on subsistence agriculture, animal husbandry, trade, and labor migration (Adhikari 2008, NTNC 2008b, Chaudhary et al. 2007, Rogers 2004, Vinding 1998, Fischer 1986, Gurung, H 1980, Messerschmidt 1976). These practices are shared by rural mountain dwellers in many parts of Asia (Kassam 2010a, Scott 2009, Felmy and Kreutzman 2004) and in mountainous areas in other parts of the world (Jodha 1997). They are adaptive strategies based in ecological and traditional knowledge that have evolved so that mountain people can survive in a harsh environment (Ase et al. 2010, Dong et al. 2007, Ramakrishan 2005, Gurung, H 2004b, Messerschmidt 1976, Rhoades and Thompson 1975, Iijima 1964).

There is archaeological (Alt et al. 2003) and paleoethnobotanical (Knörzer 2000) evidence from Mustang that many of these same strategies were practiced more than 3000 years ago in Nepal, which is a strong indication that these adaptations were ecologically based, transmitted orally, and sustainable, hence embedded in traditional ecological knowledge. In Nepal, many of the alternative livelihood strategies have involved migration either to do trade or petty business during the winter, serve as mercenary soldiers in the Gurkha regiment of the India and British armies, or for wage labor (Malville 2005, Gurung, H 2004a). The period of the Trans Himalayan Salt Trade provided many with an extra livelihood option as collectors, buyer, sellers, intermediaries, or transporters. Communities that had access to a good trade route with Tibet, such as the communities living in Mustang and Myagdi along the Kali Ghandaki River corridor, benefitted substantially from the trade (Van Spengen 2000, Vinding 1998, Fisher 1986, Iijima 1977, Fürer-Haimendorf 1975). Other communities, such as those in the Manang Valley, that did not have a good route for northern trade developed trade links with southern trading centers (Rogers 2004, Van Spengen 2000, Messerschmidt 1995). After the Chinese closed the border with Nepal in 1959, things changed substantially for those involved in the northern route and the trade pattern began to be focused south. This trade also involved collection and sale of high

value medicinal plants, which were essential for Ayurvedic medicine practiced in India. By the late 1970s, tourism had started to become an additional livelihood option that helped fill the void left by the decrease in trade. Tourism has become the substitute for trade in many mountainous areas in Nepal (NTNC 2008b, Vinding 2008, Chaudhary, Aase, and Vetaas 2007, Gurung, H 2004b,) as well as in other highland areas of the world (GLOUCHAMORE 2007). This trend toward tourism was addressed at the GLOUCHAMORE (Global Change and Mountain Regions Research Strategy) *Workshop on Altitudinal Gradient Studies* in Samedan, Switzerland (2007:82).

Tourism has replaced trade, pilgrimage, and pastoralism. Resources extracted on a large scale such as water, electric energy, and minerals have become major sources of income. In most of the world's mountain systems, traditional and modern societal linkages are mixed. Common to all mountain systems is the gradual decline in formal land use rights and ownership with elevation, which is a source of conflict when new land use systems are installed in a traditional cultural landscape (Berge 2006; Körner and Ohsawa 2006). Cultural landscapes include many ecological elements rooted in traditional land use practice that are not necessarily obvious from scientific knowledge but contribute to sustainable development (Ramakrishnan et al 2005). There are new challenges in identifying and measuring the advantages of traditional (sustainable) land care systems in terms of lowland benefits such as safety of transit routes and amount and quality of drinking water (catchment value).

Currently in Nepal, there is a significant amount of out-migration to foreign countries to seek employment. Consequently, remittances have become a very important part of livelihood strategies not only in the mountains but also in many areas of Nepal (Lokshin et al. 2010, UNDP 2009b, Adhikari 2008, Kollmair et al. 2006, Gill 2003). As roads are built into mountainous areas, traditional agricultural practices have changed to take advantage of new markets. Market driven cash crops have taken the place of traditional crops, and animals that produce milk products or animals that are used for Hindu sacrifices, such as goats, have taken the place of previous livestock types. With the high degree of outmigration, there has been a subsequent decrease in the amount of land under cultivation and many villages now have abandoned fields. In some villages, fields that are abandoned can be worked under contract by sharecroppers who

have migrated from adjacent areas. In return for being allowed to work the land and keep the produce, they take care of the family house and land for the urban living owner (Tsering Dhundup, sharecropper from Dolpa District, Purang near Muktinath, personal communication, May 5, 2009). In general, the younger generation seems more interested in pursuing a more ‘modern’ lifestyle either in the city or abroad. This has resulted in a huge decline in the indigenous labor force, which is filled by others from outside the area who have in-migrated seeking better livelihood opportunities (Tsering Dhundup, sharecropper from Dolpa District, Purang near Muktinath, personal communication, May 5, 2009).

The 2005 GLOCHAMORE project pointed out some of the important characteristics of making a living in mountain areas. One concept that has received a lot of attention is the climatic variation with elevation that produces ‘vertical zonation’ and how that influences agriculture and transhumance (GLOCHAMORE 2007, Gurung, A 2006, Grotshach and Stadel 1997 in Ives and Messerli 1997, Metz 1989, Guillet 1983, Rhoads and Thompson 1975, Iijema 1964). The GLOCHAMORE (2007:82) workshop put this theme into perspective.

A characteristic feature of high mountains is their vertical zonation into climate-driven elevational belts: 1) the snow and ice covered nival belt, 2) the alpine belt (treeless, above treeline), 3) the mainly forested montane belt (below treeline), and 4) the valley floors and forelands. Figure 1 shows a typical mountain region with clearly identifiable belts. People live and use resources in these altitudinal belts (Allan 1986). However, at higher elevations, conditions become increasingly difficult, creating societal interdependencies with lower belts and the lowlands. Traditionally, there are 3 ways to secure a livelihood at high elevations despite the harsh environmental conditions:

- Using overly large land areas, thus compensating for low annual productivity per unit of land and mitigating seasonal irregularities in resource availability through traditional storage/reserve schemes and transhumance systems;
- Capitalizing on specific mountain resources, which are valued downslope and can be traded for basic supplies (eg medicinal plants, wool, timber, minerals);
- Capitalizing on the recreational, trade, or spiritual demands of non-mountain societies, and operating within the associated mountain infrastructure (eg pass roads, pilgrimage trails). These cross-elevational linkages still exist, but modes of interaction have changed (Price and Thompson 1997).

Their model, referred to as Figure 1 (**Figure H.1**) is derived from data in a mountainous region of Switzerland but they claim it is typical of high mountain zonation.

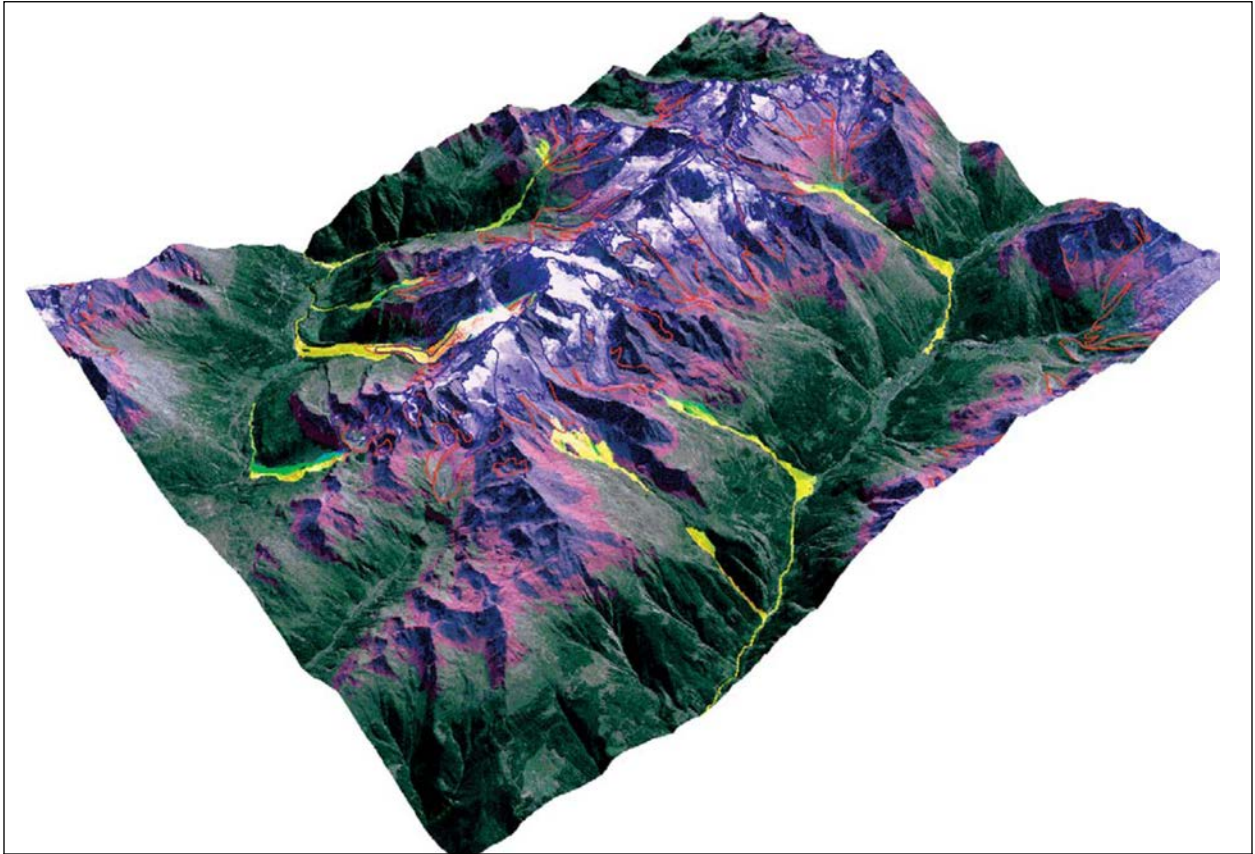


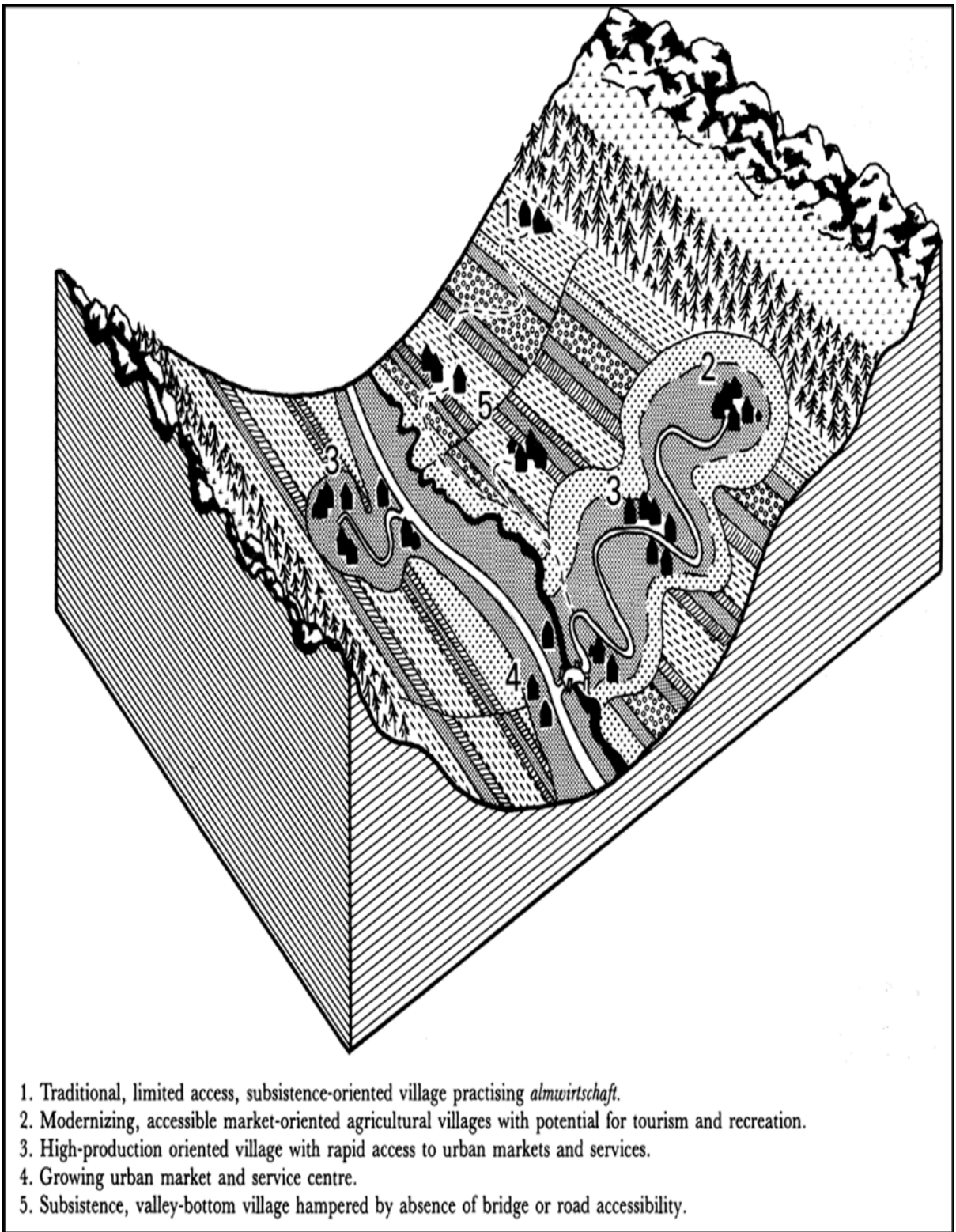
FIGURE 1 View of a typical high mountain region: the Saas Valley/Simplon region, Switzerland, as derived from a combination of information from Indian Remote Sensing satellite (IRS) and Landsat satellite images. The image shows the glacier belt (white and gray, about 3000 m; red lines define the extent of the glacier in 1850 and blue the position in 1973), the periglacial belt (blue and pink; where blue represents permafrost and pink the transition from warm/thin permafrost to seasonal soil freezing), the alpine vegetation belt (light green), and the montane forest belt (dark green) down to the valley bottoms (about 1500 m). Potential pathways of debris flows, rock avalanches and lake outbursts (GLOFs), estimated by integrative modeling, are indicated in light yellow and green. (Source: Huggel et al 2004 and 2005)

**Figure H.1** Model of a typical mountain zonation (Huggel et al 2004 and 2005 in CLOCHAMORE 2007)

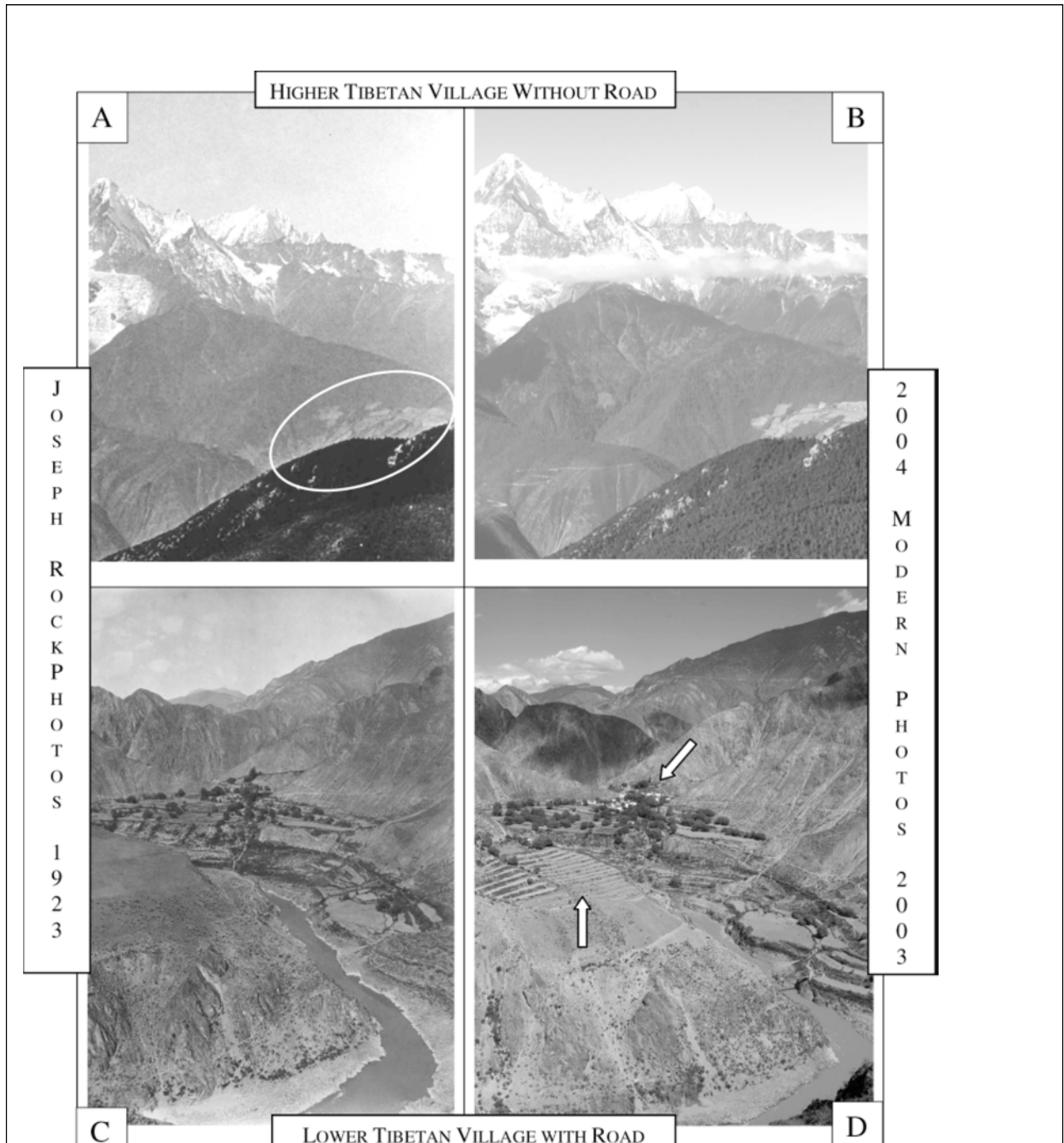
Messerschmidt and Goldstein (1980) point out that in some areas of Nepal ‘cross-elevational’ or latitudinal zonation is seen rather than the elevation model. Allan (1986) points out that regardless of the type of model, once access is opened up in mountainous area after a

road arrives, land use patterns change in response to market demand and subsistence crops change to cash crop varieties. His model takes this access factor into account (**Figure H.2**). Salick et al. (2005) conducted a study in Northwest Yunnan using repeat photography, comparing Joseph Rock's 1923 photographs of the area with photos taken of the same area in 2003-2004 (**Figure H.3**), to determine changes in land use. They then used these photos to triangulate the result from the data they collected in the area concerning the relationship between road access, elevation, and crop type and diversity.

One of the most important aspects of this paper in relation to land use and land change models is that elevational and latitudinal models do not take into account geopolitical and cultural factors. For example, when comparing Rock's photos to the recent photos (**Figure H.3**) Salick et al. (2005:83) point out subtle land use changes such as "...a bit more modern forest cover and less modern hillside agriculture..." and "...new terracing, irrigation, and cultivation of land (left) as well as more houses and walnut trees (center)." When we ask the question, why have these changes occurred, we step into a world that is beyond our experience and comprehension because we are not, in this case, of the Tibetan Buddhist worldview. Even if we have a partial understanding of this complex worldview, we still are not of the subset worldview of Tibetan Buddhist from Kham (the name of this area before the People's Republic of China changed the name) that has gone through all the changes that have occurred since the rise and decline of Mao. This subset in itself is extremely complex because Tibetans were treated differently in different parts of Tibet during Mao's tenure as head of the Communists Party of China. This applies to every aspect of their lives from what language they were allowed to speak, to what crops to grow, and on whose land, and who owned those crops.



**Figure H.2** Allan's (1986) model of accessibility and land use zonation



**Figure 2.** Examples of historic photos of study sites taken by Joseph Rock in 1923 (A and C) and modern repeats (B taken in 2004 and D taken in 2003), which show subtle differences in land use. A comparison of Rock’s historic photo A with modern photo B shows a bit more modern forest cover and less modern hillside agriculture (right). A comparison of Rock’s historic photo C with modern photo D reveals some new terracing, irrigation, and cultivation of land (left) as well as more houses and walnut trees (center).

**Figure H.3** Repeat photography of two villages in North West Yunnan (Salick et al. 2005)

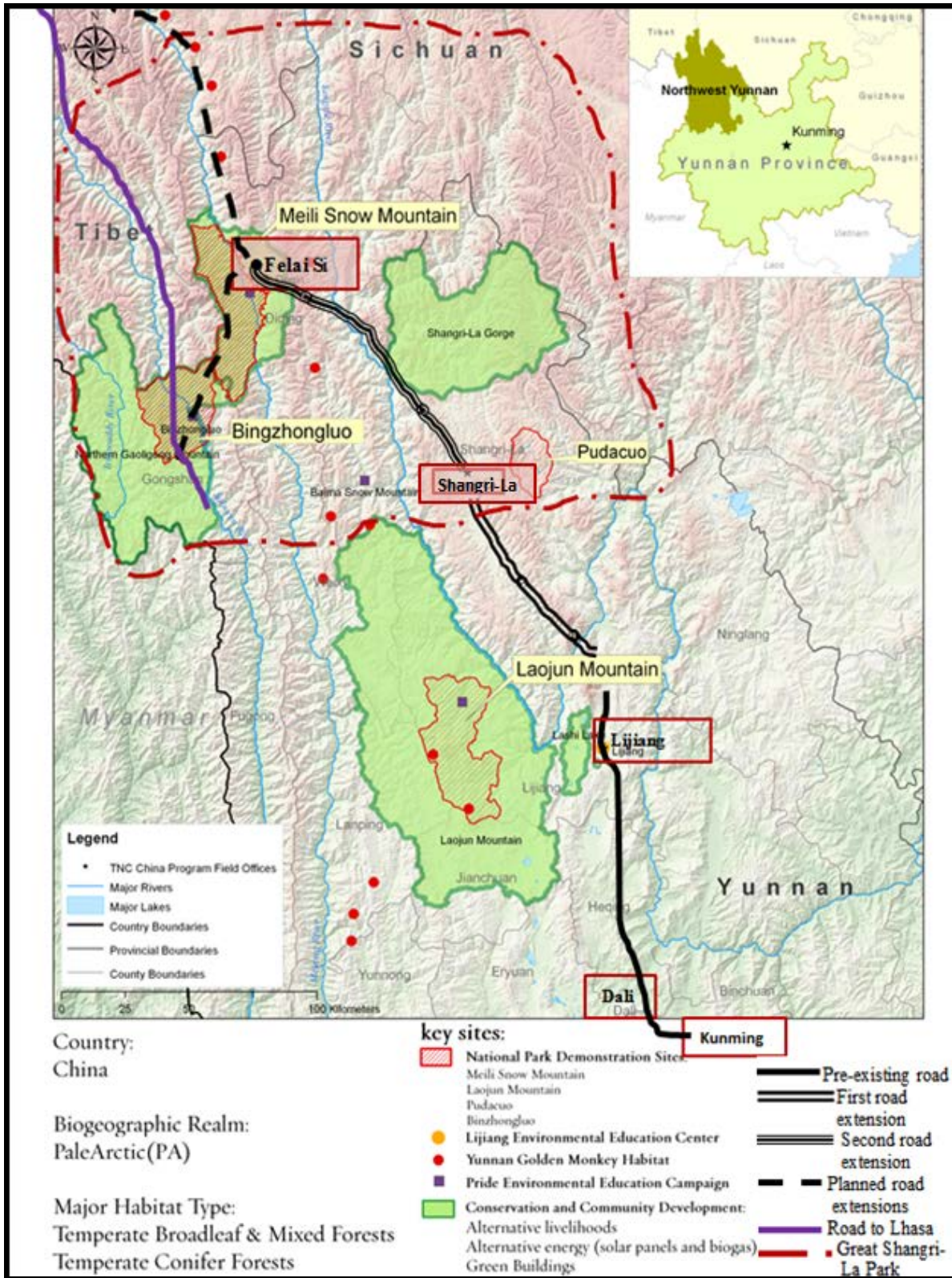
In terms of a generic Tibetan Buddhist worldview, this would include the following events:

- Mao's ascension to leader of the country in 1949.
- The Great Leap Forward (1959-61) and cooperative farming, which contributed to the "the worst famine in human history..." with "...16.5 million to as many as 30 million" deaths, which was 5% of the population in 1958 (Kung and Lin 2003).
- The Cultural Revolution (1966-1976).
- Mao's death (1976).
- The 'opening up period' during the leadership of Deng Xiaoping (1978 to present).

However, a Tibetan who formerly lived in Kham now may be living in Tibet Autonomous Region, Sichuan, or Northwest Yunnan. All of these areas in Western China were affected by:

- The Open Up the West Program (1999-present).
- The National Forest Protection Plan ban on logging in North West Yunnan (1998).
- The Conversion of Cropland to Forest Program (a.k.a. Grain for Green Program 1998).
- The increasing arrival of tourists, both domestic and international.
- Commoditization of Tibetan cultural as tourist attraction.
- More roads, more tourists.
- The Master Plan for Meili Snow Mountain (Mt. Kawa Karpo) National Park (2008).
- The development of a Tibetan Buddhist culture theme destination called Great Shangri-La Park, which will include a large area centered around the adjoining borders of Northwest Yunnan and South Central Sichuan (**Figure H.4**) (personal observation January 2008 and July – August 2009).

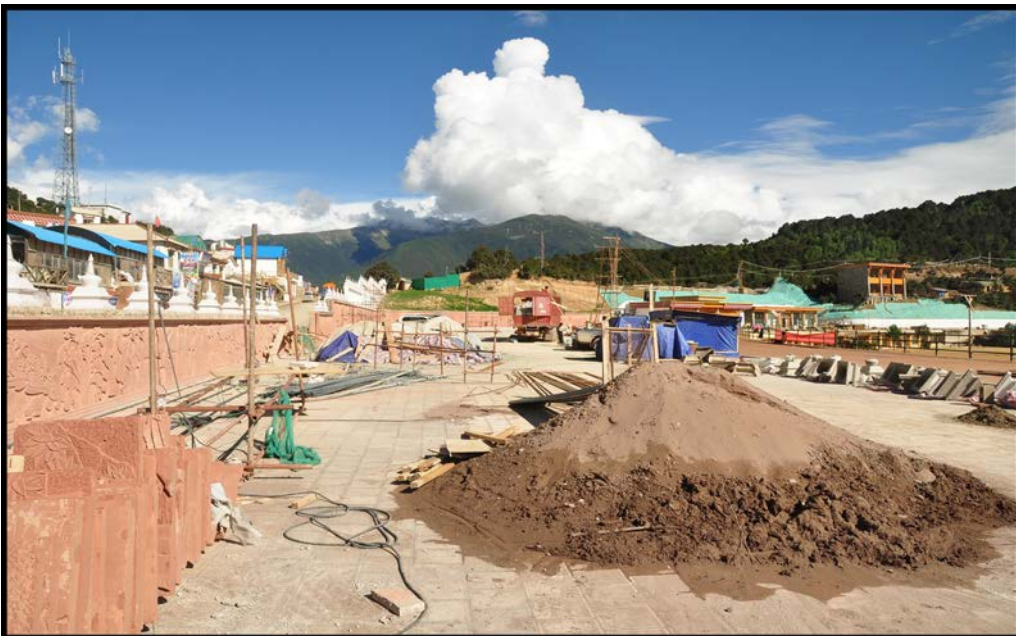
The success of tourism in Kunming, Dali and Lijiang spread north to Zhongdian, the name Zhongdian was changed to Shangri La (**Figure H.4**) in 1999 to capitalize on tourism.



**Figure H.4** North West Yunnan with the approximate borders of the planned Great Shangri-La Park (Adapted from TNC n.d.)

Zhongdian quickly became the next ‘must visit’ destination in Northwest Yunnan and it has become the hub for visiting Meili Snow Mountain Park.

While the Great Shangri-La Park is still being planning, **Figure E.4** suggests that it is currently under way and will probably be developed in phases. I heard about Great Shangri-La Park from people involved in the master plan for Meili Snow Mountain National Park (Wang Yin, Meili Snow Mountain National Park Development Committee member, personal communication, July 10, 2009), and from other residents of the area including my field assistant, Tenzing Wangbo (Tenzing Wangbo, Tibetan field assistant, personal communication, July-August, 2009; Sonam Gyatso, farmer and homestay owner, Yubeng, Northwest Yunnan, personal communication, January 12, 2009; Tenzing Tswang, farmer and guesthouse owner, Felai Si, Northwest Yunnan, August 27, 2009). I also personally observed the transformation of Felai Si from a small five guest house village on my first visit in January 2008, to a construction zone of new hotels (including a five star hotel) (**Figure H.5**).

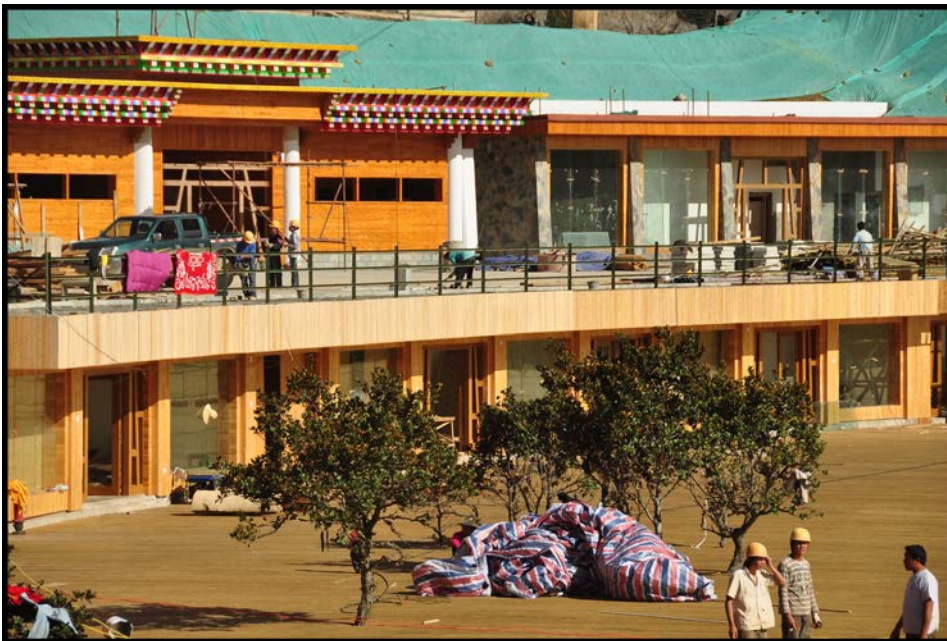


**Figure H.5** Construction zone in Felai Si July 16, 2009, the beginning of the five star hotel (R.E. Beazley 2009)

In addition, numerous new Tibetan stupas (**Figure H.6**), and a Tibetan theme shopping mall in the most scenic location in the village (**Figures H.6-H.8**) were also being constructed.



**Figure H.6** The beginning of the Tibetan theme shopping mall with a new manufactured stupa in Felai Si July 16, 2009 (R. E. Beazley 2009)



**Figure H.7** The Tibetan theme shopping mall one month later, August 17, 2009, taken from approximately the same spot as **Figure H.6** above (R. E. Beazley 2009).



**Figure H.8** The Tibetan theme shopping mall in Felai Si taken with a wide angle lens, August 17, 2009 (R.E. Beazley 2009)

I also saw numerous signs pointing out Tibetan cultural points of interest to visit (**Figure H.9**)



**Figure H.9** The commodification of Tibetan culture in Meili Snow Mountain National Park: “Respecting Nature, Protecting Environment, Continuing History, Ecological Tibetan Village, Tibetan Villager’s Sacred Cave” (R.E Beazley 2009)

Another example comes from an interview I did with the mother of my Tibetan translator in Xiaoshun, North West Yunnan. It is a common assumption in the west that Tibetans have been persecuted under the Communist Chinese rule. However, the first thing I noticed when I walked into this woman's kitchen was a huge poster of and Mao, and the Chinese leaders that followed him (**Figure H.10**).



**Figure H.10** Poster of leaders of the People's Republic of China (R.E. Beazley 2009)

She told me that they were all heroes because Mao had freed her and her family from serfdom. Her family had been indentured laborers to a large landowner, which was common in Tibet pre-1950. After Mao came to power he abolished the tenure system and redistributed land. Consequently, she and her family were able to have their own land and farm (Tsering Wangbo, Tibetan mom, personal communication, August 9, 2009). My interpreter went on to explain that in Yunnan Tibetans are happy with the government. He said it was mainly the Tibetans around central Tibet and Lhasa who had been persecuted, but in Yunnan, the Chinese had done many

good things for Tibetans (Tenzing Wangbo, field assistant, personal communication, August 9, 2009).

My point in presenting this discussion of Northwest Yunnan is that land use and land change is a coupled system that involves highly complex interactions in both human and ecological systems. If someone were to go to this area ten years from now, it would be very hard for them to understand the process of land use change without knowing many of the details I described above. Land use models for mountainous areas may be useful as a general concept, but each area has its own specific cultural, religious, and geopolitical history, which is embedded in the physical landscape. I argue that the human landscape use and change is result of the psychological landscape of the people living there, which is also embedded with the same constituents. Therefore, land use and land change models have limited applicability because they are based on insufficient understanding and data and tend to be generalized to all mountainous areas.

To their credit, Salick et al. (2005) have done an excellent job in trying to avoid this pitfall. They did numerous interviews with Tibetan elders in the community, as well as using repeat photography to inform their analysis. Salick and colleagues have done a great deal of research in the area and have published extensively on it (Byg et al. 2010, Law et al. 2010, Salick et al. 2009, Byg and Salick 2009, Salick and Ross 2009, Law et al. 2007, Salick et al. 2007, Salick et al. 2006, Law et al. 2006, and so on). Their study and results presented in the paper discussed above serves as an example of how this type of research should be done.

Many of these land use models have been debated in the literature (Gurung, H 2004b, Kreutzman 2004a, Price and Thompson 1997, Fricke 1989, Metz 1989, Allan 1986, Guillet 1983). However, what is common to all the patterns of land use and land use change, whether it is highland to lowland or lowland to highland trade, is motion. This motion is the reason why the study of movement corridors, trails and roads, and how they influence communities is vital in understanding rural mountain livelihoods.

APPENIX I: Manang Seasonal Round

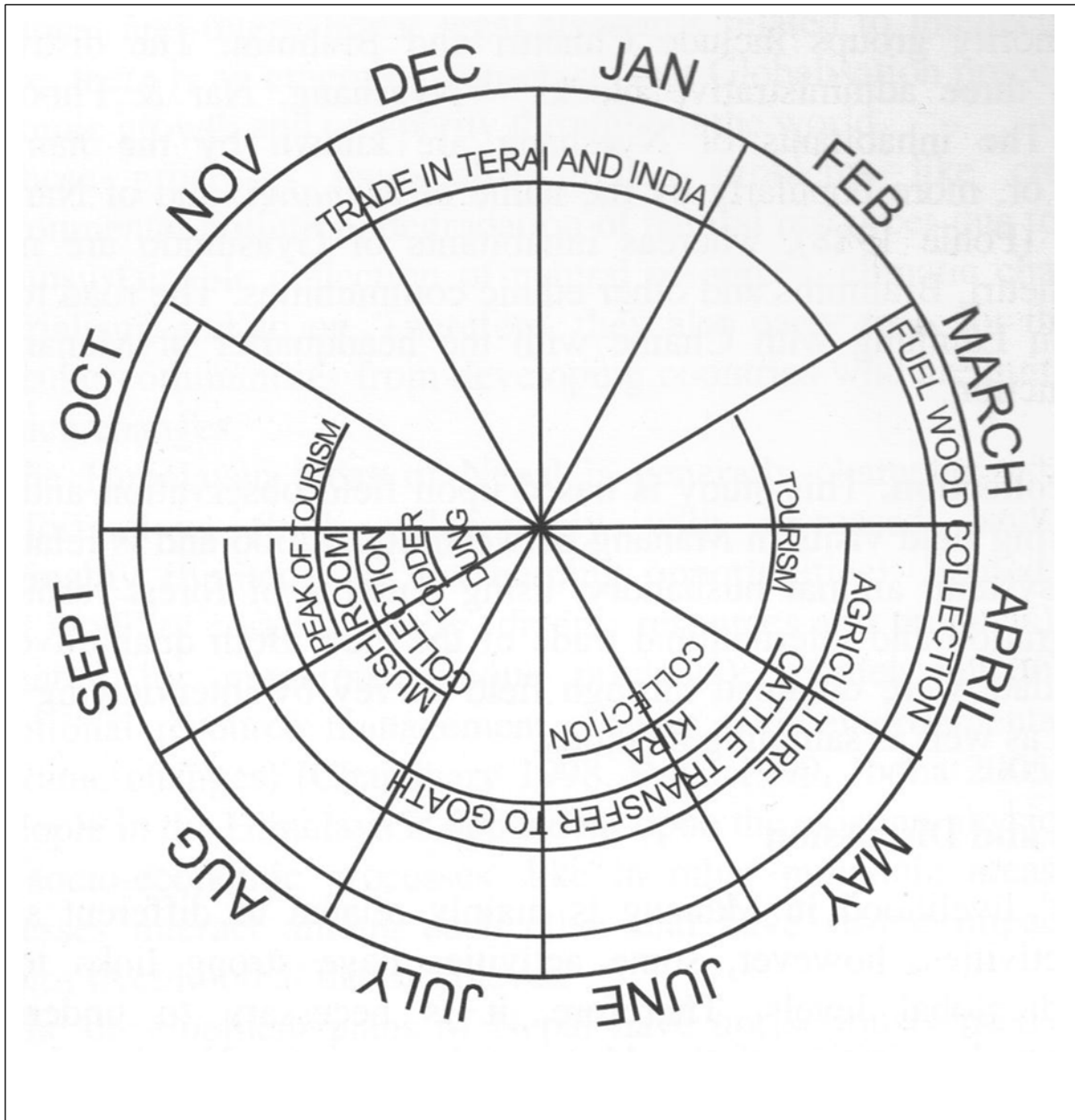
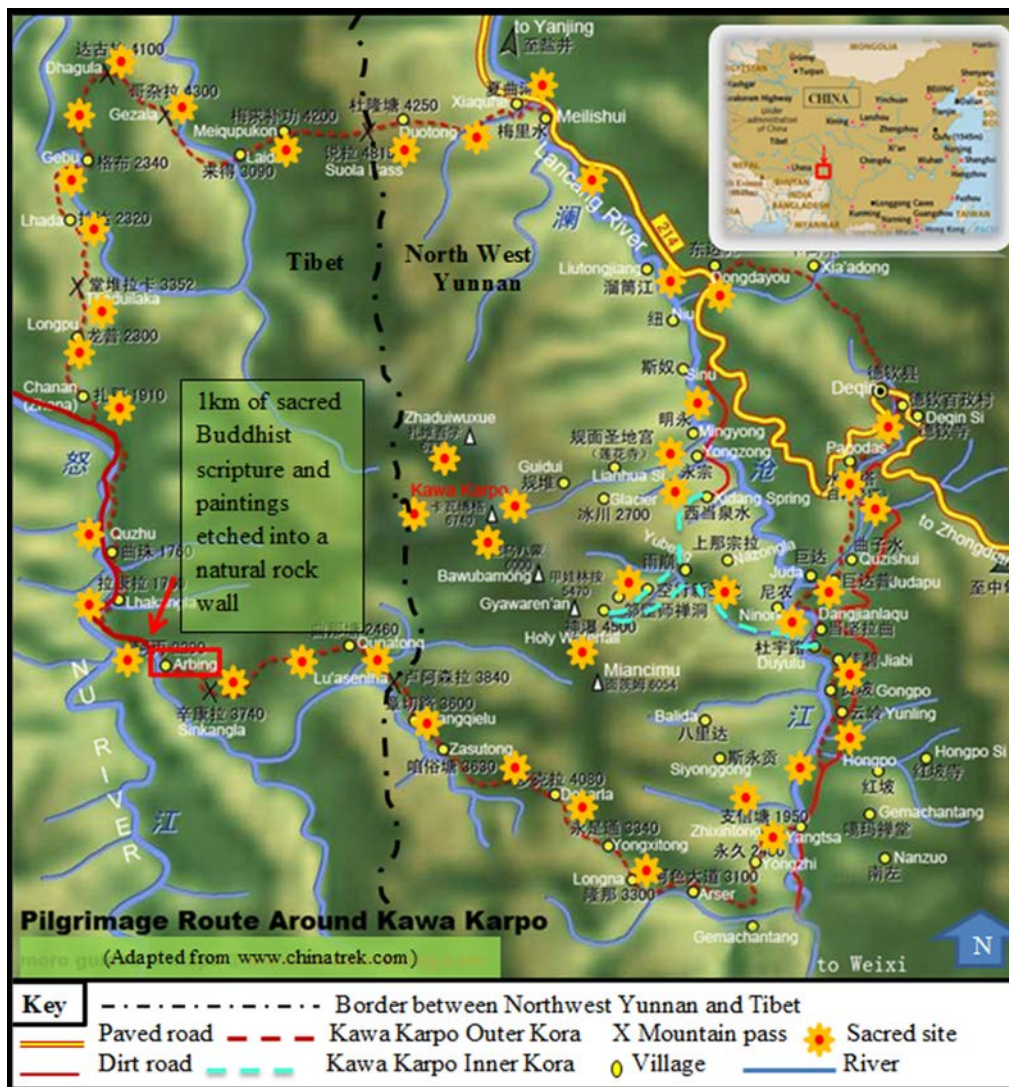


Figure I.1 Manang Seasonal Round Diagram (Chaudhary, Aase, and Vetaas 2007:4)

## APPENDIX J: THE *KHA BA DKAR PO KORA* (A.K.A. KAWA KARPO), NORTHWEST YUNNAN AND TIBET

The *Kha ba dkar po* (a.k.a Kawa Karpo or Kawagebo) *Kora* circles one of the 10 sacred mountains of Tibet, Mt. *Kha ba dkar po* (Kawagebo) (**Figure J.1**).



**Figure J.1** Map of Kawa Karpo *Kora*, which circles Mt. Kawa Karpo on the border of Northwest Yunnan and Tibet (adapted from <http://www.chinatrekking.com/maps/yunnan-maps/kawa-karpo-pilgrimage-route-map>)

The *Kora* begins in Northwest Yunnan, crosses a mountain range, and enters the Salween River Valley in Tibet (see **Figure J.1**). The Chinese built a dirt road leading to Lhasa along the

Nu River (a.k.a. Salween) on the Tibetan side of the *kora* (see **Figure J.1**). Groups of pilgrims pay a nominal fee to crowd into the back of trucks travelling the road (**Figure J.2**). This saves a day of walking, but it also means the pilgrims no longer stop at several of the 80 sacred sites (**Figures J.3 – J.5**) along the *kora* (personal observation, July 30 – August 17, 2009).



**Figure J.2** Tibetan pilgrims on the Kawa Karpo Kora loading in a truck for a portion of the *kora* (R. E. Beazley 2009)



**Figure J.3** A Tibetan Buddhist monk placing his hand over the handprint the Karmapa (a Buddhist saint) left in the rock, one of the sacred spots pilgrims miss when travelling by vehicle rather than on foot. (R. E. Beazley 2009)



**Figure J.4** A pilgrim praying along the half kilometer of rock etchings near Arbing (see **Figure F.1**), a sacred spot that pilgrims miss when travelling by vehicle. (R. E. Beazley 2009)



**Figure J.5** One of the paintings etched in to the rock wall near Arbing (see **Figure I.1**). (R. E. Beazley 2009)

It is typical for whole families and communities to do this *kora* together. The government allows Tibetan children to take a vacation from school to go with their parents on the *kora* (Tsering Tsdong, Tibetan pilgrim, personal communication July 23, 2009). This shows the significance of this auspicious *kora* and of pilgrimage in the Tibetan worldview. Along the *kora* parents show their children the sacred spots and teach them about their significance (personal observation, July 30, 2009), an important link in traditional knowledge (**Figure J.6**).



**Figure J.6** A Tibetan father teaching his children about the Wheel of Life painting in one of the temples along the Kawa Karpo *Kora*, (R. E. Beazley 2009)

Now, when pilgrims travel by vehicle, I argue that a major cultural shift takes place in both the traditional form of Tibetan Buddhist Himalayan pilgrimage and in the transference of traditional knowledge. Some of the men in the villages compete with each other to see how fast they can complete the *kora*. Now, they can complete what used to be a 10 – 12 days walk in only

5 days by taking vehicles along portions of the *Kora* that are road (Tsering Tsdong, Tibetan pilgrim, pers. comm. August 2, 2009) . One of the high lamas along the Yunnan side of the kora has warned the villagers that this is not the correct way to do a *kora*. Buddhist Pilgrimage scholar Katia Buffetrille (2003:2) states it succinctly:

As a rule, one must walk during a pilgrimage. In the Buddhist world, it is said that the merit obtained is greater if one traverses the pilgrimage route on foot rather than on horseback. Thus, a pilgrimage can take a very long time, as pilgrims tend to visit all the sacred sites along their way. The time required is even greater, sometimes taking several years, if the pilgrim performs prostrations along the entire route from the place he begins the pilgrimage to his destination at the holy site. Thus, along the way, pilgrims pass through new regions, encounter others (which sometimes result in weddings), pass on news, and transmit knowledge. Pilgrimage thus serves to transcend the cultural boundaries that crisscross Tibet.

## BIBLIOGRAPHY

- Aase, TF, Ram P Chaudhary, RP, and Vetaas, OR (2010) Farming flexibility and food security under climatic uncertainty: Manang, Nepal Himalaya, *Area* **42**(2):228–238. Retrieved 7/22/10 from <http://onlinelibrary.wiley.com/doi/10.1111/j.1475-4762.2009.00911.x/pdf>
- Aase, TF and Manandhar, N (2007) Reflections on the Origins of Manang Community. In: Chaudhary, RP, Aase, TH, Vetaas, OR and Subedi, BP (Eds.) *Local Effects of Global Changes in the Himalayas: Manang, Nepal* (183-88). Kathmandu, Nepal: Jagadamba Press
- Acharaya, KP (2002) Twenty-four years of community forestry in Nepal, *International Forestry Review* **4**(2):149-56
- Adams, LW (1984) Small mammal use of an interstate highway median strip. *Journal of Applied Ecology* **21**:175–178
- Adhikari, B, Di Falco, S, and Lovett, JC (2004). Household characteristics and forest dependency: Evidence from common property forest management in Nepal. *Ecological Economics*, **48**(2):245-257
- Adhikari, J (2008) *Changing Livelihoods: Essays on Nepal's Development since 1990*. Kathmandu, Nepal: Martin Chautari Press
- Allan, N (1986) Accessibility and altitudinal zonation models of mountains, *Mountain Research and Development* **6**(3):185-194.
- Alt, KW, Burger, J, Simons, A, Schon, W, Grupe, G, Hummel, S, Grosskopf, B, Vach, W, Tellez, CB, and Fischer, C-H (2003) Climbing into the past—first Himalayan mummies discovered in Nepal. *Journal of Archaeological Science* **30**:1529–1535
- Ahmad, F, Joshi, S, and Gurung, M (2003) *Indigenous Honeybees of the Himalayas: The Himalayan Cliff Bee *Apis laboriosa* Smith and the Honey Hunters of Kaski* (Volume 1). Kathmandu: ICIMOD
- Amrhein, C, Strong, JE and Mosher, PA (1992) Effect of deicing salts on metal and organic matter mobilization in roadside soils. *Environment Science Technology* **26**:703–9
- Andrews, A (1990) Fragmentation of habitat by roads and utility corridors: a review. *Australian Zoologist* **26**:130–141.
- Annapurna 1:100,000 (1993) Map of Annapurna, Nepal-Kartenwerk der Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung Nr. 9. Munich:Arbeitsgemeinschaft für vergleichende Hochgebirgsforschung.
- Aruga, K, Sessions, J, and Miyata, E (2005) Forest road design with soil sediment evaluation using high-resolution DEM. *Journal of Forestry Resources* **10**:471-479

- [ADB] Asian Development Bank (2010) *Overview of Gender Equality and Social Inclusion in Nepal*. Retrieved 7/12/11 from <http://www.adb.org/sites/default/files/pub/2010/cga-nep-2010.pdf>
- [ADB] Asian Development Bank (2008) *ADB, Roads, and HIV/AIDS: A resource book for the transport sector*. Retrieved 6/11/10 from <http://www.adb.org/Documents/Books/ADB-HIV-Toolkit/ADB-HIV-Toolkit.pdf>
- [ADB] Asian Development Bank (2006) *Reaching the Poor: Strengthening Inclusive Road Development and Management*. Retrieved 6/5/10 from <http://www.adb.org/PRF/prc-areawide-road-network.pdf>
- Ayers, JM, De Magalhes Lima, D, De Souza Martins, E, and Barrieros, JLK (1991) On the Track of the Road: Changes in Subsistence Hunting in a Brazilian Amazonian Village. In: Robinson, J G and Redford, K H (Eds.) *Neotropical Wildlife Use and Conservation*, (82-92) Chicago: University of Chicago Press.
- Bajracharya, SB, and Dahal, N (Eds.) (2008) *Shifting Paradigms in Protected Area Management*. Kathmandu: NTNC. Retrieved 5/2/10 from [http://www.ntnc.org.np/sites/default/files/publicaations/Book\\_Final\\_Verson.pdf](http://www.ntnc.org.np/sites/default/files/publicaations/Book_Final_Verson.pdf)
- Bajracharya, SB, and Lama, AK (2008) Linking Tourism to Biodiversity Conservation: A Paradigm Shift in Protected Area Management. In: Bajracharya, S B and Dahal, N (Eds) *Shifting Paradigms in Protected Area Management* (107-117), Kathmandu: NTNC. Retrieved 5/2/10 from [http://www.ntnc.org.np/sites/default/files/publicaations/Book\\_Final\\_Verson.pdf](http://www.ntnc.org.np/sites/default/files/publicaations/Book_Final_Verson.pdf)
- Bajracharya, D, Bhujju, DR and Pokhrel, JR (2006) *Science, Research, and Technology in Nepal*. United Nations Educational, Scientific and Cultural Organization (UNESCO) Report, Kathmandu, Nepal: UNESCO. Retrieved 6/13/10 from <http://unesdoc.unesco.org/images/0014/001461/146117e.pdf>
- Baker, B and Moseley, R (2007) Advancing tree line and retreating glaciers: Implications for conservation in Yunnan, P.R. China, *Arctic, Antarctic and Alpine Research*, **39**(2):200–209
- Baldwin, A. (2008) *The Army Corps of Engineers: A History*, Defense Dept., Army, Corps of Engineers, Office of History. Retrieved 4/9/12 from [http://publications.usace.army.mil/publications/eng-pamphlets/EP\\_870-1-68\\_pfl/toc.htm](http://publications.usace.army.mil/publications/eng-pamphlets/EP_870-1-68_pfl/toc.htm)
- Baral, N, Stern, M, and Bhattarai, R (2008) Contingent valuation of ecotourism in Annapurna Conservation Area, Nepal: Implications for sustainable park finance and local development, *Ecological Economics*, **66**(2–3):218-227
- Baral, N, and Heinen, J (2006) The Maoist people's war and conservation in Nepal. *Politics and the Life Sciences* **24**(1–2):2–11

- Basnyat, S (2003, December 12) Making eco-tourism work for the people. *Nepali Times*. Retrieved on 5/23/10 from, <http://www.nepalitimes.com/issue/2003/12/12/Nation/5974>
- Becker, A, Körner, C, Gurung, AB, and Haeberli W (2007). Selected issues from the Samedan GLOCHAMORE Workshop on Altitudinal Gradient Studies. *Mountain Research and Development*, **27**(1):82-86.
- Becquelin, N (2000) Xinjiang in the Nineties. *The China Journal* **44**:65-90
- Berkes, F (2012) *Sacred Ecology*, 3<sup>rd</sup> ed., New York: Routledge.
- Berkes, F (2010) Shifting perspectives on resource management: resilience and the reconceptualization of 'natural resources' and 'management'. *MAST Maritime Studies* **9**:11-38.
- Berkes, F (2009) Indigenous ways of knowing and the study of environmental change *Journal of the Royal Society of New Zealand*, **39**(4):151-156
- Berkes, F, Colding, J and Folke, C (2003). *Navigating Social-ecological Systems: Building Resilience for Complexity and Change*. Cambridge, UK: Cambridge University Press:.
- Berkes, F, and Folke, C (2002). Back to the future: Ecosystem dynamics and local knowledge. In: Gunderson, LH and. Holling, CS (Eds.) *Panarchy: Understanding Transformations in Human and Natural* (121-146). Washington, DC: Island Press
- Berkes, F, Colding, J and Folke, C (2000) Rediscovery of traditional ecological knowledge as adaptive management, *Ecological Applications*, **10**(5):1251–1262
- Bezruchka, S and Lyons, A (2011) *Trekking Nepal: A Traveler's Guide*, Eighth edition, Seattle, Washington: The Mountaineers Books
- Bhandari, S (2010, May 7) Tourists hit by Maoist shutdown in Nepal. *Vancouver Sun*. Retrieved on 5/3/10 from, <http://www.vancouversun.com/travel/Tourists+Maoist+shutdown+Nepal/2984267/story.html>
- Bhattarai, K, Conway, D and Shrestha, N (2005) Tourism, terrorism and turmoil in Nepal, *Annals of Tourism Research*, **32**:669–688.
- Bhujju, RB, Shakya PR, Basnet TB and Shrestha S (2007) *Nepal Biodiversity Book: Protected Areas, Ramsar Sites, and World Heritage Sites*. Kathmandu: ICIMOD. Retrieved 5/27/10 from <http://books.icimod.org/demo/index.php/search/subject/2/15>
- Bista D B (1987) *People of Nepal*. Kathmandu: Ratna Pustak Bhandar.
- Blaikie, P, Cameron, J, and Seddon, D (1977) *The Effects of Roads in West Central Nepal, Part I (Summary)*. A report to the Economic and Social Committee for Overseas Research, Ministry of Overseas Development. East. Anglia, UK:Overseas Research Group , University of East Anglia

- Blaikie, P, Cameron, J, Feldman, D, Fournier, A, and Seddon, D (1976) *The Effects of Roads in West Central Nepal*. A report to the Economic and Social Committee for Overseas Research, Ministry of Overseas Development. East. Angila, UK:Overseas Research Group , University of East Anglia
- Bleie, T (2003) Pilgrim tourism in the Central Himalayas The case of Manakamana Temple in Gorkha, Nepal, *Mountain Research and Development*, **23**(2):177–184.
- Bonham, C, Edmonds, C, and Mak, J (2006) *The Impact of 9-11 and Other Terrible Global Events on Tourism in the US and Hawaii*, East West Center Working Papers, Economic Series, No. 87, February, 2006. Retrieved 5/1/12 from <http://scholarspace.manoa.hawaii.edu/bitstream/handle/10125/3683/ECONwp087.pdf?sequence=1>
- [BBC] British Broadcasting Corporation (2001, June 1) *Nepal Royal Family Massacred*. Retrieved 5/23/10 from, [http://news.bbc.co.uk/onthisday/hi/dates/stories/june/1/newsid\\_3987000/3987183.stm](http://news.bbc.co.uk/onthisday/hi/dates/stories/june/1/newsid_3987000/3987183.stm)
- [BBC] British Broadcasting Corporation (2003, November 12) *Nepal Gunmen Rob Western Trekkers* Retrieved 5/ 23/10 from, [http://news.bbc.co.uk/1/hi/world/south\\_asia/3264357.stm](http://news.bbc.co.uk/1/hi/world/south_asia/3264357.stm)
- Brown, D (2001) Characterizing the human imprint on landscapes for ecological assessment In: Jensen, ME and Bourgeron, PS (Eds.) *A Guide for Integrated Ecological Assessments* (404-415). New York: Springer-Verlag
- Brushett, S and Osika, JS (2005) *Lessons Learned to Date from HIV/AIDS Transport Corridor Projects*. World Bank Global HIV/AIDS Program. Retrieved on 6/11/10 from <http://siteresources.worldbank.org/INTHIVAIDS/Resources/375798-1103037153392/Transport.pdf>
- Buffetrille, K (2003) *The Evolution of a Tibetan Pilgrimage: The Pilgrimage to Amnye Machen Mountain in the 21st Century*, 21st Century Tibet Issue. Symposium on Contemporary Tibetan Studies. Taipei, Taiwan. Retrieved 7/8/10 from [www.case.edu/affil/tibet/tibetanNomads/documents/Taiwan\\_art.doc](http://www.case.edu/affil/tibet/tibetanNomads/documents/Taiwan_art.doc)
- Buntaine, MT, Mullen, RB, and Lassoie JP (2007). Human use and conservation planning in alpine areas of northwestern Yunnan, China. *Environment, Development, and Sustainability*, **9**(3):305–324
- Calvo, CM (1998) *Options For Managing and Financing Rural Transport Infrastructure*. World Bank Technical Paper No. 411 Washington DC: World Bank. Retrieved 2/8/10 from <http://www.ingentaconnect.com/content/wb/295/1998/00000001/00000001/art00001>

- Byg, A., Salick, J and Law, W (2010). Medicinal Plant Knowledge among Lay People in Five Eastern Tibet Villages. *Human Ecology* **38**:177-191.
- Byg, A. and Salick, J (2009). Local perspectives on a global phenomenon—Climate change in Eastern Tibetan villages. *Global Environmental Change* **19**:156-166
- Carson, B (1985) *Erosion and Sedimentation Processes in the Nepalese Himalaya*. ICIMOD Occasional Paper No.1. Kathmandu: ICIMOD. Retrieved 6/15/10 from <http://books.icimod.org/index.php/search/subject/15/45>
- [CIA] Central Intelligence Agency (2010) *World Fact Book Nepal*. Retrieved 5/28/10 from <https://www.cia.gov/library/publications/the-world-factbook/geos/np.html>
- Chaudhary, RP, Paudel, KC and Koirala K (2009) *Nepal Fourth National Report to the Convention on Biodiversity*. Kathmandu: GoNMFSC. Retrieved 5/25/10 from [http://www.forestrynepal.org/publications/country\\_reports](http://www.forestrynepal.org/publications/country_reports)
- Chaudhary, RP, Aase, TH and Vetaas, OR (2007) Globalization and Peoples' Livelihood: Assessment and Prediction for Manang, Trans-Himalayas, Nepal. In: Chaudhary, RP, Aase, TH, Vetaas, OR and Subedi, BP (Eds) *Local Effects of Global Changes in the Himalayas: Manang, Nepal* (183-88).Kathmandu: Tribhuvan University: Jagadamba Press.
- Chaudhary, RP, Aase, TH, Vetaas, OR and Subedi, BP (Eds) (2007) *Local Effects of Global Changes in the Himalayas: Manang, Nepal* (183-88).Kathmandu: Tribhuvan University: Jagadamba Press.
- Chaudhary, RP (2000) Forest conservation and environmental management in Nepal: a review. *Biodiversity and Conservation* **9**:1235–1260
- Clarke, J (1989) Hindu Trading Pilgrims, In: McKay, AC (Ed.) *Pilgrimage in Tibet* (52-70), Surrey, UK: Curzon Press
- Cook, CT, Duncan, SJ, Anil, S and Wu, G (2005), *Assessing the Impact of Transport and Energy Infrastructure on Poverty Reduction*, Manila: Asian Development Bank, Retrieved 6/6/10 from <http://www.adb.org/Documents/Reports/Assessing-Transport-Energy/assessing-transport-energy.pdf>
- Cook, C (1991) Social Analysis in Rural Road Projects. In: Cerena, MK (Ed.) *Putting People First: Sociological Variables in Rural Development* (Chapter 11:397-494), Cambridge, UK: Oxford University Press
- Cottle, D and Keys, A (2007) The Maoist conflict in Nepal: a Himalayan perdition? *Australian Journal of International Affairs*, **61**(2):168 — 174. Retrieved 5/31/10 from <http://dx.doi.org/10.1080/10357710701358337>

- [CEQ] Council on Environmental Quality (1974). *The Fifth Annual Report of the Council on Environmental Quality*. US GPO. Washington, DC. Retrieved 5/23/10 from <http://www.eric.ed.gov/PDFS/ED116921.pdf>
- Cowie, ID and Warner, PA (1993) Alien plant species invasive in Kakadu National Park, Tropical Northern Australia. *Biological Conservation* **63**:127–135.
- Crane, E (1991) *The World History of Beekeeping and Honey Hunting* (284). New York: Routledge
- Craw, H (1943) The Burma Road, *The Geographical Journal*, **99**(5/6):238-246. Retrieved 12/20/11 from <http://www.jstor.org/stable/1789413>
- Cruikshank, J (1985) The Gravel Magnet: Some Social Impacts of the Alaska Highway on Yukon Indians. In: Coates, K (Ed.) *The Alaska Highway: Papers of the 40<sup>th</sup> Anniversary Symposium* (172-187). Vancouver: University of British Columbia Press
- Cui, BS, Hu B, Zhai HJ, Wei, G, and Wang, J (2007) Study on the interaction between engineering construction and ecosystem changes in the Longitudinal Range-Gorge Region, *Chinese Science Bulletin* **52**(Supp. II):21-32.
- Dahal, RK, Hasegawa, S, Nonomura, A, Yamanaka, M, Dhakal, S and Paudyal, P (2008) Predictive modeling of rainfall-induced landslide hazard in the Lesser Himalaya of Nepal based on weights-of-evidence, *Geomorphology* **102**:496-510
- Dahal, RK, Hasegawa, S, Masuda, T and Yamanaka, M (2006) Roadside slope failure in Nepal during torrential rainfall and their mitigation. In: Marui, H and Mikoš, M (Eds.) *Disaster Mitigation of Debris Flows, Slope Failures and Landslides*, Proceedings of the INTERPRAEVENT International Symposium Disaster Mitigation of Debris Flows, Slope Failures and Landslides held on September 25-27, 2006 in Niigata, Japan. Retrieved 2/2/10 from [http://www.interpraevent.at/palm-cms/upload\\_files/Publikationen/Tagungsbeitraege/2006\\_2\\_503.pdr](http://www.interpraevent.at/palm-cms/upload_files/Publikationen/Tagungsbeitraege/2006_2_503.pdr)
- Daming, HE, Zhao, W and Chen, L (2004) The ecological changes in Manwan reservoir area and its causes. *Journal of Yunnan University* **26**(3) 220-226 Retrieved on 6/2/10 from <http://www.lancang-mekong.org/Upload/upfile/20051226115012156.pdf>
- Dana, J (2007) “You Don’t Belong Her Sister”: *The politics of Belonging at a Pilgrimage Site*. Proceedings from The Politics of Belonging in the Himalayas: Democracy, Citizenship, and Belonging in the Himalayas. New Delhi, India 19-21 March 2007. Retrieved 6/5/10 from [http://scholar.googleusercontent.com/scholar?q=cache:HMAKIF6UEAQJ:scholar.google.com/&hl=en&as\\_sdt=0,33](http://scholar.googleusercontent.com/scholar?q=cache:HMAKIF6UEAQJ:scholar.google.com/&hl=en&as_sdt=0,33)
- Deoja, BB (1994) *Sustainable Approaches to the Construction of Roads and other Infrastructure in the Hindu Kush-Himalayas*. International Centre for Integrated Mountain Development, Kathmandu: ICIMOD. Retrieved 6/15/10 from <http://books.icimod.org/index.php/search/subject/25/60>

- Deyer, JT (2003) Economic development in Tibet under the People's Republic of China. *Journal of Contemporary China*, **12**(36):411-430.
- Dhundup, T, Kvaerne, P, Reynolds, J, Rinpoche, TW, Namdak, LT, Chaoul, MA, Snellgrove, DL (2006) *A Collection of Studies on the Tibetan Bon Tradition*. Retrieved 7/12/10 from <http://www.holybooks.com/wp-content/uploads/A-Collection-Of-Studies-On-The-Tibetan-Bon-Tradition.pdf>
- Dijkshoorn JA and Hunting JRM (2009) *Soil and Terrain Database for Nepal*. Report 2009/01 ISRIC – World Soil Information, Wageningen. Retrieved 5/17/10 from <http://www.isric.org>)
- Dong, SK., Lassoie, J, Yan, ZL, Sharma, Shrestha, E, and Pariya, D (2007) Indigenous rangeland resource management in mountainous areas of northern Nepal: A case study from the Rasuwa District. *The Rangeland Journal* **29**:149-160.
- Edmonds, C and Mak, J (2006) *Terrorism and Tourism in the Asia Pacific Region: Is Travel and Tourism in a New World After 9-11*, East West Center Working Papers, Economic Series, No. 86, February 2006, Retrieved 4/8/12 from <http://scholarspace.manoa.hawaii.edu/bitstream/handle/10125/3697/ECONwp086.pdf?sequence=1>
- Edwards, P, Suwal, R, and Thapa, N (2006) *Upper Mustang Biodiversity Conservation Project: Final Report of the Terminal Evaluation Mission*, United Nations Human Development Programme (UNDP). Retrieved 8/12/10 from <http://erc.undp.org/evaluationadmin/downloaddocument.html?docid=798>
- Ehrhard, F.K. (1993a). Tibetan sources on Muktinath. Individual Reports and normative guides, *Ancient Nepal*. Journal of the Department of Archaeology, **134**: 23-41. Retrieved 5/18/10 from <http://vajrayana.faiweb.com/natha/muktinath.pdf>
- [ERS] Environmental Resources Management (1996) The significance of secondary effects from roads and road transport on nature conservation. *English Nature Research Report No. 178*, (91). Peterborough, Ontario: English Nature. Retrieved 6/3/10 from <http://naturalengland.etraderstores.com/NaturalEnglandShop/R178>
- Evink, GL (2002) *Interaction Between Roadways and Wildlife Ecology: A Synthesis of Highway Practice*. NCHRP Synthesis 305. Transportation Research Board — The National Academies: Washington, DC. Retrieved 5/23/10 from <http://arc-solutions.org/wp-content/uploads/2012/03/Evink-2002-Interaction-between-roadways-and-wildlife-ecology.pdf>
- Fabricius, C., and Koch, E (2004). *Rights, Resources and Rural Development: Community-based natural resource management in Southern Africa*. Earthscan: London

- Fan, S and Chang-Kang, C (2009) Regional road development, rural and urban poverty: Evidence from China, *Transport Policy* **15**:305–314
- Fan, S., and Chan-Kang, C.(2005). *Road development, economic growth, and poverty reduction in China*. Washington, DC: International Food Policy Research Institute. Retrieved 5/25/10 from <http://www.ifpri.org/sites/default/files/publications/rr138.pdf>
- Fan, S, Hazell, P and Thorat, S (1999) *Linkages Between Government Spending, Growth, and Poverty in Rural India*. International Food Policy Research Report No. 110. Washington, D.C. Retrieved 4/13/10 from <http://www.ifpri.org/sites/default/files/pubs/pubs/abstract/110/rr110.pdf>
- Fernando, P and Porter, G (Eds.) (2002) *Balancing the Load: Women, Gender, and Transport*, New York: Zed Books
- Findlay, C S and Bourdages, J (2000) Response time of wetland biodiversity to road construction on adjacent lands. *Conservation Biology*, **14**(1) 86–94.
- Findlay, CS and Houlihan, J (1997) Anthropogenic correlates of species richness in Southeastern Ontario wetlands, *Conservation Biology*, **11**(4):1000–1009.
- Fisher, RJ (1991). *Studying Indigenous Forest Management Systems in Nepal: Towards a more Systematic Response*. Environment and Policy Institute, Working Paper No. 30. East-West Centre, Honolulu: East West Centre.
- Fisher, RJ (1990). Institutional incompatibility in community forestry: The case of Nepal. In: Fox, JF and Fisher, RJ (Eds.) *Community Organisations and Government Bureaucracies in Social Forestry*. Environment and Policy Institute, Working Paper No. 22. East-West Centre, Honolulu: East West Centre.
- Flower J (2004) A Road Is Made: Roads, Temples, and Historical Memory in Ya'an County, Sichuan, *The Journal of Asian Studies*, **63**(3):649-685.
- Folke, C (2004) Traditional knowledge in social–ecological systems. *Ecology and Society* **9**(3):7
- Folke C, Carpenter S, Elmqvist T, Gunderson L, Holling CS, and Walker B (2002). Resilience and sustainable development: Building adaptive capacity in a world of transformations. *AMBIO: A Journal of the Human Environment*, **31**(5):437–440
- Folke C., J. Colding, and F. Berkes, (2002). Synthesis: Building resilience for adaptive capacity in social-ecological systems. In: Berkes F., J. Colding, and C. Folke (Eds). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change* (352-387). Cambridge, UK: Cambridge University Press.

- Food and Agriculture Organization (FAO) (2010) *Global Forest Resources Assessment (FRA) 2010 Country Report Nepal*. FRA 2010/144. Retrieved 5/30/10 from <http://www.fao.org/forestry/20262-1-35.pdf>
- Forbes, A (1999) The importance of being local: Villagers, NGOs, and the world bank in the Arun valley, Nepal, *Identities*, **6**(2):319 — 344. Retrieved 6/25/10 from <http://dx.doi.org/10.1080/1070289X.1999.9962647> .
- Forman, R, Sperling, D, Bissonette, J, Clevenger, A, Cutshall, D, Fahrig, L, France, R, Goldman, C, Heanue, K, Jones, J, Swanson, F, Turrentine, T, and Winter, T (2002) *Road Ecology*, Washington, DC: Island Press:
- Forman, RT (2000) Estimate of the Area Affected Ecologically by the Road System in the United States, *Conservation Biology*, **14**(1):31-35
- Forman, R T and Alexander, L E (1998) Roads and their major ecological effects. *Annual Review of Ecological Systems* **29**:207-31
- Fricke, T (1989) Introduction: Human ecology in the Himalaya, *Human Ecology* **17**(2):131-145
- Fürer-Haimendorf, Christoph von (1983) Bhotia highlanders of Nar and Phu. *Kailash* **10**(1–2):64–117. Retrieved 6/20/10 from <http://www.digitalhimalaya.com/collections/journals/kailash/>
- Fürer-Haimendorf, Christoph von (1975) *Himalayan Traders: Life in Highland Nepal*. London: John Murray.
- Gachassin, M, Najman, B, and Raballand, G (2010) *The Impact of Roads on Poverty Reduction A Case Study of Cameroon*, Policy Research Working Paper No. 5209, The World Bank Africa Region Transport Unit. Retrieved 6/22/11 from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1559726##](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1559726##)
- Gautam, KH (1987). Legal authority of forest user group, *Banko Jankari*, **1**(4):1–4. Retrieved 6/16/10 from <http://www.odi.org.uk/resources/libraries/forestry-grey-literature/gautam.pdf>
- Ghimire, S., McKey, D., Aumeeruddy-Thomas, Y (2005) Heterogeneity in ethnoecological knowledge and management of medicinal plants in the Himalayas of Nepal: implications for conservation. *Ecology and Society* **9**(3):6
- Ghimire, SK and Parajuli, DB (2001) Indigenous knowledge and practice on pasture resource management: Among the Pugmo People of Shey Phukshendo National Park, Dolpa, *Wildlife Magazine*, **3**(10):7-14. Retrieved 6/2/2010 from <http://nepjol.info/index.php/OPSA/article/download/1114/1592>

- Ghimire, SK, Shah, JP, Shrestha, KK, and Bajracharya, D (1999) Ecological study of some high altitude medicinal and aromatic plants in the Gyasumdo Valley, Manang, Nepal. *Ecoprint* **6**(1):17-25.
- Gibson, J and Rozelle, S (2003) Poverty and access to roads in Papua New Guinea, *Economic Development and Cultural Change*, **52**(1):159-185
- Giersch, CP (2010) Across Zomia with merchants, monks, and musk: process geographies, trade networks, and the Inner-East–Southeast Asian borderlands, *Journal of Global History* **5**:215–239
- Gill, G (2003) *Seasonal Labour Migration in Rural Nepal: A Preliminary Overview*. Working paper 218, Overseas Development Institute, Retrieved on 6/1/10 from <http://www.odi.org.uk/resources/download/1783.pdf>
- Gilio, B (1986) Warfare in Polonoeste, *Cultural Survival Quarterly* **10**(2). Retrieved 6/10/10 from <http://www.culturalsurvival.org/publications/cultural-survival-quarterly/brazil/warfare-polonoeste>
- Gilmour, DA, King, GC, and Hobley, M (1989). Management of forests for local use in the hills of Nepal 1.Changing forest management paradigms. *Journal of World Forest Resource Management*, **4**:93–110
- Gobyn, W (2009) From war to peace: The Nepalese Maoists's strategic and ideological thinking, *Studies in Conflict and Terrorism*, **32**(5):420 — 438. Retrieved 5/31/10 from <http://dx.doi.org/10.1080/10576100902831578>
- Goldstein, MC and Messerschmidt, DA (1980) The significance of latitudinality in Himalayan Mountain ecosystems. *Human Ecology* **8**(2):117-133
- [GoN/MPPW/DoR] Government of Nepal Ministry of Physical Planning and Works, Department of Roads (2008a) District Road Maps, Kathmandu: HMIS Unit DOR
- [GoN/MPPW/DoR] Government of Nepal Ministry of Physical Planning and Works, Department of Roads (2008b) *Statistics of Strategic Road Network SSRN 2006/07*. Kathmandu: HMIS Unit DOR.
- [GoN/MTCA] Government of Nepal/Ministry of Tourism and Civil Aviation (2010) *Summary of Tourism Scenario 2010*. Retrieved 6/23/10 from <http://www.tourism.gov.np/uploaded/statistics2010.pdf>
- [GoN/MTCA] Government of Nepal/Ministry of Tourism and Civil Aviation (2008) *Nepal Tourism Statistics 2008:Annual Statistical Report*, Kathmandu: GoN/MTCA. Retrieved 5/12/10 from <http://www.tourism.gov.np/tourismstatistics.php>

- [GoN/NPCS/CBS] Government of Nepal/National Planning Commission Secretariat/Central Bureau of Statistics (2008) *Nepal in Figures 2008*. Retrieved 5/15/10 from [www.cbs.gov.np](http://www.cbs.gov.np)
- [GoN/NPCS/CBS] Government of Nepal/National Planning Commission Secretariat/Central Bureau of Statistics (2001a) *Average Agricultural Holding Size Map* (2001 data) Retrieved 6/22/10 from <http://www.cbs.gov.np/maps.php>
- [GoN/NPCS/CBS] Government of Nepal/National Planning Commission Secretariat/Central Bureau of Statistics (2001b) *Caste Ethnicity Population 2001*. Retrieved 5/22/10 from [http://www.cbs.gov.np/population\\_caste.php](http://www.cbs.gov.np/population_caste.php)
- Graafen, R and Seeber, C (1992-93) Important trade routes in Nepal and their importance to the settlement process, *Ancient Nepal*, Number 130-133:34-38. Retrieved 6/15/2010 from [http://himalaya.socanth.cam.ac.uk/collections/journals/ancientnepal/pdf/ancient\\_nepal\\_130-133\\_05.pdf](http://himalaya.socanth.cam.ac.uk/collections/journals/ancientnepal/pdf/ancient_nepal_130-133_05.pdf)
- Graafen, R (1997) Trade and Trading Villages between Tibet and the Lowlands: The Districts of Mustang and Kaski. In: Strellrech, I and Winiger, W (Eds.) *Perspectives on History and Change in the Karakorum, Hindukush, and Himalaya*. Vol. 3 (71-79). Köln: Rüdiger Köppe Verlag.
- Graner (2001) Labor markets and migration in Nepal. *Mountain Research and Development* 21(3):253-259.
- Gregson, J (1997) *Bullet up Grand Trunk Road*, Sinclair-Stevenson Ltd: London
- Grootaert, C (2002) *Socioeconomic Impact Assessment of Rural Roads: Methodology and Questionnaires*, The Roads and Rural Transport TG and the Transport Economics and Poverty TG. Retrieved 5/3/10 from [http://siteresources.worldbank.org/INTISPM/Resources/383704-1153333441931/11274\\_Cgrootaert-Impact-Rural\\_Roads\].pdf](http://siteresources.worldbank.org/INTISPM/Resources/383704-1153333441931/11274_Cgrootaert-Impact-Rural_Roads].pdf)
- Guillet, D, Godoy, RA, Guksch, CF, Kawakita, J, Love, TF, Matter, M, and Orlove, BS (1983) Toward a cultural ecology of mountains: The Central Andes and the Himalayas compared [and comments and reply], *Current Anthropology*, 24(5):561-574.
- Gurung, A (2006) (Ed.) *Global Change and Mountain Regions Research Strategy 2005*, Zurich:ADAG. Retrieved 7/23/10 from [http://www.epbrs.org/PDF/GLOCHAMORE\\_Research\\_Strategy\\_color.pdf](http://www.epbrs.org/PDF/GLOCHAMORE_Research_Strategy_color.pdf)
- Gurung, CP (1993) Conservation for sustainable development: Myth or reality? A Case of the Annapurna Conservation Area Project, Nepal. *Himalayan Research Bulletin* 13(1-2)
- Gurung CP and De Coursey, MD (1994) The Annapurna Conservation Area Project: A Pioneering Example of Sustainable Tourism? In: Cater E and Lowman G (Eds.) *Ecotourism: A Sustainable Option?* New York: Wiley and Sons.

- Gurung, G and McVeigh, C (2000) Pastoral Management and Yak Rearing in Manang's Nar-Phu Valley. In: Jianlin, H, Richard, C, Hanotte, O, McVeigh, C, and Rege, J (Eds.) *Yak production in central Asia highlands* (104-119). Proceedings of the third international congress on yak held in Lhasa, P.R. China, 4-9 September 2000. Retrieved 6/20/10 from <http://www.platauperspectives.org/pubs/Yak%20conference.pdf>
- Gurung, H (2004a) *Landscape Change in the Nepal Hills: Evidence from Lamjung*. Kathmandu: ICIMOD. Retrieved 5/25/10 from [http://books.icimod.org/uploads/tmp/icimod-landscape\\_change\\_in\\_the\\_nepal\\_hills\\_evidence\\_from\\_lamjung.pdf/](http://books.icimod.org/uploads/tmp/icimod-landscape_change_in_the_nepal_hills_evidence_from_lamjung.pdf/)
- Gurung, H (2004b) *Mountain Reflections*. Kathmandu: Mandala.
- Gurung, H (1998) *Nepal Social Demography and Expressions*, Kathmandu: New ERA
- Gurung, H (1997) State and Society in Nepal. In: Gellner, G, Pfaff-Czanecka, J and Whelpton, J (Eds.) *Nationalism and Ethnicity in a Hindu Kingdom: The Politics and Culture of Contemporary Nepal*. Amsterdam:Routledge
- Gurung, H (1980) *Vignettes of Nepal*. Kathmandu: Sajha Prakashan
- Gurung H, Gurung Y and Chidi CL (2006) *Nepal Atlas of Ethnic and Caste Groups*. Kathmandu: National Federation for Development of Indigenous Nationalities.
- Gurung NJ (1977) An ethnographical note on Nar-Phu Valley. *Kailash* 5(3):230-244 Retrieved 6/20/10 from <http://www.digitalhimalaya.com/collections/journals/kailash/>
- Gurung, NJ (1976) An Introduction to the socio-economic structure of Manang District. *Kailash* 4(3):295-311. Retrieved 6/20/10 from <http://www.digitalhimalaya.com/collections/journals/kailash/>
- Gutschow (1999) Pilgrimage and Space: *The Definatory Purpose of Pilgrimage Routes: Case Studies from Bhaktapur, Kag and Muktinath (Nepal) and Varanasi*. Contribution for the Proceedings of the Conference "Pilgrimage and Complexity" at Indira Gandhi National Centre for the Arts in New Delhi, 5-9 January 1999. Retrieved 8/1/10 from <http://www.colorado.edu/Conferences/pilgrimage/papers99/Gutschow.html>
- Gyanendra Bir Bikram Shah Dev (2005, February 1) *Proclamation to the Nation from his Majesty King Gyanendra Bir Bikram Shah Dev*, 1 February, 2005. Retrieved 5/28/ 11 from <http://www.satp.org/satporgtp/countries/nepal/document/papers/05emergencyking.htm>
- Hagen, T (1998) *Nepal: The Kingdom in the Himalayas*. Lalitpur, Nepal: Himal Books
- Hagen, T (1994) *Building Bridges to the Third World: Memories of Nepal 1950-1992*. Delhi:Book Faith India.
- Hamilton, FB (1819) *An Account of the Kingdom of Nepal and of the Territories Annexed to this Dominion by the House of Gorkha*, London, UK: Richard Marquis Wellesley, K.G. Gutenberg eBook #3036. Retrieved 7/10/10 from <http://www.satp.org/satporgtp/countries/nepal/document/papers/05emergencyking.htm>

- Hamilton, LS and Bruijnzeel, LA (1997) Mountain watersheds-integrating water, soils, gravity, vegetation, and people. In: Messerli, B and Ives, J (Eds.) *Mountains of the World: a Global Priority* (337-370). New York: Parthenon Publishing
- Hasegawa, S, Dahal, RK, Yamanaka, M, Bhandary, NP, Yatabe, R and Inagaki, H (2009) Causes of large-scale landslides in the Lesser Himalaya of Central Nepal. *Environmental Geology* **57**:1423-1434
- Harman, W (2004) Hindu Devotion. In: Rinehart, R (Ed.) *Contemporary Hinduism: Ritual, Culture, and Practice* (99-122). Santa Barbara, California: ABC-CLIO, Inc.
- Harris, LD and Scheck, J (1991) From Implications to Applications: the Dispersal Corridor Principle Applied to the Conservation of Biological Diversity. In: Saunders, DA, and Hobbs, RJ (Eds.), *Nature Conservation 2: The Role of Corridors*. (189–220). Surrey Beatty, Australia: Chipping Norton.
- Hearn, GJ (2002) Engineering geomorphology for road design in unstable mountainous areas: lessons learnt after 25 years in Nepal, *Quarterly Journal of Engineering Geology and Hydrogeology* **35**:143-154
- Heinen, JT and Rayamajhi, S (2001). Commentary: On the Use of Goal Oriented Project Planning for Protected Area Management in Nepal. *Environmental Practice*, **3**:227-236
- Heinen J T and Kattel B (1992) A review of conservation legislation in Nepal: Past progress and future needs. *Environmental Management* **16**(6):723-733. Retrieved 5/27/10 from <http://www.springerlink.com/content/aq1mt7775153r204/>
- Hettige, H (2006) *When Do Rural Roads Benefit the Poor and How?* Operations Evaluation Department, Asian Development Bank, Manila, Philippines, Retrieved 6/6/10 from [http://www.adb.org/Documents/Books/ruralroad\\_benefits/rural-roads.pdf](http://www.adb.org/Documents/Books/ruralroad_benefits/rural-roads.pdf)
- Hewitt, K (1997) Risk and Disasters in Mountain Lands. In: Messerli, B and Ives, J (Eds.) *Mountains of the World: a Global Priority*. New York: Parthenon Publishing
- [HMGN] His Majesty's Government of Nepal (1996) *Nepal Tourism Statistics*. Kathmandu: HMG Ministry of Tourism.  
<http://www.tourism.gov.np/>
- [HMGN/CBS] His Majesty's Government of Nepal Central Bureau of Statistics (2001) *Area and Population Distribution of Population and Area by Development Regions and Districts, 1981, 1991 & 2001*. Retrieved 5/23/10 from <http://www.cbs.gov.np/>
- [HMGN/MFSC] His Majesty's Government of Nepal Ministry of Forest and Soil Conservation (2002) *Nepal Biodiversity Strategy*. Kathmandu: HMGN. Retrieved 6/2/10 from <http://www.ansab.org/UserFiles/Nepal%20Biodiversity%20Strategy%202002.pdf>

- [HMGN/MLD/DoLIDAR] His Majesty's Government of Nepal Ministry of Local Development Department of Local Infrastructure and Agricultural Roads (2005) *Integrated Rural Accessibility Planning: Guideline*. Kathmandu: DoLIDAR. Retrieved 6/12/10 from <http://www.dolidar.gov.np/publication/publication.php>
- [HMGN/MPPW] His Majesty's Government of Nepal Ministry of Physical Planning and Works (2001) *National Transport Policy*. Retrieved 6/13/10 from [http://www.dor.gov.np/documents/4\\_National\\_Transport\\_Policy.pdf](http://www.dor.gov.np/documents/4_National_Transport_Policy.pdf)
- [HMGN/MWT/DOR] His Majesty's Government of Nepal Ministry of Works and Transport, Department of Roads (1985) *Nepal Road Statistics*, Kathmandu: Katunja Press.
- Howe, J (1984), The Impact of Rural Roads on Poverty Alleviation: A Review of the Literature. In: Howe, J and Richards, P (Eds.) *Rural Roads and Poverty Alleviation* (Chapter III: 48-81) Boulder, Colorado: Westview Press.
- Hrabovszky, JP and Miyan, K (1987) Population, growth, and land use in Nepal "The Great Turnabout", *Mountain Research and Development*, 7(3), Proceedings of the Mohonk Mountain Conference: The Himalaya-Ganges Problem, 264-270. Retrieved 5/28/10 from <http://www.jstor.org/stable/3673203>
- Huber, T (1999) *The Cult of Pure Crystal Mountain: Popular Pilgrimage and Visionary Landscape in Southeast Tibet*. New York: Oxford University Press.
- Huggel C, Zraggen-Oswald S, Haerberli W, Käab A, Polkvoj A, Galushkin I, and Evans SG. (2005). The 2002 rock/ice avalanche at Kolka/Karmadon, Russian Caucasus: Assessment of extraordinary avalanche formation and mobility and application of QuickBird satellite imagery. *Natural Hazards and Earth System Sciences* 5:173-187
- Huggel C, Käab A, Salzmann N (2004). GIS-based modeling of glacial hazards and their interactions using Landsat-TM and IKONOS imagery, *Norwegian Journal of Geography* 58(2):61-73.
- Iijima, S (1977) Ecology, Economy, and Cultural Change Among the Thakalis in the Himalayas of Nepal. In: Iijima, S (Ed.) *Changing Aspects of Modern Nepal Relating to Ecology, Agriculture and Her People*. Tokyo: Institute for the Study of Languages and Cultures of Asia and Africa.
- Iijima, S (1964) Ecology, economy, and social systems in the Nepal Himalayas, *Developing Economies* 2:91-105
- Inspection Panel (World Bank) (1994) *The Inspection Panel Report on Request for Inspection, Nepal: Proposed Arun III Hydroelectric Project and Restructuring of the Arun III Access Road Project*. Washington, D.C. 16 Dec. Retrieved 6/23/10 from [http://siteresources.worldbank.org/EXTINSPECTIONPANEL/Resources/Investigation\\_Report\\_62195.pdf](http://siteresources.worldbank.org/EXTINSPECTIONPANEL/Resources/Investigation_Report_62195.pdf)
- [ILO] International Labour Organization (2005) *HIV/AIDS and Work, Using the ILO Code of Practice on HIV/AIDS and the World of Work: Guidelines for the Transport Sector*, 2.

- Retrieved 6/11/10 from  
<http://www.ilo.org/public/english/dialogue/sector/papers/transport/transp-hivguidlines.pdf>
- [IRF] International Road Federation (2008) *World Development Indicators*, Switzerland.  
Retrieved 6/10/10 from <http://data.worldbank.org/indicator/IS.ROD.TOTL.KM>
- Ives, J (2004) *Himalayan Perceptions: Environmental Change and the Well-being of Mountain Peoples*. New York: Routledge
- Ives, J and Messerli, B (1989) *The Himalayan Dilemma: Reconciling Development and Conservation*. New York: Routledge
- Jacoby, HG (2000) Access to Markets and the benefits of rural roads. *The Economic Journal* **110**:713-737.
- Jampal, Rabgye Rinpoche (2001) *The Clear Mirror: A Pilgrimage Guide to the Major Sacred Place Chumig Gyatsa ('One Hundred Springs', also known as Muktinath, Nepal)*. Amsterdam: Muktinath Foundation International. Retrieved 10/3/09 from [www.muktinath.org](http://www.muktinath.org)
- Jianchu, Xu and Melik, D (2007) *Towards Community-driven Conservation in Southwest China: Reconciling State and Local Perceptions*, ICRAF Working Paper, Kathmandu, Nepal: Nagarjuna Publication Ltd.
- Jianchu, Xu and Wilkes A (2004). Biodiversity impact analysis in northwest Yunnan, southwest China. *Biodiversity and Conservation* **13**(5):959–983
- Jodha, NS (1997) Mountain Agriculture. In: Messerli, B and Ives, J (Eds.) *Mountains of the world: a global priority* (313-369). New York: Parthenon Publishing
- Joshi S, Ahmad, F and Gurung, M (2004) Status of *Apis laboriosa* populations in Kaski district, western Nepal: Indigenous Honeybee Project, ICIMOD, *Journal of Apicultural Research* **43**(4):176–180.
- Kafle, GP (1992) Salient features of bee keeping in Nepal. In: Verma, LR (Ed.), *Honeybees in Mountain Agriculture*, (155-162). ICIMOD, Boulder: Westview Press.
- Kafle, MP (2007) *Nepal: Enhancing Poverty Reduction Impact of Road Projects*. Asian Development Bank (ADB) Report Retrieved 6/2/10 from <http://www.adb.org/Documents/Produced-Under-TA/39525/39525-NEP-DPTA.pdf>
- Kanel. KR (2005) *Current Status of Community Forestry in Nepal*. Regional Community Forestry Training Center for Asia and the Pacific Bangkok, Thailand. Retrieved 4/20/2009 from [http://www.recoftc.org/site/uploads/content/pdf/Nepal\\_CF\\_Profile\\_94.pdf](http://www.recoftc.org/site/uploads/content/pdf/Nepal_CF_Profile_94.pdf)
- Karan, PP, and Iijima, S (1985) Environmental stress in the Himalaya. *Geographical Review* **75** (1): 71-92

- Karkee, M (2008) *Nepal Economic Growth Assessment: Agriculture*, USAID Nepal. Retrieved 8/3/10 from [http://pdf.usaid.gov/pdf\\_docs/PNADN016.pdf](http://pdf.usaid.gov/pdf_docs/PNADN016.pdf)
- Karki,G (2005) *Community Forestry in Nepal: An Ethical Journey to Sustainable Livelihoods is Now at Crossroads?* (A Discussion paper on Ethical Issues of Nepalese Community Forest Management), Community Forest Discussion Paper, University of Joensuu Faculty of Forestry Joensuu, Finland. Retrieved 9/2/10 from [http://www.forestrynepal.org/images/publications/Ethics\\_Gyanendra%20karki\\_2006.pdf](http://www.forestrynepal.org/images/publications/Ethics_Gyanendra%20karki_2006.pdf)
- Kassam, K A, Baumflek, M, Ruelle, M and Wilson, N (2011) Human Ecology of Vulnerability and Adaptation: Case Studies of Climate Change from High Latitudes and Altitudes. In: Blanco, J and Kheradman, H (Eds.) *.Climate Change – Socioeconomic Effects* (217-236). InTech Open Access Publishers.. Retrieved 1/5/12 from [http://cdn.intechopen.com/pdfs/19638/InTech-Human\\_ecology\\_of\\_vulnerability\\_resilience\\_and\\_adaptation\\_case\\_studies\\_of\\_climate\\_change\\_from\\_high\\_latitudes\\_and\\_altitudes.pdf](http://cdn.intechopen.com/pdfs/19638/InTech-Human_ecology_of_vulnerability_resilience_and_adaptation_case_studies_of_climate_change_from_high_latitudes_and_altitudes.pdf)
- Kassam, K-A (2010a). Pluralism, resilience, and the ecology of survival: Case studies from the Pamir Mountains of Afghanistan. *Ecology and Society* **15**(2):8.
- Kassam, K-A (2010b). Coupled socio-cultural and ecological systems at the margins: Arctic and alpine cases. *Frontiers of Earth Science in China*, **4**(1):89-98
- Kassam, K-A, Karamkhudoeva, M, Ruelle, M and Baumflek, M (2010c). Medicinal plant use and health sovereignty: Findings from the Tajik and Afghan Pamirs, *Human Ecology*, **38**(6):817-829
- Kassam, K-A (2009a) *Biocultural Diversity and Indigenous Ways of Knowing: Human Ecology in the Arctic*. Calgary: University of Calgary Press.
- Kassam, K-A (2009b) Viewing change through the prism of indigenous human ecology: Findings from the Afghan and Tajik Pamirs, *Human Ecology*, **37**(6):377-390
- KC, BK, Subedi, G and Gurung, YB (2001) *Nepal Trafficking in Girls With Special Reference to Prostitution: A Rapid Assessment*. International Labour Organization International Programme on the Elimination of Child Labour (IPEC) Report. Retrieved 6/11/10 from [http://www.ilo.org/legacy/english/regions/asro/newdelhi/ipec/download/resources/su\\_bregion/subpubl01eng8.pdf](http://www.ilo.org/legacy/english/regions/asro/newdelhi/ipec/download/resources/su_bregion/subpubl01eng8.pdf)
- Keck, M (1998) Planaflo in Rondonia: The Limits of Leverage. In: Fox, JA (Ed.) *The Struggle for Accountability: The World Bank, NGOs, and Grassroots Movements* (181-218). Cambridge MA: MIT Press.
- Kemp, P H (Ed.) in collaboration with Alff, U, Botsch, F, Butzinski, K, Christians, S, Guth, M, Hoffman, E, Krimmel, T, Kuppers, W, Niedermeier, S, Nolting, B, Popp, C, Rudkowski, H, Schurgens, K, Spieker, R, Stock, V, and Wendel, R. (1984) *The Changing Himalayan Landscape in West Nepal* (Project Report) Berlin:Reimer.

- Khadka, D, Nepal, SK (2010) Local responses to participatory conservation in Annapurna Conservation Area, Nepal, *Environmental Management* **45**:351–362
- Khandari, S (2010, May 7) Tourists hit by Maoist shutdown in Nepal, *Vancouver Sun*. Retrieved on 5/3/10 from <http://www.vancouversun.com/travel/Tourists+Maoist+shutdown+Nepal/2984267/story.html>
- Khandker, SR, Bakht, Z and Koolwal, GB (2010) *The Poverty Impact of Rural Roads: Evidence from Bangladesh*, World Bank Policy, Research Working Paper No. WPS 3875, Retrieved 6/23/11 from [http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2006/03/29/000012009\\_20060329093100/Rendered/PDF/wps38750rev0pdf.pdf](http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2006/03/29/000012009_20060329093100/Rendered/PDF/wps38750rev0pdf.pdf)
- Khanal, N (1996) *Assessment of Natural Hazards in Nepal*. ICIMOD's case study report (unpublished).
- Khanal, S (2009, October 28) Roads to link all district HQs in 3 yrs, *Republica* [Kathmandu] Retrieved 6/13/10 from [http://www.myrepublica.com/portal/index.php?action=news\\_details&news\\_id=11154](http://www.myrepublica.com/portal/index.php?action=news_details&news_id=11154)
- [KMTNC] King Mahendra Trust for Nature Conservation (2004) *King Mahendra Trust for Nature Conservation Annual Report 2004*. KMTNC: Kathmandu. Retrieved 5/30/10 from <http://www.kmtnc.org.np/contact.php>
- [KMTNC] King Mahendra Trust for Nature Conservation (1997) *Annapurna Conservation Area Management Plan*. Kathmandu: KMTNC
- Koch, U (2002) *The Saltmen of Tibet*. A documentary film about the Tibetan tradition of collecting salt from lakes. Berlin: Zeitgeist Video
- Kollmair, M, Manandhar, S, Subedi, B, and Thieme, S (2006) New figures for old stories: Migration and remittances in Nepal. *Migration Letters* **3**(2): 51-160. Retrieved 3/15/10 from [www.migrationletters.com](http://www.migrationletters.com)
- Knörzer (2000) 3000 years of agriculture in a valley of the high Himalayas, *Vegetation History and Archaeobotany*, **9**:219-222
- Kreutzman, H (2004a) Pastoral practices and their transformation in the Northwest Karakoram, *Nomadic Peoples* **8**(2):54-88.
- Kreutzman, H (2004b) Accessibility for High Asia: Comparative perspectives on Northern Pakistan's traffic infrastructure linkages with its neighbours in the Karakoram-Himalaya, *Journal of Mountain Science* **1**(3):193-210.
- Kreutzman, H (2000) Improving Accessibility for Mountain Development: Role of Transport Networks and Urban Settlements. In: Banskota, M., Papola, TS and Richter, J (Eds.), 2000, *Growth, Poverty Alleviation and Sustainable Resource Management in the*

- Mountain Areas of South Asia: Proceedings of the International Conference*, 31 January - 4 February 2000 (485–513). Retrieved 3/15/10 from <http://www.mountainforum.org/rs/ol/searchft.cfm?step=vd&docid=711>
- Kreutzman, H (1991) The Karakoram Highway: The impact of road construction on mountain societies. *Modern Asian Studies* **25**(4) 711-736
- Kung, JK and Lin, JY (2003) The causes of China's Great Leap Famine, 1959-1961, *Economic Development and Cultural Change*, **52**(1):51-73. Retrieved 2/17/10 from <http://www.jstor.org/stable/3203085>
- Lakshmanan, TR (2010) The broader economic consequences of transport infrastructure investments, *Journal of Transport Geography* **19**:1–12
- Lama, T (2002) *Kailash Mandala: Pilgrim's Trekking Guide*, Kathmandu: Humla Conservation and Development Association
- [LPSPT] Landslide and Public Safety Project Team (2001) *Forestry, Landslides and Public Safety: An Issue Paper prepared for the Oregon Board of Forestry by The Landslide and Public Safety Project Team*, Retrieved 6/3/10 from <http://www.oregon.gov/ODF/privateforests/docs/LandslidesPublicSafety.pdf>
- Lassoie, J and Sherman, R (2010) Promoting a coupled human and natural systems approach to addressing conservation in complex mountainous landscapes of Northwest Yunnan, China. *Frontiers of Earth Science in China*. **4**:67-82.
- Laurance WF, Nascimento HE, Laurance SG, Andrade A, Ewers RM, Harms, K, Regina, Luiza, C and Ribeiro, J (2007) Habitat fragmentation, variable edge effects, and the landscape-divergence hypothesis. *PLoS ONE* 2(10):e1017. Retrieved 6/23/10 from [www.plosone.org](http://www.plosone.org).
- Law, W, Salick, J and Knight, T (2010). The Effects of Pollen Limitation on Population Dynamics of Snow Lotus, a Threatened Tibetan Medicinal Plant of the Eastern Himalayas. *Plant Ecology* **210**:343-357
- Law, W and Salick, J (2007) Comparing Conservation Priorities for Useful Plants Among Botanists and Tibetan Doctors, *Plant Conservation and Biodiversity*, **16**:173-185
- Law, W. and Salick, J (2006) Comparing Conservation Priorities for Useful Plants among Botanists and Tibetan Doctors, *Biodiversity and Conservation*, **16**(6):1747-1759
- Lawoti, M (2010) Nepal and Bhutan 2009: Transition of travails? *Asian Survey*, **50**(1):164–172. Retrieved on 5/30/10 from <http://caliber.ucpress.net/doi/pdfplus/10.1525/as.2010.50.1.164>
- Leinbach, TR (1995) Transport and third world development: Review, issues, and prescription. *Transportation Research Part A: Policy and Practice*, **29A**(5):337-344.
- Lewis, T (1994) Himalayan religions in comparative perspective: Considerations regarding Buddhism and Hinduism across their Indic Frontiers, *Himalayan Research Bulletin*, **14**(1-

- 2):25-46. Retrieved 6/15/10 from <http://digitalcommons.macalester.edu/cgi/viewcontent.cgi?article=1452&context=himalaya>
- Liechty, M (2005) Building the road to Kathmandu: Notes on tourism in Nepal, *Himalaya*, **25** (1-2). Retrieved 6/8/11 from <http://digitalcommons.macalester.edu/cgi/viewcontent.cgi?article=1287&context=himalaya>
- Liu JG, Dietz T, Carpenter SR, Alberti M, Folke C, Moran E, Pell AN, Deadman P, Kratz T, Lubchenco J, Ostrom E, Ouyang Z, Provencher W, Redman CL, Schneider SH, Taylor, WW (2007a). Complexity of coupled human and natural systems. *Science*, **317**(5844): 1513–1516
- Liu JG, Dietz T, Carpenter SR, Alberti M, Folke C, Moran E, Pell AN, Deadman P, Kratz T, Lubchenco J, Ostrom E, Ouyang Z, Provencher W, Redman CL, Schneider SH, Taylor W (2007b). Supporting materials for: complexity of coupled human and natural systems. *Science*, **317**(5844):1513–1516. Retrieved October 13, 2010 from [www.sciencemag.org/cgi/content/full/317/5844/1513/DC1](http://www.sciencemag.org/cgi/content/full/317/5844/1513/DC1)
- Liu JG, Dietz T, Carpenter SR, Folke C, Alberti M, Redman CL, Schneider SH, Ostrom, E, Pell AN, Lubchenco J, Taylor WW, Ouyang Z, Deadman P, Kratz T, Provencher W. (2007c). Coupled human and natural systems. *AMBIO: A Journal of the Human Environment*, **36**(8):639–649
- Liu J, Linderman M, Ouyang Z, An L, Yang J, and Zhang H (2001). Ecological degradation in protected areas: The case of Wolong Nature Reserve for giant pandas. *Science*, **292**(5514):98–101
- Lokshin, M, Bontch-Osmolovski, M and Glinskaya, E (2010) Work-related migration and poverty reduction in Nepal, *Review of Development Economics* **14**(2):323-332.
- Longcore, T and Rich, C (2004) Ecological light pollution. *Frontiers in Ecology and the Environment*, **2**(4):191–198
- Lonsdale, WM and Lane, AM (1994) Tourist vehicles as vectors of weed seeds in Kakadu National Park, Northern Australia. *Biological Conservation* **69**:277–283.
- Lucas, PHC (1992) *Protected Landscapes: A Guide for Policy Makers and Planners*. Gland Switzerland: IUCN.
- Macfarlane, A (2001) Sliding Down Hill: Some reflections on thirty years of change in a Himalayan village. *The European Bulletin for Himalayan Research*. Retrieved 6/17/10 from [http://himalaya.socanth.cam.ac.uk/collections/journals/ebhr/pdf/EBHR\\_20-1.pdf](http://himalaya.socanth.cam.ac.uk/collections/journals/ebhr/pdf/EBHR_20-1.pdf)
- Macfarlane, A and Gurung, I (1990) Gurungs of Nepal: A Guide to the Gurungs. Kathmandu: Ratna Press

- Macfarlane, A (1989) Some background notes on Gurung identity in a period of rapid change. *Kailash* **14**(3-4). Retrieved 6/17/10 from [http://himalaya.socanth.cam.ac.uk/collections/journals/kailash/pdf/kailash\\_15\\_0304\\_05.pdf](http://himalaya.socanth.cam.ac.uk/collections/journals/kailash/pdf/kailash_15_0304_05.pdf)
- Machlis GE, Force JE, Burch WR Jr (2005) *The Structure of Human Ecosystems*, V.05.2, Retrieved 2/7/2010 from <http://www.webpages.uidaho.edu/~gmachlis/files/model.pdf>
- Machlis GE, Force JE, and Burch WR Jr (1997). The human ecosystem part I: the human ecosystem as an organizing concept in ecosystem management. *Society and Natural Resources*, **10**(4):347–367
- Mader, HJ (1984) Animal habitat isolation by roads and agricultural fields. *Biological Conservation* **29**:81–96.
- Malville, NJ (2005) Bearing the burden: Portage labor as an adaptive response to predictable food deficits in Eastern Nepal, *Human Ecology*, **33**(3):419-438.
- Maskey, M (1992) Mountain women and beekeeping in Nepal. In: Verma, LR (Ed.), *Honeybees in Mountain Agriculture*, (119-132). ICIMOD, Boulder: Westview Press.
- Mayhem, B and Bindless, J (2009) *Trekking in the Nepal Himalaya (Walking)*. Victoria: Lonely Planet Publications
- McDougall, C, Ojha, H, Banjade, MR, Pandit, BH, Bhattarai, T, Maharjan, M, and Rana, S, (2008) *Forests of Learning: Experiences from Research on an Adaptive Collaborative Approach to Community Forestry in Nepal*. Center for International Forestry Research Bogor Barat, Indonesia: CIFOR. Retrieved 7/3/10 from [http://www.cifor.org/publications/pdf\\_files/Books/BMcDougall0801.pdf](http://www.cifor.org/publications/pdf_files/Books/BMcDougall0801.pdf)
- McKay, KH, Zahnd, A, Sanders, C and Nepali G (2007) Responses to innovation in an insecure environment in rural Nepal. *Mountain Research and Development*, **27**(4):302-307, Retrieved 5/31/10 from <http://www.bioone.org/doi/pdf/10.1659/mrd.0946>
- McPeak, J, Lee, D and Barrett, C (2006) The dynamics of coupled human and natural systems, *Environment and Development Economics*, **11**(1):9-13.
- Mehta, JN and Heinen, JT (2001) Does community-based conservation shape favorable attitudes among locals? An empirical study from Nepal. *Environmental Management* **28**(2):165–177.
- Merz, J, Dangol, PM, Dhakal, MP, Dongol, BS, Nakarmi, G and Weingartner, R (2006) Road construction impacts on stream suspended sediment loads in nested catchment system in Nepal. *Land Degradation and Development* **17**:343-351
- Merz, J (2004) *Water Balances, Floods and Sediment Transport in the Hindu Kush-Himalayas: Data Analyses, Modelling and Comparison of Selected Meso-scale Catchments*.

- Kathmandu: ICIMOD. Retrieved 6/15/10 from <http://books.icimod.org/demo/index.php/search/subject/15/15>
- Merz, J, Nakarmi, G, Shrestha, SK, Dahal, BM, Dangol, PM, Dhakal, MR, Dongol, BS, Sharma, S, Shah, RB, and Weingartner, R (2003) Water: A scarce resource in rural watersheds of Nepal's Middle Mountains. *Mountain Research and Development*, **23**(1):41-49.
- Metz, J (1990) Conservation practices at an upper-elevation village of West Nepal. *Mountain Research and Development* **1**(1):7-15.
- Messerschmidt, DA (2011) The Muktinath Trail, *ECS Nepal* online journal March 2011. Retrieved 10/5/11 from [http://ecs.com.np/feature\\_detail.php?f\\_id=457](http://ecs.com.np/feature_detail.php?f_id=457)
- Messerschmidt, DA (1995) Gateway-hinterland relations in changing Nepal, *Contributions to Nepalese Studies Journal*, **8**(1):21-40. Retrieved 7/13/10 from [http://himalaya.socanth.cam.ac.uk/collections/journals/contributions/pdf/CNAS\\_08\\_01\\_02.pdf](http://himalaya.socanth.cam.ac.uk/collections/journals/contributions/pdf/CNAS_08_01_02.pdf)
- Messerschmidt, DA (1992) *Muktinath: Himalayan Pilgrimage, A Cultural and Historical Guide*. Kathmandu: Sahaugi Press
- Messerschmidt, DA (1986) *People and Resources in Nepal: Customary Resource Management Systems of the Upper Kali Ghandaki*, In Proceedings from the conference on Common Property Resource Management April 21-23, 1985. Washington D.C.: National Academy Press
- Messerschmidt, DA (1976) Ecological Change and Adaptation among the Gurungs of the Nepal Himalaya. *Human Ecology*, **4**(2):167-185
- Messerschmidt, L, Gurung, D, Klatzel, F, Lama, M, Ghale, T, and Ghale, T (2004) *Stories and Customs of Manang: As told by the Lamas and Elders of Manang*, Mera Publications, Kathmandu.
- Morkel, S and Park, M (2000) *Apple Farming in Marpha: Sustainability of Large Scale Production in Remote Mountain Areas*, University of Gießen, Germany. Retrieved 5/11/11 from <http://www.uni-giessen.de/~gg1057/nepal/marphapp.htm>
- Mumford, SR (1990) *Himalayan Dialogue*. Madison: University of Wisconsin Press.
- Munguira, ML and Thomas, JA (1992) Use of road verges roads by butterfly and burnet populations, and the effect roads on adult dispersal and mortality. *Journal of Applied Ecology* **29**:316–329.
- Murphy, ML, Oli, KP, Gorzula, S, and International Institute for Sustainable Development. (2005). *Conservation in conflict: The impact of the Maoist-government conflict on conservation and biodiversity in Nepal*. Winnipeg, Manitoba International Institute for Sustainable Development. Retrieved 8/10/10 from [http://www.iisd.org/pdf/2005/security\\_conservation\\_nepal.pdf](http://www.iisd.org/pdf/2005/security_conservation_nepal.pdf)

- Mwankusye, JA (2002) Do Intermediate Means of Transport Reach Rural Women? In Fernando, P and Porter, G (Eds.) *Balancing the Load: Women, Gender, and Transportation* (37-49). New York: Zed Books
- Nagendra, H, and Ostrom, E (2011) The challenge of forest diagnostics. *Ecology and Society* **16**(2):20.
- [NTB] National Tourism Board (2001) *National Ecotourism Strategy And Marketing Programme of Nepal 2001 PART ONE : NATIONAL ECOTOURISM STRATEGY*. Retrieved 5/29/10 from <http://www.discovernepal.org.np/pdf/nationalEco2001.pdf>
- [NTNC] National Trust for Nature Conservation (2008a) *Sustainable Development Plan of Manang (2008-2013)*. Kathmandu, Nepal: NTNC/GoN/UNEP. Retrieved 9/16/09 from [http://www.rrcap.unep.org/nsds/uploadedfiles/file/sa/np/mnmt/document/sd\\_masterplan\\_Manang.pdf](http://www.rrcap.unep.org/nsds/uploadedfiles/file/sa/np/mnmt/document/sd_masterplan_Manang.pdf)
- [NTNC] National Trust for Nature Conservation (2008b) *Sustainable Development Plan of Mustang (2008-2013)*. Kathmandu, Nepal: NTNC/GoN/UNEP. Retrieved 9/18/09 from [http://www.rrcap.unep.org/nsds/uploadedfiles/file/sa/np/mnmt/document/sd\\_masterplan\\_Mustang.pdf](http://www.rrcap.unep.org/nsds/uploadedfiles/file/sa/np/mnmt/document/sd_masterplan_Mustang.pdf)
- [NEA] Nepal Electricity Authority (An Undertaking of His Majesty's Government of Nepal) 1993, Arun III Hydroelectric Project, Environmental Assessment and Management, Executive Summary. Kathmandu: NEA. Retrieved 5/1/09 from [http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1993/05/01/000009265\\_3970702135146/Rendered/PDF/multi\\_page.pdf](http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1993/05/01/000009265_3970702135146/Rendered/PDF/multi_page.pdf)
- Nepal, SK (2003) *Tourism and The Environment: Perspectives From The Nepal Himalaya*. Lalitpur, Nepal: Himal Books
- Nepal, SK (2002) Mountain ecotourism and sustainable development: Ecology, economics, and ethics, *Mountain Research and Development*, **22**(2):104-109
- Noonan, M (2001) *The Fall and Rise and Fall of the Chantyal Language*, University of Wisconsin-Milwaukee. Retrieved 5/28/11 from [http://archiv.ub.uni-heidelberg.de/savifadok/volltexte/2008/185/pdf/Chantyal\\_Fall\\_and\\_Rise.pdf](http://archiv.ub.uni-heidelberg.de/savifadok/volltexte/2008/185/pdf/Chantyal_Fall_and_Rise.pdf)
- Noss, RF (1995) *The Ecological Effects of Roads or the Road to Destruction*. Unpublished report. Wildlife CPR, Retrieved 6/2/10 from <http://www.wildlandscpr.org/node/41/print>
- O'Connor (1965) New railway construction and the pattern of economic development in East Africa, *Transactions of the Institute of British Geographers*, No. 36 (Jun., 1965), pp. 21-30. Retrieved 7/17/10 from <http://www.jstor.org.proxy.library.cornell.edu/stable/pdfplus/621451.pdf?acceptTC=true>
- Olsson, P, Folke, C, Berkes, F, (2004) Adaptive co-management for building resilience in social-ecological systems, *Environmental Management* **34**(1):75-90.

- Ostrom, E (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.
- Oxley DJ, Fenton, MB and Carmody, GR (1974) The effects of roads on populations of small mammals. *Journal of Applied Ecology* **11**:51–59. Retrieved 6/2/10 from <http://www.jstor.org/stable/pdfplus/2402004.pdf>
- Pande, K (2006) *Country Status: Nepal*. Regional Experiences and Lessons in Financing Infrastructure and Improving Road safety 8-10 May 2006. Expert Group Meeting on the Development of the Asian Highway Network. United Nations Economic and Social Commission for Asia and Pacific Bangkok, Thailand. Retrieved 6/13/10 from [http://www.unescap.org/ttdw/roadsafety/StatusPapers2006/Nepal\\_statuspaper.pdf](http://www.unescap.org/ttdw/roadsafety/StatusPapers2006/Nepal_statuspaper.pdf)
- Pandit, B, Albano, A, and Kumar, C (2008) *Improving Forest Benefits for the Poor: Learning from Community-based Forest Enterprises in Nepal*. Center for International Forestry Research (CIFOR). Bogor, Indonesia: CIFOR. Retrieved 7/23/10 from [http://www.cifor.org/publications/pdf\\_files/Books/BAlbano0801.pdf](http://www.cifor.org/publications/pdf_files/Books/BAlbano0801.pdf)
- Panjak, T. (2000) *Framework for quantifying social and economic benefits from rural road development; Some thoughts and practical insights*, Retrieved June 5, 2010 from [http://www.transport-links.org/transport\\_links/filearea/documentstore/322\\_Thampil%20Pankaj%20Paper%201.pdf](http://www.transport-links.org/transport_links/filearea/documentstore/322_Thampil%20Pankaj%20Paper%201.pdf)
- Paudyal, D P (1998) *Access Improvement and Sustainable Development –Rural Road Development in Nepal*, Kathmandu: ICIMOD. Retrieved 6/7/10 from <http://books.icimod.org/demo/uploads/ftp/Access%20Improvement%20and%20Sustainable%20Development.pdf>
- Pearce, D (Sunday 17 August 2008) Annapurna: Nepalese trekker route at risk from push for richer tourists, *The Guardian*. Retrieved 7/20/10 from <http://www.guardian.co.uk/environment/2008/aug/18/nepal.manang.development>
- Peet, R (2003) *Unholy Trinity: The IMF, World Bank, and WTO*. New York: Zed Books Ltd.
- Petley, DN, Hearn, GJ, Hart A, Rosser, NJ, Dunning, SA, Oven, K and Mitchell, WA (2007) Trends in landslide occurrence in Nepal, *Natural Hazards*, **43**:23-44.
- Pokharel, B. (2002). *Contribution of Community Forestry to People's Livelihoods and Forest Sustainability: Experience from Nepal*, Regional Workshop on Adaptive Collaborative Management September 26-27, 2002, Bangkok. Retrieved 9/20/09 from <http://www.fao.org/docrep/ARTICLE/WFC/XII/0321-C1.HTM>
- Pokharel, RK and Suvedi, M (2007) Indicators for Measuring the Success of Nepal's Community Forestry Program: A Local Perspective, *Human Ecology Review*, **14**(1):68-75.

- Poudel, K R (2006) *Tourism in Nepal: A Case Study for Myagdi District*. (Master's Thesis, Department of Economics, Tribhuvan University, Kathmandu, Nepal). Retrieved 6/27/10 from [www.clickitahari.com/...TOURISM%20IN%20NEPAL%3B%20A%20CASE%20STUDY%20OF%20](http://www.clickitahari.com/...TOURISM%20IN%20NEPAL%3B%20A%20CASE%20STUDY%20OF%20).
- Pradhan, R and Shrestha, A (2005) *Ethnic and Caste Diversity: Implications for Development*. Asian Development Bank Report, NRM Working Paper No. 4. Retrieved 5/28/10 from <http://www.adb.org/Documents/Papers/NRM/wp4.pdf>
- Preston, J. (1992) Spiritual magnetism: An organizing principle for the study of pilgrimage. In Morinis, A (Ed.). *Sacred Journeys* (31-46), Westport, CT: Greenwood Press.
- Price, DP (1989) *Before the bulldozer: The Nambiquara Indians and the World Bank*. Maryland: Seven Locks Press.
- Price, M, Wachs, T and Byers, E (1999) *Mountains of the World: Tourism and sustainable mountain development*, Mountain Agenda, Institute of Geography, University of Berne, Switzerland. Retrieved 5/20/12 from <http://mtnforum.org/sites/default/files/pub/378.pdf>
- Price, MF and Thompson, M (1997) The complex life: Human land uses in mountain ecosystems, *Global Ecology and Biogeography Letters*, **6**(1): 77-90, Mountain Ecology Special Issue: Organism Responses to Environmental Change.
- Raj, PA (1978) *Road to the Chinese Border*, Kathmandu: Foreign Affairs Journal Publication
- Ramakrishnan, PS (2005) Mountain Biodiversity, Land Use Dynamics and Traditional Ecological Knowledge. In Huber, UM et al. (Eds.), *Global Change and Mountain Regions* (551-561). The Netherlands: Springer. Retrieved 9/30/10 from <http://www.springerlink.com.proxy.library.cornell.edu/content/r245l8nk67501h21/fulltext.pdf>
- Reijnen, R, Foppen, R, Ter Braak, C and Thissen, J (1995) The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads. *Journal of Applied Ecology* **36**:187-202
- Rhoades, RE and Thompson, SI (1975) Adaptive strategies in alpine environments: Beyond ecological particularism, *American Ethnologist*, **2**(3):535-551. Retrieved 10/06/2010 from <http://www.jstor.org/stable/643726>
- Richards, P (1984) The Economic Context of Rural Roads. In: Howe, J and Richards, P (Eds.) *Rural Roads and Poverty Alleviation*. Boulder, Colorado: Westview Press
- Roach, J (2004, April 14) Himalaya Honey Hunters Cling to Cliffside Tradition, *National Geographic News*. Retrieved 5/29/12 from [http://news.nationalgeographic.com/news/2004/04/0414\\_040414\\_honeyhunters.html](http://news.nationalgeographic.com/news/2004/04/0414_040414_honeyhunters.html)
- Rogers, C (2004) *Secrets of Manang: The story behind the phenomenal rise of Nepal's famed business community*. Kathmandu: Mandala.

- [RBGE] Royal Botanical Garden of Edinburgh (2010) *Flora of Nepal*. Retrieved 5/27/10 from <http://www.rbge.org.uk/science/major-floras/flora-of-nepal>
- Salick, J and Ross, N (2009) Traditional Peoples and Climate Change, *Global Environmental Change* **19**:137-139.
- Salick, J., Amend, A, Anderson, D, Hoffmeister, K, Gunn, B and Fang, ZD (2007) Tibetan Sacred Sites Conserve Old Growth Trees in the Eastern Himalayas, *Biodiversity and Conservation*, **16**:693-706.
- Salick, J., Byg, A, Amend, A, Gunn, B, Law, W, and Schmidt, H (2006) Tibetan Medicine Plurality. *Economic Botany* **60**:227-253
- Salick, J, Yongping, Y and Amend, A (2005) Tibetan land use and change near Khawa Karpo, Eastern Himalayas. *Economic Botany* **59**(4):312-325.
- Sandford, AW (2004) Hindu Ritual Calendar. In: Rinehart, R (Ed.) *Contemporary Hinduism: Ritual, Culture, and Practice* (123-154). Santa Barbara, California: ABC-CLIO, Inc.
- Sapkota, R (2004, August 7) Ghost Town in the Annapurnas, *Nepali Times*, ISSUE #209 (13 AUG 2004 - 19 AUG 2004), Retrieved 5/20/10 from <http://www.nepalitimes.com.np/issue/2004/08/13/FromtheNepaliPress/1711>
- Sax, WS (1993) Village daughter, village goddess: Residence, gender, and politics in a Himalayan Pilgrimage, *Ethnologist*, **17**(3):491-512 Retrieved 6/19/2010 from <http://www.jstor.org/stable/644858>
- Schaffner, U (1987) *Road Construction in the Nepal Himalaya: the experience from the Lamosangu-Jiri Road project*. ICIMOD Occasional paper No. 8. Kathmandu: ICIMOD Retrieved 6/4/10 from <http://himaldoc.icimod.org/record/7750>
- Scheinder, R (2010) Integrated, watershed-based management for sustainable water resources, *Frontiers in Earth Science. China* **4**(1):117–125
- Schroeder, M (1971) *Impact of the Sonauli-Pokhara Highway on the Regional Income and Agricultural Production of Pokhara Valley, Nepal*. (Thesis H36 1971 S381 Ithaca, New York: Cornell University)
- Schuh, D (1994) Investigations in the history of the Muktinath Valley and adjacent areas, *Ancient Nepal* **138**:9-92. Retrieved 6/24/10 from <http://www.digitalhimalaya.com/collections/journals/ancientnepal/>
- Scott, D A (Ed) (1989) *A Directory of Asian Wetlands*. IUCN, Gland. Retrieved on 5/30/10 from, <http://ramsar.wetlands.org/ADirectoryofAsianWetlands/tabid/822/language/en-US/Default.aspx>
- Scott, JC (2009) *The Art of Not Being Governed: An Anarchist History of Upland Southeast Asia*, New Haven, CT: Yale University Press.

- Seddon, D and Hussein, K (2002) *The Consequences of Conflict: Livelihoods and Development in Nepal*. Working Paper 185, Overseas Development Institute, Retrieved on 5/24/10 from <http://www.odi.org.uk/resources/download/1992.pdf>
- Seddon, D and Shrestha, A (2002) Gender in Rural Transport Development: Chattrra Deruali, Nepal. In Fernando, P and Porter, G (Eds.) *Balancing the Load: Women, Gender, and Transport* (235-245). New York: Zed Books.
- Shaffer, ML and Stein, BA (2000) *Precious Heritage: The Status of Biodiversity in the United States*. New York: Oxford University Press.
- Shah, N (2007) *Transport Sector Performance and Impact Indicators-A Nepalese Case Study*. World Bank Report. Retrieved 6/13/10 from <http://www.worldbank.org/transport/transportresults/program/sl-04-05/annex16.pdf>
- Shaha, R (1988) Ancient and Medieval Nepal, *Kailash* **14**(3 and 4). Retrieved 6/8/10 [http://himalaya.socanth.cam.ac.uk/collections/journals/kailash/pdf/kailash\\_14\\_0304\\_01.pdf](http://himalaya.socanth.cam.ac.uk/collections/journals/kailash/pdf/kailash_14_0304_01.pdf)
- Sharma, KK (2010) *Status Paper on Road safety in Nepal*, The fourth meeting of the Working Group on the Asian Highway and Export Group Meeting on Progress on Road Safety Improvement in Asia and the Pacific Bangkok, Thailand, 27 to 29 September 2010. Retrieved 11/30/10 from <http://www.unescap.org/ttdw/common/Meetings/TIS/EGM-Roadsafety-2011/Status/Countries/Nepal-2010-Status.pdf>
- Sharma, PR (1977) Caste, social mobility, and Sanskritization: A study of Nepal's old legal code. *Kailash* **5**(4):277-299. Retrieved 6/18/10 from [http://www.digitalhimalaya.com/collections/journals/kailash/index.php?selection=5\\_4](http://www.digitalhimalaya.com/collections/journals/kailash/index.php?selection=5_4)
- Sherman R, Mullen R, Li H, Fang Z, and Wang Y (2008). Spatial patterns of plant diversity and communities in alpine ecosystems of the Hengduan Mountains, Northwest Yunnan, China. *Journal of Plant Ecology*, **1**(2):117–136
- Shimokawa, S (2007) *Rural Road Investments, Agricultural Development, and Poverty Alleviation in China*, Case Study #6-9 of The Program: "Food Policy for Developing Countries: The Role of Government in the Global Food System" Ithaca, New York: Cornell University. Retrieved 6/18/10 from [http://cip.cornell.edu/DPubS/Repository/1.0/Disseminate?view=body&id=pdf\\_1&handle=dns.gfs/1200428179](http://cip.cornell.edu/DPubS/Repository/1.0/Disseminate?view=body&id=pdf_1&handle=dns.gfs/1200428179)
- Shrestha, R L (1980) *Impact of Kathmandu Raxaul Highway (Tribhuban Rajmarg) on Nepalese Economy (1956-1975)*. Kathmandu: Katunja Press
- Shrestha, S (2009) Arun-III Project: Nepal's electricity crisis and its role in current load shedding and potential role 10 years hence, *Hydro Nepal*, **4**:30-35. Retrieved 10/12/10 from <http://nepjol.info/index.php/HN/article/view/1822/1771>

- Sidle, RC, Ziegler, AD, Negishi, JN, Nik, AR, Siew, R and Turkelboom, F (2006) Erosion processes in steep terrain- Truths, myths, and uncertainties related to forest management in Southeast Asia. *Forest Ecology and Management* **224**:199-225.
- Siliguri Link to Nepal Sex Trade (2009 January 19) *The Telegraph* [Calcutta] Retrieved 6/11/10 from [http://www.telegraphindia.com/1090120/jsp/siliguri/story\\_10411921.jsp](http://www.telegraphindia.com/1090120/jsp/siliguri/story_10411921.jsp)
- Simons, A, Schon, W and Shrestha, SS (1994) The prehistoric settlement of Mustang. First results from the 1993 archaeological investigations in cave systems and connected ruined sites, *Ancient Nepal* **137**:93-129. Retrieved 6/24/10 from <http://www.digitalhimalaya.com/collections/journals/ancientnepal/index.php?selection=137>
- Singh, S (2004) Religion, heritage and travel: Case references from the Indian Himalayas, *Issues in Tourism*, **7**(1):44 — 65. Retrieved 7/29/10 from <http://dx.doi.org/10.1080/13683500408667972>
- Sिताला, TP (2009) *Infrastructure Development in Nepal: Opportunities and Challenges for Engineers*. Retrieved 5/23/10 from <http://scaef.org.np/>
- Smith, DS and P. Hellmund, P (Eds.) (1993) *Greenway Case Studies: Ecology of greenways— design and function of linear conservation areas*. Minneapolis: University of Minnesota Press.
- [SANDEE] South Asian Network for Development and Environmental Economics (2004). *Community Forestry in Nepal Management Rules and Distribution Benefits*. South Asian Network for Development and Environmental Economics (SANDEE) Policy Brief Number 1-04, March 2004. Retrieved
- Sovacool, B, Dhakal, S, Gippner, O and Bambawale, M (2012) Halting hydro: A review of the socio-technical barriers to hydroelectric power plants in Nepal, *Energy*, **36**(5):3468-3476. Retrieved 5/29/12 from <http://www.sciencedirect.com/science/article/pii/S0360544211002192> )
- Staal, J (1963). Sanskrit and Sanskritization, *The Journal of Asian Studies*, **22**(3):261-275.
- Stevens, SF (1997) Annapurna Conservation Area: Empowerment, conservation, and development in Nepal. In Stevens, SF. (Ed.) *Conservation through Cultural Survival* (237–62). Washington, D.C.: Island Press.
- Stifel, D and Minten, P (2008) Isolation and agricultural productivity in Madagascar, *Agricultural Economics* **39**:1–15
- Strickland, R (2009) *External Review of District Roads Support Programme (DRSP)* Retrieved 6/9/10 from <http://www.drspnepal.org/drsp/downloads/External-Review-DRSP-2009.pdf>

- Stringer (2011) Global counterinsurgency and US army expansion: the case for recruiting foreign troops, *Small Wars & Insurgencies*, **22**(01):142-169. Retrieved 5/23/11 from <http://dx.doi.org/10.1080/09592318.2011.546604>
- Subedi, G and Gurung, YB (2001) *Nepal Trafficking in Girls with Special Reference to Prostitution: A Rapid Assessment*. International Labour Organization International Programme on the Elimination of Child Labour (IPEC) Report. Retrieved on 6/11/10 from <http://www.ilo.org/legacy/english/regions/asro/newdelhi/ipec/download/resources/subregion/subpubl01eng8.pdf>
- [SDC] Swiss Agency for Development and Cooperation (2008) *Nepal – Roads to Prosperity Partnership Results*, Asia Brief, Nepal Rural Roads. Retrieved 7/23/10 from [http://www.swiss-cooperation.admin.ch/nepal/en/Home/Document\\_Archive](http://www.swiss-cooperation.admin.ch/nepal/en/Home/Document_Archive)
- Tamding, T (1998) Buddhism and Bön, *Bulletin of Tibetology*, **34**(2):7-12, Retrieved 1/4/11 from [http://himalaya.socanth.cam.ac.uk/collections/journals/bot/pdf/bot\\_1998\\_02\\_02.pdf](http://himalaya.socanth.cam.ac.uk/collections/journals/bot/pdf/bot_1998_02_02.pdf)
- Thapa, GB and Sharma, JN (2009) From insurgency to democracy: The challenges of peace and democracy-building in Nepal, *International Political Science Review* **30**:205. Retrieved 5/30/10 from <http://ips.sagepub.com/cgi/content/abstract/30/2/205>
- [TNC] The Nature Conservancy (n.d.) Map: The Nature Conservancy in Northwest Yunnan. TNC. Retrieved from TNC office in Lijiang, Yunnan, China.
- [TNC] The Nature Conservancy (2010) *China: Places we protect: Yunnan Forests*. Retrieved 7/28/10 from <http://www.nature.org/wherewework/asiapacific/china/work/yunnanforests.html>
- Tilman, HW (1952) *Nepal Himalaya*. London: The Cambridge University Press.
- Tiwary, M (2005) Marginal farmers, agricultural practices, and rural poverty in Nepal, *Jahrbuch der Österreichischen Gesellschaft für Agrarökonomie*, **12**:123-147. Retrieved 6/25/10 from [www.boku.ac.at/oega](http://www.boku.ac.at/oega)
- Tomasi, L. (2002) Homo Viator: from Pilgrimage to Religious Tourism Via the Journey. In: Swatos, WH and Tomasi, L (Eds.) *From Medieval Pilgrimage to Religious Tourism* (1–24). Westport, CT: Praeger
- Trapp, H and Mool, P (1996) *MENRIS Case Study Series No. 4: Lamjung District Information System for Local Planning and Assessment of Natural Resources Using GIS and RS Technology*. Mountain Environment and Natural Resources' Information Service (MERIS). Kathmandu: ICIMOD. Retrieved 9/28/09 from <http://lib.icimod.org/record/7616>
- Tsunokawa, K and Hoban C (2007) (Eds) *Roads and the Environment: A Handbook*. World Bank Technical Paper No 376, Washington: World Bank. Retrieved on 2/19/10 from <http://www.worldbank.org/transport/roads/enviro.htm>

- Tuchman, BW (2001) *Stilwell and the American Experience in China, 1911-45*, New York: Grove Press
- Tucker, G, Bubb, P, de Heer, M, Miles, L, Lawrence, A, Bajracharya, SB, Nepal RC, Sherchan, R and Chapagain N R (2005) *Guidelines for Biodiversity Assessment and Monitoring for Protected Areas*. Kathmandu, Nepal: KMTNC. Retrieved 7/11/10 from <http://ia600503.us.archive.org/18/items/guidelinesforbio05gtuc/guidelinesforbio05gtuc.pdf>
- Turner, M (2010, April 1) Coburn describes travels in Nepal, *The Dartmouth*. Retrieved 7/9/10 from <http://thedartmouth.com/2010/04/01/news/shangrila>
- Udall, L (1994) The Arun III Dam: A test case in World Bank accountability, *Bulletin of Concerned Asian Scholars*, **26**:82-84 Retrieved 6/5/10 from <http://criticalasianstudies.org/assets/files/bcas/v26n04.pdf>
- Ullman, E (1956) The Role of Transportation and the Bases of Interaction. In: Thomas, J (Ed.) *Man's Changing Role in Changing the Face of the Earth* (862-880), Chicago: The University of Chicago Press.
- Underwood, BA (1986) *The Natural History of Apis laboriosa Smith in Nepal*, M.S. Thesis. Ithaca (New York): Cornell University
- [UNDP] United Nations Development Program (2010) Chapter 9 *Developing Rural Transport and Infrastructure. Millennium Development Goals Needs Assessment for Nepal*, In: Nepal Millennium Development Goals Progress Report 2010, Government of Nepal National Planning Commission and United Nations Country Team of Nepal United Nations House: Kathmandu. Retrieved 6/13/10 from [http://www.undp.org.np/publication/html/mdg\\_NAN/Chapter\\_9.pdf](http://www.undp.org.np/publication/html/mdg_NAN/Chapter_9.pdf)
- [UNDP] United Nations Development Programme (2009a) *Human Development Report 2009 Summary*. Retrieved 5/28/10 from <http://hdr.undp.org/en/reports/global/hdr2009/>
- [UNDP] United Nations Development Programme (2009b) *Human Development Report 2009 Country Factsheet Nepal*. Retrieved 5/28/10 from [http://hdrstats.undp.org/en/countries/country\\_fact\\_sheets/cty\\_fs\\_NPL.html](http://hdrstats.undp.org/en/countries/country_fact_sheets/cty_fs_NPL.html)
- [UNDP] United Nations Development Program (2006) *Developing Rural Transport and Infrastructure. Millennium Development Goals Needs Assessment for Nepal*. Retrieved 6/13/10 from [http://www.undp.org.np/publication/html/mdg\\_NAN/Chapter\\_9.pdf](http://www.undp.org.np/publication/html/mdg_NAN/Chapter_9.pdf)
- [UNESCAP] United Nations Economic and Social Commission for Asia and the Pacific (2000) *Evaluation of Infrastructural Interventions for Rural Poverty Alleviation, Transport, Communications and Tourism*, Division Economic and Social Commission for Asia and the Pacific. Retrieved 5/30/10 from [http://www.unescap.org/ttdw/Publications/TPTS\\_pubs/pub\\_1959/rurpovfulltext.pdf](http://www.unescap.org/ttdw/Publications/TPTS_pubs/pub_1959/rurpovfulltext.pdf)

- [UNESCO] [United Nations Educational, Scientific and Cultural Organization](#) (2007) *Ninth Session of the Regional Committee Meeting for the Regional Convention on the Recognition of Studies, Diplomas and Degrees in Higher Education in Asia and the Pacific: Country Report Nepal*. UNESCO-07/REGCOMIX/WD.2-NEP. Retrieved 5/28/10 from [http://www.unescobkk.org/fileadmin/user\\_upload/apeid/workshops/9th\\_convention/Country\\_Rpt\\_NEP.pdf](http://www.unescobkk.org/fileadmin/user_upload/apeid/workshops/9th_convention/Country_Rpt_NEP.pdf)
- [UNFPA] United Nations Population Fund (2010) *Nepal Country Profile*. Retrieved 5/28/10 from <http://nepal.unfpa.org/en/countryprofile/index.php>
- [UNRTF] United Nations Regional Task Force on Mobility and HIV Vulnerability Reduction. (2006). *Regional Strategy on Mobility and HIV Vulnerability Reduction in South-East Asia and Southern China 2006–2008* Retrieved on 6/11/10 from <http://www.hiv-infrastructure.info/downloads/policies/pol-00011.pdf>
- Upreti, BN (2006) *The Nexus Between Natural Disasters and Development: Key Policy Issues in Meeting the Millennium Development Goals and Poverty Alleviation*, Economic Policy Papers, Policy Paper 27, Government of Nepal/ Ministry of Finance Singha Durbar, Kathmandu, and the Asian Development Bank. Retrieved 6/5/10 from [http://www.mof.gov.np/economic\\_policy/pdf/Natural\\_Disasters.pdf](http://www.mof.gov.np/economic_policy/pdf/Natural_Disasters.pdf)
- Upreti, BN and Dhital, MR (1996) *Landslide Studies and Management in Nepal*. Kathmandu: ICIMOD. Retrieved 6/15/19 from <http://books.icimod.org/demo/index.php/search/type/0/136>
- [USAID] United States Agency for International Development (2010) *Telling Our Story: Case Study Efficient Hydropower Lights up Nepal*. Retrieved 5/30/10 from [http://www.usaid.gov/stories/nepal/cs\\_np\\_hydropower.html](http://www.usaid.gov/stories/nepal/cs_np_hydropower.html)
- Vaidya, S and Gautum, RP (2008) *Development Profile of Nepal 2008: A compilation of development statistics of Nepal*. Kathmandu: ISRSC.
- Van Spengen, W (2000) *Tibetan Border Worlds: A geohistorical analysis of trade and traders*. New York: Kegan Paul International.
- Van Spengen, W (1987) The Nyishangba of Manang: Geographical Perspectives on the Rise of Nepalese Trading Community. *Kailash* 13(3-4):131-277. Retrieved 6/19/10 from <http://www.digitalhimalaya.com/collections/journals/kailash/>
- Van de Walle, D (2008) *Impact Evaluation of Rural Roads Project*. World Bank Report. Retrieved 3/7/10 from [http://siteresources.worldbank.org/INTISPMA/Resources/383704-1146752240884/Doing\\_ie\\_series\\_12.pdf](http://siteresources.worldbank.org/INTISPMA/Resources/383704-1146752240884/Doing_ie_series_12.pdf)

- Van de Walle, D (2002) Choosing rural road investments to help reduce poverty, *World Development*, **30**(4): 575–589.
- Valli, E. (1998a) *Hunting for Honey: Adventures with the Rajis of Nepal*. Monmouth, UK: Bees for Development
- Valli, E. (1998b) Golden Harvest of the Raji, *National Geographic* **193**(6):88-103
- Valli, E; and Summers, SD (1988a) *Honey Hunters of Nepal*. London: Thames & Hudson
- Valli, E; and Summers, SD (1988b) Honey Hunters of Nepal, *National Geographic*, **174**(5):660-671
- Vetaas, OR (2007) Global Changes and its Effect on Glaciers and Cultural Landscapes: Historical and Future Considerations. In Chaudhary, R P, Aase, T H, Vetaas, O R, and Subedi, BP (Eds) *Local Effects of Global Changes in the Himalayas: Manang, Nepal* (23-39). Kathmandu: Tribhuvan University, Jagadamba Press.
- Vinding, M (1998) *The Thakali: A Himalayan Ethnography*. London: Serindia
- Vontomme, P, Markkula, A and Robin LN (Eds.) (2002) *Non Wood Forest Products in 15 Countries of Tropical Asia: An overview*. FAO Report. Bangkok: FAO. Retrieved 5/30/10 from <http://www.fao.org/docrep/005/ab598e/ab598e00.htm>
- Vos, CC and Chardon, JP (1998) Effects of habitat fragmentation and road density on the distribution pattern of the moor frog *Rana arvalis*, *Journal of Applied Ecology*. *Phytopathology*, **59**:44–56.
- Walsh, E (2012) *Nepal re-emerging on the international scene: New economic, political, and social policies are being created and enacted to overcome the country's many challenges*, Interview with Shankar Sharma, Al Jazeera. Retrieved 4/30/12 from <http://www.aljazeera.com/indepth/opinion/2012/01/2012110101521129296.html>
- Walsh, S. and McGinnis, D (2008) Biocomplexity in coupled human-natural systems: The study of population and environment interactions. *Geoforum* **39**:773-775.
- Wang J, Cui, BS, Liu, S, Dong S, Wei G, and Liu J (2007) Effects of road networks on ecosystem service value in the Longitudinal Range-Gorge Region, *Chinese Science Bulletin* **52** Supp. II:180-191
- Warr, P (2010) Roads and Poverty in Rural Laos: An Econometric Analysis *Pacific Economic Review*, **15**(1):152-169
- Wei, F, Liu, S, Degloria, S, Dong, S and Beazley, R (2010) Characterizing the “fragmentation-barrier” effect of road networks on landscape connectivity: A case study in Xishuangbanna, Southwest China. *Landscape and Urban Planning* **95**:122–129

- Wells, M and Sharma, U R (1998) Socio-economic and political aspects of biodiversity conservation in Nepal. *International Journal of Social Economics* **25** (2/3/4):226-243
- Wells, M (1994) A profile and interim assessment of the Annapurna Conservation Area Project, Nepal. In Western, D, Wright, M and Strum, S (Eds), *Natural Connections: Perspectives in Community-Based Conservation*. Washington, DC: Island Press
- Whelpton, J (2005) *A history of Nepal*. Cambridge, UK: Cambridge University Press.
- White, P A and Ernst, M (2003) *Second Nature: improving transportation without putting nature second*. Surface Transportation Policy Project, Defenders of Wildlife, Retrieved 12/10/08 from <http://repositories.cdlib.org/jmie/roadeco/white2003a>
- Wilcox, B A and Murphy, D D (1985) Conservation strategy: the effects of fragmentation on extinction. *American Naturalist* **125**:879-87.
- Windle, J and Cramb, RA (1997) Remoteness and rural development: economic impacts of rural roads on upland farmers in Sarawak, Malaysia, *Asia Pacific Viewpoint*, **38**(1):37-53
- [WB] World Bank (2010) *Nepal Country Overview 2010*. Retrieved 5/28/10 from <http://www.worldbank.org/np/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/NEPALEXTN/0,,contentMDK:22147453~pagePK:141137~piPK:141127~theSitePK:223555,00.html>
- [WB] World Bank (2009) *Gross National Income Per Capita 2009*, Retrieved 8/20/10 from <http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNIPC.pdf>
- [WB] World Bank (2006) *Infrastructure: Lessons from the last two decades of World Bank Engagement*, Discussion Paper. Retrieved 5/28/10 from <http://www-wds.worldbank.org>
- [WB] World Bank (2005) *Nepal Development Policy Review: Restarting Growth and Poverty Reduction, Poverty Reduction and Economic Management* South Asia Region, Report No. 29382-NP. Retrieved 7/11/10 from [http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2005/04/14/000012009\\_20050414112907/Rendered/PDF/29382NP.pdf](http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2005/04/14/000012009_20050414112907/Rendered/PDF/29382NP.pdf)
- [WB] World Bank (2001) *Community Forestry in Nepal, Precip* World Bank Evaluation Department, Fall 2001, Number 217, Accessed 5/28/10 from [http://lnweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/F98AB17A1743B72F85256B120070162D/\\$file/217\\_Nepal\\_Forestry.pdf](http://lnweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/F98AB17A1743B72F85256B120070162D/$file/217_Nepal_Forestry.pdf)
- Yadav, BD, Bigsby, H, and MacDonald, I (2008) Who are Controlling Community Forestry User Groups in Nepal? Scrutiny of Elite Theory, New Zealand Agricultural and Resource Economics Society >2008 Conference, August 28-29, 2008, Nelson, New Zealand. Retrieved 9/24/09 from [http://ageconsearch.umn.edu/bitstream/96666/2/2008\\_14\\_Who%20are%20Controlling%20Community%20Forestry%20User%20Groups\[1\].pdf](http://ageconsearch.umn.edu/bitstream/96666/2/2008_14_Who%20are%20Controlling%20Community%20Forestry%20User%20Groups[1].pdf)

Yunusa, MB, Shaibu-Imodagbe, EM and Ambi, YA (2002) Road Rehabilitation: The Impact on Transport and Accessibility. In Fernando, P and Porter, G (Eds.) *Balancing the Load: Women, Gender, and Transport* (111-118), New York: Zed Books.