

**Institutional Capacity and Market Accessibility as
Determinants of the Effectiveness of Climate Change Adaptation Strategies**
-The Case of Three Middle Hill Communities in Nepal-

*A project submitted in partial fulfillment of the requirements for the degree of
Master of Science (Natural Resources and Environment) at the University of Michigan*

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ABSTRACT

Political and social scientists have documented that the effects of global climate change will be felt most severely by the poor and marginalized populations of the world, who have a lesser ability to cope to a changing climate. With climate change impacts having the potential to devastate the livelihoods of vulnerable populations there is a need to determine factors that influence adaptive capacity. Since limited resources are available to vulnerable populations, there is a need to identify particular factors that facilitate institutional restructuring, rather than funding short-term projects. By doing this, one can ensure the cost effective use of resources by streamlining operations and cutting redundancies.

This research project argues that communities with access to and integration with markets together with strong institutional strength and connectivity can have significant positive impacts on a population's ability to adapt. This paper examines this argument through three case studies of communities in the Middle Hills of Nepal- by measuring market access, institutional strength and connectivity, and the amount and quality of adaptation practices.

The analysis shows that market accessibility has a positive relationship to a number and strength of institutions. Due to the small sample size, the research was unable conclude that a significant relationship exists between market access and the number of adaptation practices. Furthermore, market access was not found to have a positive relationship with the quality of adaptation practices. Finally, the research identified focal institutions, which under different circumstances play different roles by either indirectly or directly facilitating adaptation practices.

In light of these conclusions, this research concludes with recommendations directed at the local/community level- for facilitating community and organization- and at the regional/national level- for assessing environmental vulnerability and to bring attention to the need for increasing national resilience for Nepal.

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LIST OF ACRONYMS

ADB	Asian Development Bank
BCN	Bird Conservation Nepal
CARE	Cooperative for Assistance and Relief Everywhere
CBS	Central Bureau of Statistics, Nepal
CIDA	Canadian International Development Agency
CF	Community Forest
CFUG	Community Forest User Group
CPR	Common Pool Resource
DAG	Dynamic Action Group (Dalit organization)
DANIDA	Danish International Development Agency
DAO	District Administrative Office
DDC	District Development Committee
DFID	United Kingdom Department for International Development
DFO	District Forest Office
DKS	Dami, Kami, Sarki (Dalit castes)
DoA	Department of Agriculture
DoF	Department of Forests
DPTC	Disaster Prevention and Training Centre
FECOFUN	Federation of Community Forestry Users, Nepal
GLOF	Glacial Lake Outburst Flooding
ICIMOD	International Centre for Integrated Mountain Development
IFRI	International Forestry Resources and Institutions Network
INR	Indian Rupees
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
KTM	Kathmandu
LFG	Leasehold Forest Groups
LPG	Liquid Petroleum Gas
NACRMLP	Nepal-Australia Community Resources Management and Livelihoods Project
NAPA	National Adaptation Programmes of Action
NBC	Nepal Biogas Corporation
NPR	Nepali Rupees
NRRDC	Natural Resources Research and Development Centre
NTNC	National Trust for Nature Conservation- Nepal
PAR	Participatory Action Research
RPO	Range Post Office
Rs	Rupees
SAARC	South Asian Association for Regional Cooperation
SDC	Swiss Agency for Development and Cooperation
UNMIN	United Nations Mission in Nepal
USAID	United States Agency for International Development
VDC	Village Development Committee
WWF	World Wildlife Fund

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Chapter 1. Introduction



While the effects of global climate change will be felt around the world, scholars from all fields agree that the destitute and marginalized populations, who have a lesser ability to cope to a changing climate, will feel the most severe effects (Watson, 2001 and Thomas & Twyman, 2005). Questions loom as to whether vulnerable populations possess the capacity to adapt to the potentially disastrous effects of climate change or whether these populations have the ability to acquire adequate support to facilitate adaptation. Therefore, a lack of adaptive capacity has the potential to result in devastating effects on the livelihoods of vulnerable populations.

Although marginalized communities will undoubtedly feel the effects of climate change, there are internal and external factors that have the potential to increase a community's adaptive capacity. The greater the community's ability to adapt, the more able it will cope to changes. In order to utilize time and resources more efficiently, there is a need to determine which factors play the greatest role in building adaptive capacity. This paper argues that the degree of market access and the strength and connectivity between and amongst institutions (referred to here as institutional capacity) can significantly influence the adaptability of communities.

Market access is a key determinant for the number and type of community based adaptation practices. Due to readily available resources in markets, such as labor and capital, communities with greater market access can more easily respond to changes in climate. In addition, markets facilitate stronger and more connected institutions that can, in turn, influence and shape adaptation practices. In contrast, communities with a lesser degree of market access have fewer resources available to them in times of need. Lastly, the degree of connectivity between and amongst institutions is also important because this can enhance the responsiveness of communities in times of change by providing resources, organization, and communication venues.

This paper also addresses equality issues among adaptation practices across differences in gender, caste, and wealth. Equity and justice issues concerning adaptation are more readily argued at a country-to country level with little emphasis on intra-community dynamics (Thomas, Twyman, 2003). Distinct groups of vulnerable and marginalized populations exist worldwide and will each be affected by climate impacts differently.

This paper will examine how market access and institutions affect the number and quality of adaptation practices in three communities located in the middle hills in and around the Kathmandu Valley, Nepal. The paper measures market access, institutional strength and connectivity, and the amount and quality of adaptation practices in the context of each community. Adaptation practices are placed into one of five strategies- common pooling, diversification, storage, market, and mobility (Agrawal, 2008). Each practice is ranked in terms of level of equitable outcome, livelihood benefit, and sustainability. Market access is measured by four criteria- (1) year-round access to paved road; (2) proximity to local market; (3) proximity to large market; and, (4) frequency of market visit. Finally, institutions are categorized as either formal or informal and then identified as a public, collective, or market institution. Institutional strength and connectivity are measured using a mapping program, *Pajek*. Basic statistical comparisons are applied to demonstrate relationships between market access and institutional capacity vis-à-vis the number and quality of adaptation practices within each case community.

Lastly, this paper will address recommendations at the household/village level, national level, and international level. The recommendations will specifically focus on ways communities can increase their response to natural disasters by building resilience. This can be done by both developing more expansive and effective adaptation practices and utilizing institutions to their full capacity. In addition, identifying the location and availability of important resources across all scales will facilitate better responses to climate impacts.

This report is divided into ten chapters. Chapter 2 provides a brief conceptual and historical background on Nepal. Chapter 3, a literature review, describes the relevance of environmental vulnerability, adaptation, institutional capacity, and the governance of common pooled resources. Chapter 4 introduces the methodology used for data gathering in the field and analysis and discusses the frameworks. Subsequently, Chapters 5, 6, and 7 provide a brief case study on each of the three studied sites. Chapter 8 first analyzes the link between market access and the number and strength of institutions. It further describes the analysis between the number and quality of adaptation practices and market access. Finally, the analysis will conclude with the relationship between institutions, adaptation practices and market access. Chapter 9 synthesizes the general observations from this research and seeks to draw meaningful conclusions. Finally, Chapter 10 provides a record of general recommendations covering a wide range of scales and issues on the household/village, national, and international levels.

Chapter 2. Background

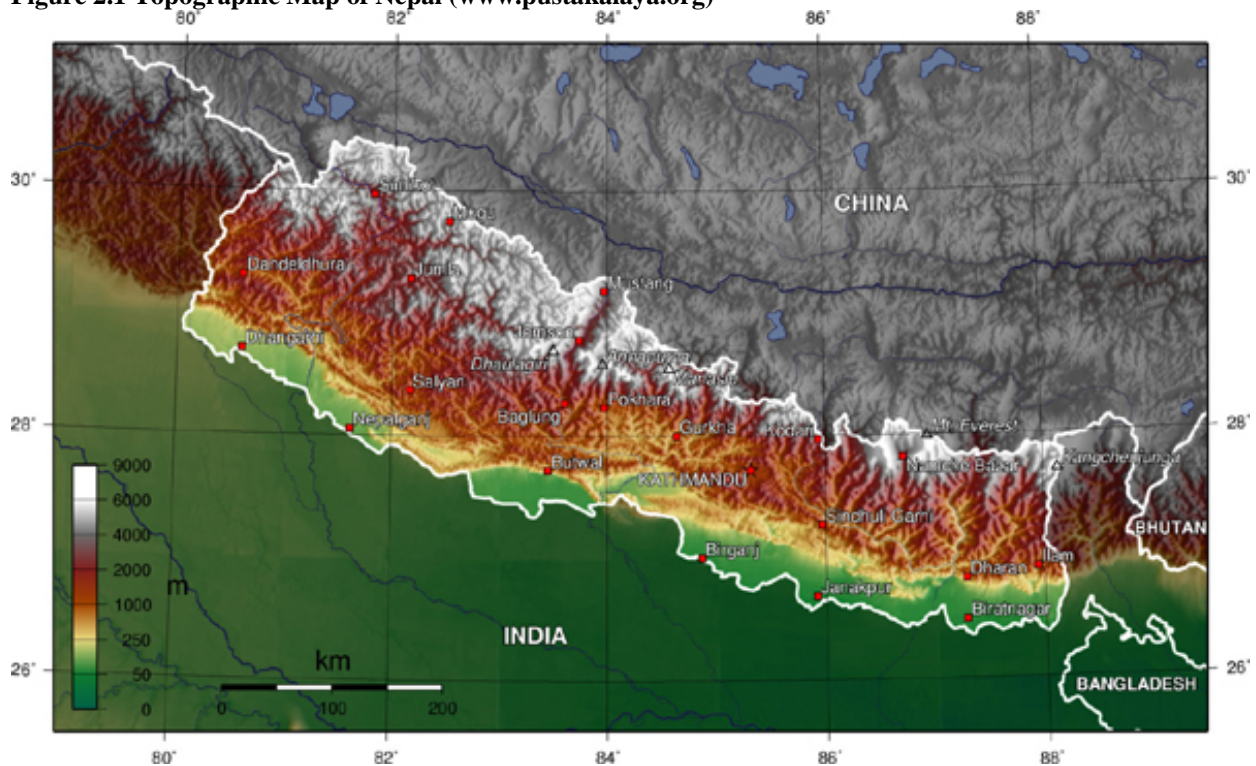
Geography
Socio-Economic & Demographic Trends
Demographics
Economy
Agriculture
Natural Disaster Management
Climate Change



GEOGRAPHY

Nepal is located along the southern slopes of the Himalayan Range in South Asia. Nepal's widely varying elevation is home to a myriad of unique ecosystems- from the lowland Terai to the high Himalayas.

Figure 2.1 Topographic Map of Nepal (www.pustakalaya.org)



Eight of the ten tallest mountain peaks in the world are within Nepal's border. At the same time, the low, fertile Gangetic Plains abuts Nepal's southern border with India. Therefore, Nepal houses an incredibly varied landscape that harbors a myriad of human cultures and flora and fauna species.

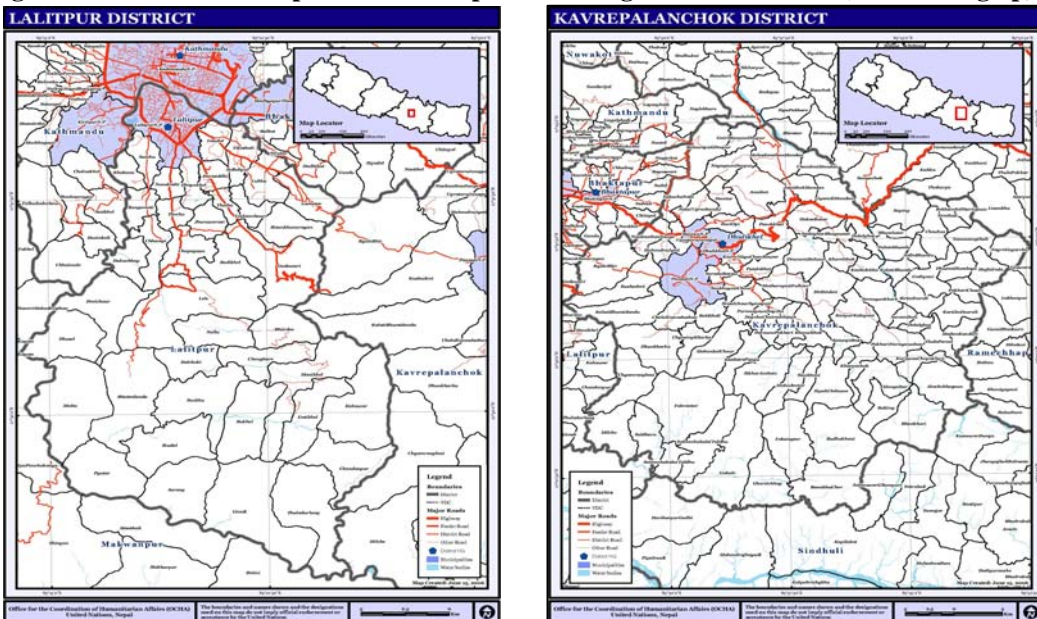
Nepal is divided into five regions, fourteen administrative zones, and 75 districts. Kathmandu- Nepal's capital city- is located in the middle hills region of central Nepal. Nepal's total land area is 141,781 km², which has been given a rank by the CIA World Factbook of 93 out of 179.

Figure 2.2 Nepal District Map (www.nepalelectionportal.org)



The field sites for this research project are located in Lalitpur and Kavre districts, both of which are located in or adjacent to the Kathmandu Valley. Lalitpur lies in the southern portions of the Kathmandu metropolitan area and includes the City of Patan, which lies directly south of Kathmandu proper. Kavre district lies to the east of Kathmandu Valley.

Figure 2.3 Kavre and Lalitpur District Maps Delineating VDC Boundaries (www.un.org.np)



SOCIO-ECONOMIC & DEMOGRAPHIC TRENDS

Nepal’s history is inextricably tied to the natural and cultural landscape of the Himalayas’. As mentioned above Nepal is home to a myriad of ecosystem types that harbor many unique plant and animal species. At the same time, this landscape is home to nearly 30 million people of vastly different ethnic and cultural origins who rely on the bounty of the land for sustenance and social development. Figures 2.4 and 2.5 below present the proportion of ethnic makeup in Nepal and the languages spoken.

Figure 2.4 Ethnic Makeup of Nepal
(www.census.gov/ipc/www/idb/)

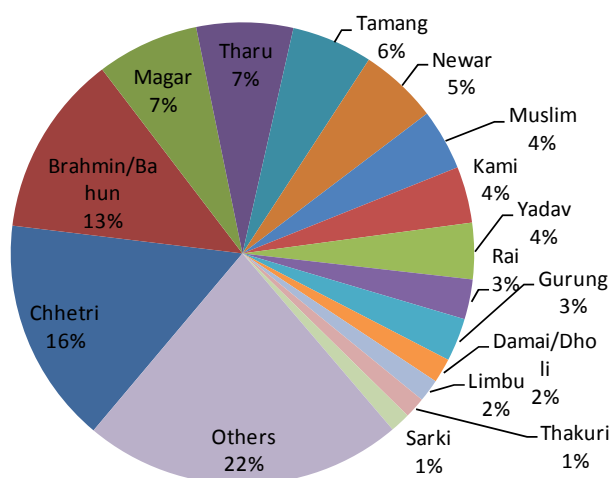
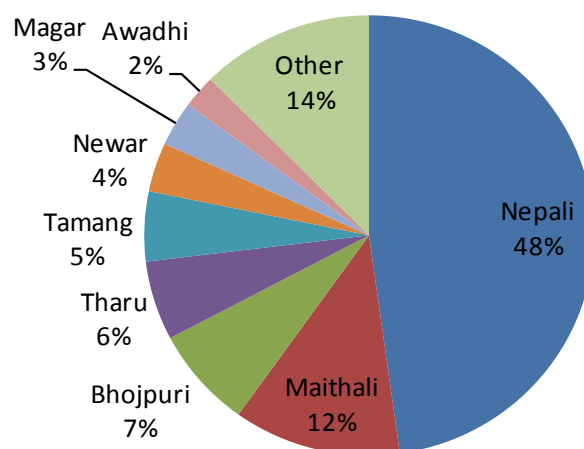


Figure 2.5 Languages Spoken in Nepal
(www.census.gov/ipc/www/idb/)



Demographics

Nepal’s stark and majestic landscape has been proven unable to sustain the country’s ballooning population numbers. Between 2000 and 2008, Nepal’s population grew more than 13% (US Census Bureau IDB) - from just under 25 million to well above 28 million - and the country witnessed an average annual population growth rate of more than 2.8% since 1970. (US Census Bureau IDB) Figure 2.6 shows Nepal’s population levels while Figure 2.7 outlines witnessed and projected changes in population growth rates for Nepal between 1950 and 2050.

Table 2.1 Historic Population Growth and Future Predictions (www.census.gov/ipc/www/idb/)

Year	1960	1970	1980	1990	2000	2010	2020	2030	2040
Population (millions)	10.03	11.9	14.7	18.9	24.8	29.0	34.2	38.9	42.8

Figure 2.6 Historic Population Growth and Future Predictions (www.census.gov/ipc/www/idb/)

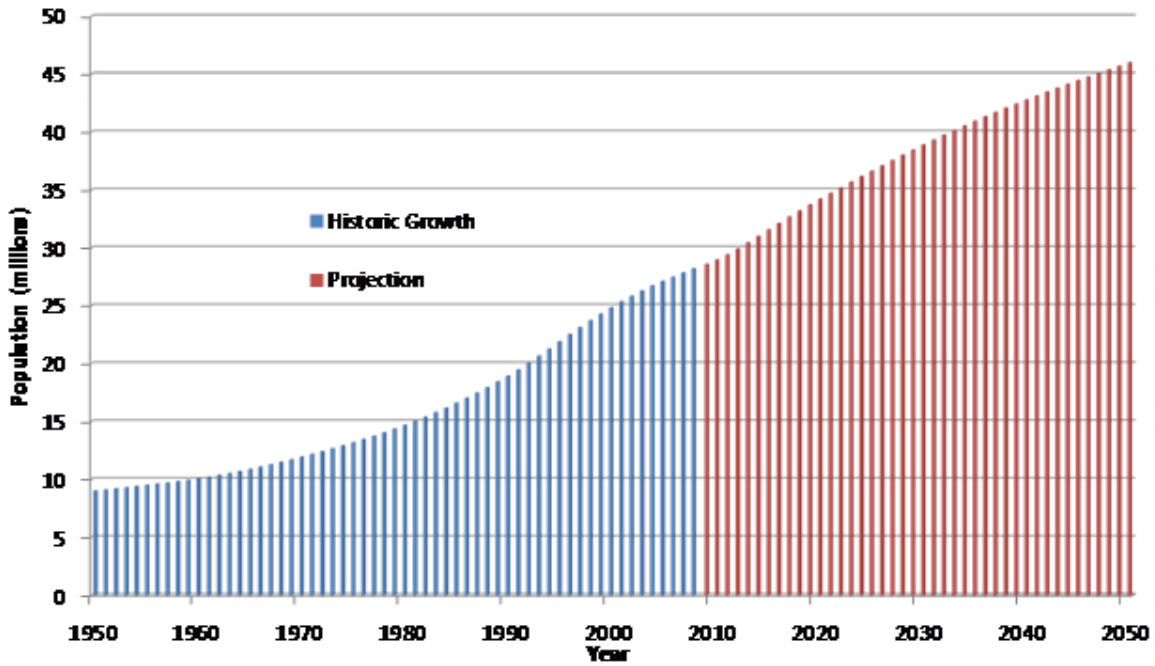
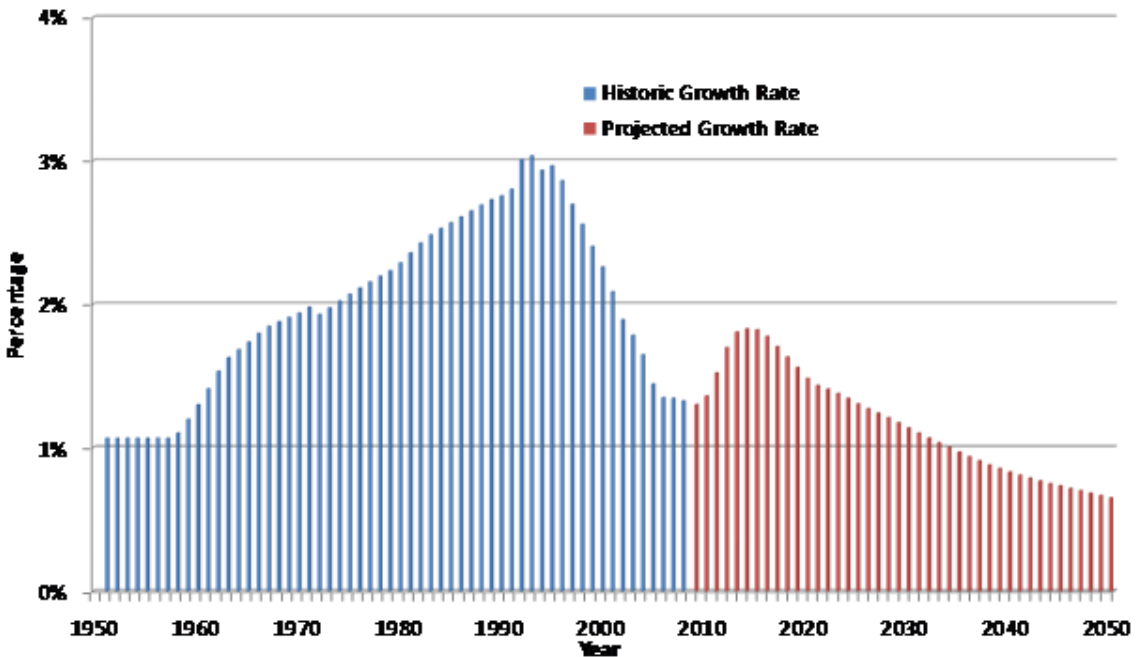


Table 2.2 Population Growth Rate (www.census.gov/ipc/www/idb/)

Year	1960	1970	1980	1990	2000	2010	2020	2030	2040
Annual Population Growth Rate	1.3%	1.9%	2.3%	2.8%	2.3%	1.4%	1.5%	1.1%	0.8%

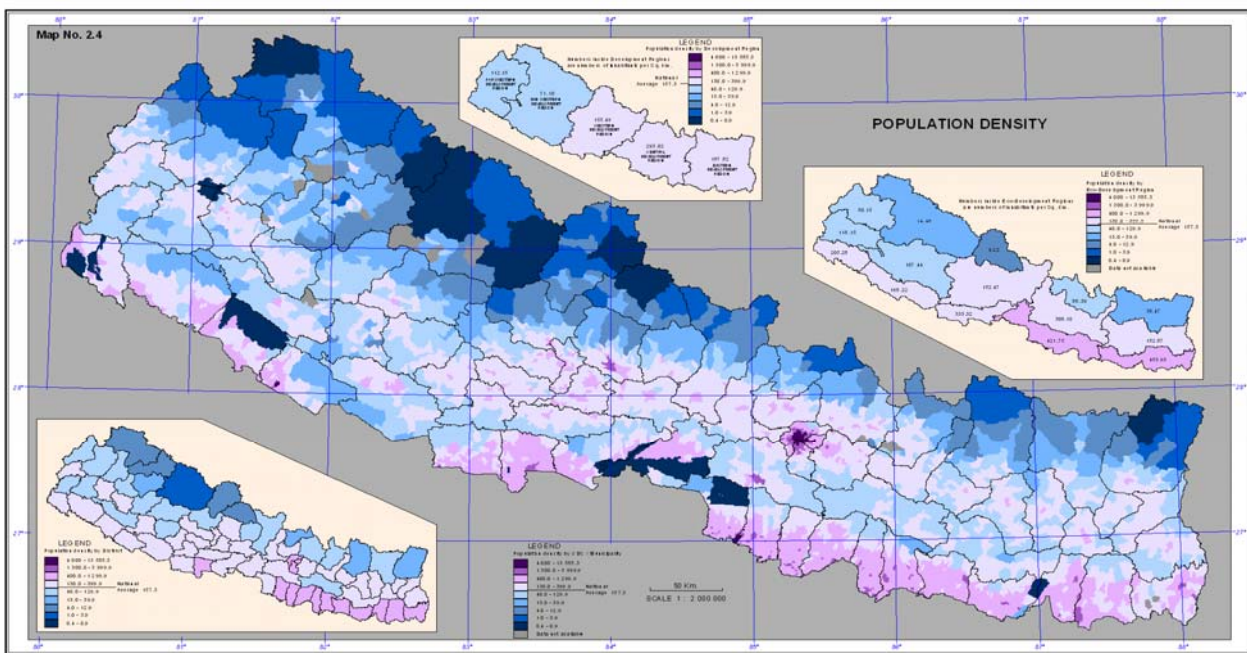
Figure 2.7 Population Growth Rate (www.census.gov/ipc/www/idb/)



The results gathered from correlating the two graphs above show that although there has been an exponential increase in Nepal's population levels since 1950, this increase is not uniform. Figure 2.7 suggests that Nepal's overall population growth is episodic, for example, the country's growth rate decreased significantly during Nepal's ten-year civil conflict between 1996 and 2006.

Another factor that characterizes Nepal's population distribution is the dichotomy between the Middle Hills and the Terai, show in Figure 2.8. The Middle Hills of Nepal is the section of the country that lies in between the plains of Northern India and the High Himalayan Range. This area is between 1000 and 4000 meters in elevation and was, for most of Nepal's history, home to the majority of Nepal's citizens. Trends show that growth in Nepal's lowlands, or Terai, has inflated in recent decades, partly due to medical breakthroughs in treating tropical diseases which results in a large Nepal population residing in the lowlands.

Figure 2.8 Population Density in Nepal (Purple=Dense; Blue=Not Dense) (www.cbs.gov.np)



Economy

Nepal's mountainous landscape and unique demographic circumstances are one of many factors that can explain the country's lack of economic and social development. Nepal is one of the poorest and least developed countries in the world, with a GDP of approximately US\$1,000 (2008) (CIA World Factbook), an unemployment rate of 42% (2004) (CIA World Factbook), and with more than 24% of the population living with less than US\$1 a day. (CIA World Factbook) Nepal was also given a Human Development Index of .534, which corresponds to a global ranking of 142 out of 179 (CIA World Factbook). This development index is a good indicator of Nepal's fairly underdeveloped society, economy, and the rate of globalization. Additionally, Nepal's population is particularly susceptible to detrimental institutional and economic dynamics due to their lack of resources and strong reliance on natural resources (Adger, 2003)

Agriculture dominates Nepal's economy. In 2007, agricultural production accounted for nearly 36% of Nepal's GDP. As such, one can gather that poor rural communities, who produce most of Nepal's agriculture, dominate Nepal's economy. Although agriculture is found in abundance in these communities, they also lack access to capital and most other resources.

Much like other developing economies, the trade and finance sectors do not account for a large proportion of Nepal's GDP. Still, Table 2.3 below shows that the importance of agriculture in generating national income has been decreasing for the past several years. Agriculture accounted for 45% of national GDP in 1998 decreasing to 36% in 2007. Oddly though, there is not a corresponding increase in the finance, manufacturing, or trade sectors between 1998 and 2007.

Table 2.3 Main Industries in Nepal (www.adb.org/statistics)

	1998	2000	2002	2003	2004	2005	2006	2007
Agriculture	45%	39%	37%	37%	37%	38%	37%	36%
Construction	6%	6%	6%	6%	6%	6%	6%	6%
Electricity / Gas / Water	2%	1%	2%	2%	2%	2%	2%	3%
Finance	11%	11%	11%	11%	10%	11%	11%	12%
Manufacturing	6%	8%	9%	9%	8%	8%	8%	8%
Mining	0%	0%	0%	0%	0%	0%	0%	0%
Public Administration	8%	8%	9%	9%	11%	12%	12%	12%
Trade	17%	19%	19%	18%	16%	15%	15%	14%
Transport / Communications	6%	7%	7%	7%	8%	8%	8%	9%

Figure 2.9 Major Industries Over the Years (www.adb.org/statistics)

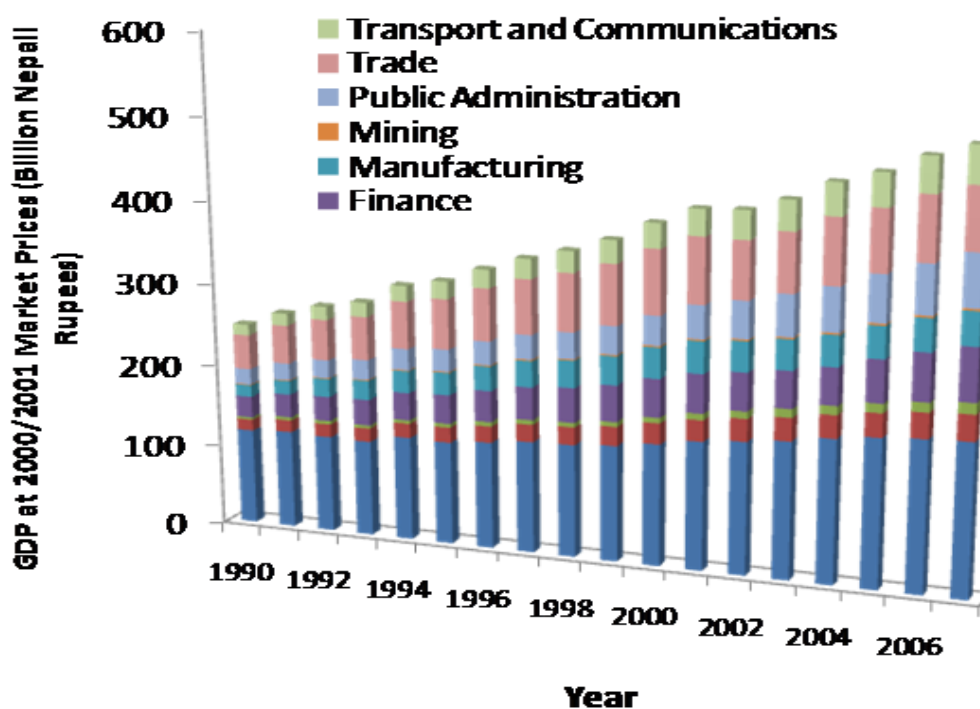


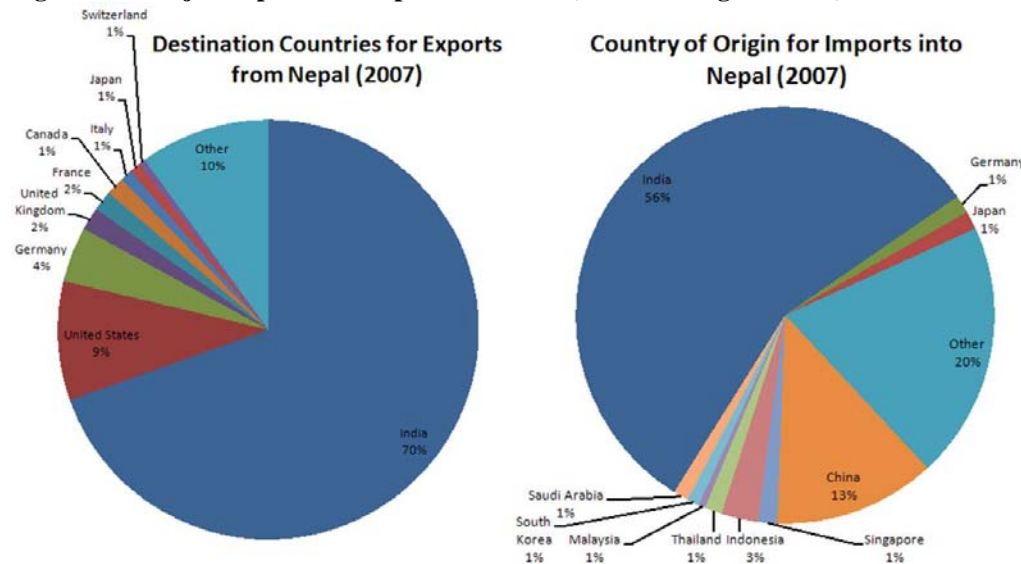
Figure 2.9 above shows that even when agricultural production remained relatively constant, Nepal’s economy continued to witness growth between 1990 and 2007. This growth can be attributed to the expansion of Nepal’s manufacturing, trade, and public sectors.

Moreover, Nepal’s economy is heavily reliant upon the economy of its neighbors- India and China. In 2007, 70% of Nepal’s exports were shipped to India. In contrast, 56% of Nepal’s imports originated from India. In many ways India has shown to have somewhat of an economic stranglehold on Nepal’s economy.

Table 2.4 Major Exports and Imports

Major Exports from Nepal	Major Imports into Nepal
Clothing	Petroleum products
Carpets	Machinery/equipment
Leather goods	Electrical goods
Jute goods	
Grains	

Figure 2.10 Major Export and Import Countries (www.adb.org/statistics)



Agriculture

As highlighted above, agriculture plays a large role in Nepal’s economy and culture. Nepal’s most prevalent agricultural crops consist of rice, sugarcane, maize, wheat, and potato. Figure 2.11 displays the proportion of each type of agricultural production per year while Table 2.5 shows the amount of Nepal’s agriculture production. These figures reveal that agriculture production has more or less steadily increased since 1990. More importantly, it can be seen that maize and millet production has remained relatively stable, while potato, wheat and sugarcane production has increased over time. In contrast, rice (patty), Nepal’s most abundant crop, has minimally declined being substituted for other crops. These changes in crop production could correspond with market fluctuations.

Figure 2.11 Agricultural Production in Nepal (www.adb.org/statistics)

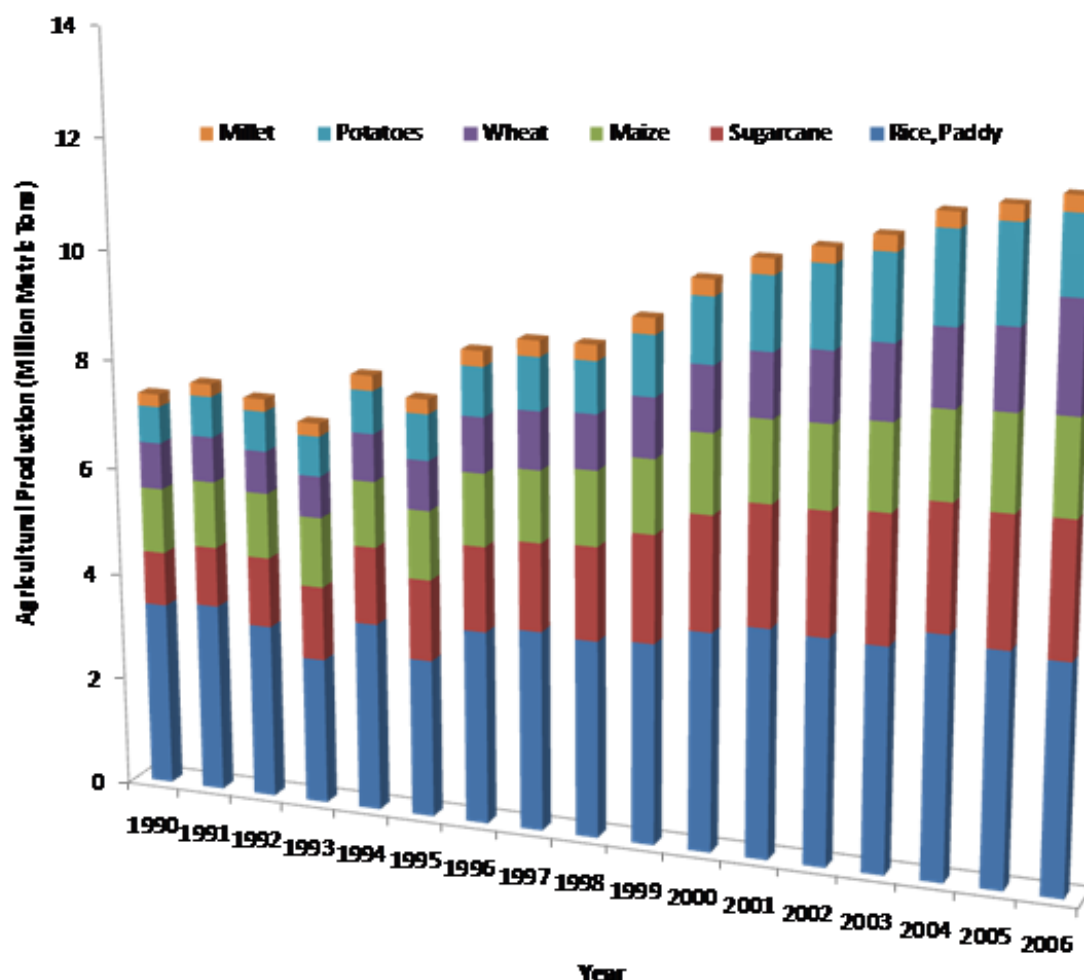


Table 2.5 Agricultural Production in Nepal (www.adb.org/statistics)

	1990	1992	1994	1996	1998	2000	2002	2004	2006
Rice, Paddy	46%	43%	43%	41%	41%	39%	38%	38%	35%
Sugarcane	14%	17%	18%	18%	19%	21%	21%	20%	20%
Maize	16%	16%	15%	15%	15%	14%	14%	14%	14%
Wheat	12%	10%	11%	12%	11%	12%	12%	12%	16%
Potatoes	9%	10%	10%	10%	10%	12%	13%	14%	12%
Millet	3%	3%	3%	3%	3%	3%	3%	2%	2%

Despite Nepal's economy being heavily dominated by the agricultural sector, there is little variety or diversity in the country's crops. Even with agricultural production increases most rural communities still do not produce enough for general livelihoods consumption, as seen in Figure 2.12.

Figure 2.12 Agricultural Sufficiency for Livelihoods (www.cbs.org.np)

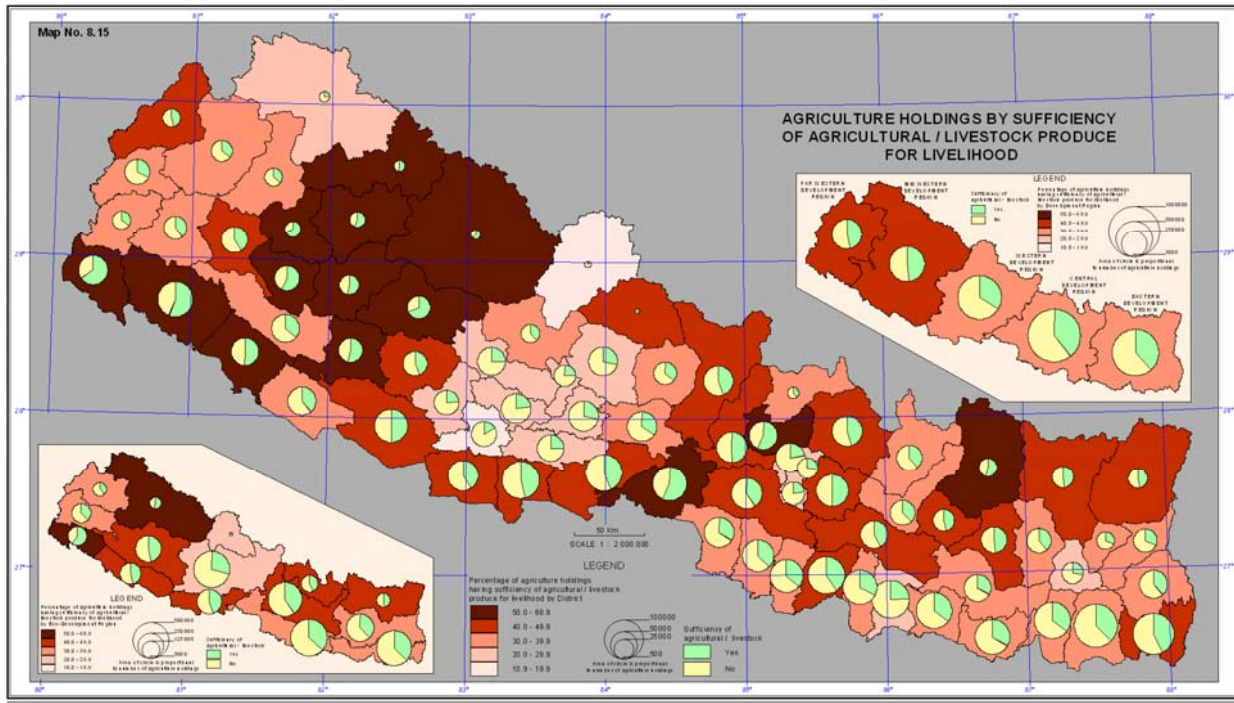
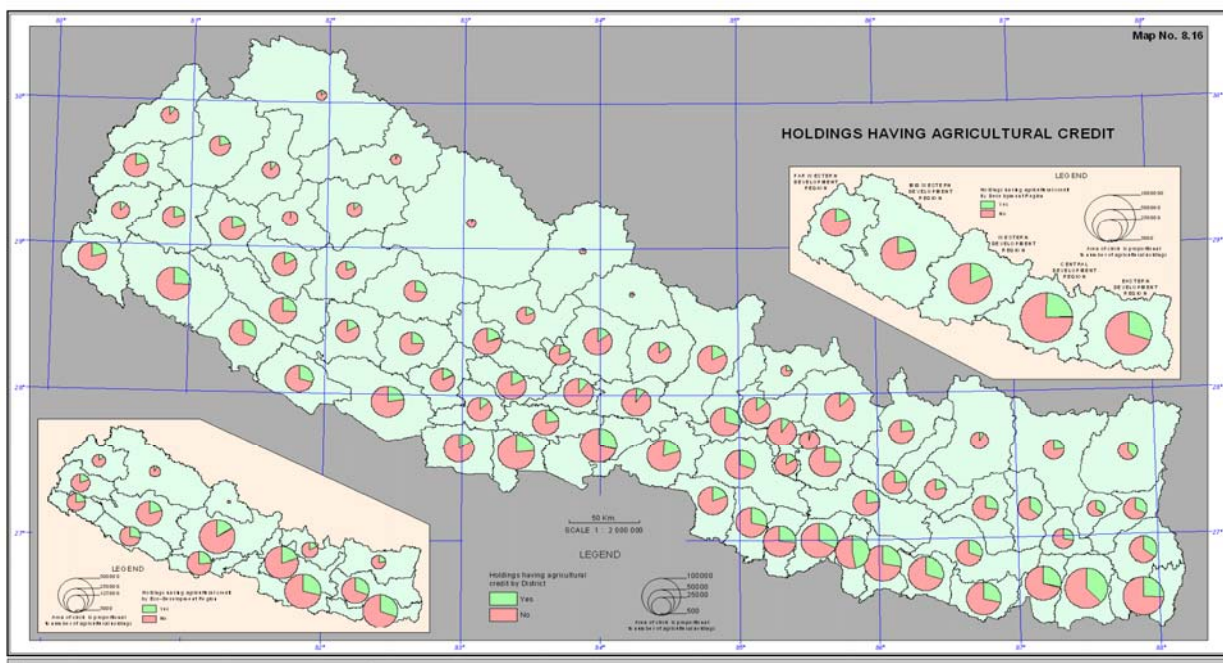


Figure 2.13 Households with Agricultural Credit (www.cbs.org.np)



The figures above reveal that districts across Nepal show insufficiencies in agricultural production even in terms of providing basic sustenance to local populations. This deficiency is most prevalent in areas with high population densities, especially in the Kathmandu Valley and in the Eastern Terai. Similarly, the map (Map 1.3) below outlines the prevalence of agricultural credit across Nepal. Since only approximately 25% of all agricultural holdings utilize the credit

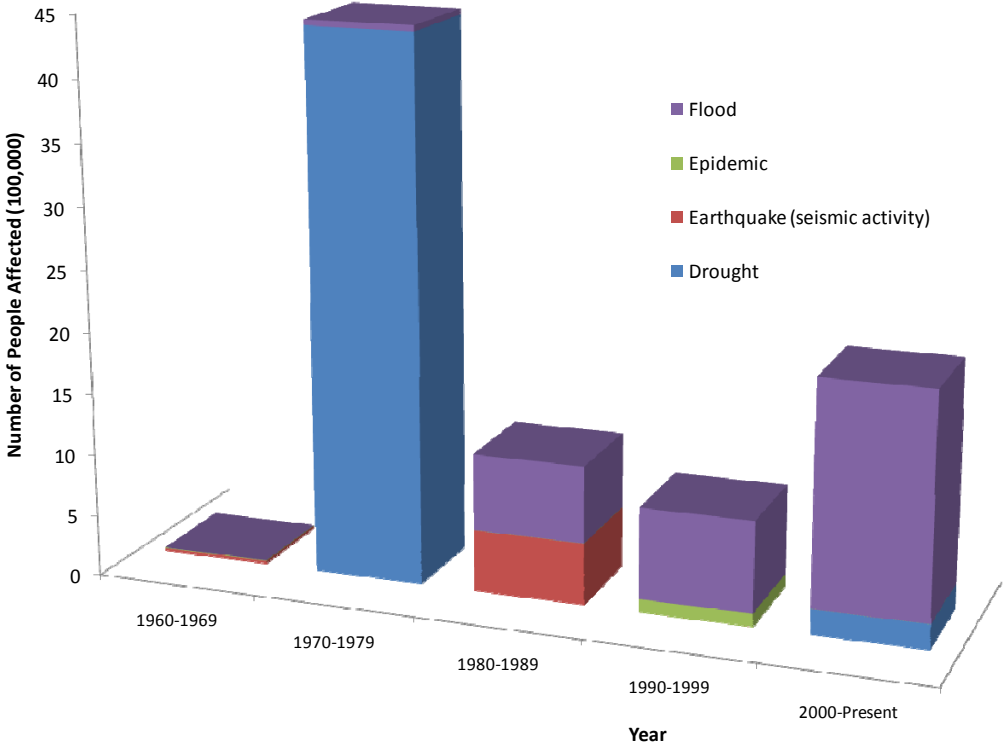
system, one can see that most agriculture is not perceived as a business, but rather a means for sustenance and for the production of basic livelihood needs. Therefore, although the agriculture sector is substantial in relation to Nepal’s national GDP, it is rather underdeveloped, which often does not provide adequate livelihoods for its population.

NATURAL DISASTER MANAGEMENT

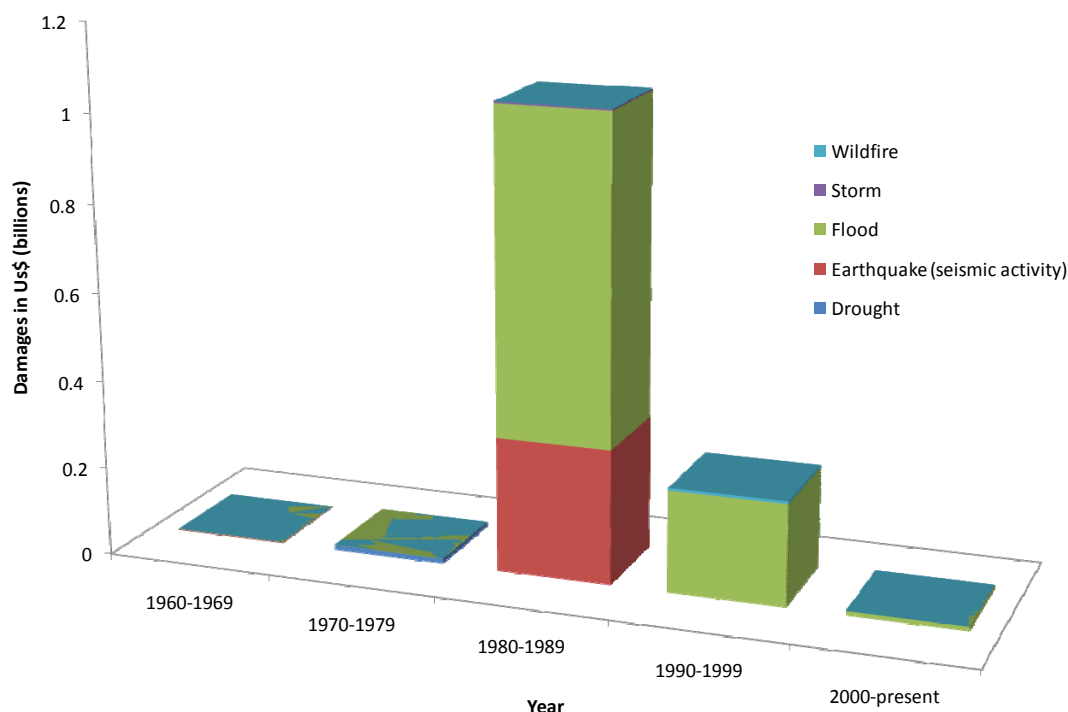
For many decades Nepal has suffered from numerous natural disasters, which have caused havoc upon the country’s citizens and economy. Since Nepal is located on some of the most rigid landscapes on Earth, the country has experienced a wide variety of events, including floods, droughts, landslides, and epidemics. From 1960 to the present, floods and droughts have been the most significant, in terms of number of people affected and economic losses, natural disasters in Nepal (EMDAT).

The Figure 2.14 displays the total number of people affected by different types of disasters in decade-long periods from 1960 to the present. The figure uncovers that floods and droughts affect the largest proportion of Nepal’s population. In coordination, Figure 2.15, links these disasters to their respective economic losses.

Figure 2.14 Natural Disaster Occurrences in Nepal (www.emdat.be)



2.15 Costs of Natural Disasters in Nepal (www.emdat.be)



Due to the prevalence and severity of natural disaster events, many branches of Nepal's national government, together with foreign aid agencies, have evolved to tackle pressing issues in disaster management. The following tables, Table 2.6 and 2.7, detail important national and foreign aid agencies involved in various disaster management initiatives throughout Nepal (from Chhetri, 2003).

Table 2.6 International Disaster Relief Organizations

Japan International Co-Operation Agency (JICA)	United Mission to Nepal (UMN)
Asian Disaster Reduction Centre (ADRC)	Co-Operation for American Relief Everywhere (CARE)
Asian Disaster Preparedness Centre (ADPC)	World Food Program (WFP)
United National Development Program (UNDP)	Save the Children Fund (SCF)
International Centre for Integrated Mountain Development (ICIMOD)	Technical Co-Operation of the Federal Republic of Germany (GTZ)
International Red Cross Society (IRCS)	Lutheran World Service (LWS)
United States Agency for International Development Mission to Nepal (USAID-Nepal)	OXFAM

Table 2.7 National Disaster Relief Organizations

Ministry of Home Affairs	Ministry of Forest & Soil Conservation	Nepal Civil Police Force
Ministry of Water Resources	Ministry of Agriculture & Co-Operatives	Nepal Armed Police Force
Ministry of Physical Planning & Construction	Ministry of Education & Sports	Nepal Red Cross Society
Ministry of Health	Ministry of Science & Technology	Department of Forest & Soil Conservation
Ministry of Finance	Ministry of Children, Women & Social Welfare	Department of Narcotics Control & Disaster Management
Ministry of Defense	Ministry of Industry, Commerce & Supplies	Department of Water Induced Disaster Prevention
Ministry of Foreign Affairs	Secretariat of National Planning Commission	Department of Mines & Geology
Ministry of Information & Communication	Nepal Army	Department of Hydrology & Meteorology

Still, because of many resource and institutional limitations, these agencies have been unsuccessful in remedying the effects of natural disasters on Nepal's population and economy. Chhetri (2003), in particular, cites the following as the main impediments to a successful national disaster preparedness and mitigation program in Nepal:

- Limited resources.
- Remote, rural, and difficult geo-physical condition of the country.
- Inadequacy of infrastructure facilities.
- Low literacy rate.
- Lack of public awareness.
- Absence of modern technology, such as insurance and early warning systems.
- Poor coordination.
- Very few NGOs willing to work in disaster mitigation programs.
- Wrong perceptions of the people.
- Increasing population, haphazard construction and unplanned settlements.

These factors suggest that many institutional and organization improvements could be made in order to facilitate a more effective disaster mitigation and response mechanisms. The data synthesized above suggests that even with a myriad of organizations working within this arena, the negative effects of natural disasters continue to be far reaching.

Moreover, even though the Nepali government passed the Natural Disaster Relief Act (NDRA) in 1982 attempting to remedy the institutional barriers to nation-wide disaster management efforts, many of the problems identified by Chhetri continue to exist. But even with the passing of the NDRA, mechanisms for dealing with existing environmental hazards have been grossly inadequate as shown by the negative economic impacts during the 1980's. Assuming that disaster events will increase in magnitude, the Nepali government clearly does not have the

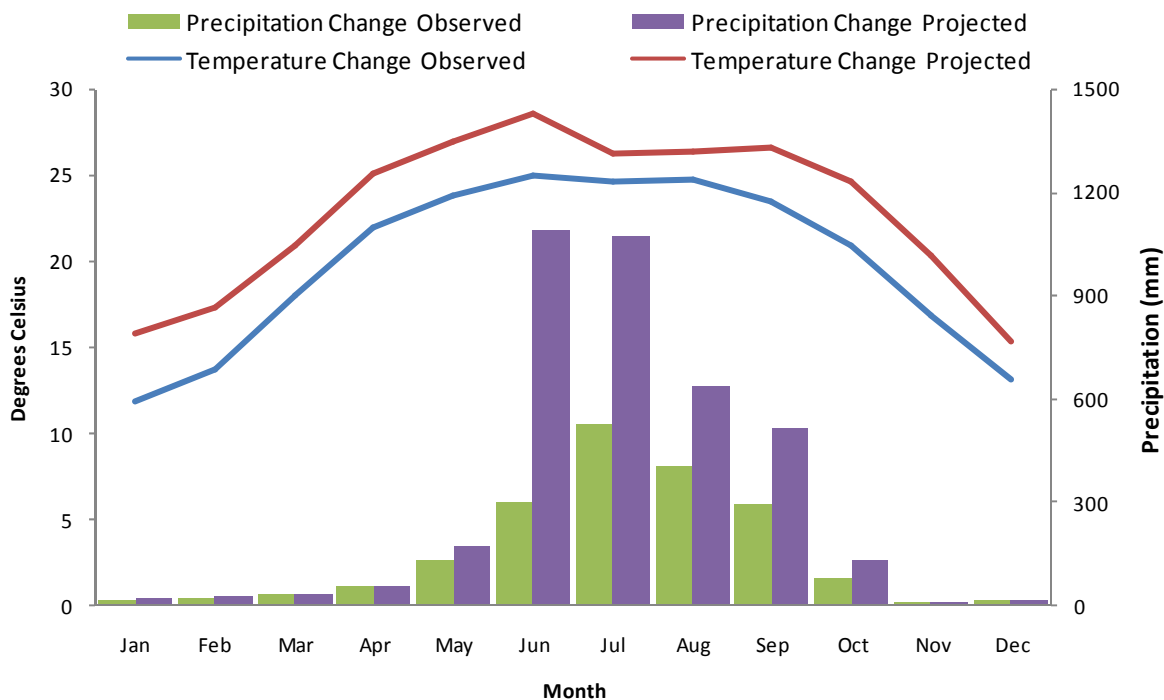
capacity to deal with potential large-scale environmental shifts in the future. Box 1 provides basic details of the NDRA.

CLIMATE CHANGE

Nepal’s Middle Hill region has rich biological and environmental resources that serve as a water reservoir and act as a climate regulator for ecological systems (Yohe & Tol, 2002). When climate systems alter general ecosystem dynamics, communities may not be able to cultivate essential forest products, such as timber, grasses, and leaf bedding (Adhikari, 2005) or agricultural products, such as rice, maize, soybeans, and potatoes. This raises critical questions about whether vulnerable populations in Nepal can cope with potentially livelihoods challenges.

Due to Nepal’s diverse terrain the effects of climate change are vast and far-reaching. The data from the U.S. Country Study of Nepal (USCSP, 1997) shows drastic shifts in both average temperatures and precipitation rates if the atmospheric carbon dioxide concentration was doubled. In particular, the data suggest that mean temperatures in January (the winter season) will surge more than 32% if worldwide atmospheric carbon dioxide levels are doubled. Similarly, precipitation levels would increase nearly 265% for June (USCSP, 1997 & Nepal Case Study- NAPA Workshop, 2003), as seen in Figure 2.16. Hence, the data suggest that temperatures, on the whole, would increase most significant during the winter season. Similarly, the data seem to show severe increases in precipitation levels during the monsoon season.

Figure 2.16 Projected Temperature and Precipitation Change (USCSP, 1997 & Nepal Case Study- NAPA Workshop, 2003)



The projected increases in average temperature and rainfall levels also have significant potential health and environmental effects. Chart 2.8, from the *Vulnerability and Adaptation Assessment for the Hindu Kush-Himalaya Region*, produced by the World Health Organization (WHO), shows significant health and environmental effects for Nepal and its neighbors. In particular, Nepal is projected to experience increased episodes of droughts, floods, and diseases.

Table 2.8: Health determinants and health outcomes that currently exist in mountain regions or are related to mountains: synthesis of country reports. (From *Vulnerability and Adaptation Assessment for the Hindu Kush-Himalaya Region*)

Country	Afghanistan	Bangladesh	Bhutan	China	Nepal	India
Heat waves	+	+	-	+	+	+
Glacial Lake Floods	M	-	M	M	M	M
Flash Floods	M	+	M	M	M	M
Plain Floods	+	+	-	+	+	+
Malaria	+	+	+	+	M	+
Japanese Encephalitis	-	+	-	+	+	+
Kala-Azar	+	-	-	-	+	+
Dengue	-	+	+	+	-	+
Water-Borne Diseases	M	+	M	M	M	M
Water scarcity, quality	M	+	+	M	M	M
Drought-Related Food Insecurity	M	+	-	M	-	M

An “M” indicates the health determinant or outcome is present in the mountainous region of the country; a “+” indicates the health determinant or outcome is present elsewhere in the country; a “-” indicates the health determinant or outcome is not present.

Although a National Adaptation Programmes of Action (NAPA) has not been completed for Nepal, the 2003 NAPA conference in Bhutan produced a brief case study on Nepal. Due to the projected changes in temperature and precipitation, along with the episodes of drought, floods and diseases the case study has identified vulnerable sectors in Nepal. Table 2.9 shows Nepal’s vulnerable sectors, which include; water, agriculture, forest/biodiversity, and health sectors. These sectors are projected to be the most vulnerable to climate change uncertainties. Increasingly important is the human impact to vulnerabilities in these sectors. As mentioned above, many Nepali households rely on the natural resources they live among to survive, especially agriculture, forest and water. In addition, Nepal does not have the financial capital to respond to these changes.

Table 2.9 Sectors that are most vulnerable to climate change (NAPA Workshop-Nepal Case Study, 2003).

Sectors	Reasons for Vulnerability
Water Resources	<ul style="list-style-type: none">- Alterations in hydrological cycle.- Increased variability in runoff. Peak discharge period would likely shift from August to July because mountaintop snowmelt will occur earlier in the year.- Increased flooding and drought situations in different areas.
Agriculture	<ul style="list-style-type: none">- Sector is highly dependent on weather.- Productivity increases in this sector has not been in sync with population growth in recent years.- Population is highly dependent on rice, maize, and wheat and the changes in winter precipitation levels will disrupt planting and harvesting cycles in the winter and spring seasons.- Rice yields in the Western Regions of Nepal are projected to fall.
Forestry/Biodiversity	<ul style="list-style-type: none">- Vegetation patterns will be altered because of changes in temperature and precipitation.- Biodiversity changes in forested regions will be most severe.- Nepal is home to many endangered species and an additional 2.4% of species are projected to be lost in the near future.
Health	<ul style="list-style-type: none">- There will be increased incidences of natural disasters, particular floods associated with melting glaciers.- Incidences of malaria and Japanese encephalitis are projected to move up in elevation.- Nepal currently lacks a comprehensive primary healthcare system.

Nepal's relatively deficient levels of economic and human development, together with current projections of potential climate change, suggest that Nepal ranks high in term of vulnerability to climate change impacts. This research, then, seeks to understand factors which influence the ability to adapt to climate change. The paper then develops recommendations focused on mechanisms, which will enhance institutional capacity for facilitating adaptation practices that reduce people's vulnerability to climate change.

Chapter 3. Literature Review

Environmental Vulnerability Institutional Capacity for Climate Change Adaptation Governing Common Pool Resources



Recent research on global climate change has begun to focus on impacts, vulnerability, and adaptation by peoples and ecosystems (IPCC, 2007). This switch in focus is due to the fact that time lags between greenhouse gas emissions and their impacts mean that human communities around the globe are already committed to potentially significant impacts stemming from climate change. Many of these impacts will be experienced as increased variability and unpredictability of climate patterns. In mountain regions, these impacts are likely to lead to hazards such as erratic rainfall, flash floods, landslides, crop failure, and greater incidence of water borne diseases.

A growing body of literature discusses the linkages between social-ecological systems and their ability to remain resilient to climate effects. These scholars combine social-ecological system resiliency with literature on environmental governance regimes. Specifically, social and environmental scientists have begun to identify various institutional arrangements for effective environmental governance of natural resources. Environmental governance is defined as the “set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes” (Lemos & Agrawal 2006, 298). These types of institutional arrangements can be particularly effective in structuring the management and use of natural resources, including common property resources, and must be considered vital to structuring adaptation strategies and practices in a local context.

ENVIRONMENTAL VULNERABILITY

Before one can investigate the adaptive capacity of institutions, one must understand the concept of vulnerability. The Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC, 2001), Yohe & Tol (2002), and Adger et al. (2003) recognize that the vulnerability of any system to an external stress should be defined as follows:

$$Vulnerability = f(exposure, sensitivity, adaptive\ capacity)$$

Moreover, Adger et al. (2003) argue that “vulnerability is a socially constructed phenomenon influenced by institutional and economic dynamics” (Adger et al. 2003, 181).

Resilience, on the other hand, can be defined as “the amount of change a system can undergo and still retain the same function and structure while maintaining options to develop” (Nelson et al., 2007). Both theories of vulnerability and resilience describe the state of a system in response to external environmental stressors. Although the theories of resilience and vulnerability complement traditional ecological theory, social vulnerability and social resilience are products of engrained cultural and communal phenomena that are in flux and evolve constantly and therefore, are much harder to conceptualize and quantify.

Social systems with complex cultural organizational structures are more often associated with the need for adaptation. Adaptation is defined as “the decision-making process and set of actions undertaken to maintain the capacity to deal with current/future predicted change or perturbations to a social-ecological system without undergoing significant changes in function, structural identity, or feedbacks of that system while maintaining the option to develop” (Nelson et al., 2007). According to Nelson et al. (2007), adaptation is important for three reasons:

- (1) Many future environmental risks are now more apparent and predictable than ever.
- (2) Even where risks are not quantifiable, environmental changes may be hugely significant.
- (3) Environmental change has indisputable human causes. Thus, adaptation and adaptation assistance are increasingly demanded by those made vulnerable by increased exposure to risk.

INSTITUTIONAL CAPACITY FOR CLIMATE CHANGE ADAPTATION

While research on climate change adaptation is growing, these endeavors have mainly focused on the role of broader institutions at larger political and geographic scales (Agrawal, 2008). Institutions are humanly created formal and informal mechanisms that shape social and individual expectations, interactions, and behavior (Ostrom 1990, North 1990, Bates 1981). Institutions structure and shape outcomes through the actions of individuals and decision makers associated with them. To understand their impacts it is necessary to examine their internal processes, external relationships, and linkages with different social groups and households (Agrawal 2008). Hence, institutions often play a pivotal role in facilitating vulnerable population’s adaptation to climate change (Adger et al., 2003). However, a minimal amount of research has focused on the role of local institutions in determining community-based climate change adaptive capacity. It has been well-documented, however, that local institutions can work to structure effective social outcomes in natural resource distribution and other areas, and are therefore critical to adaptation. In regards to climate change adaptation, Agrawal (2008) identifies three particular areas where local institutions may be critical to climate change adaptation:

- (1) They structure environmental risks and variability and thereby the nature of climate impacts and vulnerability.
- (2) Institutions create the incentive framework within which outcomes of individual and collective actions unfold.

- (3) Institutions are the media through which external interventions reinforce or undermine existing adaptation practices.

Hence, the practice of adaptation should be tailored to address system vulnerabilities and increase resilience against environmental risks. According to Agrawal (2008), adaptation practices can be classified into five classes: mobility, storage pools, diversification, communal pooling, and exchange. These adaptation practices should address vulnerability in the national/regional, community, and household levels while looking at indicators such as poverty, inequality, social capital, institutional effectiveness and connections, literacy, political rights, civil liberties, life expectancy, mortality rates (Adger 1999, Brooks et al. 2005, Eakin 2005). This paper will seek to relate various adaptation practices with the need to address the aforementioned vulnerability indicators.

The idea of adaptive governance seeks to introduce factors associated with adaptation into resource management schemes. According to Nelson et al. (2007), adaptive governance entails steering processes of change through institutions: “for adaptation to be successful, institutions clearly need to endure and be persistent throughout the process of adjustment and change” (Nelson et al., 2007).

In terms looking at adaptive governance in rural situations, one would have to look at three types of institutions: public, civic, and market (Agrawal, 2008) The three sectors entail vastly different agencies and organizations, but they all involve information, vision, trust, technology, financial investments, and leadership (Agrawal, 2008 & Olsson et al. 2004). Since these factors dictate the system of organizations and agencies in rural setting, one can suggest that these are exactly the same factors that affect the list of adaptation practices (mobility, storage, diversification, communal pooling, and exchange) as stated by Agrawal (2008). Therefore, an inclusive calculation of adaptive capacity should include all the factors as listed by Adger (1999), Brooks et al. (2005), Eakin (2005), and Agrawal (2008)- inequality, social capital, institutional effective and connections, political rights, civil liberties, etc.

Village women in the rice paddies.



According to Olsson et al. (2007) - “ecosystems are complex adaptive systems that require flexible governance with the ability to respond to environmental feedbacks.” (Olsson et al. 2007) Therefore, to ensure the resilience of natural resources and their respective communities- represented as a social-ecological system-, the following must happen (Olsson et al., 2007):-

- (1) The enabling of legislation that creates social space for ecosystem management;
- (2) Sufficient funds for responding to environmental change and for remediation action;

- (3) Capacity for monitoring and responding to environmental feedbacks;
- (4) Adequate information flow through social networks;
- (5) The combination of various sources of information and knowledge; and
- (6) The establishment of arenas for collaborative learning for ecosystem management.

This report examines whether or not “local groups self-organize, learn, and actively adapt to and shape change with social networks that connect institutions and organizations across levels and scales” (Olsson et al., 2007) - with particular emphasis on natural resources-dependent communities and climate change.

GOVERNANCE OF COMMON POOL RESOURCES

Our research also addresses specific areas within the broader literature on institutions and adaptation by looking at institutions that manage common-pooled resources. CPRs are resources characterized by difficulty of exclusion and generate finite resource units so that one person’s use subtracts from the quantity of resource available to others (Ostrom et al., 1990). Common-pooled resources are common to everyone who wants to exploit it, but the goods produced are private (Ostrom et al., 1999). The dynamics of common-pooled resources (CPR) are also important to understand in the climate change context since many communities manage common-pooled natural resources through governance structures composed of local institutions. Understanding institutional arrangements for CPR management is particularly crucial for Nepal, where community-based management of forests is institutionalized and many rural communities collectively manage water resources as well.

Using historical and contemporary evidence, scholars like Agrawal (1999) and Ostrom (1992) have shown that resource users often create institutional arrangements and regimes for equitable CPR management, over long periods of time (Agrawal, 2001). To date, this focus has been on small user groups and communities (Agrawal, 2001). It is argued that sustainable use of commonly used resources is possible provided a natural resource is used by a specific group of people. The group can then decide who may use the resource and to what extent (Feeny et al., 1992; Ostrom, 1990; and Wade, 1992). The institutions for governing natural resources, then, include the established rules and social norms that deal with the preservation of the resource against continued extraction and depletion. More often than not, the complexity surrounding the governance of CPRs, such as forests, result in organizations for resource management, which are concrete manifestations of institutions with an identifiable location, personnel, and role structure (Uphoff & Buck, 2007). For the purpose of this paper, the social organizations and policy institutions will be assessed in relationship to projected climate change effects on forest resources and other natural-resource dependent practices endemic to these communities under study.

Building off of this body of literature, this paper investigates the relationship between institutions, accessibility to markets, and their relationship to the effectiveness of community-based climate change adaptation strategies and practices. The adaptive capacity of an affected community, region or nation depends upon its ability to cope effectively with the impacts and risks associated with climate change (IPCC, 2001). Although existing research and knowledge

about adaptation has examined a number of ways in which household and community vulnerability is experienced, far more place-based, context-sensitive research on the subject is necessary to permit the ways in which rural communities have coped with climate impacts so as to develop a deeper understanding of the relationship between climate hazards, human resources, and adaptive capacity.

Therefore, this paper will seek to identify the role of local institutions in facilitating climate change adaptation strategies and environmental risk management initiatives in three natural resources-driven communities in the Middle Hills of Nepal. The results are a discussion of the role of institutions in dealing with potential climate change effects and the role that these institutions have in shaping the effectiveness of a particular adaptation strategy and/or practice. The framework and methodology for understand the relationship between market accessibility and institutional capacity will be outlined in Chapter 4.

Chapter 4. Research Frameworks & Methodology

Research Framework

- The Importance of Local Context
- The Role of Market Accessibility
- The Role of Institutions
- The Market, Institution, Adaptation Nexus

Methodology

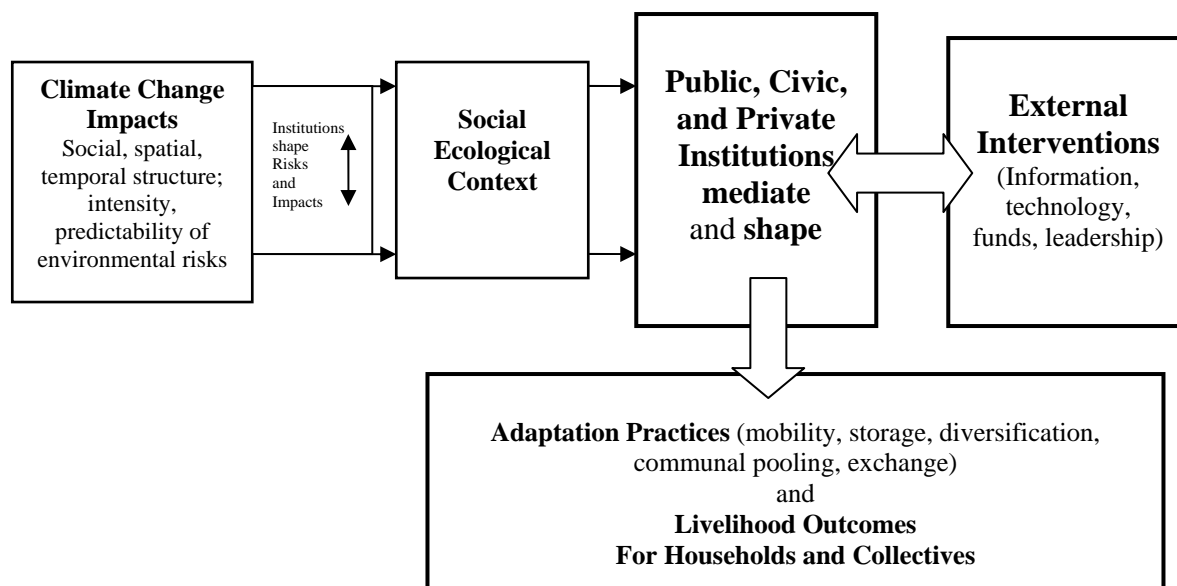
- Site Selection
- Unit of Analysis
- Surveying Methods
- Data Collection
- Data Analysis
- Statistical Analysis



RESEARCH FRAMEWORK

The frameworks utilized for this research seek to understand and explain the relationship between climate change adaptation, local institutions, and climate change impacts in our three selected communities in the middle hills of Nepal. Our research, which focuses on the nexus between institutions, market accessibility, and climate change adaptation, builds off of the framework for local institutions and adaptation proposed by Agrawal (2008). The research carried out in this particular study utilizes the broader themes and ideas proposed through Agrawal's framework, as shown below, as a basis for our methods.

Figure 4.1 Illustration of Climate Change Adaptation (Agrawal, 2008)



This framework suggests that “institutions structure the impacts of climate risks on households in a given ecological and social context, and shape the degree to which the responses of households are likely to be individually or collectively oriented. They also mediate the influence of any external interventions on adaptation practices” (Agrawal 2008). In other words, institutions play a crucial role in dictating the shape and form of many adaptation strategies.

The Importance of Local Context

Agrawal (2008) points out that the manner in which institutions influence adaptation strategies will depend on a large variety of factors, among which “the local context, household and community endowments [and] the larger set of social and political factors within which institutions function” are highly important. Thus, a thorough understanding of the local political, social, and environmental contexts is critical to understanding institutional adaptation facilitation.

Table 4.1 lists key vulnerability indicators at the national, community, and household levels. The table suggests that indicators may overlap across different levels (Adger 1999, Brooks et al. 2005, Eakin 2005). While past research has mainly focused on evaluating national-level vulnerability, our study focuses on community and household level vulnerability variables, indicated, also, in Table 4.1.

Our field research collected

community-level indicators of vulnerability such as, institutional inter-connections, institutional density, institutional effectiveness, gender composition, inequality (social and economic) and poverty within each community. In addition, the field research also collected household-level indicators of vulnerability including, poverty, asset portfolios, occupations, labor availability, institutional access, literacy, and gender balance. As such, this research addresses several of the non-climatic indicators that shape the extent to which rural households and communities are susceptible to environmental risks. Specifically, this research analyzes the role of institutional and governance linkages for helping communities to better adapt to climate change and for accessing different kinds of social and natural assets (Bebbington 2000; Leach, Mearns, and Scoones 1999).

Tamang women (Riyale, June 2008)



Table 4.1 Key Indicators of Vulnerability at Different Levels (Adger 1999, Brooks et al. 2005, Eakin 2005)

National/Regional Level (Indicators)	Community Level (Variables)	Household Level (Variables)
1. population with access to sanitation, 2. literacy rate, 15–24-year olds, 3. maternal mortality, 4. literacy rate, over 15 years, 5. calorific intake, 6. voice and accountability, 7. civil liberties, 8. political rights, 9. government effectiveness, 10. literacy ratio (female to male), 11. life expectancy at birth.	1. poverty 2. inequality 3. social capital 4. social entrepreneurs 5. institutional interconnections 6. institutional density 7. institutional effectiveness 8. gender composition 9. cultural factors (whether indigenous) 10. age compositions	1. poverty 2. dependence on risky resources 3. asset portfolios 4. occupations 5. skill sets 6. information availability 7. labor availability 8. institutional access 9. literacy 10. gender balance 11. age distribution

The Role of Market Accessibility

The basic coping strategies outlined by Agrawal (2008) were used to categorize five adaptation strategies against livelihoods risks, which are (1) mobility, which helps address risks across space; (2) storage (across time); (3) diversification (across asset classes); (4) communal pooling (across households); and, (5) market exchange, which can be substituted with the other classes of risk mitigation when households and communities have access to markets (Halstead & O’Shea, 1989). Placing these five particular strategies into individual categories allows for the relationship between community livelihoods and the capabilities of communities and households to be compared across a myriad of dimensions, such as time, space, asset classes, and households (Agrawal, 2008).

Agrawal (2008) elaborates on the nature of each of these adaptation strategies:-


- 1) Mobility pools risks across space and has been found to be especially successful in combination with clear information about the spatial and temporal distribution of precipitation.
- 2) Storage reduces risks across time. Communities and households that have developed techniques and infrastructure for reducing the perishability of food and have demonstrated high level of coordination across households and social groups have effectively warded off complete livelihood failures at a given point in time. Storage as an adaptation practice can be both at the individual and community level.
- 3) Diversification can occur both in the form of productive and nonproductive assets, consumption strategies, and employment opportunities. Households that practice diversification often trade off returns in exchange for the greater security provided by the strategy.
- 4) Communal pooling refers to adaptation responses involving joint ownership of assets and resources- sharing of wealth, labor, or incomes from particular activities across households, or mobilization and use of resources that are held collectively during times of scarcity.

- 5) Lastly, market exchange is an adaptation strategy that is the most versatile of adaptation responses. Importantly, market exchange-based adaptation practices can substitute for the first four types of adaptation strategies when rural poor have access to markets.

Market exchange is arguably the most important of the climate change adaptation strategies listed above due to its inherent versatility. In order to investigate the relationship between market access and adaptive capacity, our research focused on communities that experienced various gradients of market access- from low to high. Out of this research's field sites, one community experienced high levels of market access, the second one experienced intermediate levels of market access, and the third site experienced low levels of market access.

The physical proximity or barriers to the market were hypothesized to have a strong positive influence not only the adaptation strategies of the studied communities, but also the institutional presence and effectiveness and livelihood options available within each community (See Figure 4.2). This positive relationship may be attributed to the increased amount of resources available and the increased opportunities for exchanging resources in market situations.

Figure 4.2 Determinants of Market Accessibility



Criteria	Riyale	Dibdol	Godawari
Year-round access to paved road	0	1	1
Proximity to local market	1	1	1
Proximity to large market	0	1	2
Frequency of market visit	0	0	1
TOTAL	1	3	5

Year-round access to paved road- 0=No, 1=Yes.

** Access to local market- 0=It takes more than 30 minutes to reach local market; 1=It takes less than 30 minutes.*

** Access to large market- 0=It takes more than 1 hour; 1=It takes 30 minutes to 1 hour; 2=It takes less than 30 minutes.*

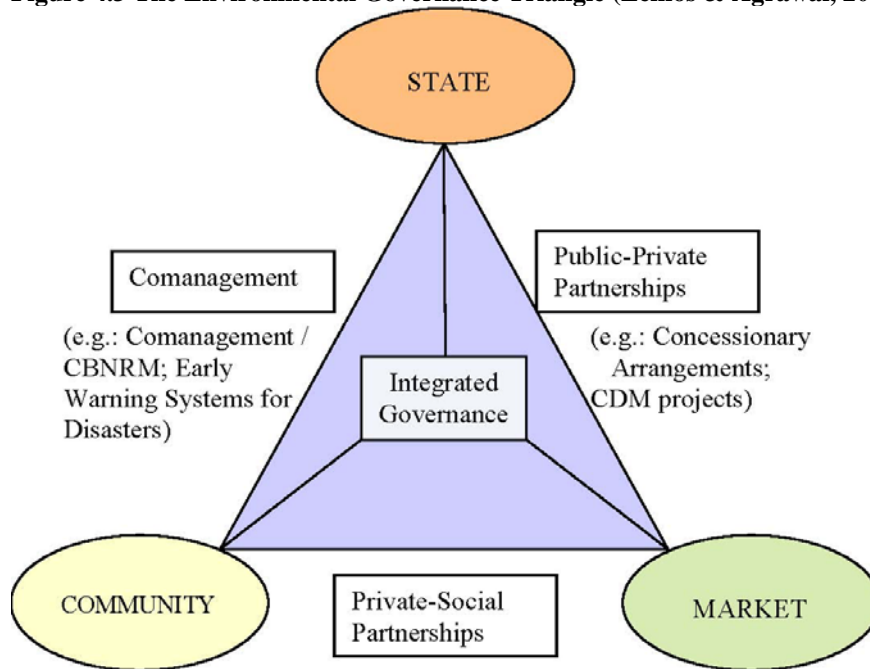
** Frequency of market visit- 0=Non-daily; 1=Daily.*

The Role of Institutions

The broader outline of our research was based on the assumption that institutions have a significant role in determining the way in which vulnerable communities mediate and facilitate adaptation strategies, either by helping communities and households gain access to and use resources (Agrawal, 2008). The natural resources-dependent communities that were studied are particularly reliant on forests, agriculture, and water to sustain and substantiate their livelihoods. Furthermore, these communities have a major stake in and play a significant role in governing their resources effectively. These resources are governed through one or a combination of state, private, and communal institutions. By investigating the institutional context of natural-resources

dependent communities, one can assume that the link between hybrid forms of environmental governance would provide an in-depth institutional understanding of climate change adaptation.

Figure 4.3 The Environmental Governance Triangle (Lemos & Agrawal, 2006)



Through using the typology proposed by Lemos and Agrawal (2006) (Figure 4.3) of public, private (or market), and community (or collective) institutions, institutional networks could be understood to work interdependently, such as through hybrid forms of governance, and with interconnected links that impact the access and use of resources by communities. These types of state, market, and community actors can also be sub-categorized into their formal or informal nature, and similar evaluations can be made of formal or informal institutional effectiveness. Agrawal (2008) hypothesizes that the effectiveness of local institutions to facilitate adaptation is determined by three factors: their nature and goals, pattern of adaptation strategy facilitation, and linkages of institutions with each other and with different rural households.

Using this particular framework of institutional classification is also important to establish the relationship between institutional typology and adaptation strategies. The roles of institutions, particularly formal local institutions, work in ways that promote informal processes or support informal institutions- interactions which can be critical to adaptation (Agrawal, 2008).

Agrawal (2008) argues that institutional linkages are critical to adaptation because of the ways they affect the flow of resources and can influence the relationships between households and social groups.

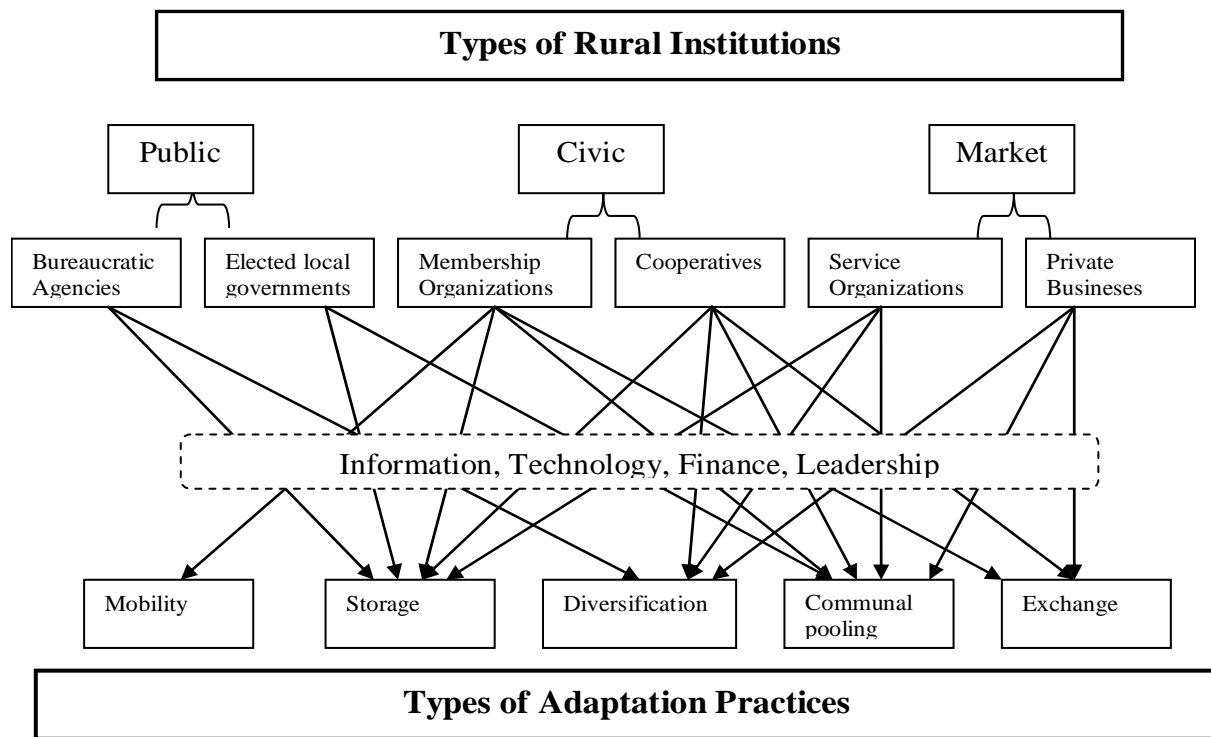
The nature of inter-institutional connections is defined as institutional articulation. The three main metrics that serve as proxies for measuring institutional articulation are: the flow of information, the flow of resources, and decision-making influence between each institution. Household and social group linkage to institutions is defined as institutional access in which households and social groups establish links of varying degrees with the institutions (Agrawal,

2008). Institutional articulation and access address institutional interconnectedness, the density of institutional networks, and the inequalities that exist in institutional facilitation practices.

Institutional articulation has the most important bearing on how communities adapt to climate change. Agrawal (2008) points out that “even if there are multiple rural institutions in a given location, the nature of their impacts on adaptation will be very different depending on the degree to which they are connected, whether and how they coordinate their actions and responses to climate hazards, and how they articulate with institutions and resources outside their immediate area of operation.” This assumes that institutions that lack links to other institutions are likely to be far less effective than those with multiple positive links with other institutions. Social network analysis tools, then, help us to identify, visualize, and analyze institutional access and articulation.

Once institutional access and articulation have been determined for a given social group, Agrawal (2008) argues that the interconnections between institutions, households, and adaptation strategies can be established to show how institutions can mediate external interventions to facilitate adaptation.

Figure 4.4 Institutional Mediation of External Interventions to Facilitate Adaptation (Agrawal, 2008)



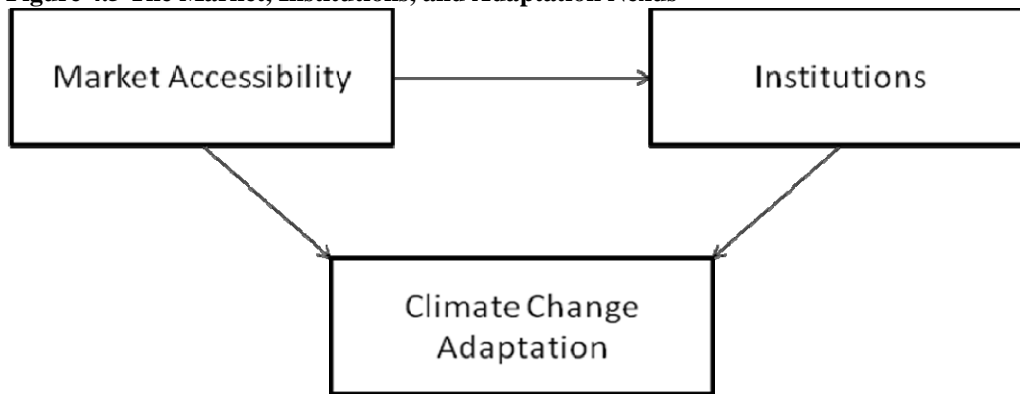
Adopted from Agrawal (2008), Figure 4.4 demonstrated how institutions- public, civic and market- reinforce the five adaptation strategies outlined earlier (mobility, storage, diversification, communal pooling, exchange) by influencing how information, technology, finance and leadership directs household and communities’ coping capabilities. These interventions can be viewed as mechanisms that provide the resources needed to enhance adaptive capacity (Agrawal, 2008). Institutions structure adaptation in three major ways:

- 1) By shaping the impacts of climate hazards on social groups and communities, and thus affecting their vulnerability and resilience.
- 2) By serving as the mechanisms that link individual with collective action, and thereby the outcomes of adaptation strategies.
- 3) By acting as mediating mechanisms for external interventions (Agrawal, 2008).

The Market, Institutions, and Adaptation Nexus

This research proposes that market accessibility, institutions, and adaptive capacity are intricately linked. In particular, this report hypothesizes that a higher level of market access is positively related to institutional capacity and similarly, a higher level of market access is positively related to the quality and quantity of community adaptation practices. Interesting, a positive relationship between institutional capacity and adaption quality may also exist.

Figure 4.5 The Market, Institutions, and Adaptation Nexus



Therefore, the methodology for testing this particular hypothesis involves assessing a particular communities accessibility to a local market and its institutional capacity- in the form of institutional connectivity, connectedness, and in identifying key characteristics of focal institutions. These findings will be used as proxies for determining the effectiveness of particular climate change adaptation strategies and/or practices.

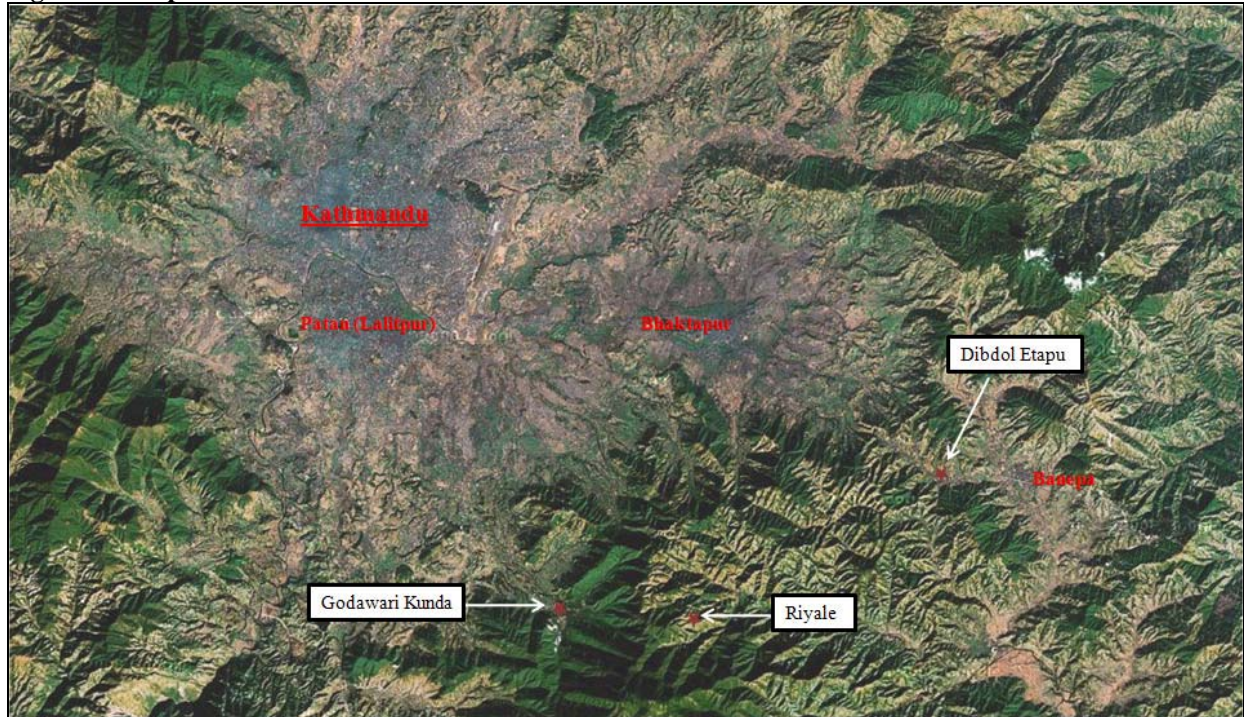
METHODOLOGY

Site Selection

Three sites were selected for this study based on 1) the presence local institutions, such as a CFUG, and 2) the degree of market access. The three sites- Riyale, Dibdol-Etapu, and Godawari Kunda- were selected through past research and professional advice from the Natural Resources Research and Development Council (NRRDC) and the International Centre for Integrated Mountain Development (ICIMOD), both located in Kathmandu. Past recorded research had only been conducted with the CFUG in Riyale, but pre-existing relationships existed with all three sites.

The three communities were chosen for their varying degrees of market access. The primary selection criterion for determining the degree of market access was the community's proximity to an all-weather road. Other site selection criteria included a relatively similar number of households and the presence of a community forest user group (CFUG). (It should also be noted that proximity to Kathmandu was taken into account for time and travel purposes, and all sites under consideration were within one day's travel distance by a motorized vehicle from Kathmandu). Reconnaissance visits confirmed the appropriateness of each site and the willingness of each community to participate in the study.

Figure 4.6 Map of Field Sites



Of the three sites, Riyale was chosen as the non-market site, Dibdol-Etapu as a semi-market site, and Godawari as a market access site. Figure 4.6 shows the relative location of the three sites within the Kathmandu Valley and its neighboring districts.

Riyale

Riyale is located within the Riyale Village Development Committee (VDC) of Nepal's Kavre District. The Riyale settlements have poor access to all-weather roads and residents travel on foot to visit nearby markets where they exchange goods and services. Residents walk approximately thirty minutes to access the closest market, relatively small in size (Manedobhan), and roughly two hours to access the nearest large market (Godawari, Kushadevi).

Dibdol-Etapu

Dibdol-Etapu is also located within Kavre District's Nasikasthan Sanga VDC. It is adjacent to the Arniko highway, which runs between Kathmandu (approximately 30km away) and a nearby

market town Banepa (approximately 3km away). However, access to the main highway from different settlements of the village is only available by fair-weather roads, making Dibdol-Etapu roads poorly integrated with the Arniko highway system. Community members rely primarily on public transportation, and partially on foot, to access nearby markets and exchange goods and services.

Godawari Kunda

The Godawari village community lies within the Godawari VDC of Lalitpur District. Nearly all the settlements found within the village are directly connected to an all-weather road and have direct access to a local market. Additionally, the cities of Patan and Kathmandu are twelve kilometers away (approximately 30 minute microbus ride), which can be accessed by microbus. Interestingly, seventy-five percent of the households in Godawari own a motorcycle, which is indicative of the high level of mobility of Godawari's residents.

Unit of Analysis

The research analyzed individual household's involvement with their respective community forest user group (CFUG). CFUGs are composed of community households that collaborate with Nepal's Department of Forests (DoF) to collectively assign rules and codes-of-conduct to forest use and management. The CFUGs served as a useful unit of analysis because almost all the households within a distinct geographic area hold a membership, it allowed for measurement of the member groups and non-member groups, and also has a central leadership committee. The leadership committee had one of the more holistic views of the community and a strong association with most community households. Thus, although each CFUG failed to include all households in their respective villages, the CFUGs were successful in capturing a majority of their residents. The number of CFUG member households varied slightly between Riyale (115), Dibdol-Etapu (135), and Godawari Kunda (120) CFUGs.

Table 4.2 Community Profile

	<u>Riyale</u>	<u>Dibdol-Etapu</u>	<u>Godawari</u>
District Name	Kavre	Kavre	Lalitpur
District Headquarters	Dhulikhel	Dhulikhel	Patan
VDC	Riyale	Nasikasthan Sanga	Godawari
Number of Households in CFUG	115	135	120
Population	700	810	990
Literacy Rate	30%	50%	75%
Household Income – Construction (Men/Women)	120 NPR/day (men), 60 NPR/day (women)	200 NPR/day (men), 100 NPR/day (women)	300 NPR/day (men), 120 NPR/day women)
Major Castes	Tamang; Brahmin/Chhetri	Brahmin/Chhetri; Dalit; Tamang	Brahmin/Chhetri; Dalit; Tamang

Notes: Average exchange rate at the time field data was collected was 1 USD equaling 68 NPR.

Surveying Methods

A mix-methods approach was applied to the research by collecting data through a combination of focus groups, individual interviews, and participatory action research at the three sites. Focus groups were used for participatory action research (PAR) activities, climate change adaptation information, and institutional mapping exercises. These groups were arranged by our facilitator and translator through key community informants, which primarily consisted of executive committee members of the CFUG.

Community Mapping (Riyale, June 2008)



Focus Groups

For PAR and institutional mapping exercises, relatively large (eight to twelve people) and diverse groups of community members with different age, gender, socioeconomic status, caste and leadership roles were selected for focus groups. Whereas climate change adaptation focus groups were smaller (four to eight people) and consisted of members from a particular social group: gender (male or female), socioeconomic status (rich or poor), and different castes. However, availability, immediacy, and respectfulness also dictated the groups. Community leaders were consulted to assist in determining individuals who fit into the rich or poor focus group, thus opinions dictated the groups as opposed to strict measureable criteria. . All the focus groups were approximately one to two hours in length, except for institutional mapping exercises which varied according to community size and lasted approximately 4 hours.

Interviews

In-person interviews were conducted for the International Forest Resources and Institutions (IFRI) questionnaire with one to five members of executive committees of the CFUG. These interviews gathered information on a wide variety of topics related to the geographic, demographic, economic, social, environmental, and governance aspects of the community and its forest management practices. They were used to give both context and

Interview with a Woman's Group (Riyale, June 2008)



depth for households within the CFUG and their interaction with the community forests. The complete IFRI questionnaire contains ten separate forms complete with questions. For our study, a set of questions were selected from appropriate forms to gather a holistic perspective on the forest, its management, and the livelihood benefits of the settlements.

Data Collection

Background Information

Preliminary background and contextual information was compiled upon arrival at each site to inform a more holistic picture of community life. This information helped to clarify information on adaptive strategies and institutions within the community. It also, at times, brought to light information on a specific adaptive strategy or institution.

Background information was gathered through IFRI interview questions with executive committee members of the CFUG and the PAR tools of creating a community timeline and resource map. Questions were related to 1) geographic and local information, 2) forest history, 3) forest settlement information, 4) forest products/species, 5) forest policy and legislation, 6) forest system information, 7) forest rules to entry, 8) rules related to maintaining and monitoring the forest, 9) CFUG information, and 10) CFUG relationships. Lastly, some background information on Riyale was gathered prior to arrival through past reports by the NRRDC.

Climate Change Adaptation Strategies

Climate change adaptation practices were identified through six different focus groups in each community. The focus groups were identified through gender, socioeconomic status and caste criteria; where only men, women, poor, rich, or individual castes were represented. Two primary techniques were used to collect key information on adaptation practices. This division facilitated the understanding of (1) the relative impacts of a previous climate hazard; (2) how each group coped with the impact differently; and (3) how institutions assisted, if at all, in mediating the coping strategy for each socio-economic group.

First, historic disturbance information was sought from each focus group by asking questions related to any natural, economic, or social stressors that affected the community members and their livelihoods. Two of these disturbances were then used as scenarios to understand how different social groups were affected and what coping strategies they employed as a reaction to the situation. Coping strategy questions focused on changes in labor distribution within households; reliance on other family members, neighbors and community members; institutional support; and economic and resource

Men Focus Group (Riyale, June 2008)



use effects. Second, a majority of focus groups were asked explicitly what practices they used in each of the five adaptive strategies: common pooling, storage, mobility, market exchange, and diversification.¹

Institutions

The research also investigated formal and informal institutions existent and functional in each community. Institutional information was used to develop institutional networks and understand the mechanisms of intra-institutional communication and collaboration in facilitating adaptation strategies. To accomplish this, a focus group was arranged to collect information on all functional institutions in each site. The list of institutions was compiled by asking the focus group about formal and informal market, civic, and public institutions within their community. A list of examples for each group of institutions was used to prompt responses from the group. In addition, periodically, an institution unmentioned during the focus group would surface through an individual interview or in a different focus group which would be eventually added to the original list.

Once a complete list of institutions was collected, it was used for two purposes. First, the level of institutional connectivity was discovered by arranging a large focus group (See “Survey Methods”) to determine if and how institutions collaborated or connected with one another. For each institution it was determined whether or not it shared 1) information, 2) resource, and/or 3) exerted decision-making influence with each of the other institutions. Answers to these questions were binary (yes/no) answers but clarifications were made for some connections. Second, each social group (e.g. caste, gender, and socioeconomic status) focus group was asked to respond to whether not they used or interacted with a particular institution in order to determine how different social groups had different affiliations with institutions.

Constraints

A few constraints were encountered while conducting the field research. First, almost all of the focus groups and interviews were conducted in Nepali. While the translator did an honorable job of facilitating the focus group by periodically translating, there was undoubtedly information and detail lost in the actual translation and in the amount of information that needed to be translated.

Second, while every effort was made to ensure that focus groups were appropriately representative, two difficulties were encountered. First, there were probably a few times when individuals joined a focus group for which they were not qualified. This was the most difficult to control for socioeconomic level focus groups since prior focus group screening was not arranged out of respect. These problems were specifically in two of the sites- Godawari and Riyale. It was also difficult to ensure that men and women were not present during their respective focus groups. More difficulties were encountered with men than women, particularly in the Godawari

¹ The basic coping strategies in the context of environmental risks to livelihoods can then be classified into five analytical categories of adaptation responses and their combinations: mobility, which helps address risks across space, storage (time), diversification (asset classes), communal pooling (across households), and market exchange – which can substitute for the above four classes of risk mitigation when households and communities have access to markets (Halstead and O’Shea1989 discuss four of these).

and Riyale sites. Godawari posed its own difficulties since the CFUG executive committee was present at the large majority of socially divided focus groups. Second, there was difficulty ensuring that heterogeneous focus groups were representative. PAR and institutional mapping focus groups lacked complete representation and heterogeneity in each of the three sites due to time and geographic constraints.

Lastly, field research coincided with the planting season, which made it difficult to find individuals for conducting focus groups. While focus groups were completed for each of the social groups, the choice of individuals was constrained by their availability.

Data Analysis

Adaptive Practices

Adaptive strategies were analyzed according to the number of practices per site and the quality of each practice. To determine adaptive practice quality, each practice was measured according to three parameters, level of equity, sustainability, and livelihood benefits. Each parameter was rated on a scale of 0 to 2, with a 0 representing the lowest score and a 2 representing the highest score. Equity ratings were determined according to the occurrence of each practice across social groups (i.e. parity between caste, gender, and socioeconomic status). Strategies were considered strongly equitable if all applicable social groups participated in the strategy, moderately equitable if two social groups participated in the strategy, and not equitable if only one social group participated in the strategy. Sustainability was determined according to the environmental and economic sustainability of the practice, as assessed by the researcher. A strategy was considered highly sustainable if it was both environmentally and economically sustainable, moderately sustainable if it was environmentally or economically sustainable, and not sustainable if it was neither environmentally nor economically sustainable. Lastly, livelihood benefits were determined according to the social, economic, or environmental gains the community and/or household reaped from the strategy.

The scores of the three parameters, equity, sustainability and livelihood benefits, were added for each individual adaptation practice, giving each practice a quality value. The qualities of adaptation practices within a specific strategy were averaged, which generated an average quality for each of the five adaptation strategies- in overall terms, by specific strategy, and by site. These average scores could then yield the overall quality of adaptation practice for each site. Drawing from our qualitative data, we then used these relative scores to compare the quality of adaptation strategies and practices within a community and across the three communities across dimensions.

Institutions

Similarly, the institutional network was analyzed according to the number of strategies per site and the quality of the institutional network in place- measured as the density and centralization of the institutional network. The strength of each institutional network was performed using Pajek (Batagelj & Mrvar, 1998). Strength was measured as the density, which is defined as the proportion of existing connections compared to all possible connections. Betweenness

centralization is defined as “the variation in the betweenness centrality of vertices divided by the maximum variation in betweenness centrality scores possible in a network of the same size of each institutional network” (de Nooy et al., 2005).²

Institutional network maps were also created to visually depict the connections and strength of each link between institutions. The maps depict the strength of each connection by the thickness of the lines. Thickness was determined by how many ways (e.g. resource-sharing, information-sharing, decision-making influence) the institutions were connected. Individual resource, information, and influence maps were also made to show their connections within each community.

Institutional Mapping(Godawari, June 2008)



Statistical Analysis

The institutional connectivity information collected from the three network maps were applied to a computer program (*Pajek*) to calculate statistics pertaining to the degree and strength of connections between different institutions and for the system as a whole. In particular, the program allowed the generation of specific statistics that showed one institution’s connection strength relative to another institution’s. Also, a more general statistic could also be generated to show how connected all the institutions are (i.e. how dense) in the system as a whole.

Information from *Pajek* was digitized to show existing connections and the strength of each connection according to the degree of resource and information sharing. This particular way of visualizing each community allowed for the highlighting of the degree of interconnectedness between and among institutions. This was also useful in pinpointing specific institutions that were relatively well-connected with the entire system, which were then categorized as focal institutions.

Focal Institutions

Institutions that were, according to the institutional maps and *Pajek* diagrams, well connected with each institutional system were termed focal institutions. These focal institutions exhibited strong linkages with other institutions and thus was inferred to be a more integral part of each particular community’s institutional system. Thus, focal institutions are better situated for disseminating resources, information, and decision-making authority. These particular institutions, as this research hypothesizes and because of its interconnected nature, will play a crucial role in facilitating effective climate change adaptation strategies.

² Betweenness centrality of a vertex is the proportion of all geodesics between pairs of other vertices that include this vertex. Between centralization is the variation in the betweenness centrality of vertices divided by the maximum variation in betweenness centrality scores possible in a network of the same size.

Chapter 5. Case Study- Riyale

General Information

Livelihoods

Agriculture & Livestock

Cooking Mechanisms

Forest Use

Institutions

Formal

Informal

Adaptation Practices

The Future



GENERAL INFORMATION

Riyale is designated as our non-market site. It is a 120-household village made up of seven settlements - Khafuldhanda, Khanikhola, Shridhanda, Sauradhanda, Nayaghardhanda, Sauradhol A, and Sauradhol B (See Figure 5.1)– which are clustered on top of a 2000 meter ridge. Riyale is in Kavre District and is approximately 2.5 hours by foot from Dhulikhel, Kavre’s administrative center.

Figure 5.1 Satellite Map of Riyale (GoogleEarth)



Kathmandu Valley lies directly over the nearest ridge to the northwest of this site.

The settlements are dispersed, but are all easily visible from adjacent settlements and are linked to one another through footpaths that wind through the hills. Households in Riyale are generally found in clusters, primarily located in the upper elevations of hills. Both households and agriculture land are found on the south side of a valley, while community and leasehold forests lie on the north side. A stream flowing through the valley separates them.

Riyale’s settlements have very poor access to all-weather roads and thus residents rely primarily on foot travel for mobility and the transportation of goods. Nearby to the settlement is a small market area called Manedobhan, which boasts a few small shops, a school, and a savings and loan cooperative. Manedobhan is located approximately fifteen to thirty minutes by foot from Riyale. The nearest point with access to public transportation is at Kushadevi, which is approximately a one-hour walk away from Riyale. The bus from Kushadevi stops at Banepa (45 minutes), Dhulikhel (one hour), and Patan (an hour and thirty minutes) where there are accessible markets. Alternatively, community members have the ability to use the Godawari

Overview of Riyale Community (June, 2008)



market by crossing the ridge. This trip takes approximately two hours by foot and is often traveled since many community members sell and buy goods there. Households visit Manedobhan almost daily, while trips to Godawari and Patan happen about once every two weeks.

Nearly all 101 of Riyale's households are of Tamang descent. The Tamang are a caste that is related to Tibetans and generally practice Buddhism. The remaining 14 households belong to Brahmin and Chhetri castes. They live within their own clustered settlement on

the periphery of the community nearest to Manedobhan. Overall, approximately 700 people live in Riyale.

Riyale has been an established community for approximately 200 years. There were approximately thirty Tamang households living in the area 70 years ago, but since then, the community has steadily grown in size. The population growth rate has begun to slow down in recent years. The Brahmin/Chhetri community relocated en masse to Riyale about twelve years ago, hoping to become part of the community forest user group (CFUG) and to avoid the dangerous landslides in their previous settlement.

LIVELIHOODS

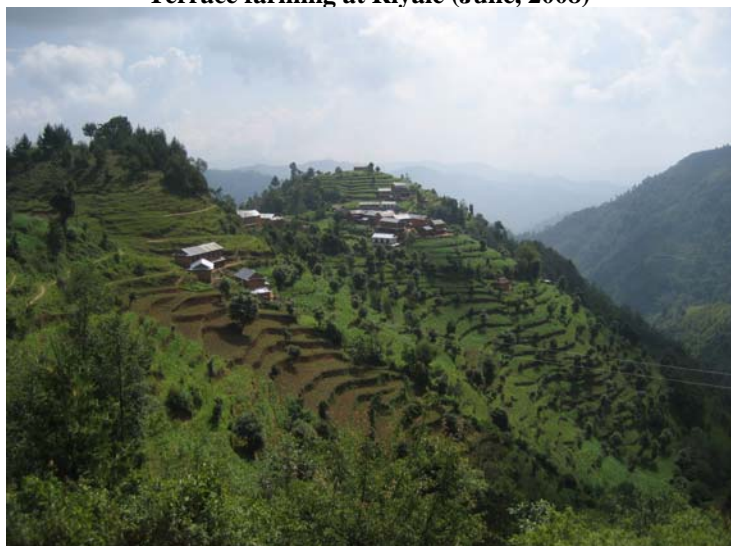
Most Riyale households sustain their livelihoods through a combination of subsistence agriculture, selling hard drinks to shops in Godawari, working for daily wages, harvesting forest products, and receiving remittances from family members who work in Kathmandu and abroad. Only 20 individuals in Riyale hold secure full-time jobs. More often community members will work in the daily-wage sector found within the Riyale community, such as labor (e.g. agricultural work) and service (e.g. construction and house making) jobs.

Daily pay is sparse and sometimes differs across gender lines. For instance, house construction

Riyale Focus Group (June, 2008)



Terrace farming at Riyale (June, 2008)



pays 60 rupees/day for women and 120 rupees/day for men, while contracted agricultural work pays men and women around 60 rupees/day. Men can also care for livestock and plow fields to earn around 250 rupees/day.

Other than agricultural work and house construction, work is largely distributed along gender lines. Men will work daily wage jobs, labor jobs, or live and work in Kathmandu for the non-agriculture months during the year. Women are largely responsible for childcare, homecare, planting and

harvesting crops, and collecting forest products. Gender lines begin to blur, however, when a crisis arises. For instance, men will take on traditionally female roles (i.e. childcare and cooking) if a crisis forces women to spend more time than usual at a particular task, such as collecting forest products. Likewise, if the family is in need of money, women may be required to work daily wage jobs.

Approximately 10-15% of men find seasonal work in Kathmandu from September through February. Riyale residents make arrangements with their respective employers to ensure their ability to return home for the planting and harvesting seasons, which span from February to September. Some men find seasonal work through a contractor, while others utilize familial or community connections. Although wages are higher in Kathmandu, men must also pay for their living expenses while away from home, which can be quite costly.

Maize Seedlings (Riyale, June 2008)



Subsequently, the amount of money sent back home or saved is relatively small. More financially successful individuals have either worked for the Nepali army or have gone overseas to areas like the Middle East or Southeast Asia for work. At the time of research, eight individuals were working in Malaysia. The remittances migrants send back from abroad are substantially larger than those sent back from Kathmandu, especially since living expenses are included for overseas contracts. However, overseas opportunities often are restrictive in regards to one's abilities for traveling back to Nepal.

Agriculture and Livestock

All households in Riyale have land and practice some type of agriculture, although only about 5% of households can live year round off of the food they produce themselves. Agricultural crops typically provide households with six months worth of food, with no household in Riyale having excess crop production. 95% of households must supplement the food they produce with food purchases from the market. Daily wages and the other jobs listed above allow Riyale residents to gain the necessary income to purchase their food from the market.

Houses within Agriculture Fields (Riyale, June 2008)



The most cultivated agricultural crop is maize. Maize is planted on the flat and gentle slopes of hilltops and on terraces along the steeper hillsides. Besides maize, households will plant and harvest peas, potato, wheat, radish, mustard seeds, and soybeans for their own consumption. Households also plant broom-grass on the edge of terraces, which help to avoid erosion and allow them to harvest the broomgrass to construct brooms to sell in the market.

The maize harvested from agriculture production is primarily used to make alcohol. Riyale residents can generate approximately 200 rupees/day by selling the alcohol they produce at the Godawari market, which is a more lucrative business than working for daily wages in the village. Households will sell alcohol when they are not planting crops between the months of May and February. If maize is not available, households adapt by substituting sugar, rice, and wheat purchased from the market to produce hard drinks.

Storing Fodder on Porch (Riyale, June 2008)



Most households also keep some type of livestock. The milk produced from buffalos, cows, and goats are used for both household consumption and sales through a milk contractor. Chicken are kept primarily for their eggs. Another supplemental form of income is to sell goats in the market during financially difficult times.

Cooking Mechanisms

Households have also become adept at finding different fuel sources for cooking. While dry firewood remains the primary source, most households will supplement it with corn cobs and stalks left over after the harvest. Another fuel source that is being promoted by the CFUG is briquettes. Briquettes are composites of bits of charcoal, grass, manure, and dry wood. They are approximately eight to ten inches in diameter and can last longer than regular firewood when burned. Briquettes are sold in the market for approximately ten rupees. New

technology is also infiltrating some of the richer households in the community-one family now uses biogas, while two to three others use liquefied petroleum gas (LPG) cylinders.

Briquettes (Riyale, June 2008)



Forest Use

Forest products, such as fodder for livestock feed, leaf litter for animal bedding, poles for construction and digging, and firewood for cooking fuel, have proven to be extremely important resources for households in Riyale, . The majority of Riyale community members have access to three different forests where they can collect forest products: the Ningrepakha Community Forest, leasehold forests, and a government forest. In addition, select households manage their own small, private forest. These forests provide different resources for the community and one can gather products at different times during the year.

Leasehold Forest Groups

Riyale households are a part of 14 different leasehold forest groups. These broadleaf forests are generally smaller in plot size than the community forest and have fewer member households than the CFUG. The main benefit of the leasehold forest is that it allows households to access another portion of land from which to extract forest products. Importantly, the forest products harvested on leasehold forest land differ from products harvested from the community forest. Leasehold forest regulations allow community members to extract dry firewood from its forest. Community members also extract fodder and leaf litter from the leasehold forest.

Forest at Riyale (June 2008)



Government Forest Use

The government forest is the farthest forest from Riyale's settlements. It takes approximately one hour to walk there. It is managed by the District Forest Office (DFO) but very little monitoring takes place, so that households are unrestricted in their collection of forest products. The government forest offers the greatest flexibility in terms of forest product extraction and time of harvest for community members. Leaf litter, fodder, dry firewood, poles for tools, and wood for charcoal are all taken from the government forest. Households can use the government forest when the community and leasehold forests are not open for harvesting, which can be important during times of crisis. For example, when a forest fire burned .25 hectares of the community forest two years ago, households were able to use the government forest to collect forest products.

Private Forest

Some households also keep small plots of forest on their property. These trees are mostly broadleaf species that can serve as fodder, leaf litter, and firewood. Some private forests contain species, such as *Alnus nepalensis*, that are not typically found within the community or government forests. Households with private forests have less need to travel to the forests and as a result, collect less forest products from the community, leasehold, and government forests. Private forest products can also be shared with neighbors. Proximity to other available forests in Riyale often determines whether a household keeps a private forest.

The Ningrepakha Community Forest

The Ningrepakha Community Forest (CF) covers an area of 29 hectares and is managed by the 115-household Community Forest User Group (CFUG). The CFUG came into existence 15 years ago through a partnership between the Riyale community and the District Forest Office (DFO) for reforesting the area. The DFO, in collaboration with the Australia-Nepal Forestry Project (NACFE), provided money and pine tree seedlings for Riyale community members to plant in degraded areas for reducing the risk of landslides. Prior to the CFUG's planting, the forest composed principally of *Quercus* (oak) and *Fraxinus* (ash) species. The forest now contains stands of *Pinus* (pine) species in addition to the oak and ash species. The forest also makes a home for a variety of wildlife, including leopard, wild pig, rabbit, porcupine, jackal, and a wide variety of birds.

The CFUG committee currently elects 13 members; although in the past it elected 9 members. Presently, 4 women and 9 men make up the committee, including a male chairman. As required by the CFUG constitution, the Committee holds general assembly meetings, in which all member households are invited to attend.

Forest on Steep Slope (Riyale, June 2008)



The CFUG committee estimates that the CF provides approximately 30% of the community's forest product needs, leaving the leasehold and government forests to supply the remaining 70%. Dry firewood, the main source of cooking fuel for Riyale households, is collected as a forest product, as well as forest fodder, which is used for feeding goat, cow and buffalo livestock. Additionally, leaf litter is collected from the forest for animal bedding, which can then be used as compost to fertilize agriculture land.

The CF is equally divided into four 7.5 hectare management blocks along hillside ridgelines. The first forest management operation took place four years ago, when CFUG members cleaned and pruned the forest. Currently, the CFUG is managing for re-growth by limiting forest product extraction to leaf litter (mostly pine and broadleaf) and small amounts of firewood only. For the past seven years, the management plan has not allowed for fodder to be collected. Forest collection takes place primarily in the winter months of January and February. However, if particular forest products are exhausted, households will collect at other times of the year. During the rainy season, April through September, when agriculture work takes priority and leeches are plentiful, forest products are very rarely collected from the CF.

The CFUG imposes fines of 100 rupees for excess or inappropriate forest product collection. However, a fine has only been imposed once, and the CFUG lacks a bank account to deposit the funds collected from such fines. The CFUG rules state that the money collected from fines goes towards the CFUG operating budget, which is 300 rupees per year, but no records are kept of infractions. When the CFUG was established, the DFO supplied forest watchers for three years, after which the community hired local watchers to guard the forest. For the past two years, the CFUG has assumed responsibility for watching the forest. The CFUG suspects that households illegally collect grass to use as livestock fodder but does not impose penalties.

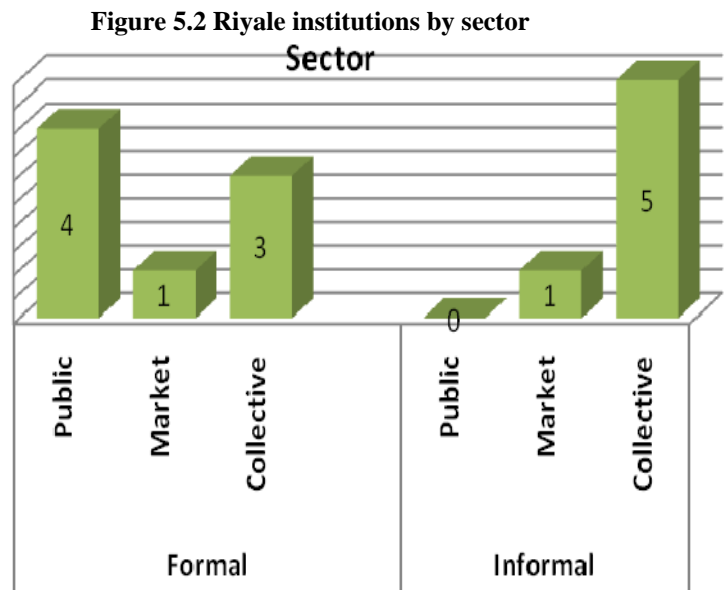
The CFUG Committee is in charge of working with the DFO Range-post Office and the DFO to improve the current five-year management plan, which will occur within the next year. The three main hopes for the upcoming plan include adding provisions for harvesting pine and oak timber, allowing the collection of dry firewood and leaf fodder, and incorporating of more stringent penalties and fines for forest product collection infractions.

Forest products allow Riyale households to collect what could potentially be costly necessities for free. For example, fodder purchased from the market costs between 125-150 rupees to feed one full-sized buffalo every day, which is equivalent to one day's wages. Forest products can

also be used to create household goods that can be sold in the market. For example, poles can be used to construct broomsticks; whereas grass can be manipulated to make baskets.

INSTITUTIONS

The Riyale community has begun to establish some important formal and informal institutions that help households to secure livelihood pursuits. Figure 5.2 depicts the number of Riyale institutions identified by sector and type. Additionally Table 5.1 lists the institutions that were identified in Riyale, which will be discussed below.



Formal

Public

Formal public institutions found in Riyale provide basic public services to Riyale community members. These services include natural resource management by the DFO, local governance through the VDC, education by the Riyale schools, and community health from the Riyale Health Post.

Kushadevi Market (July 2008)



community library. Lastly, the Riyale Health Post, located in Manedobhan, is the primary health care institution for Riyale residents.

The Riyale community has regular interactions with the DFO, who is responsible for patrolling the government forest. The DFO also offers technical assistance to the community and leasehold forest user groups to improve their 5-year operational plan for resource extraction and sustainable forestry. Riyale residents have very little interaction with District Development Committee (DDC) officials who are housed in Dhulikhel. The VDC works on infrastructure projects within Riyale—most notably the current road construction project. Riyale also has two public schools, one of which maintains a

Market

The only formal market institution in Riyale is a private medical shop, which provides households with pharmaceutical and medical products.

Collective

The CFUG and leasehold forest user groups, described above, make up a large portion of the civic organizations within Riyale and have all been proven to be helpful in managing natural resources. The other collective organization is a relatively new Manedobhan Savings-and-Loans cooperative, which enables households to save for the future or receive low interest loans. However, it is severely underutilized with only seven household participants

Manedobhan Savings-and-Loans (June, 2008)



Table 5.1 Representation of public, civic, and private institutions and their formal or informal nature in the Riyale community

Public Institutions	
<i>Formal</i>	1.) District Forest Office
	2.) Village Development Committee
	3.) Riyale Schools (2)
	4.) Riyale-3 Health Post
<i>Informal</i>	None
Civic Institutions	
<i>Formal</i>	1.) Community Forest User Group
	2.) Leasehold Forest Groups
	3.) Manedobhan Savings-&-Loans
<i>Informal</i>	4.) Agricultural Sharing Norms
	5.) Water User Group
	6.) Water Information Exchange
	7.) Sanitation Information Exchange
	8.) Road Construction Exchange
Private Institutions	
<i>Formal</i>	1.) Private Medical Shop
<i>Informal</i>	2.) Painchu System

Informal

Market

The community relies heavily on an informal market exchange of goods called the *painchu* system. In this informal system, households will exchange one type of surplus good for a good that is needed. Households may also practice a type of reciprocal lending, where they will borrow a good when it is needed and reciprocate the trade when either the household they borrowed from or another village household is in need. The thought is that due to the integration of the village, they will support one another during times of need. These types of exchanges are a combination of market exchanges and reciprocity.

Collective

Informal institutions primarily work to coordinate community infrastructure projects and the governance of public goods. The water user group and water information exchange system coordinate community water use and protection by collecting money from Riyale households. This money is then used to support projects that maintain the water system and provide water for Riyale homes. Another informal collective institution is the sanitation information exchange, which disperses information related to sanitation measures throughout the community. The exchange system was born out of the sanitation project implemented by the Red Cross, which had brought latrines to the community three years ago.

Common-pooled labor systems, called *parma*, are widespread throughout Nepali communities. In Riyale, the community utilizes it in two particular areas. First, each household donates an equal amount of labor for the construction of a road that extends from their community down to Godawari. Second, many Riyale households participate in rotational cropping, where a group of individuals will systematically plant one another's agricultural plots until they have completed each group member's planting. A similar system is used for harvesting. This practice also facilitates the shared use of agricultural tools and sharing seeds.

ADAPTATION PRACTICES

Riyale households use the five adaptation strategies— market exchange, common pooling, diversification, mobility, storage - outlined in Chapter 4 and the associated research frameworks to varying effects in order to secure their livelihoods during normal or more difficult circumstances. Table 5.2 (adaptation practices at Riyale) lists the practices that were identified in each particular adaptation strategy, whereas Figure 5.3 graphically depicts the number of adaptation practices found in Riyale.

Typical Tamang House (Riyale, June 2008)



Riyale households were found to rely on five different market exchange mechanisms. Households often sell agricultural products (such as milk, livestock, hard drinks, and vegetables), forest products, and labor in exchange for money. The primary objective of acquiring money is to purchase goods in the market that they cannot access elsewhere. Moreover, Riyale households will exchange agriculture goods for other goods in the market.

Road Construction at Riyale (June 2008)

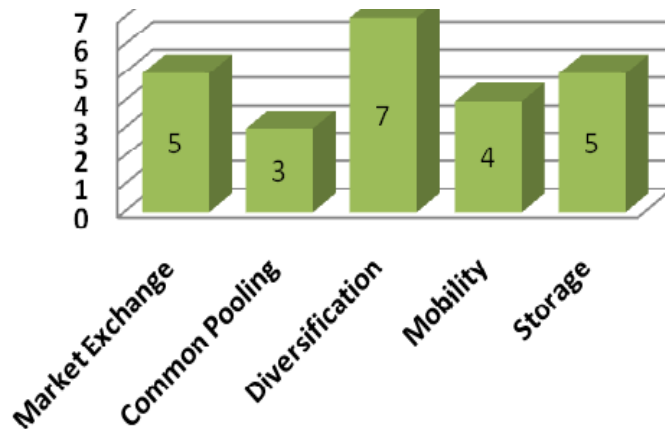


Table 5.2 Adaptation practices at Riyale

Adaptation Practices
<i>Market Exchange</i>
Agriculture Products
Forest Products
Agriculture Products for Goods
Money for Goods
Labor
<i>Common Pooling</i>
Labor
Savings and Loans
Community Forest Forests
<i>Diversification</i>
Income Generation
Agricultural Crops
Livestock
Forest Use
Fuel Sources
Food Sources
Water Sources
<i>Mobility</i>
Improved Road Access
Within Community to Higher Location
Migration/Relocation
Seasonal Mobility
<i>Storage</i>
Cooking Fuel
Water
Food
Forest Products
Money

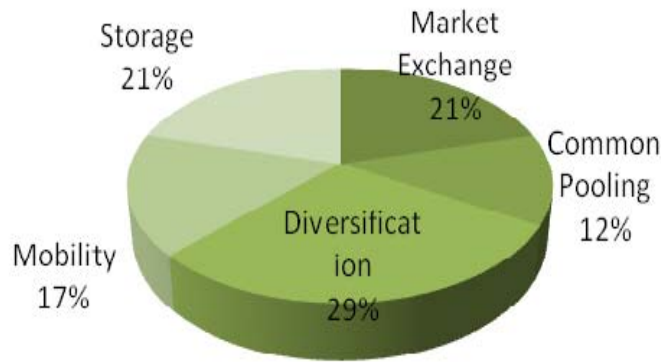
Riyale residents use common pooling as a strategy for time- and labor-intensive activities, financial resources, and natural resources. As described in the section on informal collective institutions above, labor activities are shared by households for road development and agricultural production. Furthermore, a small number of households participate in a savings and loans cooperative, which allows them to pool their money and then distribute it as loans to cooperative members. Lastly, the community and leasehold forests are common pooled resources, discussed in detail in the forest section.

Figure 5.3 Adaptation Practices at Riyale



Diversification practices in Riyale occur in a variety of forms and have proven to be an extremely beneficial adaptation strategy for households. Households have learned to diversify their sources of income in order to purchase essential household goods from the market. Since only twenty individuals hold stable jobs, the majority of Riyale households take advantage of short-term positions in order to satisfy their financial needs.

Figure 5.4 Percent Use of Adaptation Strategies at Riyale



Additionally, Riyale community members have the ability to capitalize on the different temporal and forest product benefits provided by each forest. Besides diversifying forest use, Riyale households are also able to diversity their forest products by finding innovative ways to use fodder, leaf litter, firewood, poles and grass. Diversifying cooking fuels, agricultural crops, water sources, and livestock have also shown positive results for community members during times of unexpected disaster. Finally, Riyale

residents have identified and utilized a variety of markets and exchange mechanisms to provide them with food, which allows them to read market fluctuations and respond to adversity.

Mobility was identified as a growing practice within Riyale. Improved road access will be achieved through the development of the local road to Godawari, which will allow vehicles to enter and exit the community with ease. The road will enable community members to transport goods to and from the market with modest effort in comparison to carrying it on their back, which is the practice that is currently used. A few households had also practiced intra-community mobility- relocating within the community- due to the threat of landslides or poor agriculture land.

In addition, both seasonal migration and migration abroad were mobility practices that provided immense livelihood benefits for households by securing an additional source of income.

Riyale households practice a variety of storage techniques, which increase the longevity, availability, and security of important resources. Households took advantage of food storage mechanisms, which included the storage of radish rope, potato, mustard oil, soy beans, and maize. Additionally, households store money, either at home or in the savings and loans cooperative; forest products,

Slope-side Reinforcement (Riyale, June 2008)



for animal use; and fuel, such as firewood and corn cobs. Although water is pumped throughout the community, many households collected and store rainwater periodically.

While Riyale households favored the use of diversification, they also developed innovative practices in the other adaptation areas. Figure 5.4 shows the percent use of adaptation strategies used in Riyale. The figure illustrates Riyale's ability to not relying solely on one adaptation strategy but to utilize a variety of them. This enables households to access an assortment of strategies and practices when facing a catastrophe.

THE FUTURE

The residents of Riyale often comment on Riyale's good climate for producing agriculture crops and its clean and steady water supply. Many of the community elders speak about how their lives have become easier over time. They also appreciate the familiar environment and relative proximity of their families. Instead of relocating, community members would like improve their community from the inside.

Institutions

The greater hope is that more institutional support will be made available to the Riyale community, with a specific emphasis in agriculture. Although Riyale residents understand that there are local Nepali institutions, which hold valuable information concerning agricultural improvements and community development, they are unsure of how to access them. Riyale community members never expressed an interest in direct financial assistance but desired increased support from the VDC. There was also a general agreement among community members that skill-building and training programs would be extremely valuable, especially in areas of agriculture. In addition to training programs, members of the community would like to see improved infrastructure, more specifically an irrigation system for their agricultural lands, which would avoid periods of drought and improve crop yields.

Chapter 6. Case Study- Dibdol

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Livelihoods

Agriculture and Livestock

Cooking Sources

Water

Dibdol Etapu Community Forest

Institutions

Formal

Informal

Adaptation Strategies & Practices

The Future



GENERAL INFORMATION

Dibdol, located on the eastern fringes of Kathmandu Valley in the Kavre district, is designated as our semi-market site. The village is composed of 6 nucleated settlements- Dibdol, Etapu, Padigaon, Kaufadhanda, Taudol, and Bangari- that are situated on the side of a steep ridge. The village runs along the south side of the Arniko Highway, which is a major arterial thoroughfare that runs from Kathmandu to Dibdol's nearest market, Banepa, then on to Dhulikhel, Kavre's administrative center, and then eventually to the Tibetan border. Dibdol community members feel that their proximity and accessibility to the market has a positive effect on village life.

Dibdol's community forest is located on a ridge to the southwest of the settlements. There is an unpaved dirt road that stretches from the highway, through the community, to the community forest. This newly built road has proven to be helpful in increasing mobility for transporting goods to the local market. Due to Dibdol's proximity to a main highway, local micros and buses regularly pass through Dibdol. This bustle acts as an extremely efficient form of public transportation for community members but can also have dangerous effects.

Figure 6.1 Satellite view of Dibdol (GoogleEarth)



Residents of the Dibdol community are of the Brahmin, Chhetri, Tamang, Dalit castes. Nepali is the main language spoken but Tamang and Newari are also quite prevalent. Even though the rate of educational attainment in the area has improved over the past 10-15 years, only 50% of Dibdol community members are literate, leaving half the population unable to read or write.

Children growing up in Dibdol have access to local public schools and a selection of private schools in the area.

Located in the heart of Dibdol is a communally utilized pasture, which is used for grazing livestock or as a football field. Agricultural land is abundant in Dibdol- with approximately 120 land owning households in the village (compared to 10-15 households who owe only the foundation of their house).

**Major Sources of
Local Income**

- Agriculture Sales
- Daily Wages
- Government Service
- Shopkeepers

Livelihoods

Employment activities vary widely across households in Dibdol. Approximately 20-25% of community members hold fulltime employment but more important to Dibdol is agriculture- where 90% of households rely on this sector as their most important source of income. Agricultural sales consist mainly of potatoes, which are sold both to shopkeepers and food stall owners in Banepa. Other important sources of employment are through Banepa shopkeepers, government service jobs, and various office positions. Daily-wage jobs are also an important income generation tool for Dibdol, such as tasks in agricultural labor, house construction, carpentry, and in the community forest.

Rearing Livestock (Dibdol, June 2008)



Women Tending the Fields (Dibdol, June 2008)



Remittances from workers abroad are another important source of income for Dibdol families- approximately 50 households have members who work outside of Nepal. Interestingly, two households reported that they had family members who were working for the US army in Iraq and Malaysia. Around 50% of Dibdol's residents work in the labor market in Banepa while only 15 residents work in government services. During times of extreme hardship Dibdol residents resort to work in Sanga, located approximately three kilometers to the west of Dibdol.

Although not thoroughly recognized by the public, women in Dibdol play an important role in maintaining basic livelihoods within the community. This research showed that 10% of the

women in Dibdol hold full-time employment positions, with approximately 1-1.5% of village women working outside of the community. Women also hold daily-wage jobs within the community for approximately 10-12 days per months in case of need for additional income. Women make, on average, half the amount of daily wages compared to men- totaling 100 Rps/day and with an annual rate increase of 10 NPR/year. Although, this research showed that only 10% of the women in Dibdol hold employment, many choose to rely on the *painchu* system to maintain their familial livelihoods. Due to the large amount of agriculture land available in Dibdol, there are frequent large-scale crop planting and harvesting events. Women will assist with the planting and harvesting of other community members' plantations in exchange for help on their own land. This example of the *painchu* system yields major benefits for a large number of families in the Dibdol community. Without this institutional strength, planting and harvesting crops would be a difficult and time-consuming endeavor. Although more often it is through the *painchu* system, women are sometimes paid as daily wageworkers for their labor in the agriculture fields.

The lower castes in Dibdol perform mason and blacksmith services for other members of the community. These individuals fix agriculture tools in exchange for agricultural products through a system called *balisista*. Since mason and blacksmith work is extremely inconsistent, households often experience problems in planning their finances. In addition, the agricultural products they receive in exchange for their work are of less monetary value when compared to the wages they would receive.

Many households in Dibdol sell milk and/or livestock in the market as a form of supplemental income, especially during times of financial difficulty. The profits from these services vary across households, but can potentially generate a 30-35% profit on sales.

Dibdol's household age structure can often create a financial burden for many families. A household will often house a mother, a father, a handful of children, and the husband's elder family members. During times of hardship, families find it difficult to support the entire household off of the income of one man. This situation often results in the need to use a variety of supplemental income sources, such as the ones mentioned above.

Agriculture & Livestock

Forest Products (Dibdol, June 2008)



As mentioned before, a very large portion of households in Dibdol own agriculture land. There are approximately 25 families that produce enough agriculture to support their household for the entire year. In contrast, ten households in Dibdol own no land. These households are forced to purchase all of their food from the local market, which often has prohibitively expensive prices. Crops grown in the Dibdol village include maize, wheat, potato, rice, mustard, orange, cucumber, peas, and cauliflower.

An alternative to either owning land or purchasing food from the market is for a family to rent land from households who own property- this allows families to grow at least a portion of their own vegetables. Community members living in Dibdol also utilize a form of sharecropping- Landless families will plant, maintain, and cultivate the other's land. In exchange, the workers will receive half of the crop production, which provides the workers will about 3 months worth of food.

As mentioned above, agriculture is an important source of income for Dibdol residents since 90% of households rely on the sale of vegetables to either shopkeepers in Banepa or in the daily food market. Three years ago, community members began to realize that selling vegetables was a lucrative business. This incentivized the cultivation of vegetables, which could be sold in the market. In this case, potatoes and wheat generated the most profit.

The women of Dibdol are the masterminds and workhorses behind the agricultural production in Dibdol. The women plant, cultivate, and harvest crops with very little support from the men in the community. Hence the *parma* system, mentioned above, is an extremely important institutional tool used to maximize the efficiency of crop production.

In conjunction with agriculture, Dibdol households also capitalize on the use of livestock. Cows, goats, pigs, chickens, and buffalos are all commonly found in the Dibdol community. Livestock byproducts, such as goat and cow milk, are sold in the market to generate supplemental income. Furthermore, when households experience a scarcity of income, individual goats are sold in the market. Livestock graze on the common pasture along the highway or are fed grass, which is collected from the community forest.

Cooking Sources

A variety of cooking methods can be found in households throughout the Dibdol community. Almost all households in Dibdol depend on the firewood collected from the community forest while there are 20 households who can also collect firewood from their private forests. Access to alternative cooking methods is useful due to the scarce amount of firewood found in the community forest. Twenty households use a cooking gas cylinder, while others use corncobs, sawdust, charcoal, or kerosene. Innovatively, households use wheat stalks destroyed by hail storms as an alternative source of fuel.

Carrying Firewood (Dibdol, June 2008)



There are ten households that use a biogas stove to cook, which they purchased from the Nepal Biogas Company for a subsidized prize of NPR 25,000 that included an NPR 8,500 government subsidy. Dried out cow dung is another type of cooking fuel in the community. This is

especially dangerous because most houses are built without chimneys, thus posing an indoor air pollution problem.

Similar to other communities, Dibdol households have the ability to switch between fuel sources during incidences of price fluctuations. If the cost of kerosene or charcoal is low, they will store firewood; whereas if the price of these fuels increase, they will use the stored firewood. This practice enables households to easily adapt to market volatility thus reducing household expenditures.

Water

The constant unpredictability of water resources in Dibdol has led to the fluctuating levels of availability and usage for community members. Water is also a community issue, for which community members often disagree upon its usage. Our research shows that there are two main sources of water in the community- both of which are used agriculture irrigation and household consumption. Water is collected through rainwater entrapment and from accessing two community-owned wells located in Dibdol.

Rice Fields (Dibdol, June 2008)



A portion of the community believes that they have access to a plentiful supply of water and that protecting the community forest has further facilitated water conservation and prevented landslides. These community members believe that since the well owner does not require people to pay for the use of the well and there are no rules concerning its use, the resource is, therefore, always available. This access is especially important for feeding cattle during the dry months of March and April. These community members also feel that rainfall provides them with enough water to irrigate

seasonal crops; but they did express concern that with more households moving to the area, they will need to be careful with water management in the future.

In contrast to the situation described above, other members of the community feel that the water source is by no means sufficient for accommodating the needs of everyone. They feel that certain groups in the community are allocated more water than others and its use is not proportional. These community members also feel that since rainfall is volatile, one finds it difficult to rely upon for the irrigation of their crops or for supplying the community with household water use. Still, they did agree that the presence of the community forest has enhanced the water quantity; but they feel that a broadleaf forest, as opposed to a pine forest, would facilitate more water.

The Dibdol Etapu Community Forest

The Dibdol-Etapu Community Forest User Group (CFUG) was formally established five years ago. The CFUG is composed of 135 households, with approximately 810 members. The CFUG Committee is composed of eleven members, who received daily compensation of Rps. 200 for conducting their duties.

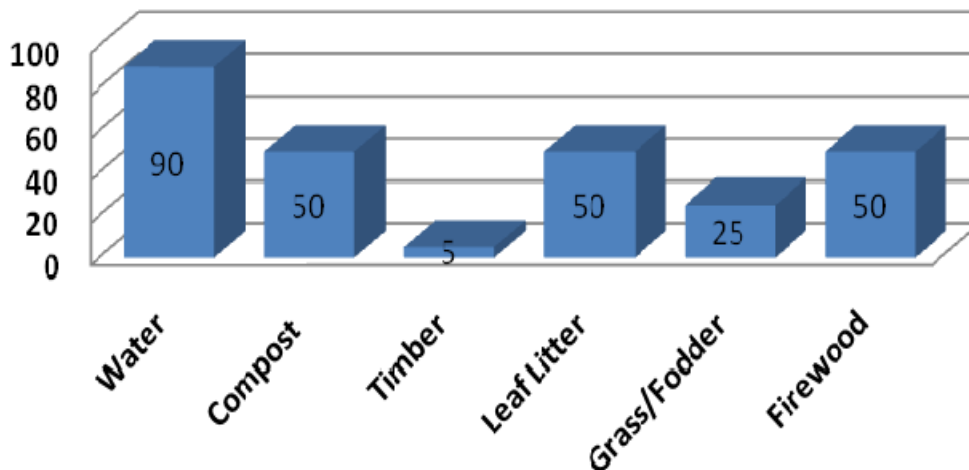
The forest, which is approximately 35 years old, was shrub land before it was converted to its current state. The District Forest Office, in coordination with Australia Community Resource Management Project, initially planted 26 hectares of pine forest. Dibdol community members supported the CFUG's formation because they wanted to protect their water source and they desired a cleaner environment. At the same time, an indigenous system for managing the forest was put in place.

The forest now covers an area of 31.75 hectares and consists of a broadleaf and coniferous mixture that is heavily dominated by pine species. Since the forest was recently converted from shrub land, the forest's density has increased by 40%. The tree species found in the forest include *Castenopsis spp.*, *Schima spp.*, *Alnus spp.*, *Pinus Roxburghii*, *Wallichina spp.*, and *Fraxinus spp.*, *Schima Wallichina* is the only protected species in the CF and it is cultivated for important religious usages, such as stick that can be sold for a generous profit in the market. Animals such as deer, leopards, jackals, wildcats, monkeys, and wild hens can be found in the forest and the numbers of these species have increased significantly since the establishment of the community forest. A number of these species have become a danger to the community. In particular, a leopard has killed 3 children over the past 5 years. Fear instilled in Dibdol residents by the leopard has decreased forest product collection.

Harvesting Timber (Dibdol, June 2008)



Figure 6.2 Types of Forest Products Collected from Dibdol CFUG



The Dibdol-Etapu Community Forest is used to collect a variety of forest products, including timber, firewood, leaf litter, fodder, and compost/mulch. Leaf litter is collected only in February and March. Firewood, collected from unwanted species in the forest, is gathered from November to January and is priced at NPR 5 per bundle. The CFUG preserves the *Castanopsis spp.* for fodder use, which is also priced at NPR 5 per bundle. When the forest is open from August to early June, CFUG members utilize the forest to collect grass for their livestock every Saturday. The percentage of CFUG members who use a particular forest product is displayed in the graph below. The most utilized resource is water whereas timber use is minimal among the CFUG members.

The Dibdol-Etapu CFUG Committee has recently expanded their timber business into a large-scale operation that supports generous profits. The pine trees are harvested for timber and are replaced with broadleaf species. The CFUG Committee members and community members, who work for daily wages, cut down the timber with hand saws, which the timber is then shipped out by trucks rented by CFUG Committee. These trucks transport the timber to the Banepa where they are sold to a contractor. The market price for one cubic feet of pine lumber is approximately NPR 200. A small percentage of the CF timber can be used for local house if the CFUG receives and approves an application from the builder.

Collected Forest Products (Dibdol, June 2008)



The CFUG Committee receives technical support from the District Forest Office for harvesting timber. In addition, the DFO provides pruning and thinning training and has helped to formalize the operating procedure. The current management plan for the forest consists of regular pruning, cleaning, splitting, and more recently, thinning activities. The operating procedure also outlines the designation of forest blocks for specific activities. There are 5 blocks in the forest: block 1 and 2 are used for water protection and conservation whereas Blocks 3, 4 and 5 are used for timber harvesting.

The CFUG Committee has also begun to plant and prohibit the harvesting of *Alnus* species in hopes of converting the existing forest into a broadleaf forest. The CFUG has also planted a bamboo border around the forest to create a distinct boundary. Two years ago, the District Forest Office launched a nursery in Dibdol by provided broadleaf species seedling to the CFUG Committee. In February 2009, the CFUG Committee will plant these seedlings in the forest and receive a payment of NPR 3 per seedling over a certain height that is maintained in the forest.

The creation of the CF has been bittersweet for the residents of Dibdol. Before the CFUG was established, residents could freely access the forest and collect forest products at their leisure. The formation of the CFUG committee facilitated the formation of a strict forest management plan and product collection payment system. This stringent management plan has driven households to rely on the market for purchasing supplements to forest products that are needed for daily livelihoods. Currently, the forest is not providing adequate amounts of firewood for the community since households are only allowed to collect for three to four months of the year. In addition, there is not enough fodder to feed cattle so straw needs to be purchased from the market from October to April.

Although there are no government forests in the area, there are approximately 20 households that own private forest. These private forests are not very large in size- on average 0.1 hectares-, but they provide important forest products in case the CF cannot. Families who own private forests are able to collect fodder and firewood from their forests at their own discretion, which allows them to have enough firewood for the entire year. Other households in Dibdol often find themselves without enough firewood. When this occurs, forest owners generously allow other community members to use their forest for product collection. Furthermore, the private forests are composed of broadleaf species as opposed to pine, much like the CF.

Selling Timber (Dibdol, June 2008)



Women in Dibdol have a more intimate relationship with the CF compared to men. Women are the community members who primarily collect forest products with minimal help from men. The strict forest management plan creates problems for women because they need to simultaneously manage their time at home and coordinate that with their time in the forest. Women, in particular, would like to see a more flexible forest access timetable. In addition, the fear of leopard attacks has forced women to travel to the forest in groups, which requires even more time and coordination.

Forest product extraction restrictions lead to tensions surrounding forest product collection within the community. Certain groups in Dibdol expressed distrust in the management of the forest because they felt there was an unequal amount of forest products collected by certain groups. There were also problems with certain groups stealing grass or forest products when they did not have the right to take them.

The majority of Dibdol residents feel that there is equal participation and representation at CFUG meetings and in planning activities. Many people commented that they always feel welcome at CFUG meetings, but instead chose not to participate while some other groups in the community feel unwelcome and marginalized by the CFUG committee. The men in the community

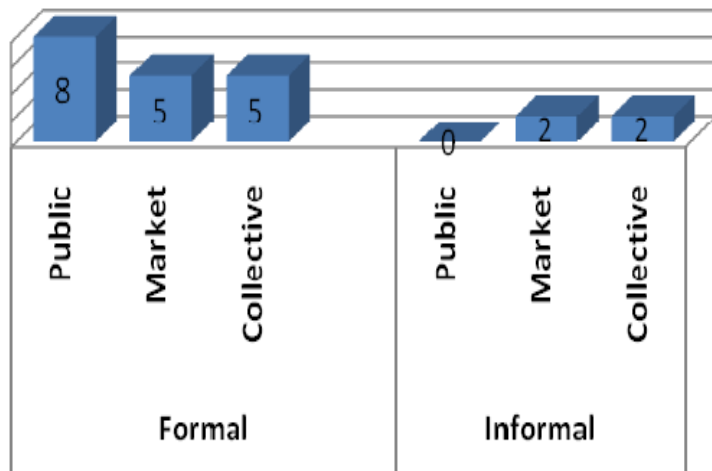
acknowledge that they hold more power in the CFUG decision making process, but they also point out that they consider the thoughts and feelings of other populations in the community, such women, when making key decisions. Women, on the other hand, do not feel that they have the power to participate in CFUG meetings or have a stake in the decision making process at all.

Other concerns about the CFUG Committee mainly revolve around timber sales. CFUG members do not feel that the timber-selling process is transparent or accountable. Also, the use of profits generated from the sale of timber is not fully known by Dibdol residents and members of the CFUG. Still, a large portion of profits has gone toward the construction of a dirt road, which starts at the main highway and winds through the community to the forest. This road is used to transport the timber to Banepa and has also eased village life by improving mobility.

INSTITUTIONS

Dibdol boasts many formal and informal institutions that are relatively well integrated with the community itself. More specifically, these institutions have close relationships with a large number of government agencies. Figure 6.3, Number of Dibdol Institutions by Sector, visually depicts the number of Dibdol institutions identified by type. Additionally, Table 6.1 lists the institutions found in Dibdol.

Figure 6.3 The Number of Institutions by Type in Dibdol



Formal

Public

Dibdol capitalizes on its proximity to Dhulikhel, Kavre's administrative center. These formal public institutions, mostly comprised of public government organizations, provide resource and information to Dibdol community members on a wide range of village issues. Most importantly, they assist Dibdol households with programs related to the Community

Forest and their agriculture land. The DFO Range-post office provides pruning and thinning training to Community Forest users and committee members and has helped to formalize the operating procedure. The District Development Office and Women's Development Center, which can be reached by public transportation, provide important services related to employment and economic development to Dibdol residents. Additionally, the public schools and local colleges facilitate equal education opportunities to Dibdol's children, aiding in its goal to increase literacy in the community.

Table 6.1 Dibdol Institutions

PUBLIC INSTITUTIONS	
Formal	Range-post Office Health Post District Development Office District Administrative Office Women's Development Center Public Schools Local Colleges Milk Collection Center
MARKET INSTITUTIONS	
Formal	Neighbor Bank Shops Saw Mill Grinding Mill Gas Station (Himal Gas)
Informal	<i>Painchu</i> <i>Sapati</i>
COLLECTIVE INSTITUTIONS	
Formal	Jal Devi Cooperative (Vinda Vasini) Children's Savings Group Community Forest User Group Guthi Religious Groups Ganesh Self-Help Savings/Loan Group
Informal	Informal Road Meetings Agricultural Sharing Norms

Market

Formal market institutions allow for employment opportunities and resource sharing within Dibdol. The local gas station allows for public transportation to be utilized more often and for increase use and accessibility of private transportation (although minimal) and also draws in business to the local shops. The Saw Mill and Grinding Mill in Dibdol provide employment opportunities and steady income for village residents. Finally, the Neighbor Bank allows Dibdol households to use private more traditional microfinance institutions for saving and taking out loans.

Collective

Similar to Godawari, Dibdol takes advantage of its fruitful formal collective institutions. Dibdol residents used to take out loans from a rich shop own in Banepa, who charged them 36% interest, compared to a typical bank interest rate of 6%. This shopkeeper actually took the land of a woman who wasn't able to pay back her loan. The introduction of formal collective microfinance institutions has enabled Dibdol

residents to rely on their fellow community members for loans with minimal interest as opposed to the shopkeeper. Thus, the Jal Devi Cooperative, Children's Saving Group, and Ganesh Self-Help Savings and Loan Group, microfinance institutions found in Dibdol have significantly eased the life of Dibdol citizens. In addition, the Community Forest User Group (CFUG) has developed a road, initially constructed for the transport of timber from the Community Forest but also used for general mobility and transporting agriculture products to the market.

Informal

Market

Dibdol households use informal market institutions through both the *painchu* and *sapati* systems. The *painchu* system is a system of community exchange and resource aggregation, where materials and goods are exchanged between households. These exchanges typically take place with a time lag, occurring when households are experiencing difficult times and do not necessarily need to occur directly between the same households. The *sapati* system acts similar to a loan between neighbors, where one household provides money to another during a time of need and the other returns it in the future, where there is no predetermined time period for the

return or interest. These informal institutions are extremely important for Dibdol households during difficult times.

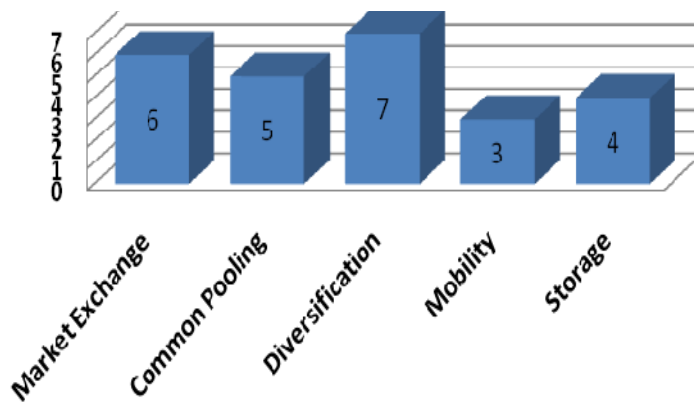
Collective

Finally, it was found that Dibdol also uses informal collective institutions, more specifically in the form of information sharing. There is an informal group of Dibdol residents that gather periodically to exchange information about the dirt road being constructed in Dibdol by the CFUG, this allows community members to share opinions and provides a formal venue for discussion sharing. In addition, Dibdol residents also informally participate in the sharing of agricultural norms, by trading information about seeds, new species, or fluctuations in market food prices.

ADAPTATION STRATEGIES & PRACTICES

The Dibdol community has instinctively developed a wide variety of adaptation practices that have enabled them to respond to changes and fluctuations in the environment and in their typical lives. Most interesting about Dibdol is their ability to consistently develop successful strategies in each of the five adaptation strategies: market exchange, common pooling, diversification, mobility, and storage (described in the background section of the report). Table 6.2 lists Dibdol's adaptation practices and Figure 6.3 graphically depicts the number of adaptations practices in Dibdol by strategy.

Figure 6.4 Number of Adaptation Practices by Strategy in Dibdol



Although Dibdol is not directly integrated with a market, it has a substantial ability to develop market exchange practices. Dibdol residents have learned to exchange agriculture products in the market with ease. Due to the prevalence of large-scale agricultural production, households regularly exchange vegetables with the market by both selling them to shopkeepers and to the local food market. Even more interesting is Dibdol's ability to capitalize on certain market environments. For example, when residents saw a sharp increase in market demand for potatoes, they switched agricultural production in favor of potato production. This understanding of market demand allows Dibdol residents to significantly increase their income as they respond to the nuances of market demand. Other market exchange practices include the exchange of forest products and labor for income. Dibdol residents have also learned that they cannot meet their need for food through agriculture production or their need for forest products by collection, therefore, they have adapted to purchase supplemental products in the markets.

Table 6.2 Dibdol Adaptation Practices

Market Exchange
Agriculture Products
Forest Products
Money for Goods
Labor
Labor for Goods
Sharecropping
Common Pooling
Labor
Savings and Loans
Community Forest
Grazing Land
Health Equipment
Diversification
Income Generation
Agricultural Crops
Livestock
Savings & Loans
Fuel Sources
Water Source
Food Sources
Mobility
Improved road access
Public Transportation
Migration
Storage
Cooking Fuel
Money
Food
Forest Products

There are other groups in Dibdol who utilize other interesting practices for market exchange. The blacksmiths and masons do not need to purchase food from the market since they can exchange their services for these goods. Sharecropping is another interesting practice for food purchases from markets, where the planting, cultivating, and harvesting of another person's field allows for the splitting of products between the owner and the worker.

Households in Dibdol have also developed significant strategies in terms of diversification. Finding employment locally, either in Banepa or Sanga, diversifies the income of households. Alternatively, different types of work, from daily wage jobs, agriculture sales, government service jobs, to working abroad, allows further diversification of income sources. This adaptation practice can prove to be extremely beneficial during times of extreme hardship or market fluctuations.

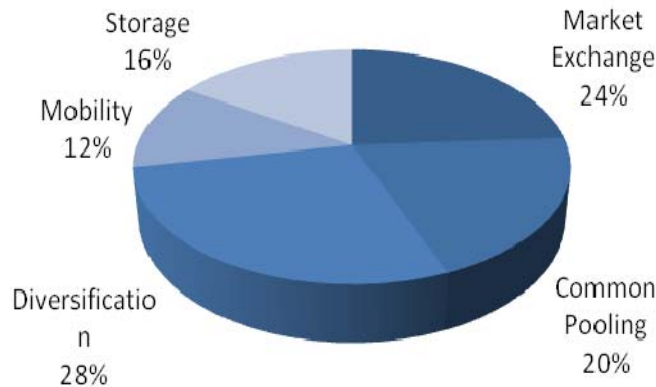
The ability for households to diversify their agricultural crops is also an extremely important adaptation practice. Weather changes, differences in soil quality and type, and fluctuations in market demand are all unpredictable factors that influence agricultural production. By diversifying crop types, Dibdol residents have the ability to easily respond to changes

within these factors. Households have also learned to diversify their livestock, food sources, and fuel sources- of which also involves market interactions.

Dibdol residents have also developed a sophisticated savings-and-loans system as another diversification practice. By having the accessibility to loans from micro-financing institutions, individual savings regimes, and from local credit, these households can easily respond to market fluctuations by resorting either to the use of one or a combination of these practices.

Since the creation of the CFUG, the availability of grazing land has proven to be an important common pooling adaptation practice. After the forest officially became a Community Forest, grazing has not been permitted in the forest surrounding the village. In order to continue to keep livestock, community members had to find an alternative spot to graze their livestock. This community-owned resource provides benefits for a wide reaching population. Residents of Dibdol also common pool their savings by taking advantage of microfinance institutions, common pool the forest by establishing the community forest, and common pool health equipment for times of need.

Figure 6.5 Percent Use of Adaptation Strategies in Dibdol



The use of common pooling labor in agriculture fields was mentioned briefly before. This is a particularly advantageous adaptation practice for Dibdol due to the presence of large agricultural fields. Women in Dibdol common pool their labor in planting, cultivating, and harvesting crops in order to complete each household's field in a timely manner. If labor was not common pooled this exercise would be extremely time consuming.

Dibdol residents also store a variety of goods as an adaptation practice. Households store firewood and other forest products during the winter because of their inability to access the forest in the rainy season. Additionally, households store their money in savings accounts, store fuel, and store food for times of need.

In contrast to the other adaptation strategies, only three adaptation practice was identified as a mobility strategy. The CFUG committee used the funds collected from timber sales to construct a road through the community. This road allows trucks, cars, and bicycles to move up and down the village with ease while also facilitating the transportation of good to the market. In addition, Dibdol's location allows them to utilize public transportation as needed which has proven to provide an important livelihood benefit. A few households in Dibdol have a family member living abroad, which increases livelihood benefits from migration.

Similar to Godawari, although it was found that Diversification as an adaptation strategy was utilized the most frequently, Dibdol does solely rely on that specific strategy. Figure 6.13, Percent use of adaptation strategies in Dibdol, shows that Dibdol uses the other adaptation strategies in complement to Diversification. It is important that Dibdol households continue to use a diversity of adaptation strategies as opposed to heavily focusing on one strategy to ensure ample options should households face a difficult time.

Through conversations with different focus groups, we were able to identify a handful of adaptation practice that did not fit into any of our five strategies. Although not all of them are mentioned in the case study, there was one practice that stood out from the others. Dibdol residents repeatedly mentioned their ability to prioritize in times of need. If there was a period where households became jobless or with little income to support their normal lifestyle, different families would jointly decide upon and purchase only essential goods. Although this practice may sound minor, it is noteworthy due to their ability to identify the benefit from this simple action. Without the ability to prioritize, residents would end in indebtedness through wasting their savings on useless/trivial items.

THE FUTURE

Different groups had differing visions for the future of Dibdol. Even though there was a wide dispersion of thoughts for the future, one could still recognize general themes amongst the broad spectrum. Recognizing both the optimistic and pessimistic feelings between different groups within this community is important for making improvements in the future and in identifying areas that need additional assistance.

Disparity

Where one group never worried about providing food for their family the other was constantly filled with fear that they would not be able to feed their children. Different households disagreed on issues regarding the ability to sustain a household on agriculture, to have enough forest products to last through the year, and to afford market prices for food. Surprisingly, it was found that there was also a lack of communication between households as well. One settlement had no idea other households in the community were having trouble supporting themselves from day to day. There is a lack of community, communication, and support between households and settlements in Dibdol.

Alternatively, women and men both spoke about the recent changes in their relationship. The women acknowledge that men were becoming more thoughtful and supportive and they attributed this to the government's social service programs and public education campaigns on gender equality through advertisements and commercials. The ability to recognize inequality in gender and alter behavior gives hope for the future.

Institutions

Dibdol community members did not give much attention to the community's institutional capacity. Select institutions, such as the *parma* system and different microfinance institutions, provided the community with important foundations for support. In contrast, other institutions had little or no influence in the lives of community members. Community members also realize that there are external institutions in Kathmandu that contain important information about agriculture, forests and microfinance; but community members have not sought out a connection with these institutions nor have the institutions established relationships with the community members. Adding to the disparity mentioned above, certain groups in the village felt that they were marginalized and that some other groups were perceived to be receiving an inequitable amount of information and assistance from these institutions. As such, there is an increased need for transparency, accountability, and connectivity within and between the institutions in Dibdol.

Chapter 7. Case Study- Godawari

General Information

Livelihoods

Agriculture and Livestock

Cooking Sources

Godawari Kunda Community Forest

Institutions

Formal Institutions

Informal Institutions

Adaptation Strategies & Practices

The Future



GENERAL INFORMATION

Godawari Kunda, designated as our market community, is located in central-eastern Lalitpur District- approximately 18 km from central Kathmandu- and is easily accessible by public transportation. The site is situated between two paved arterial roads with hourly microbus and public bus service to and Patan and Kathmandu. This community, in existence for about 8 generations, is approximately 147 hectares in size and consists of four 34-household settlements- totaling approximately 990 individuals. These nucleated settlements rest on flat and slightly sloping lands. The community, leasehold, and government forests are all situated to the east of the main settlement, stretching across the ridge that forms the eastern boundary of Lalitpur District.

The two main roads that border this community have a spattering of local shops owned by Godawari community members, which include restaurants, photo shops, supply stores, and local food shops. Prior to the establishment of the local market, individuals were forced to commute to Lagankhel and Patan, which are approximately 30 minutes by bus away, to purchase household goods. The development of this local market in their community has not only provided sustainable employment opportunities, but it also allowed time that was once used for commuting to be directed toward other important activities.

Figure 7.1 Satellite Map of Godawari (GoogleEarth)



The Godawari community is home to a diverse set of castes, including Brahmin, Chhetri, Tamang, Dami, Kami, and Sarki. Nepali is the main language but Tamang is also spoken. Approximately 90% of adult community members can sign their name and 75% are literate. For

the youth, children in Godawari have equal access to public education. Alternatively, there are several private schools in the vicinity. As for day-to-day transportation needs, most community members use the microbus, roughly 75% of households own a motorcycle, and six or seven households own private trucks.

Livelihoods

Godawari residents earn their income through a diverse set of livelihood strategies. Around 80% of individuals in the community are employed full-time. The wealthier families in the community own shops that border the town and occasionally employ other members of the community. Also, daily-wage jobs are an important source of income for many community members. These jobs consist of gravel making, carpentry, house construction, or other sporadic labor jobs. Both men and women work daily-wage jobs even though men are paid almost twice the amount paid to women. A beer factory, which was not in operation during the writing of this report, and marble factory are located close to the settlement and both of which provide a major source of employment and revenue for Godawari residents. Additionally, the Dalit caste provides blacksmithing and tailoring services to other members of the community.

Major Sources of Local Employment

- Shop Owners
- Agriculture Sales
- Nepali Army
- Daily Wage Jobs
- Beer Factory
- Marble Factor

National and international remittances also contribute a significant amount to the community's income since approximately 80% of households have family members who work in Kathmandu or abroad. Examples of employment in Kathmandu include jobs in finance, engineering, tourism, or other local service sectors. The commute from Godawari to Kathmandu takes approximately 45-60 minutes on public transportation. Working for the Nepali Army is also an alternative source of stable income for many community members. Due to a general lack of employment opportunities in Nepal, many Nepalis choose to travel overseas for long-term, sustainable work.

Overview of Godawari Settlement (June, 2008)



Compared to men, women have a more difficult time finding employment opportunities due to past gender imbalances in Nepal's education system. Fortunately, girls now have the same educational opportunities as boys in the community. Godawari women do not usually hold full time jobs but instead rely on daily-wage positions and other temporary employment opportunities as additional income sources during difficult times. In such circumstances, women typically hold jobs in teaching and in floriculture fields. Furthermore, Dalit and Tamang community members often find it

extremely difficult to obtain stable work and are therefore often forced to travel to work in Kathmandu for extended periods of time.

Many families have begun to realize the importance of diversifying employment and income sources in order to avoid disaster in the times of a market failure. Due to Godawari's unique market location and its resident's relatively high education level, a wide variety of employment opportunities exist. Citizens in Godawari have begun to understand the stability and benefits derived from a diversified economy. Furthermore, Godawari citizens have developed various adaptation mechanisms useful during times of volatile incomes and unemployment.

Agriculture & Livestock

The Godawari community relies, to a greater extent, on its ability to access the market economy rather than on local agriculture and livestock production. Only a handful of families in Godawari, which tend to be wealthier, can sustain themselves on their own agricultural produce for the entire year.

Approximately 65% of the community can support themselves for 9 months. In contrast, 30 households, mostly comprised of Tamangs, have no land ownership and are required to purchase all their food from the market. It should

also be noted that certain castes own or have access to poorer quality land than other castes, a phenomenon that is mostly dependent on one's location in the community. Agriculture crops grown in Godawari include corn, rice, millet, beans, wheat, mustard oil, and modest amounts of medicinal plants.

Lastly, a small percentage of families own livestock, which is used as an alternative source of income to agricultural production. An even smaller percentage of households use their livestock to sell milk or other byproducts. The most common species of livestock at Godawari include goats, chickens, dairy cows, ducks, fish, pigs, and one family owns a buffalo.

Cooking Sources

Households in Godawari utilize an assortment of cooking methods. Most families collect firewood from the community forest for cooking purposes. Additionally, households in Godawari also use kerosene stoves, gas, saw dust, charcoal, liquid petroleum, and biogas to cook. Most families have access to both firewood and alternative cooking mechanisms. As the cost of fossil fuels, such as cooking gas, charcoal, or kerosene, increases, families will begin to rely on firewood for cooking needs. Responding to fluctuations in market prices, Godawari

Agricultural Fields (Godawari, June 2008)



residents have learned to diversify their cooking methods to ensure cooking fuels only uses a small percentage of their income.

The Godawari Kunda Community Forest

The Danish International Development Agency (DANIDA) in coordination with the District Forest Office (DFO) facilitated the establishment of Godawari's Community Forest User Group (CFUG) in 1993. The DFO Range Post Office assisted the community in forming the CFUG through the writing of the CFUG constitution and through the development of their operating procedure. This creation process took approximately two years and upon its completion, 13 years ago, the CFUG and CFUG Committee were established.

The Godawari CFUG Committee is currently composed of eleven members- a Chairman, Vice-Chairman, Secretary, Treasurer, and seven additional sitting members. Both men and women hold various positions on the Committee, with the current Chairman being male and the current Vice-Chairman being female. Godawari's residents feel there is equal representation of caste and gender in the CFUG decision-making process. Additionally, the Committee organizes monthly internal meetings and bi-annual community-wide meetings to discuss the current use and management of the Community Forest and prospects for the future.

Godawari Kunda CF (Godawari, June 2008)



There are 120 household members in the CFUG. The Committee requires households to pay 100 rupees per family annually in order to be an official member of the CFUG and have access to forest products. The funds collected from CFUG membership dues is deposited into the CFUG general fund and is used to pay for various items, such as a forest guards, tea during Committee meetings, management personnel, and external projects. An example of a past external project supported by the CFUG is local school child CFUG supported scholarship.

After the government used the forest for timber about 55 years ago it began a natural regeneration process. The forest has gradually returned to its initial density due to the prudent management efforts of the CFUG. The forest is currently 147 hectares in size and it consists of several species of mixed-broadleaf trees (*Castenopsis*, *Rhododendron*, *Quercus*, *Schima wallichina*, *Kawloo*, *Kaffle*, *Khari*, very little *Pinus wallichina*). The CF borders the eastern edge of Godawari and is easily accessible to all households. The furthest a household must walk to reach the CF is 4 km. Community members mainly use the CF to collect forest products despite the fact that there are several government forests and leaseholds forests in the vicinity. There is a wide diversity of animals that inhabit the forest including leopards, deer, monkeys, wild pigs, rabbits, jackals, bears, porcupines, bears, and wild dogs.

The Godawari community depends on the use of its forests products. Members of the CFUG collect firewood for cooking, fodder to feed livestock, and leaf litter for livestock bedding and compost. Between October to February, community members may collect firewood and participate in forest management activities, such as thinning, pruning and, clearing. Also during this time, pole size timber, used to construct rooftops, is collected. This collection requires an application, which must be approved by the Committee. Between October and April, members are allowed to collect fodder from the forest borders with permission from the Committee. It should be noted that women typically have a stronger relationship with the forest than men simply by being the main gathers of forest product. The only grievance with the CFUG was voiced through the Tamang community. Before the community forest was established the Tamangs would sell the firewood they collected from the CF, generating an alternative source of income. The quantity restrictions imposed subsequent to the creation of the CFUG have inhibited them from collecting enough firewood to sell in the market.

Two years ago the Committee invited a neighboring community to join their CFUG. This settlement, Kitini, composed of 16 households, hoped to gain access to forest products by joining a neighboring CF but was deterred by high costs. The Godawari Kunda CFUG invited members of Kitini to join at a more affordable rate. One family located in Kitini was given special permission from the Committee to collect firewood during the off-season. The sale of this firewood was used to pay for her daughter's college education.

There is community-wide agreement that protecting the forest is a high priority for Godawari. Residents feel the forest contributes to Godawari's good environment, primarily through the providing of natural ecosystem services that reduces pollution from Kathmandu. In addition, the preservation of the CF has ensured a sustainable supply of water, thus allowing a large majority of this to be sold by the VDC and transported for use in Kathmandu.

The Committee is continually brainstorming new uses for the CF. For example, it has considered selling timber when trees reach an appropriate size and using the carbon market to raise revenue in avoided deforestation. In the future, the Committee would like to see more community support, especially in terms of volunteering with forest upkeep and maintenance.

One of the Markets at Godawari (June 2008)



INSTITUTIONS

Table 7.1
List of Institutions at Godawari

Due to the settlements close relationship with the market and its proximity to the greater Kathmandu metropolitan area, Godawari has developed numerous formal and informal institutions as well as integrated itself with a myriad of external institutions. Figure 7.2, Number of Godawari Institutions by Sector, below quantifies the number of institutions located in Godawari by institutional type. The adjacent table, Table 7.1 Godawari Institutions, lists the institutions found in Godawari by their sector.

Formal Institutions

Public

Many formal institutions, which provide essential services to Godawari members, have either relocated to or near the settlement itself. These organizations provide an assortment of resources for the community. For example, the Forest Training Centre, Fisheries Research Centre, and Disaster Preparedness Training Center have provided training for residents, allowing them to gain valuable opportunities for both employment and community development. In addition, the Botanical Gardens attract tourists to the area, which supplies local restaurants and shops with customers. The DFO Rangepost and Territorial Offices work with the Community Forest User Group in informational exchange and maintain constant dialogue. The introduction of public schools in the area has supplied equal education opportunities to children in Godawari. Finally, the Floriculture, Development Office and Public Schools have provided many Godawari women with employment and job training.

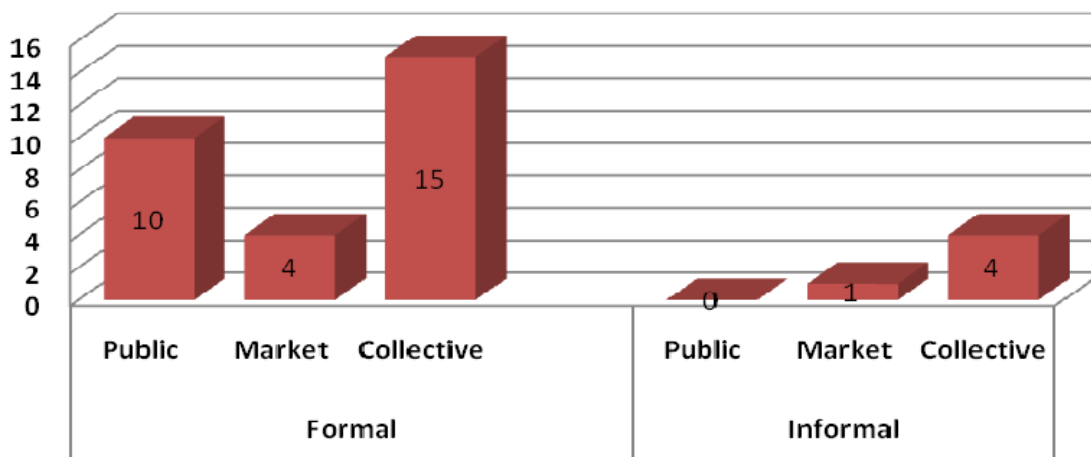
PUBLIC INSTITUTIONS	
Formal	DFO Rangepost Office DFO Territorial Office Forest Training Centre Floriculture Development Office Botanical Gardens Fisheries Research Centre Disaster Preparedness Training Center Village Development Committee Public Schools Health Post
MARKET INSTITUTIONS	
Formal	Marble Factory Beer Factory Saw Mill Local Shops & Restaurants
Informal	<i>Painchu</i>
COLLECTIVE INSTITUTIONS	
Formal	ICIMOD Community Forest User Group Hindu Temples Buddhist Monastery Christian Churches Phulchoki Women's Awareness Group Laligoras Women's Group KAKI Women's Group Private Schools Gentlemen's Group Guthi Religious Group Savings & Loan Cooperative Drinking Water Utilization Group Lama Kunda Conservation Group Dalit Group (DAG)
Informal	Agriculture Sharing Norms Shindu Saraaswati Group Youth Library Model Youth Club

Village Development Committee

Village Development Committees (VDC), formal public institutions, were established by Nepal's Local Development Ministry as its more decentralized administrative unit, are meant to facilitate greater public-government interaction and administration. Although the VDC is supposed to be present in village life, its relationship with Godawari was difficult to assess. During focus groups, many Godawari residents nonchalantly breezed over their interactions with the VDC and did not address its role in Godawari. The most common comment regarding the VDC was that Godawari residents hoped to see more support from them in the future.

Unfortunately, even though the role of the VDC for Godawari residents is nebulous, the VDC has direct and complete control over the CF's water supply, which was contracted out to water distributors in Kathmandu. Many large water-transporting trucks regularly commute through Godawari to collect water and transport back to Kathmandu for urban consumption and use. Godawari residents know nothing of where the revenue goes or which projects it supports. The role of the VDC as an institution should be explored in further detail.

Figure 7.2 Number of Godawari Institutions by Sector



Market

Formal market institutions have also had a lasting effect on the Godawari community. The Marble Factory, Beer Factory, and Saw supply a significant number of community members with steady employment and stable income. In addition, the local shops and restaurants that surround the Godawari settlement enhance the living quality of Godawari residents and facilitate easy market exchanges.

Collective

Godawari has developed its formal collective institutions more significantly than other sectors. These groups are found to address the needs of village life directly, by facilitating the exchange of information and providing valuable resources to community members. They have proven to be vitally important for Godawari's economic development and the implementation of essential

adaptation practices. For example, ICIDMOD, a not-for-profit, assisted the CFUG with forest management techniques and provided training on medicinal plants and alternative energy usages. Additional formal collective groups include Godawari's religious groups, which allow Godawari residents to openly practice religion. Included in these institutions are the Hindu Temple, Buddhist Monastery and Christian Churches and Guthi Religious Group.

Godawari has developed a set of formal collective institutions which have successfully organized a myriad of tourism practices used as both economic and community development tools. The Lama Kunda Conservation User Group Committee has initiated a local community development project aimed at developing the area's tourist base while being conscious of local conditions. Through collecting community donations, the User Group has begun to construct a manmade lake around a natural heritage site. This project not only can provide employment opportunities for local community members, it will also be open to the public as a swimming and recreation area. Furthermore, the CFUG has utilized forest conservation to create alternative mechanisms for economic and community development. By clearing out a portion of the CF, the CFUG has created a number of picnic spots geared towards recreational usage. The leasing of picnic spots is a source of additional revenue for the CFUG and also provides shopkeepers and restaurants with customers and firewood sales. Both the Lama Kunda Conservation User Group Committee and the CFUG Committee are continuing to explore tourism projects for the future. For example, the CFUG Committee is working with Bird Conservation Nepal to begin a bird-watching tourism business- community members will be trained as guides and tourists will pay for guided bird watching tours.

Construction of Conservation Area (Godawari, June 2008)



Godawari also has a multitude of highly utilized microfinance organizations, in the form of savings and loans groups. The widespread distribution of these groups allows for their services to be used without discrimination across different castes, wealth levels, or gender. The most impressive characteristic of these organizations is that they address the need for structural change within the community by teaching group members how to save, record savings, and understand the process of group lending. Local Godawari shop

owners will take out loans for their business, whereas other community members may use loans as a way to make upfront payments for private school education or livestock acquisitions. Although loans are typically not used for residents who are facing dire situations, the availability of loans is still important because it acts as a safety net for many community members.

Various savings and loans groups, including, the Dalit Group (DAG), the Gentleman's Group, The KAKI Women's Group and the Savings and Loans Cooperative work with specific sectors of the community on microfinance. More influential groups in Godawari are the Laliguras Women's Group and the Women's Awareness Group Collective, who both have widespread reach within the village. These two groups provide essential services to the Godawari community and have succeeded in developing a particularly large footprint.

Informal Institutions

In addition to formal institutions, Godawari has also established informal institutions, which facilitate the exchange of information and also markedly, provide marginalized sectors with essential services and opportunities uncommon in Nepali society.

Market

The only identified informal market institution in Godawari has proven to be an essential and common institution in Nepali village life. The *painchu* system is a system of community exchange and resource aggregation, where materials and goods are exchanged between households. These exchanges typically take place with a time lag, occurring when households are experiencing difficult times and do not necessarily need to occur directly between the same households. Godawari residents have found that the *painchu* system is especially useful when household members experience debilitating illnesses. Although this information market institution is utilized frequently, it is not always reliable or the most desirable institutions for Godawari households to use.

Collective

In addition to the informal market institution mentioned above, Godawari residents are also prolific in organizing organic informal collective institutions, which address a wide array of village life. Agriculture Sharing Norms organizes community members to regularly share information and discusses issues relating to agriculture and livelihoods. Moreover, alternative youth institutions, such as the Model Youth Club and Youth Group Library, facilitate youth development and enhance individual growth.

External Institutions

A wide variety of external organizations have established valuable ties in Godawari. Heifer International, in particular, has provided many women with goats and other livestock that can be used for supplemental income. The Japanese International Cooperation Agency (JICA) and the Danish International Development Agency (DANIDA) both assisted with the establishing and development of many critical community development projects in Godawari. Other external organizations have periodically worked with the community on a variety of short-term, small-scale development projects.

ADAPTATION STRATEGIES & PRACTICES

The Godawari Kunda community has successfully developed a multitude of adaptation practices in each of the five adaptation strategies- market exchange, common pooling, diversification, mobility, and storage; which were described in the background section of the report. Table 7.3 Godawari Adaptation Practices lists the individual adaptation practices by strategy found in Godawari.

Of the five adaptation strategies, Godawari households have best developed and effectively utilized diversification practices. Community members have discovered sundry mechanisms to avoid market fluctuations, agricultural changes, and income volatility. For example, as mentioned above, most Godawari households have the ability to utilize both firewood and alternative cooking mechanism such as kerosene, biogas, sawdust, or gas. In case one particular cooking mechanism becomes prohibitively expensive, households possess the ability to substitute that with another mechanism. This substitution practice enables them to avoid dedicating a large portion of their income for cooking when a price increase occurs. Similarly, strategies for income generation demonstrate another good example where households have the ability to hold different jobs concurrently. This strategy can also be seen through the diversification of crops and livestock. Additionally, many Godawari residents diversify their food sources by simultaneously growing their own vegetables, purchasing food in the local market, or through other markets in Patan, Lagankhel, and Satdobato. This diversification allows households to retain a reliable access to food in case of crop failure or drastic fluctuations in market prices.

Godawari households have also developed useful and resourceful common pooling practices, the most successful being the creation of various microfinance savings and loans groups. These groups provide access to capital and teach strategies for saving across a wide array of groups in the community. This practice is particularly helpful for the low- and middle-income families since it results in empowerment and the creation of a safety net in the event of disaster. Godawari citizens also share agricultural equipment, seeds and a common pooled ambulance. Moreover, Godawari has a large number of common pooled buildings and open spaces, including, a library, the CFUG building, various religious spaces, recreations areas, and Lama Kunda. Another example of common pooling is the community forest, which provides many households in the

Table 7.2 List of Godawari Adaptation Practices

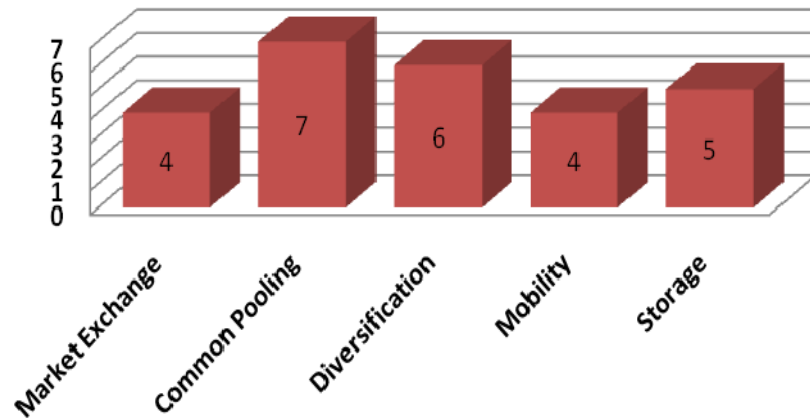
Market Exchange
Forest Products Agricultural Products Money for Goods Labor
Common Pooling
Health Services Savings and Loans Buildings Open Spaces Community Forests Labor Agricultural Equipment & Seeds
Diversification
Fuel sources Income Generation Agricultural Crops Savings and Loans Livestock Food Sources
Mobility
Private Transportation Public Transportation Migration Seasonal Mobility
Storage
Water Forest Products Money Cooking Fuel Food

community with critical resources that they are highly dependent on. Both the establishment of the CF and the subsequent creation of resource allocation and usage rules allow for the avoidance of potentially disastrous “tragedy of the commons” problems.

Storage is another strategy that is heavily utilized by Godawari residents.

Households often store natural resources, such as forest products, food, and water, in and around their homes. Also, households store money either in their homes, banks, or cooperatives. Effective storage mechanisms can prove to be extremely important during times of shock, especially since this allows households to have temporary resolutions to immediate needs and it also allows for the development of thoughtful solutions for the future.

Figure 7.3 Number of Adaptation Practices by Strategy at Godawari



Forestry Training Centre (Godawari, June 2008)



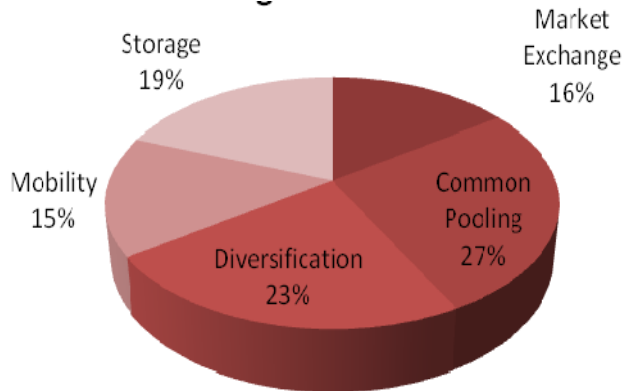
Both private and public modes of transportation are mobility strategies commonly used in Godawari. Migration to Kathmandu and abroad for alternative employment opportunities has also been an effective practice used by Godawari households. This allows households to diversify income and thus strive to achieve sustained and stable development towards household prosperity.

Finally, Godawari residents use market exchange as an adaptation strategy. Particular residents and shops sell forest products in the market for a variety of uses. The CFUG sells firewood it

collected in the CF to picnickers as one strategy for developing their tourist base and citizens sell firewood to urbanites as a supplemental income source. The largest annual exchange of forest products occurs during *Dashain*, a holiday in which many Nepalis require forest resources for religious purposes. Residents and shop owners also often sell agricultural products in the local market or through local shops while several residents choose to sell their agriculture in Patan. Finally, the market also facilitates income generation for Godawari citizens because local employment in shops, mills, and factories. Since Godawari is a market community in itself and the actions and lifestyles of its residents are heavily intertwined with the market the identification of all market exchange practices utilized by Godawari residents would be difficult.

Although it was found that common pooling as an adaptation strategy was utilized the most frequently, Godawari does not put all its eggs in one basket. Diversification was also common in Godawari households as well as storage. It is important that Godawari households continue to use a diversity of adaptation strategies as opposed to heavily focusing on one strategy to ensure ample options should households face a difficult time. The percent use of adaptation strategies in Godawari can be seen by Figure 7.4.

Figure 7.4 Percent Use of Adaptation Strategies in Godawari



THE FUTURE

The Godawari community expressed pride and optimism for their economic growth, community development, and options for the future. When asked: ‘how would you cope in the event a future disaster?’ community members responded that they do not spend time worrying about future problems, but will deal with issues when they arise. This sentiment truly demonstrates the reason behind Godawari’s success in developing an adaptable community that utilizes resources effectively and efficiently. The following is a summary of the hopes and aspirations of Godawari residents.

Government

The Godawari community hopes for increased support from the local Village Development Committee, either through increased resources allocation or through increased communication venues. Through such coordination with the VDC, residents hope for a new and better government during the nation’s transition from a monarchy to a democracy.

Water Trucks (Godawari, June 2008)



Microfinance

A repeated feeling from Godawari residents was their desire to increase savings for the future, either to prepare for or prevent disaster. Therefore, although Godawari microfinance institutions have been successful in the past, they aspire to expand and improve them in order to meet their future needs. Furthermore, households with family members working outside of Godawari experienced problematic time lags when receiving income remotely. Residents are hopeful that

this problem can be solved through government intervention, better microfinance mechanisms, or through better accessibility to international banks.

Community Cohesion

Various groups of the community have continuously expressed their desire to develop and solidify their community unity, specifically across different wealth distributions and castes. They feel this unity will allow them to better address future problems by collaboratively developing innovative community structure and organizational designs and through improved community decision-making processes. Various informal institutions plan to pursue tourism development as a means of additional and sustained economic and community development.

Chapter 8. Analysis of Results

Institutions

Number of Institutions

Institution Types

Institutional Network Analysis

Institutional Network Density and Centralization

Institutional Centrality

Observations from Institutional Analysis

Climate Change Adaptation Analysis

Number of Strategies and Practices

Quality of Strategies and Practices

Summary of Adaptation Analysis

The Institution-Adaptation Nexus

Direct Adaptation Facilitation

Institutional Networks and Adaptation

Institutional Centrality and Adaptation

Alternative Analysis



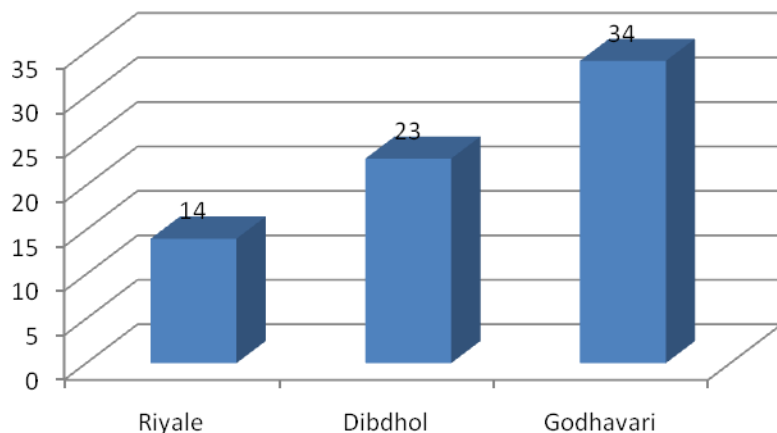
INSTITUTIONS

The following section will present an analysis of institutions that were examined in each of the three field sites. As outlined in the research framework and methodology section of this report, an analysis of the number of institutions, as a quantitative measure of institutional presence, in each site is presented in this section. Institutions are then divided into a classification of either formal or informal, and are further subdivided into public, market, and collective typologies. These classifications and sub-classifications allow this study to analyze the relative importance of each institution type. The core findings from the institutional analysis are presented through a series of social network analyses, which are used to visualize and represent institutional articulations for each site in the form of institutional network maps and summary statistics tables.

Number of Institutions

Figure 8.1 summarizes the total number of institutions and their distribution across the three sites. Since similar institutions were combined for the ease of summarizing and analysis, the actual number of institutions present in each site may be higher. The results show that there is a decreasing trend in number of institutions from market to non-market site. Godawari, which was our

Figure 8.1 The number of Institutions per Site



market site, had the largest number of institutions, followed by Dibdol, the semi-market site, and Riyale, the non-market site. In terms of descriptive statistics the number of institutions differed remarkably between the sites as well. Dibdol (semi-market site) showed a 64.28% higher institutional presence than Riyale (non-market); whereas Godawari (market site) showed a 142.86% higher institutional presence as compared to Riyale (non-market).

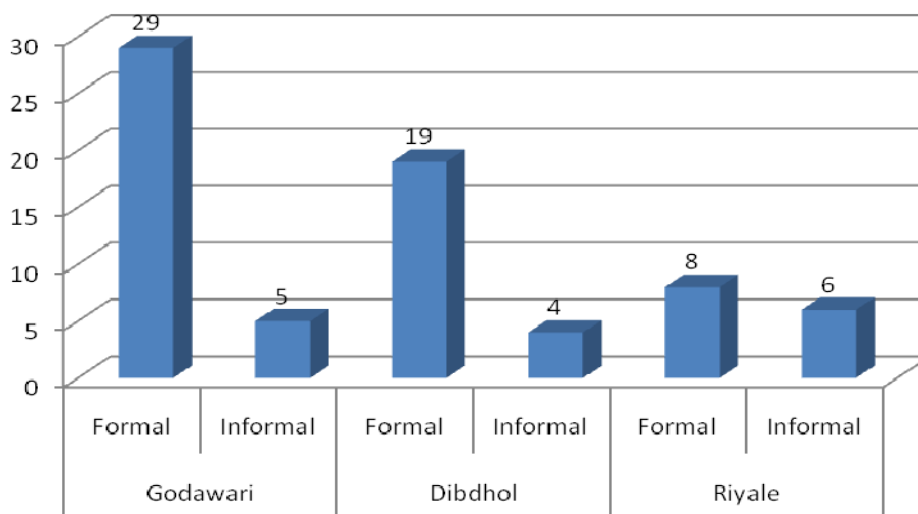
From the above analysis it is concluded that institutional presence, as measured by total number, is often constrained by market access. Our analysis showed that market access has a positive impact on the total number of institutions that are present in a community.

Institution Types

Apart from quantifying the total number of institutions as a comparison between the three communities, institutions in each site were classified as formal and informal and then subcategorized into public, market, and collective typologies. Fig 8.2, Fig 8.3 and Fig 8.4 are representations of this institutional breakdown in each of the three sites.

The intra-community institutional analysis indicates that the number of formal institutions in each site is far greater than the number of informal institutions (Figure 8.2). However, this trend is less distinct for the non-market site. For example, the ratio of formal to informal institutions in Riyale is 1.33, which is far less than that for Dibdol (4.75) and Godawari (5.8) - a difference that could be explained by the large number of informal collective institutions found in Riyale. Riyale’s rural location catalyzes the domination of informal collective institutions, which are important to community organization and in facilitating the exchange of resources, influence and information. These informal institutions can prove to be extremely effective for rural communities which lack market access. It can also be concluded from the above analysis that market access influences the formulation and presence of formal institutions in comparison to informal institutions.

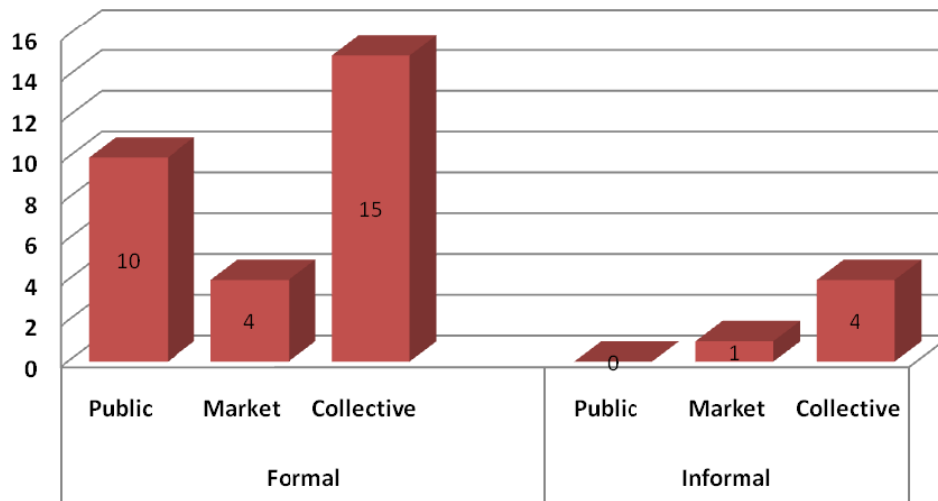
Figure 8.2 Number of Formal and Informal Institutions by Site



Godawari

Godawari's (market site) institutions were more concentrated in the formal sector, as seen above, with the largest aggregate being formal collective institutions, followed by formal public institutions (as seen through Figure 8.3). The vast presence of organized collective institutions in Godawari demonstrates the community's ability to collectively empower its members to set and work toward collective goals. The lesser number of informal collective institutions in Godawari may be attributed to the organization of otherwise earlier informal institutions.

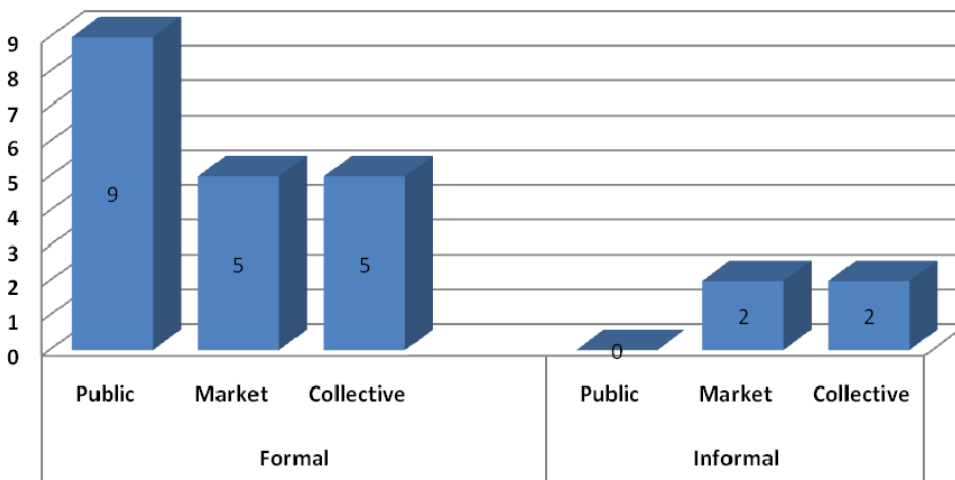
Figure 8.3 The Number of Institutions by Type in Godawari



Dibdol

Dibdol (semi-market site), on the other hand, had the largest number of formal public institutions; followed by the same number of formal market and formal collective institutions, as seen in Figure 8.4. Far fewer informal institutions were found in Dibdol when compared to formal institutions.

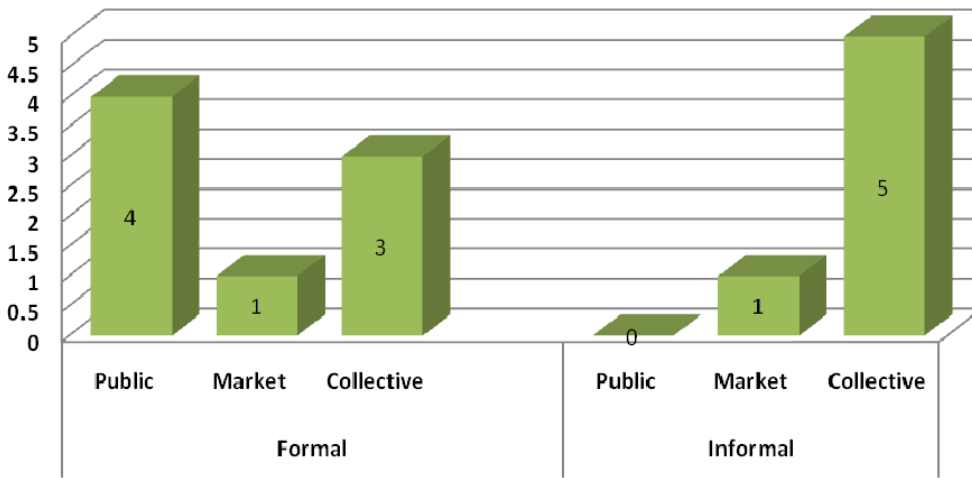
Figure 8.4 The Number of Institutions by Type in Dibdol



Riyale

Riyale, designated as a non-market site, was the outlier in terms of its balance between the number of formal and informal institutions. However, informal institutions were heavily weighted as collective, with only one informal market institution. As explained above, this is most likely due to Riyale's inaccessibility, which may have hindered the development of formal collective and market institutions. Lack of market access also makes it difficult for formal public institutions to access the community, leaving the community to take care of itself.

Figure 8.5 The Number of Institutions by Type in Riyale



In summary, the above analysis provides evidence that market access is a key determinant of the number, nature and type of institutions that are present in a particular village community. At a broader level it can be concluded that market access encourages formalization of institutions while lack of formal institutions in non-market sites encourages the formation of informal institutions in the form of norms, rules and expectations. Descriptively our analysis showed that well organized formal institutions, particularly formal market institutions, have the propensity to integrate into communities that are easily accessible and are situated close to main roads. This dynamic is a key explanation for finding a higher number of institutions in Godawari.

INSTITUTIONAL NETWORK ANALYSIS

The trend with market access is also seen between the connectivity and efficiency of the institutional networks within each community. Institutional networks demonstrate the linkages between institutions within a given community. It can show us which institutions connect to each other, and sometimes more importantly, which institutions lack connections with each other. When looked at as a whole, the institutional network can determine whether or not the ways in which these institutions are connected to one another creates for an efficient, strongly-connected network of institutions. These connections are important for knowing how these institutions can and do support one another.

As outlined in our methods section, data was collected on an institutions ability to support others through sharing information, sharing resources, and whether the decision-making of one institution is directly influenced by another institution (e.g. the District Forest Office (DFO) influences the decisions of the Rangepost Office because it is higher up in the government hierarchy and can pass down policies to the Rangepost Office). The degree to which institutions are linked in this way will determine efficiency and interconnectedness of the whole network. We can measure the efficiency and interconnectedness through a variety of descriptive statistics (See Box 1). Interconnectedness is measured by the density of the institutional network (See Box 1). The density of the network conveys how close-knit and connected the network is as a whole. While some connections between institutions are implausible or unnecessary, density still conveys the tightness of the institutional network and the degree of cooperation between institutions. Efficiency is measured by the centralization of the network. There are three measurements of centralization: degree, betweenness, and closeness (See Box 1). Each measurement of centralization is a different way to gauge how efficient a network can be, for our purposes, they simply represent the overall efficiency of the institutional network.

The role of a specific institution can also be displayed in terms of its relationship with the entire institutional network. Thus, we are also able to look at how important an institution is for the efficiency and interconnectedness of the institutional network. The measures of interconnectedness for individual institutions are cluster size and degree centrality. We can also evaluate the efficiency of each institution within the network. The efficiency measures how important an institution is to the institution in terms of the efficient flow of information and resources. Our research evaluated 1) how each community's institutional network functions to distribute information and resources throughout the community's institutions and 2) how important each institution is to the network for dispersing information and resources throughout the network.

Box 2: Definitions

Measures for Institutions

Cluster size is simply the total number of institutions to which a particular institution is connected.

Degree centrality is the proportion of actual connections compared to all possible connections.

Measures for Institutional Network

Density is the proportion of actual connections between institutions within the institutional network divided by the number of possible connections (i.e. the more connections, the greater the density of the institutional network).

Degree centralization measures the variation in number of connections between institutions. A network with high degree centralization is likely to have a few nodes with a many ties and many nodes with a few ties.

Betweenness centrality measures the frequency with which an institution is located on a path between other institutions.

Betweenness centralization measures the variation in betweenness centrality scores of institutions. A network with high betweenness centralization is likely to have a few nodes that act as bridges to other institutions.

Closeness centrality is the degree to which an institution is close to other nodes in the institutional network.

Closeness centralization is the variation in distances between institutions within an institutional network.

(Bienenstock & Bonacich, *Balancing Efficiency and Vulnerability in Social Networks*)

Institutional Network Density and Centralization

When all variable connections (i.e. information, resources, and decision-making could be transferred from one institution to the other) were considered, both Godawari and Dibdol's centralization scores exceeded Riyale, as seen in Table 8.1.

Riyale was found to have the least dense institutional network and the lowest centralization scores, which may be due to the sparse numbers and disparate types of institutions found within the community. The variation institutional topics in Riyale (i.e. water, forest, savings and loans, agriculture) may mean that institutions rarely lend themselves to collaborative efforts. Many of Riyale's institutions also lacked capacity, mostly due to insufficient or sporadic funds. For example, the Manedobhan Savings-and-Loans and the CFUG both lacked enough capital to be able to offer loans and support community projects, respectively. Riyale's lack of resource capacity is further demonstrated by the fact that its institutions have a far greater number of information-sharing connections amongst each other than resource-sharing connections. The efficiency of Riyale's information-sharing is slightly higher than Dibdol's, suggesting that Riyale's institutions share information on the same level as a site with many more institutions and greater market access (See Table 8.1). However, the Riyale community fails in its collaborative efforts for resource-sharing. Information-sharing is relatively cheap, and given the connections between the leaders within Riyale's community, it lends itself to the idea that information on various institutional activities would be easily transmitted.

Godawari and Dibdol are comparatively similar in terms of their centralization scores. Both sites have a large number of institutions that have overlapping goals and purposes and often lend themselves to sharing information, resources, or decision-making power. Godawari, however, is more efficient in transmitting information, while Dibdol is slightly more efficient in terms of dispersing resources.

Two factors within Godawari favor better transmission of information: First, Godawari's large clustered settlements show that there is a greater concentration of institutions and people within a given space. Housing is denser, so neighbors have greater opportunities to come into contact with one another and with formal institutions throughout the day. Conversely, Dibdol has scattered settlements- with few houses in close proximity to one another. Likewise, their institutions are scattered throughout the settlement and in the nearby towns of Banepa and Sanepa. Second, Godawari has a tight-knit leadership network, which makes information flow from one institution to another quick and simple. However, Dibdol has a number of different institutional leaders throughout the community, which does not provide the same ease of information-sharing.

Both Dibdol and Godawari's institutions have higher resource sharing centralization levels due to their institutions' having greater capital and capacity, thus allowing institutions to share their resources with one another in a mutually-beneficial way. Additionally, much of the resource-sharing takes place between public institutions or between public and collective institutions. In Dibdol and Godawari, where there are many more public and collective institutions, there are more opportunities for public funding to support these types of institutions.

Table 8.1 Comparison of Institutional Density and Centralization across the three Communities for All Connections, Information, and Resources

	Godawari	Dibdol-Etapu	Riyale
Density (Total)	0.19	0.21	0.15
<i>Information</i>	0.11	0.15	0.13
<i>Resources</i>	0.12	0.13	0.038
Betweenness Centralization (Total)	0.31	0.34	0.22
<i>Information</i>	0.53	0.22	0.24
<i>Resources</i>	0.26	0.30	0.003
Closeness Centralization (Total)	0.55	0.55	N/A
Degree Centralization (Total)	0.47	0.47	0.37
<i>Information</i>	0.49	0.36	0.38
<i>Resources</i>	0.21	0.26	0.09

Institutional Centrality

Godawari

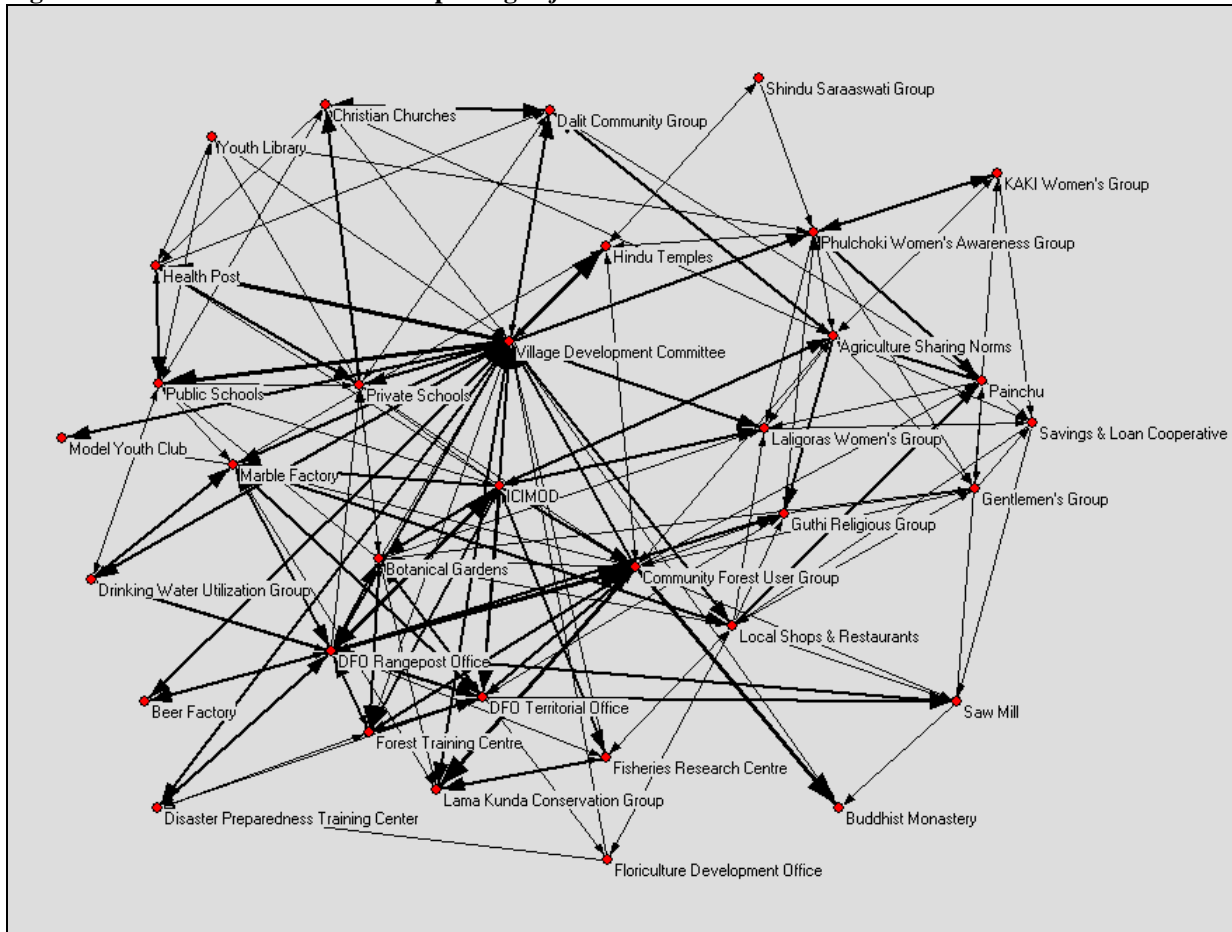
Godawari had the largest and most complex institutional network of institutions within its community. As mentioned above, when compared to the other two communities, public and collective institutions had a much larger presence in Godawari. The large number of public institutions included some regional and national-level institutions, such as the Disaster Preparedness Training Centre, Fisheries Research Center, and Floriculture Development Office, which was most likely due to Godawari's close proximity to

View Over Godawari Market (June 2008)



Kathmandu, ample space considerations, accessibility by roads, and favorable physical environment for scientific research. Godawari also contains a large number of community organizations that facilitate various household and livelihood pursuits. These institutions have specific roles within the community based on different livelihoods pursuits (i.e. loans for agriculture and livestock, loans for shops, sharing seeds, distributing forest products) and different demographic groups (i.e. caste, religion, gender).

Figure 8.6 Godawari Institutional Map using Pajek



Reading an Institutional Map

The red dots represent institutions, with each institution's name corresponding to a red dot. The black lines of varying thickness represent the linkages between institutions -- thicker lines indicating a stronger connection (e.g. an institution that shares information, resources, and decision-making power with another institution will have the thickest line). The arrows demonstrate the directional flow of information, resources, and/or decision-making from one institution to another.

Public

The local governmental institutions have the greatest importance for the flow of information and resources within Godawari. Most important in density and centralization is the Village Development Committee (VDC) (See Table 8.2). The VDC has the broadest mission of local governmental institutions serving the Godawari community. The other local government agencies primarily address forest management, such as DFO Rangepost and Territorial Offices, which plays a large role in the community, but does not undertake as many interdisciplinary issues as the VDC. This may be the reason that the VDC has the strongest presence within Godawari and the most diverse connections between public, collective, and market institutions.

Table 8.2 Pajek Statistics for Godawari (F=formal institution)

GODAWARI				
	Cluster	Degree	Betweenness	Closeness
<i>PUBLIC</i>				
Village Development Committee (F)	42	0.64	0.34	0.8
DFO Rangepost Office (F)	27	0.41	0.08	0.58
Botanical Gardens (F)	20	0.3	0.04	0.61
DFO Territorial Office (F)	19	0.29	0.02	0.61
Forest Training Centre (F)	13	0.2	0.01	0.53
Health Post (F)	10	0.15	0	0.51
Fisheries Research Centre (F)	9	0.14	0	0.52
Disaster Preparedness Training Center (F)	8	0.12	0	0.49
Floriculture Development Office (F)	5	0.08	0	0.51
<i>CIVIC</i>				
Community Forest User Group (F)	27	0.41	0.13	0.66
ICIMOD (F)	20	0.3	0.05	0.61
Agriculture Sharing Norms	18	0.27	0.06	0.55
Phulchoki Women's Awareness Group (F)	17	0.26	0.06	0.6
Public Schools (F)	17	0.26	0.02	0.52
Private Schools (F)	15	0.23	0.02	0.56
Laligoras Women's Group	11	0.17	0.03	0.57
Gentlemen's Group	11	0.17	0.02	0.52
Guthi Religious Group	11	0.17	0.02	0.53
Christian Churches (F)	11	0.17	0.01	0.54
Dalit Community Group	10	0.15	0.01	0.54
Drinking Water Utilization Group	10	0.15	0	0.49
Savings & Loan Cooperative	8	0.12	0.02	0.49
Hindu Temples (F)	8	0.12	0	0.54
Youth Library	7	0.05	0	0.53
KAKI Women's Group	6	0.09	0	0.42
Lama Kunda Conservation Group (F)	6	0.12	0	0.52
Buddhist Monastery (F)	4	0.06	0	0.51
Model Youth Club	3	0.05	0	0.46
Shindu Saraaswati Group	3	0.05	0	0.39
<i>PRIVATE</i>				
Marble Factory (F)	17	0.26	0.02	0.59
Local Shops & Restaurants (F)	16	0.27	0.07	0.59
Painchu	10	0.15	0.01	0.53
Saw Mill (F)	9	0.14	0.01	0.51
Beer Factory (F)	4	0.06	0	0.47

The VDC plays a particularly important role acting as a bridge for information and resources between various institutions (Betweenness=0.34) and collecting information to disperse information to other institutions. The VDC is only a few steps away from all other institutions (Closeness=0.8), meaning the information they pass along does not have far to travel before it reaches all institutions within the community. Thus, it is reasonable to assume that the VDC can be an effective source and focal point for providing important support to other institutions. The

DFO Territorial and Rangepost Offices were also found to be focal points but only for the forest sector.

As mentioned above, Godawari also draws in regional and national-level public institutions. While there was not much interaction between local institutions and regional and national agencies, the little interaction that takes place often brings new, technical information and resources into local institutions

Collective

Interestingly, the second tier of central organizations primarily consists of formal collective institutions with strong public support. The Community Forest User Group (CFUG) was the collective institution with the most profound effect on the Godawari institutional network. The CFUG receives on-going technical assistance from the DFO Offices and the VDC in their efforts and sporadic support from national public agencies and ICIMOD. Also, the CFUG is a highly entrepreneurial institution. It sells forest products and rents picnic areas to develop a substantial budget that can be used to support other local institutions and households. These connections are deepened by the fact that many of the CFUG leaders also are members of other collective institutions, such as the women's and gentlemen's groups and the Hindu religious groups. Thus, the CFUG can control both the flow of financial resources profited through forest product sales and raw forest product resources. Likewise, public and private schools are also well-connected throughout the community and receive significant public support and assistance.

Similar to the regional and national public institutions, the international organization, ICIMOD, has its field-station headquarters in Godawari. ICIMOD has many connections to different institutions within Godawari, but the depth of the connections remains unclear. It appears that besides offering on-going work opportunities for households, ICIMOD only provides support when needed. Although support is typically directed at public institutions, ICIMOD's technical expertise in agriculture and forestry benefit the community.

The other formal institutions that play a significant role in Godawari's communal life are the various collective groups that offer loans, savings opportunities, training programs, technical assistance, and resources, such as seeds or agricultural equipment. These institutions- the Phulchowki Women's Awareness Group, Laligoras Women's Group, Gentlemen's Group, Savings-and-Loans Cooperative, Dalit Group, and the KAKI Women's Group- most likely have the strongest direct connections to community households. Microfinance and cooperative institutions mostly maintain connections with other, collective institutions, which accounts for its moderate to low centrality scores (0.26 to 0.09).

This thriving collective institutional sector is most likely benefited by Godawari's higher income generation. Households within Godawari have the excess capital to put their money in savings and the security to take loans. These formal collective organizations also help to facilitate the less formal and highly important agricultural sharing norms throughout the community. Their groups share agricultural equipment, share seeds within their groups, and assist each other with agricultural planting and harvesting (*parma*).

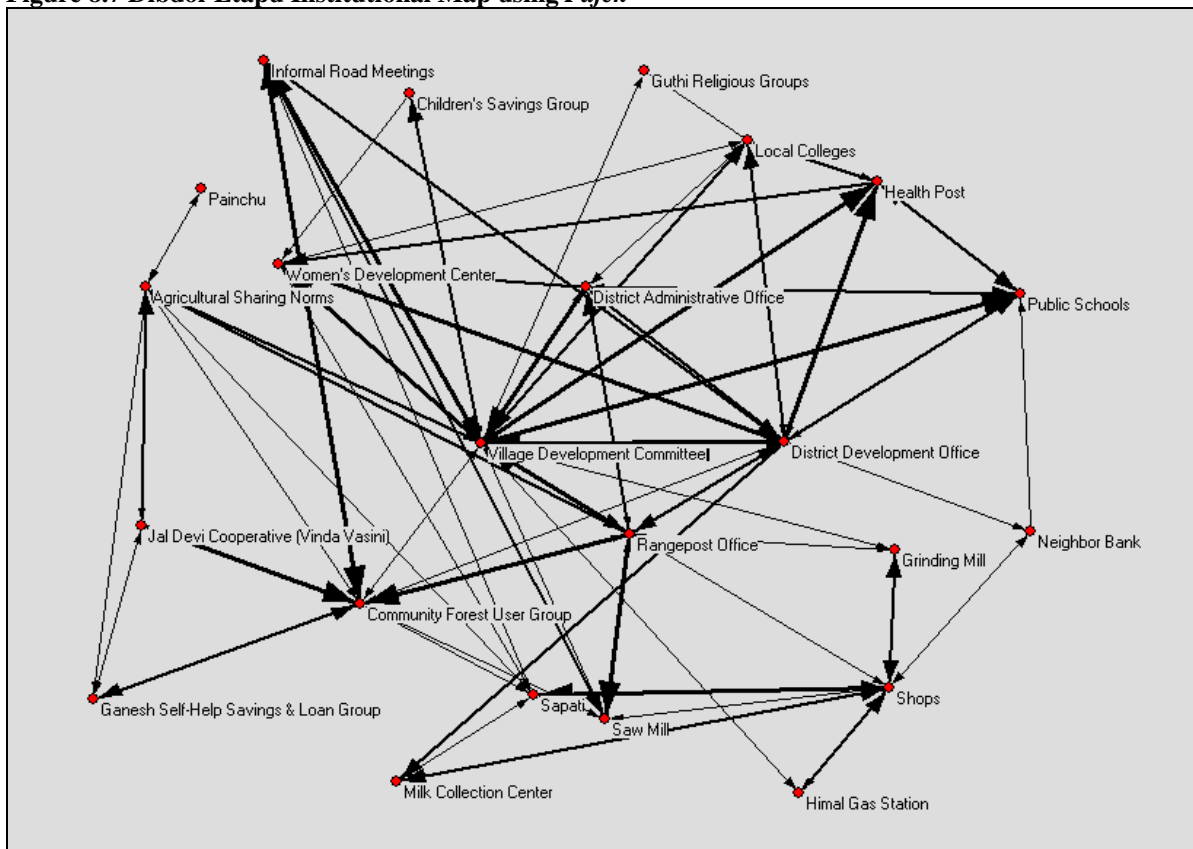
Market

Godawari has a number of market institutions that have connections to a number of public and collective institutions throughout the community. Individual shops and restaurants are important sources of income and they facilitate the buying and selling of goods throughout the community. Godawari also has a number of large businesses, including the marble factory and the now-defunct beer factory. The marble factory, due to their environmentally-hazardous quarry mining practices, has connections to a number of the public sector institutions to ensure compliance, safety, and best practices.

Dibdol

The Dibdol institutional network is almost evenly divided between public, collective, and market institutions. It has fewer institutions than Godawari in the public and collective sectors, but it has relatively more institutions within the market sector.

Figure 8.7 Dibdol-Etapu Institutional Map using Pajek



Reading an Institutional Map

The red dots represent institutions, with each institution's name corresponding to a red dot. The black lines of varying thickness represent the linkages between institutions -- thicker lines indicating a stronger connection (e.g. an institution that shares information, resources, and decision-making power with another institution will have the thickest line). The arrows demonstrate the directional flow of information, resources, and/or decision-making from one institution to another.

Public

Similar to Godawari, the local governmental institutions play the most important role in the institutional network by facilitating information and resources throughout the institutional network and exert decision-making influence over other, public institutions. The VDC was the most connected public institution (Degree centrality= 0.64) and the most efficient institution, due to its importance in connecting other institutions to each other and having little distance from all institutions (Betweenness centrality=0.37, Closeness centrality=0.79). In Dibdol, the VDC had a similarly interdisciplinary role as in Godawari. They worked with the community on everything from establishing a Children's Savings Group to attending and advising on their new road construction project. Unlike in Godawari, Dibdol residents cited the important role of their District Development Office (DDO). The DDO was particularly well-connected in supporting other public institutions, but it did not have a strong direct connection to collective and market institutions within the community. It may be that Dibdol residents had a better understanding of hierarchical, public institutional connections than Godawari and Riyale residents.

Table 8.3 Centrality of Dibdol-Etapu Institutions (F=formal institutions)

DIBDOL-ETAPU				
	<i>Cluster</i>	<i>Degree</i>	<i>Betweenness</i>	<i>Closeness</i>
<i>PUBLIC</i>				
Village Development Committee (F)	28	0.64	0.37	0.79
District Development Office(F)	20	0.45	0.13	0.65
Rangepost Office(F)	12	0.27	0.03	0.59
District Administrative Office(F)	11	0.25	0.01	0.54
Health Post(F)	9	0.2	0	0.52
Women's Development Center(F)	8	0.18	0.01	0.55
<i>CIVIC</i>				
Community Forest User Group(F)	17	0.39	0.13	0.63
Agricultural Sharing Norms	13	0.3	0.16	0.58
Local Colleges(F)	10	0.23	0.01	0.54
Informal Road Meetings	9	0.2	0.03	0.55
Public Schools(F)	9	0.2	0.01	0.51
Ganesh Self-Help Savings & Loan Group(F)	6	0.14	0	0.42
Jal Devi Cooperative (Vinda Vasini)(F)	6	0.14	0	0.42
Milk Collection Center(F)	5	0.11	0	0.48
Children's Savings Group(F)	3	0.07	0	0.47
Guthi Religious Groups	2	0.05	0	0.46
<i>MARKET</i>				
Shops(F)	13	0.3	0.11	0.55
<i>Sapati</i>	9	0.2	0.06	0.55
Saw Mill(F)	9	0.2	0.02	0.55
Neighbor Bank(F)	5	0.11	0.03	0.46
Himal Gas Station(F)	4	0.09	0.02	0.49
Grinding Mill(F)	4	0.09	0	0.5
<i>Painchu</i>	2	0.05	0	0.37

Unlike Godawari, public institutions lie outside of Dibdol in nearby Banepa and in the district headquarters in Dhulikhel. Thus, Dibdol does not enjoy the integration of public institutions throughout their community. Similarly, the community does not have the same attraction for regional and national public agencies. Still, Dibdol also has connections to the DFO Rangepost Office, which is connected to market institutions, such as the saw mill, and collective institutions, like the CFUG. Loose connections also exist between the Women's Development Center in Banepa and public and collective institutions.

Collective

A diverse set of institutions compose Dibdol's collective sector. Dibdol has a relatively similar diversity of collective institutions when compared to Godawari, although it lacks Godawari's overall collective sector size. Similar to Godawari, the CFUG has a central role in directing the flow of resources and information throughout the community. The CFUG primarily directs forest products to other institutions as most CFUG revenue goes towards building better roads throughout the community. The CFUG has many expected links to public institutions, such as the DFO and Rangepost, and market institutions, like the saw mill. However, the CFUG also has partnered with a few of the cooperatives. Most notably, they have worked with the Ganesh Self-Help Group to monitor the forest and enforce forest product use.

Agricultural-sharing norms are important to Dibdol since most households rely heavily on agricultural production for their livelihoods. Seed-sharing is particularly important and is a common practice within community organizations (Degree centrality=0.3). The VDC or other local public institutions often provide the seeds.

Dibdol's cooperatives are different from Godawari's cooperatives in that they are not strongly connected to each other (Degree centrality range 0.14 to 0.07). They also have more diverse missions, including a cooperative specifically directed towards children (e.g. Children's Savings Group) and dairy sales (e.g. Milk Collection Center). Additionally, compared to Godawari, this sector of Dibdol is relatively small given a similar number of households from different caste and socioeconomic groups. Three factors could contribute to Dibdol's smaller collective sector. First, in Godawari, savings and loans groups composed a large portion of the formal collective sector. Dibdol has access to private banks within Banepa and an informal loan system, called *sapati*, which executes similar tasks. Thus, the market sector may replace some of the collective institutions. Additionally, collective institutions that facilitate opportunities such as savings, loans, and trainings may have vaster missions and memberships than their counter-parts in Godawari. Second, Dibdol has greater disparity between rich and poor and amongst the various castes. Lack of income in the Dalit and Tamang castes, in particular, means fewer opportunities for savings and more risk in taking formal loans. The lack of capital may discourage the joining or formation of savings and loans groups. Lastly, Dibdol has scattered households throughout the settlement, which may mean less integration of households. These settlements are often characterized by a particular caste or socioeconomic group. Thus, integration across geographic and social boundaries may prove to be difficult.

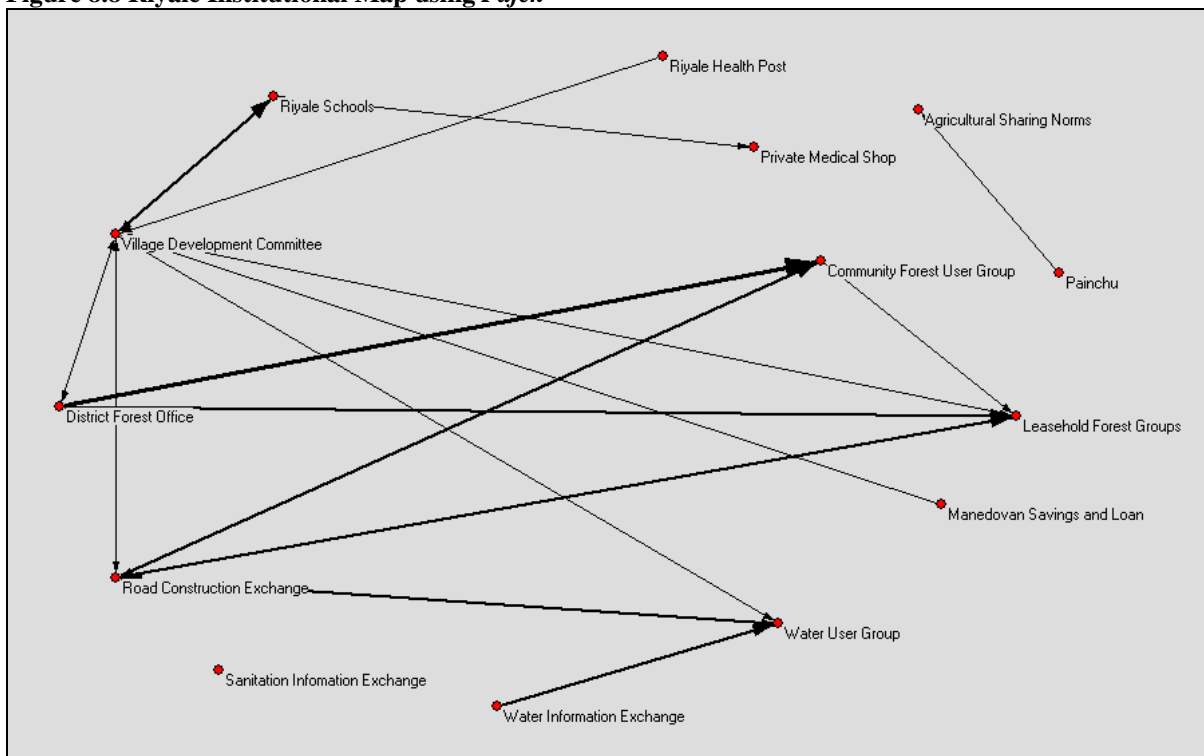
Market

The market sector in Dibdol favors connections with local shops and the informal loan system, *sapati*. Interestingly, the connections between local shops and other institutions differ from Godawari in the type of institutional connections. While Godawari's shops were more tightly connected to public and civic institutions, the local shops primarily connect with market-based institutions, such as the saw mill, grinding mill, gas station, and milk collection center. Thus, while Godawari's collective and public institutions support its market institutions through loans and other means, Dibdol's market institutions support one another through private transactions. Dibdol's private support may be due to its sturdier economic position because of its shops' location along the Arniko Highway.

Riyale

Riyale shows some similar institutional centrality trends as Godawari and Dibdol. However, it lacks a robust market sector, and its collective sector consists of far more informal and transient institutions than in Dibdol and Godawari.

Figure 8.8 Riyale Institutional Map using *Pajek*



Reading an Institutional Map

The red dots represent institutions, with each institution's name corresponding to a red dot. The black lines of varying thickness represent the linkages between institutions -- thicker lines indicating a stronger connection (e.g. an institution that shares information, resources, and decision-making power with another institution will have the thickest line). The arrows demonstrate the directional flow of information, resources, and/or decision-making from one institution to another.

Public

Riyale exhibited a similar ordering of institutional centrality as Godawari and Dibdol. The VDC and DFO, for similar reasons as the other two communities, were the most connected of the public institutions (Table 8.4). Riyale's public institutions, however, lacked the same degree of connectivity seen in both Godawari and Dibdol. This lack of connectivity is most likely due to the absence of hierarchical public institutions (i.e. DDC, DDA, DFO Rangepost Office and DFO District Office) and any extraordinary public agencies, such as the Women's Development Office in Dibdol and Fisheries Research Center in Godwari, within Riyale. In addition, Riyale lacks proximity to the district headquarters and is a remote location for public agencies.

Collective

Riyale's collective sector consists primarily of informal institutions that address public goods, such as water and infrastructure projects, and agriculture. Interestingly, the degree centrality of these informal institutions corresponds to the priority areas of the community. Currently, road construction takes high precedence because the community is presently working on constructing a road system that leads to Godawari. Water use is a constant issue that needs to be managed. However, sanitation consists of periodically relying new information for the community's pre-existing latrine system.

Table 8.4 Centrality of Riyale Institutions (F=Formal institutions)

RIYALE				
	<i>Cluster</i>	<i>Degree</i>	<i>Betweenness</i>	<i>Closeness</i>
PUBLIC				
Village Development Committee(F)	5	0.46	0.23	0.6
District Forest Office(F)	3	0.23	0.01	0.41
Riyale Schools(F)	2	0.12	0.06	0.39
Riyale Health Post(F)	1	0.04	0	0.36
CIVIC				
Road Construction Exchange	4	0.31	0.04	0.46
Leasehold Forest Groups (F)	4	0.31	0.02	0.44
Community Forest User Group (F)	3	0.23	0	0.34
Water User Group	2	0.19	0.04	0.44
Manedobhan Savings and Loan (F)	1	0.04	0	0.36
Water Information Exchange	1	0.04	0	0.29
Agricultural Sharing Norms	0	0.04	0	0.14
Sanitation Information Exchange	0	0	0	0
PRIVATE				
Painchu	1	0.04	0	0.14
Private Medical Shop (F)	0	0.04	0	0.27

The formal collective institutions were shown to have very little institutional capacity in Riyale, which dampens their ability to provide resources for other institutions. The Leasehold Forest Groups (LFGs) and the CFUGs both facilitate resource use throughout the community, but they lack any extra revenues to direct funds towards other institutions. Although their immediate

missions vary, it seems that there should be ample room for connections between forests, water, agriculture, and governance structures. This suggests that a lack of community cohesion and leadership may prevent Riyale from realizing important, appropriate institutional connections.

Interestingly, agricultural sharing norms were not nearly as central to the Riyale institutional network. These results are somewhat surprising since Riyale relies on direct agricultural production more than either of the other two communities. Agricultural sharing norms could potentially lack centrality because the formal public sector, which often donates seeds, and the formal collective sector, which often facilitates the sharing of agricultural tools and labor, do not facilitate these tasks in Riyale. Instead, community members assemble labor-sharing with their neighbors as opposed to members of their cooperative group.

Market

It is possible that similar reasons exist for why the informal, market institution *painchu* lacks connectivity throughout the institutional network. Community members relied upon the *painchu* system heavily, especially during times of difficulty. However, the lack of formal institutions to facilitate *painchu* exchange meant that community members needed to rely more heavily on neighbors and family as opposed to working with formalized groups. As expected, Riyale lacks any substantial formal, private sector.

Summary from Institutional Analysis

When comparing across market gradients, our three research sites showed a number of differences on the institutional network and institutional category (i.e. public, market, collective and formal and informal) level. Two trends could be seen in terms of institutional networks. First, the number of institutions increased with greater market accessibility (Fig. 8.1). More specifically, the number of market institutions remains relatively constant, while public and collective institutions increase with greater market access. Second, the proportion of informal institutions decreased with greater market accessibility. While some informal institutions have been practiced for many years (i.e. *parma*, *painchu*, *sapati*), other informal institutions, such as road construction and water user groups, may be more transient. Transient institutions may be appropriate at times, but their eventual loss subtracts structural support from the institutional network of the community.

The three institutional networks follow a similar theme in terms of density and efficiency. However, Godawari and Dibdol have relatively similar efficiency and density scores, while Riyale is substantially lower. When we dissect the connections down to information and resource-sharing linkages, we can see that Godawari has a high amount of information-sharing and moderate amount of resource-sharing; Dibdol has a high amount of resource-sharing and a moderate amount of information-sharing; and Riyale has an extremely low amount of resource-sharing and a moderate amount of information-sharing. Another important trend is that public and collective institutions tend to be well-connected with and between one another. Public institutions tend to be most connected to other public institutions, while collective institutions tend to be supported by other collective institutions and public institutions.

There are some common threads for which institutions provide the greatest structural support for the institutional network (See Table 8.2, Table 8.3, and Table 8.4). In terms of connectivity and efficiency, the VDC has the highest scores in all of the three communities. The VDC is the greatest facilitator of information and resources and has the fewest steps to most institutions. The community forest user groups also have a high connectivity and efficiency in all of the communities, though to a greater degree in Godawari and Dibdol.

Different institutional sectors are distinct to each community. Godawari has a robust, interconnected group of formal collective institutions. These institutions are particularly well-connected with each other. Dibdol has a uniquely well-connected number of market institutions, which may help to support its collective institutions. Riyale has a large number of collective institutions where informal institutions are particularly well-connected. Interestingly, informal institutions are well-connected in Godawari and Dibdol because formal collective institution (e.g. cooperative members) affiliation dictates membership in activities such as household-to-household loans and exchange of labor; whereas, in Riyale, social affiliation (e.g. family, neighbors) encourages participation in informal institutions.

There are also some common institutions across sites as well as institutions specific to a particular community. Each community has access to the VDC, DFO Range-post Office, health post, public schools, a community forest user group, a savings and loan cooperative. Likewise, they each practice similar agricultural sharing norms, such as seed-sharing, agricultural tool-sharing, and exchange of agricultural labor; and the *painchu* system. Riyale is only unique in that they have leasehold forests as well as a community forest. Leasehold forests, however, are purposefully established for households below a particular income threshold. Thus, the presence of leasehold forests in Riyale is indicative of the income differences between it and the other two sites. Godawari and Dibdol, however, have a number of institutional similarities. They have two common market institutions: a saw mill and local shops. Godawari and Dibdol's sizeable Hindu population also means the presence of guthi religious groups. Godawari's unique institutions includes the previously mentioned national and regional public institutions, ICIMOD, a caste-specific savings and loan, religious institutions (e.g. Christian church, Buddhist monastery, and Hindu temple), and recreational opportunities. Dibdol's unique institutions include public institutions such as the DDO, Women's Development Center, and milk collection center. They also have unique private institutions in the grinding mill, private Neighbor Bank, and local gas station. Lastly, they have a children-specific savings group to save money for the children's future education.

CLIMATE CHANGE ADAPTATION ANALYSIS

An analysis of the number and quality of adaptation strategies and practices will be presented in the following section. Please refer to the methods section of this report to find detailed information on how these adaptation practices were identified and in turn, given a quantitative ranking.

The Number of Adaptation Strategies & Practices

Table 8.5 and Figure 8.9 summarize the number of adaptation practices found in each of the three sites and their distribution between adaptation strategies. Although the number of practices in each adaptation strategy differed among sites, common trends were identified. Godawari, our market site, was found to have the greatest number of adaptation practices, totaling 26. Our semi-market site, Dibdol, was found to have 25 adaptation practices, one fewer than Godawari and one more than Riyale, our non-market site, which was found to have 24. Therefore, the difference in total number of adaptation practices in three communities was not found to be significant.

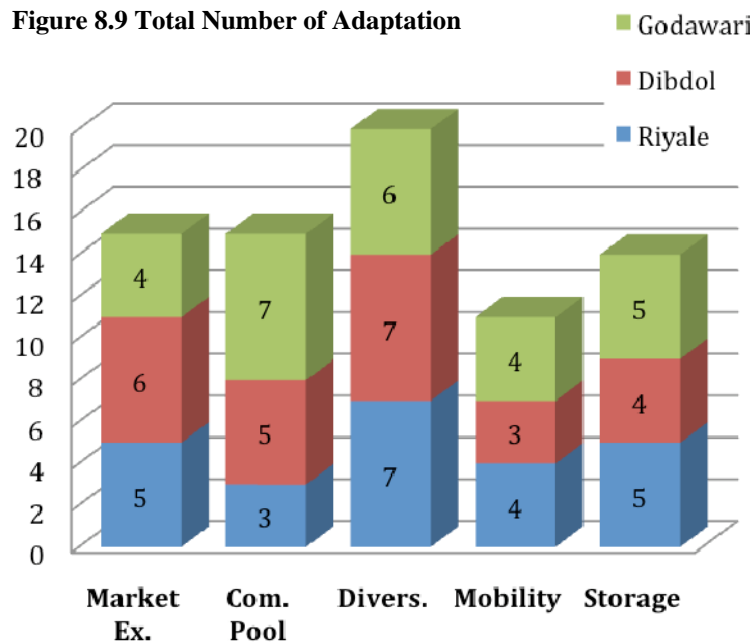
Table 8.5 Number of Adaptation Practices

	Riyale	Dibdol	Godawari	Total
Market Exchange	5	6	4	15
Common Pooling	3	5	7	15
Diversification	7	7	6	20
Mobility	4	3	4	11
Storage	5	4	5	14
<i>Total</i>	<i>24</i>	<i>25</i>	<i>26</i>	

Diversification was the most utilized adaptation strategy in both Riyale and Dibdol, and was found to be the second most common adaptation strategy in Godawari, as seen in Figure 8.9. Each of the three sites invented ways to diversify income, agriculture crops, fuel sources, and food sources. It was found that there was an increase in the number of diversification practices as you moved away from market access, suggesting diversification is used as a substitute for market access. The results indicate that due to its high use, diversification was easily applied to various sectors of village life and were often found to be implemented due to a past tribulation. For example, the practice of diversifying crops was developed in response to a weather related disaster in Dibdol. By diversifying crops households are able to salvage their drought resistant crops when faced with a shortage of water.

Common pooling and market exchange were also common adaptation practices, although their distribution between sites differed. Godawari highly favored common pooling whereas Riyale used it the least. These results could be linked to both the nucleated nature of the Godawari settlements and their access to capital. In contrast Riyale's dispersed households did not allow for common pooling to be an effective strategy due to commuting time and proximity to a large number of households. Furthermore, Riyale households did not possess the capital to build and construct common pooled resources, such as recreation areas and buildings. Common pooling was the only strategy which was found to have a direct relationship between the number of adaptation practices and proximity to markets. This could be due to a variety of reasons including access to resources and capital.

Figure 8.9 Total Number of Adaptation



The reverse was found for market exchange, with Dibdol utilizing the most market exchange practices, followed by Riyale. Conversely, Godawari was found to have the least number of different market exchange practices, where its residents mainly relied on monetary exchanges as opposed to traditional bartering systems. This is mostly likely due to their deep integration with the market. Interestingly, Riyale's market exchanges were often done through a non-monetary exchange system called *painchu*, where communal reciprocal lending acts as a substitute for good for good exchanges. Although this was

identified as an institution as opposed to an adaptation practice, the *parma* system supplements important market exchange mechanisms.

Storage, as an adaptation strategy was the second least utilized by the three communities, but only by a small margin. Similar storage practices were recognized in the three sites, by practicing the storage of forest products, money, food, and cooking fuel. Furthermore, Godawari and Riyale practiced the storage of water, whereas Dibdol found this subject somewhat contentious. The storage practices found were all associated with important household resources, many of which could be supplemented with market products. By storing these resources, households have the ability to use the stored reserves both during times of financial need, when they are not able to purchase from the market - either due to market fluctuations or decreased income, or in the case where a resource becomes scarce. Storage practices often require space, which is not limitless in households; therefore, spatial constraints may make the expansion of storage practices unachievable. The fewer number of storage practices used in households may be due to the fact that households were found to only store the most essential resources for surviving.

When compared to other strategies the number of mobility adaptation practices was used less, although mobility practices proved to be a relatively important. Both improved road access and migration were identified as important adaptation practices under this strategy. Riyale households, due to its minimal market access, practiced seasonal mobility into Kathmandu and intra-community mobility more often than the other two sites. Secondly, mobility practices seem larger in scale and not necessarily limited to household practices. For example, Riyale's road construction was a large community endeavor which could not be done by a single household. In addition, migration abroad requires aggressive commitments and therefore is not as often practiced by households. The large scale nature of mobility practices may be a reason for its lesser use.

The pie chart below, Figure 8.10, shows the percent use of adaptation strategies, as a combination of all three sites. Although diversification, as an adaptation strategy, was favored it was not disproportionately used. In other words, although the five adaptation strategies were not all practiced equally, no one adaptation strategy was relied on. Figures 8.11, 8.12, and 8.13 show the percent use of adaptation strategies for each site. The results show, similar patterns to the total number of adaptation strategies; where none of the three sites relied heavily on one specific adaptation practices, with percent use moderately similar among all adaptation strategies.

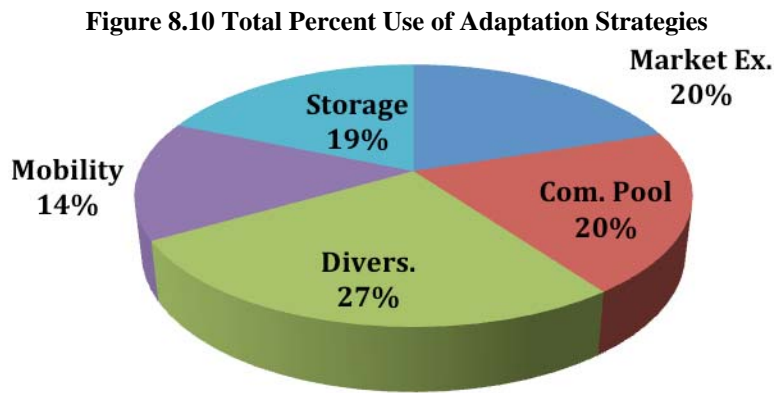
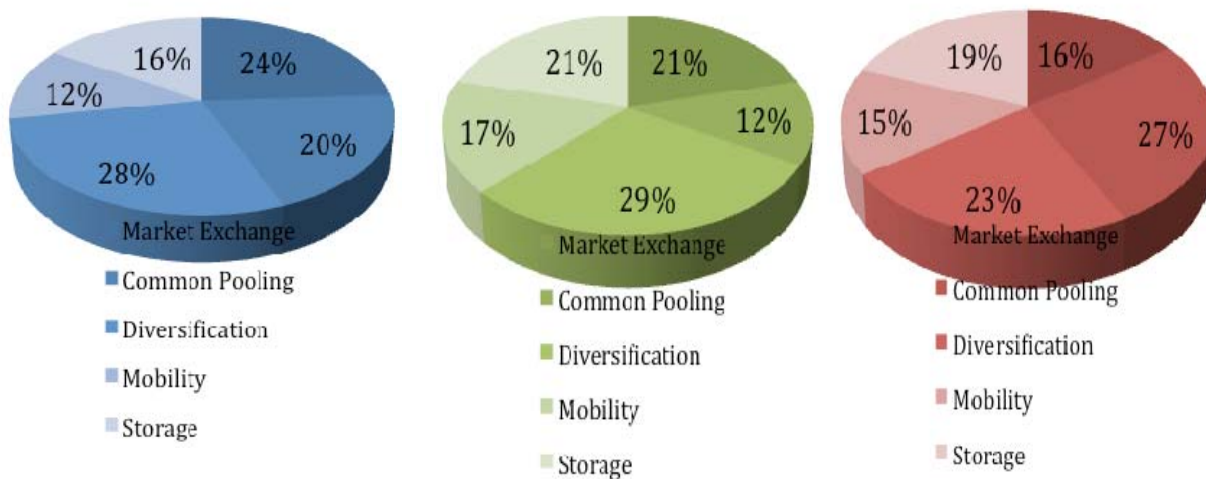


Figure 8.11, 8.12, 8.13 Percent Use of Strategies in Dibdol (Blue), Riyale (Green), and Godawari (Red).



The Quality of Adaptation Strategies & Practices

The quality of each adaptation practice was also measured as a function of equality, sustainability and livelihood benefits. The methods section thoroughly describes the reasoning and logic behind the quantitative analysis. This section will examine the differences between sites in terms of average strategy quality and individual practice quality.

Figure 8.14 illustrates and Table 8.6 lists the average adaptation practice quality identified at each site, measured by the three parameters of equity, sustainability, and livelihood benefits. Each parameter is given a score of 0, 1, or 2, permitting 6 as the highest possible average. The

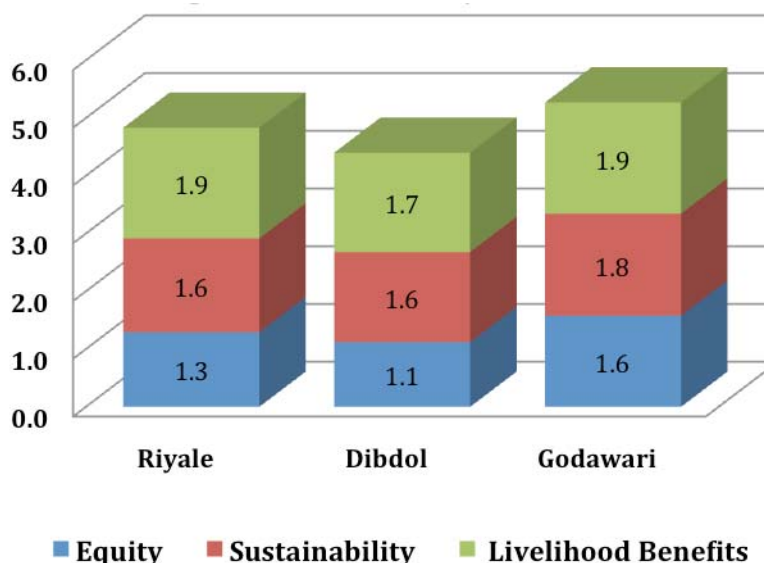
table shows that Godawari demonstrated a higher overall average quality of adaptation practice when compared to Dibdol and Riyale. Unexpectedly, Riyale, our non-market site, demonstrated higher adaptation quality than Dibdol, our semi-market site. Therefore, results show that market access and adaptation quality do not show a positive relationship. A better explanation of these results can be seen from site characteristics, such as village cohesion, caste distribution or equity.

Table 8.6 Average Quality of Total Adaptation Practices

	Equity	Sustainability	Livelihood Benefits	Total
Riyale	1.3	1.6	1.9	4.8
Dibdol	1.1	1.6	1.7	4.4
Godawari	1.6	1.8	1.9	5.3

Godawari and Riyale demonstrated stronger community cohesion and social parity whereas Dibdol’s community members conveyed a sense of community separation and segregation, which created barriers to adaptation practice access. Lack of community cohesion would most likely lead to a lower equity score across adaptation practices as demonstrated in Figure 8.14. In addition, the wealth disparity between households in Riyale also adds to lower equity scores. Sustainability scores, on the other hand, were highest in Godawari, most likely due to its strong institutions, leadership and support systems during times of turmoil. On the other hand, lack of formal effective community based institutions and individual leadership resulted in Riyale and Dibdol’s adaptation practices being less sustainable.

Figure 8.14 Average Quality of Total Adaptation Practices by Parameter



Finally, Godawari and Riyale both obtained nearly perfect livelihood benefits scores, while Dibdol scored slightly lower. Dibdol’s common pooling practices scored significantly lower in livelihood benefits than other adaptation strategies which contributed to lower average livelihood benefits for this site. Specifically, common pooling of grazing land, community forest and medicinal equipment were found to have low livelihood scores in Dibdol where these practices provided meager benefits to households and did not facilitate significant positive changes in village life.

Average Quality of Market Exchange

Collectively, market exchange was the second most utilized adaptation strategy but was found to have the second lowest average quality, see Table 8.7. Table 8.7 lists the average quality of market exchange practices found in each site. Godawari, our market site, was found to have fewer market exchange practices but nevertheless, obtained a much higher average quality score than both Riyale and Dibdol, who had developed more market exchange practices. Dibdol scored lower in its composite average quality compared to the other two sites.

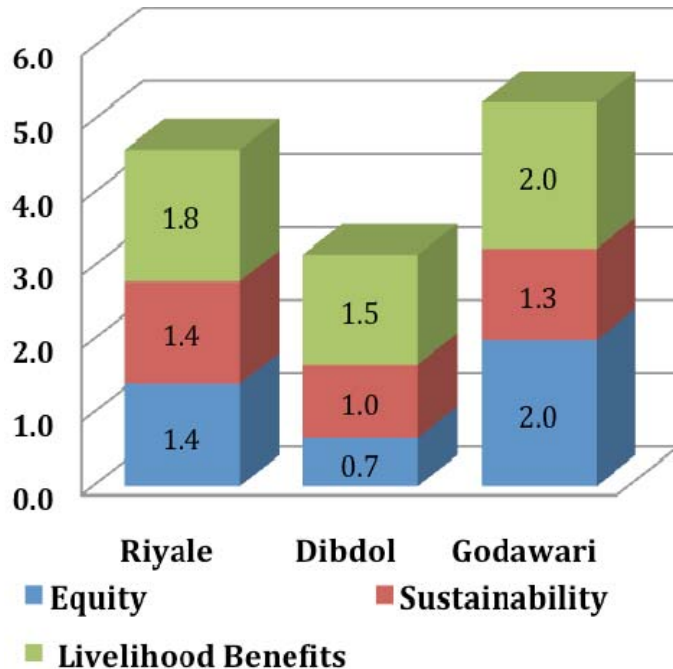
Table 8.7 Average Quality of Market Exchange Practices

	Equity	Sustainability	Livelihood Benefits	Total
Riyale	1.4	1.4	1.8	4.6
Dibdol	0.7	1.0	1.5	3.2
Godawari	2.0	1.3	2.0	5.3

Market exchange was found to be Dibdol’s lowest quality adaptation strategy. In the appendix the table, Adaptation Practice Quality Scores in Dibdol shows that the practices of sharecropping, providing labor for money, and exchanging labor for goods are all practices utilized most frequently by the lower caste, which caused this low value. This exceptionally low equity score triggers a community conundrum because the livelihood benefits for these market exchange practices are disproportionately distributed in the Dibdol community.

In contrast, Godawari’s culture, which has become ingrained with market interactions, has allowed this strategy to provide significant livelihood benefits. More importantly these practices were found to be extraordinarily equitable; this is most likely due to the fact that all of Godawari’s households are immersed in the market, which doesn’t allow discrimination. In addition, Godawari’s interconnectedness with the market has its drawbacks because it is often at the mercy of market fluctuations. This is the cause for Godawari’s somewhat lower sustainability score. For example, Godawari shopkeepers experienced extreme purchase volatility during a recent strike, where community members did not have the financial capacity to use the market (during this time households relied on items they had stored).

Figure 8.15 Average Quality of Market Exchange Practices



Riyale’s lack of market access allows for market exchange practices to provide important livelihood benefits for households when they are able to access the market. In addition, market exchange practices in Riyale yield meager equity scores due to its distance from markets. For example, a household whose residents have minimal mobility due to an injury would not have equal access to markets, therefore not acquiring equal livelihood benefits from market exchange practices.

Average Quality of Common Pooling

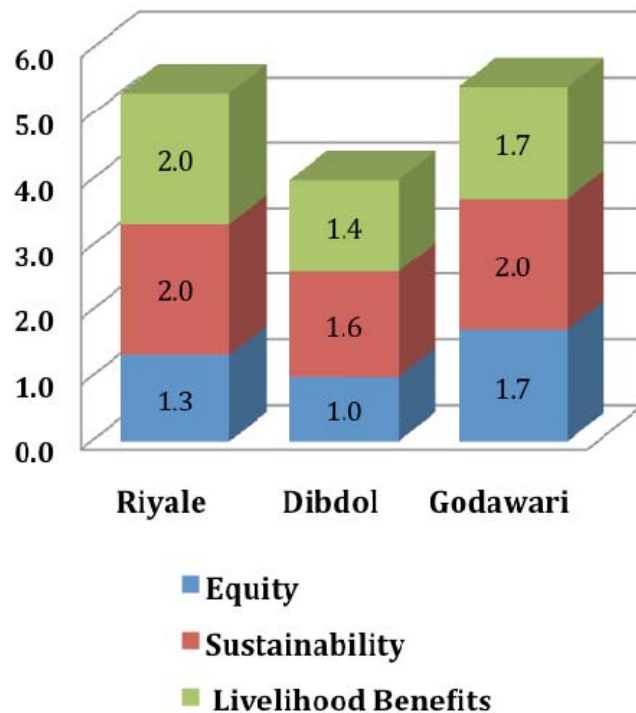
Common pooling was the second most collectively utilized strategy among the sites, tied with market exchange. It was also found to score in the middle in terms of adaptation practice quality. As seen with market exchange, the equity scores tended to lower the quality of common pooling practices. Table 8.8 lists the average quality of market exchange practices by parameter. Once more, Godawari was found to have the highest average quality of common pooling practices, followed closely by Riyale. Similarly, Dibdol scored significantly lower in quality of common cooling practices due to social inequity.

Table 8.8 Average Quality of Common Pooling Practices

	Equity	Sustainability	Livelihood Benefits	Total
Riyale	1.3	2	2	5.3
Dibdol	1	1.6	1.4	4
Godawari	1.7	2	1.7	5.4

The concept of common pooling has a foundation related to community inclusion. As mentioned earlier, Godawari and Riyale experienced a more unified community whereas Dibdol’s settlements were divided by both geography and socioeconomic status. It was found that common pooling in Dibdol was practiced regularly but not between dissimilar groups in the village. For example, common pooling labor in Dibdol was common, but only among members of the same caste not between castes. Similar issues arose in the Dibdol community’s use of savings and loans, where it was found that certain castes or income brackets in Dibdol common pooled their savings but the groups did not blend castes. Additionally, Dibdol scored low in the livelihood benefits obtained from common pooling practices. This is due to Dibdol’s sparse, common pooled grazing land, low extraction of

Figure 8.16 Average qualities of common pooling practices



community forest products, and poor access to medicinal equipment practices, which provided only nominal benefits to households. For example, although the community forest provided Dibdol households with forest products, collection times were limited and pine species, from which the forest was mainly comprised, were not as valuable to households as broadleaf species.

In contrast, common pooling was Godawari’s most common strategy. There was an abundance of common pooling practices found within the community, for which the quality was particularly high. The Godawari community succeeded in making their common pooled resources available to the entire community, and rarely were these practices isolated from a certain group. Therefore, these practices were equitable, sustainable and provided important livelihood benefits, especially seen through Godawari’s use of common pooled savings and the community forest. Godawari’s monetary and resource wealth helped immensely in their ability to spread common pooled benefits throughout the community. This can be seen by the community forest’s ability to provide an abundance of forest products for households. Additionally, the community’s overall more plentiful monetary wealth allows for more expansive savings and loans cooperatives, which results in amplified loan opportunities.

Although not commonly used in Riyale, common pooling practices had a relatively high average quality, with perfect scores in livelihood benefits and sustainability. Community and leasehold forests received a perfect score across equity, sustainability and livelihood benefits because they were accessible to all members of the community, maintained a sustainable management plan, and provided households with a large percentage of their necessary forest products. As mentioned above, the lack of common pooling practices could be due to Riyale’s dispersed households or lack of startup capital.

Average Quality of Diversification

Collectively, diversification was the most utilized adaptation strategy, with Riyale and Dibdol using diversification more than any other strategy, and Godawari using it second to common pooling. Diversification practices were found to have the second highest average quality across the three communities. Table 8.9 demonstrates that diversification practices are relatively sustainable and provide substantial livelihood benefits across the three sites. Quite the opposite, the table also shows that diversification practices are significantly inequitable across sites. Once again, Godawari was found to have the highest quality of diversification practices, as well as the highest average equity value. Godawari’s equity score set it apart from Dibdol and Riyale, although each community was found to have similar diversification practice scores.

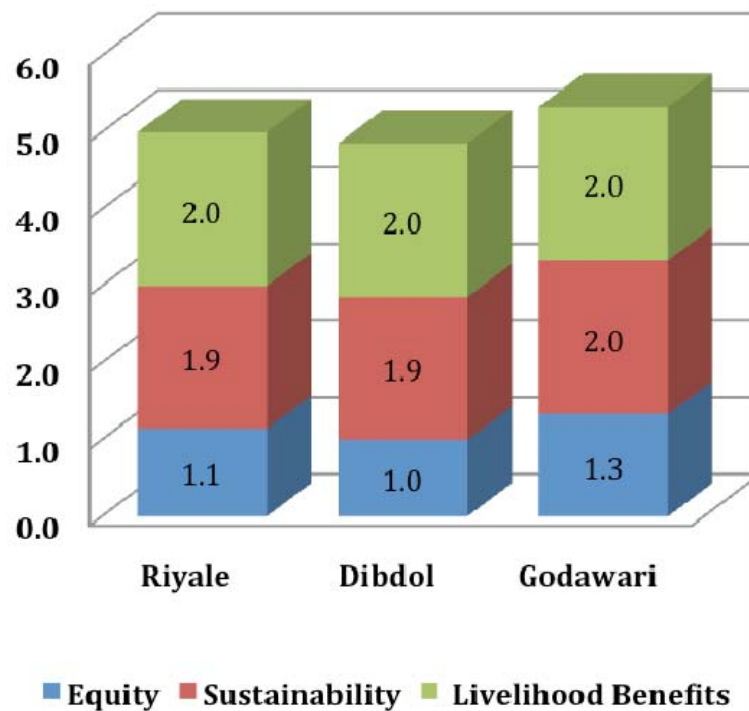
Table 8.9 Average Quality of Diversification Practices

	Equity	Sustainability	Livelihood Benefits	Total
Riyale	1.1	1.9	2	5
Dibdol	1	1.9	2	4.9
Godawari	1.3	2	2	5.3

The diversification of water sources was identified as a diversification practice in Dibdol. As previously stated, water is a contentious subject in Dibdol, with discrete groups of community members polarized in their opinions concerning water allocation and availability. As a result,

Dibdol households learned the benefit in diversifying their water sources, which allowed them to acquire a constant, reliable source of water. This controversial subject in combination with Dibdol's disconnected community, which causes inequitable benefits, leads to a low equity score.

Figure 8.17 Average Qualities of Diversification Practices



Riyale, scoring only one tenth of a point higher in equity than Dibdol, was not found to have a diversification practice that was completely inequitable, such as Dibdol's diversification of water. Conversely, Riyale's only fully equitable practice was forest diversification, due to the equitable use of both the community and government forests. Although government and community forests were available for all Riyale residents, private and leasehold forests located in the area are not accessible to Riyale's entire residents. Although leasehold forests were not open access, like the government forest, they were found to provide significant benefits to a large majority of community

members. Another example of inequity in diversification practices was Riyale's ability to diversify cooking fuels; mechanisms other than firewood were found disproportionately in high income households.

Godawari's equity scores for diversification practices were also found to be much lower than average, mostly due to the results of income generation diversification. Selected groups in the Godawari community, such as men, had a greater ability to diversify their income sources. Women and members of the lower caste had a more difficult time finding different types of employment due to disparities in education and gender norms. In addition, diversification of food sources and savings and loans were also inequitable across community groups, mostly due to the caste system. For example, households of the Tamang caste did not have access to savings and loan cooperatives whereas households of the Dalit, Brahmin and Chhetri had a variety of which to choose membership.

Average Quality of Mobility

Collectively mobility practices were found to have the lowest overall average quality and were used the least. Dissimilar to findings for the other adaptation strategies, Dibdol's average mobility quality was significantly higher than both Godawari and Riyale. However, Dibdol was found to have only 3 mobility practices, which was the fewest number of practices identified in

any strategy by any site. Table 8.10 exhibits the scores associated with each sites mobility practices.

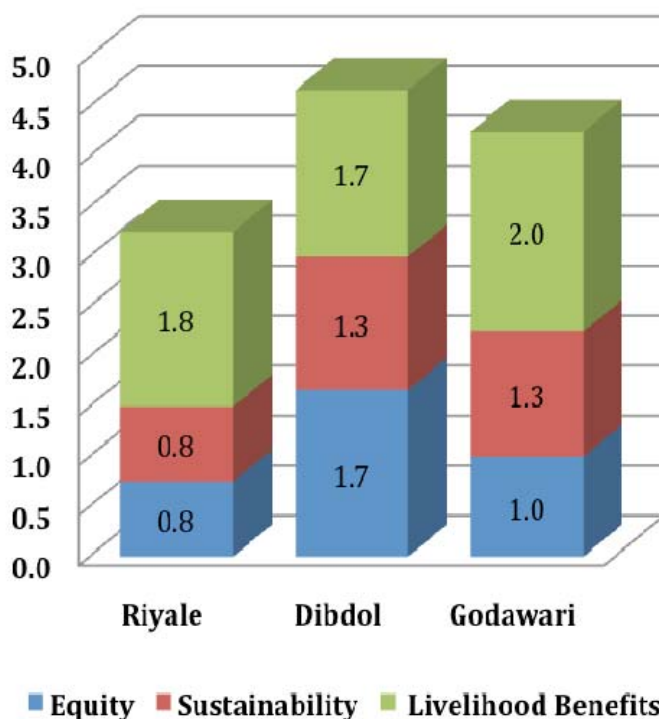
Table 8.10 Average Quality of Mobility Practices

	Equity	Sustainability	Livelihood Benefits	Total
Riyale	0.8	0.8	1.8	3.4
Dibdol	1.7	1.3	1.7	4.7
Godawari	1	1.3	2	4.3

Although Riyale scored extremely low in the parameters of sustainability and equity, mobility practices provided household with substantial livelihood benefits. This suggests that although mobility practices are difficult to develop, they significantly improve the livelihoods of Riyale households.

Mentioned above was the hypothesis that mobility practices are larger in scale than other adaptation practices and can be both a household practice as well as a wider community endeavor. Mobility practices require significant investment of time, capital, and psychological strain. For example, Riyale was in the process of constructing a road which would lead directly to the closest market, Godawari. This practice would have extensive public benefits for community members upon completion but required the common pooling of labor, where each household donated time to working on the road development, and financing from a wealthy former community member outside of the community. The large-scale nature of these projects may limit their abundance.

Figure 8.18 Average Quality of Mobility Practices



Furthermore, it was found that migration and seasonal mobility were both inequitable across groups, because they favored both the rich and men, but provided significant benefits to households due to their enhanced incomes.

Minimal households in Riyale possessed the capacity to allow a family member to work abroad or in Kathmandu, which requires an absence in the household. The absence of a family member is difficult for Riyale households because they rely heavily on the labor provided by family members to work in agriculture fields, collect forest products and care for livestock. This shows

that adaptation practices which do not require the loss of an individual in the household but provide additional income or access to markets would be an ideal practice.

Godawari’s equity scores for mobility were the lowest of any adaptation strategy. These low scores were mostly due to the inequitable use of private transportation, for which only higher income households can afford. Furthermore, both migration and seasonal mobility practices were found to be only partially equitable and sustainable. The public infrastructure necessary for Godawari residents to use private and public transportation were somewhat unsustainable in that they disrupted watershed hydrology and led to water pollutants from re-tarring.

Although Dibdol revealed a high quality of mobility practices, it is only relative to its ranking between the communities. Unlike Godawari and Riyale, Dibdol’s advantage was that none of its three mobility practices were completely inequitable. Dibdol’s public transportation practice, similar to Godawari, was found to be a high quality practice, with perfect scores in equity, sustainability and livelihood benefits. In addition, Dibdol’s other two mobility practices; road improvements and migration were also found to be of better quality than adaptation practices in other strategies. This higher quality was due to the road’s proximity in the community, which maneuvered through most of the household clusters, in addition to, the village’s proximity to Banepa and other large cities.

Average Quality of Storage Practices

Although Riyale, Dibdol, and Godawari were found to perform relatively few storage practices compared to other strategies, storage had the highest overall quality of any strategy in all three sites. Table 8.11, outlines the scores for storage practices. Godawari was found to have the highest average quality for storage, with Riyale and Dibdol following closely. Both livelihood benefits and sustainability of storage practices were given maximum scores in all three sites. In addition, these storage practices were also found to be significantly equitable across groups.

Table 8.11 Average Quality of Storage Practices

	Equity	Sustainability	Livelihood Benefits	Total
Riyale	1.8	2	2	5.8
Dibdol	1.8	2	2	5.8
Godawari	2	2	2	6

Storage practices were inclined to generate valuable livelihood benefits for village households. This is principally because storage practices facilitate a household's ability to respond to a disaster or disturbance by acquiring a basic reserve of important household survival goods in order to get through a difficult time. Moreover, households can depend on the use of these goods while deciding what their response to a disturbance will be, which avoids sudden crisis or emergency. It also allows households to extend the use of resources that they may only be able to acquire a few times during the year (e.g. forest products and agricultural crops) over a longer period of time.

Storage was found to be a simple and uncomplicated strategy. In addition, information related to storage practices were easily exchanged between households and villages. Due to its simplicity and quality one might wonder why households would not develop more storage practices.

Our findings suggest that storage practices were found to be used for basic household goods, which were necessary to survive, such as forest products, food, and money. Storage practices often require space to accumulate and stock goods, which inhibits the expansion of this strategy. Space constraints may limit the number of storage practices used by households, which would force households to choose prioritize their storage practices. The result is that households only store goods which are crucial to their survival as opposed to goods that may not be as essential. Observing which storage practices are used in the household allows outsiders to identify which resources are prioritized in the household, information which could prove very useful when developing recommendations.

Summary of Adaptation Analysis

Our results indicate that Godawari, our market site, was found to have the largest number of adaptation practices, followed by Dibdol, the semi-market site, and then Riyale, the non-market site. However, our results show that there is not great variation between the total numbers of adaptation practices found at the three sites. Therefore, we do not feel comfortable stating that a significant relationship was found between market access and the number of adaptation practices. The small sample size and minimal number of identified adaptation practices may not fully depict the relationship between the number of adaptation practices and market access. If the sample size was to increase, results may in fact find that a significant relationship between market access and adaptation practices does exist.

Figure 8.19 Average Quality of Storage Practices

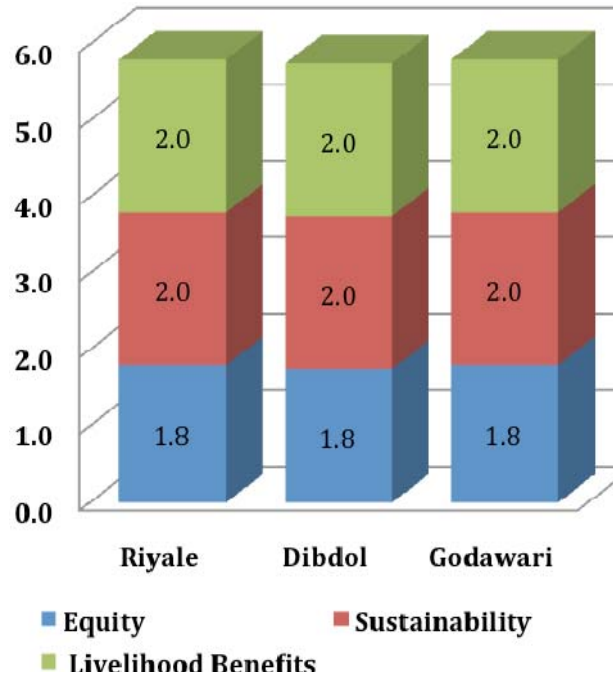
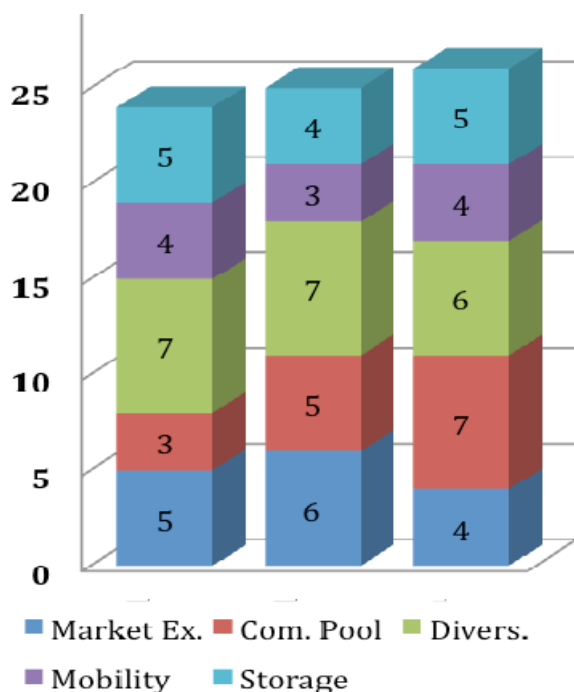


Figure 8.20 Number of Adaptation Practices by Strategy



In summary, Figure 8.20 shows the number of adaptation practices found by site, highlighting each site's use of a particular adaptation strategy. The results conclude that there was little difference found between the three sites in terms of the total number of adaptation practices identified. Furthermore, the figure shows that the sites developed a similar, but not equal, number of practices within each particular strategy, with the one exception being common pooling. Godawari highly favored common pooling, whereas Riyale utilized it the least. As mentioned above, this could be due to Riyale's dispersed households compared to Godawari's nucleated settlements. Additional important findings point out that households do not rely on one particular adaptation practice more significantly than the others. This phenomenon could be

described as another measurement of adaptability. The ability to diversify adaptation strategies allows households to fall back on or substitute in another strategy when presented with an unexpected situation. Options are important resources for village households and allow for maximum benefits to be achieved.

Table 8.12 Summary of Average Quality of Adaptation Strategies by Site

Adaptation Practice	Non-Market			Semi-Market			Market		
Market Exchange	4.6			3.2			5.3		
	1.4	1.4	1.8	0.7	1.0	1.5	2.0	1.3	2.0
Common Pooling	5.3			4.0			5.4		
	1.3	2.0	2.0	1.0	1.6	1.4	1.7	2.0	1.7
Diversification	5.0			4.9			5.3		
	1.1	1.9	2.0	1.0	1.9	2.0	1.3	2.0	2.0
Mobility	3.3			4.7			4.3		
	0.8	0.8	1.8	1.7	1.3	1.7	1.0	1.3	2.0
Storage	5.8			5.8			5.8		
	1.8	2.0	2.0	1.8	2.0	2.0	1.8	2.0	2.0
Total	4.8			4.4			5.3		
	1.3	1.6	1.9	1.1	1.6	1.7	1.6	1.8	1.9

The results from Table 8.12 indicate that the best quality adaptation practices were found to be storage practices, whereas mobility practices were collectively found to be of the worst quality. As mentioned above, although mobility practices often provided substantial livelihood benefits they were much more difficult to develop due to their large-scale nature and copious commitment-level. Storage practices, on the other hand, were limited to essential household resources but provided extreme livelihood benefits and were tremendously sustainable and equitable.

Finally, Table 8.12 summarizes the average quality of adaptation strategies by site. The findings show that Godawari's adaptation practices were almost always the highest quality, followed by Riyale. Dibdol which was found to generally have the lowest quality adaptation practices. This low quality scores were mainly due to low equity scores. Our results suggest that again, there is no significant relationship between the quality of adaptation practices and market accesses. Due to the small sample size, the results may be skewed but it is also important to recognize that other factors have the potential to impact the quality of adaptation practices. Specifically in Dibdol's case, its community segregation led to equity issues between groups. In contrast, both Riyale and Godawari experienced a sense of community cohesion, which reduced inequality across groups. Additionally, other factors could contribute to the variation in adaptation quality such as community size, relationship with the VDC or external institutions, and population size.

The relationship between sustainability, equity and livelihood benefits is an important concept. If a practice scores high in livelihood benefits but low in equity the benefits provided by the practice are most likely distributed disproportionately throughout the community. In addition, if livelihood benefits and equity scores are high but sustainability scores are low, market fluctuation may limit the benefits to households, which results in undependable practices. Diversifying adaptation practices has the potential to relieve the inconsistency associated with the market fluctuations. These tradeoffs are important to recognize when evaluating the relevance and quality of adaptation practices. In addition, when making recommendations, these tradeoffs need to thoroughly be analyzed.

Our methodology does not capture all of the factors that have to do with adaptation practices. The results to capture the number of adaptations practices per strategy as well as their relative quality, measured by livelihood benefits, sustainability and equity. These characteristics can provide a great deal of information related to both adaptation practices and strategies but do not capture all of their attributes. For example, our result did not analyze the depth of reliance on a particular adaptation practice or strategy. The relative importance of these practices or strategies should be considered when providing a thorough analysis of the adaptation practices. This could potentially be another parameter of measurement for the quality of adaptation practice or a separate analysis itself. It should be noted that different sites relied more heavily on different adaptation strategies. For example, Riyale was very reliant on the exchange of agricultural crops, where it did not depend much on exchanging forest product. Similarly, Godawari households often relied on the market for steady employment, whereas Riyale and Dibdol had a more difficult time securing stable income generation.

THE INSTITUTION-ADAPTATION NEXUS

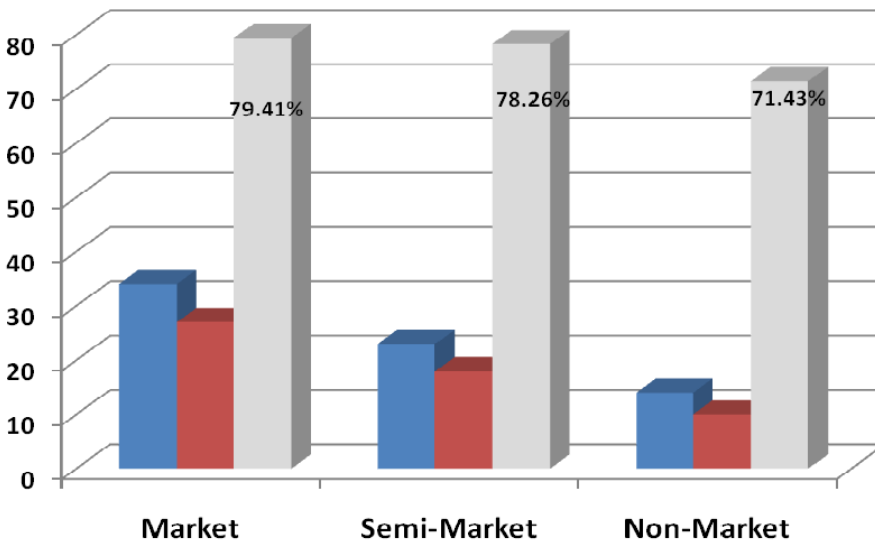
Our hypothesis suggested that institutions have a direct role and relationship in determining the nature and extent of adaptation strategies and practices for a particular community. The following analysis is an attempt to establish the relationship between institutions, institutional networks, and climate change adaptation.

The following section shows how institutional access and institutional articulation influence adaptation practices. Institutional access is the degree to which households and different social groups in a given location are connected to institutions and have the ability to gain institutional benefits as a result of such connections. On the other hand, institutional articulation is the nature and extent to which different institutions in a given territory are linked to each other to share information, influence and resources.

Extent of Direct Adaptation Facilitation

First, this section of the analysis looks at which institutions directly facilitate adaptation practices. The bar diagram below, Figure 8.21, shows the percent of institutions which facilitate adaption directly in each site. The long solid bars graphically show the percent of institutions which directly influence adaptation practices. Our findings show that this proportion is directly related to market access, with our market site totaling 79.41%, semi-market site totaling 78.26% and non-market site totaling 71.43%. The variation in institutional proportions between market and non-market sites is critical due to the fact that non-market sites have fewer institutions to begin with and, thus, a lesser proportion of institutions facilitating adaption directly.

Figure 8.21 Institutional Participation in Direct Adaption Facilitation (Blue bars= total number of institutions; red bars= institutions that directly facilitate adaptation).



These figures show that the market site has a higher proportion of institutions which are involved in facilitating adaption directly, in comparison to non-market sites.

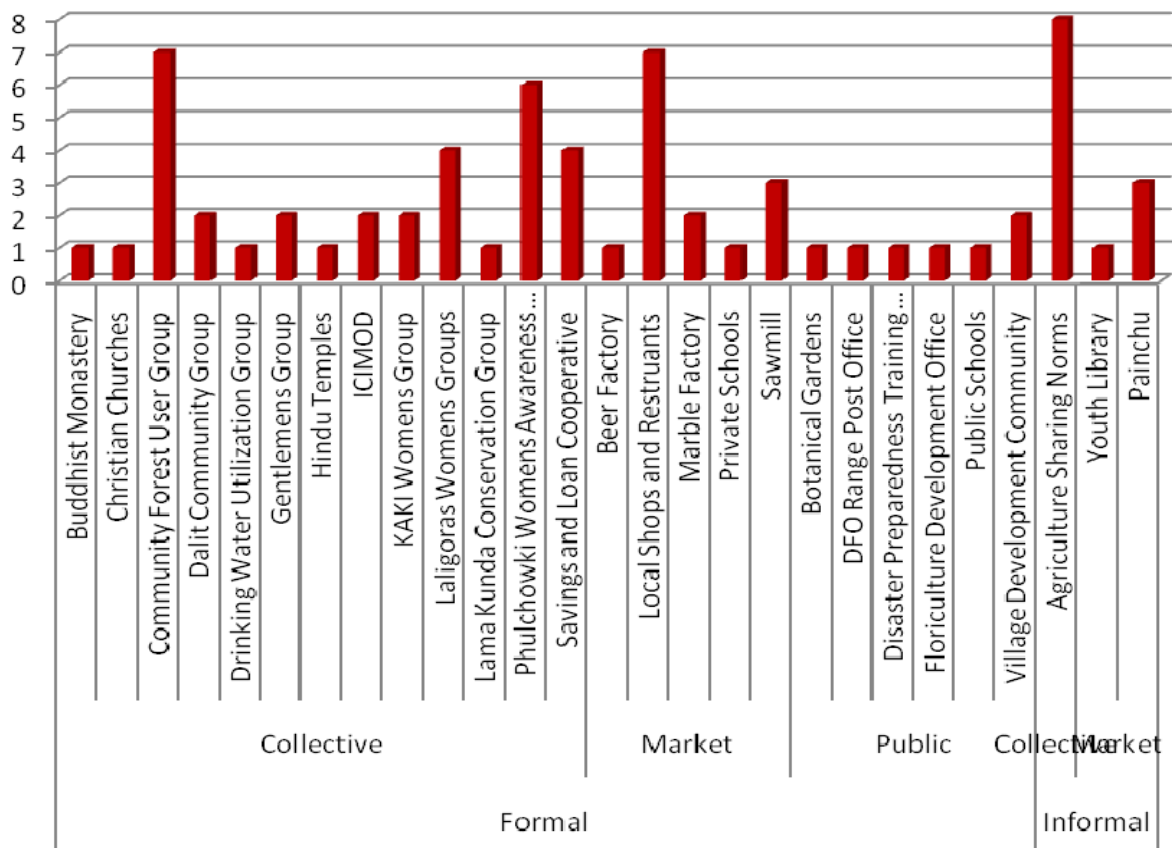
Cross Site Comparisons

The following analysis seeks to understand the nature and extent of institutional role that they play in facilitating adaptation across different sites. The analysis, which uses both descriptive and quantitative approaches, was useful to establish important trends. In addition, it also set a context for identifying key institutions for climate change adaptation across these three sites.

Institutions and Adaptation in Market Site

Each institution in the market site was linked to the number of adaptation practices it facilitates or has connections for. Figure 8.22 depicts the direct role each institution plays in facilitating adaptation practices in the market site, given by the number of practices it has connections with. The results show that there are only a few institutions which facilitate a very large number of adaptation practices, while the other institutions more specifically focus on a smaller number of adaptation practices. This is not to downplay the importance of the later institutions because those institutions might be facilitating highly important and useful adaptation strategies and/or practices. Interestingly, the institutions which facilitate a large number of adaptation practices are not more heavily weighted in one specific type of institutions.

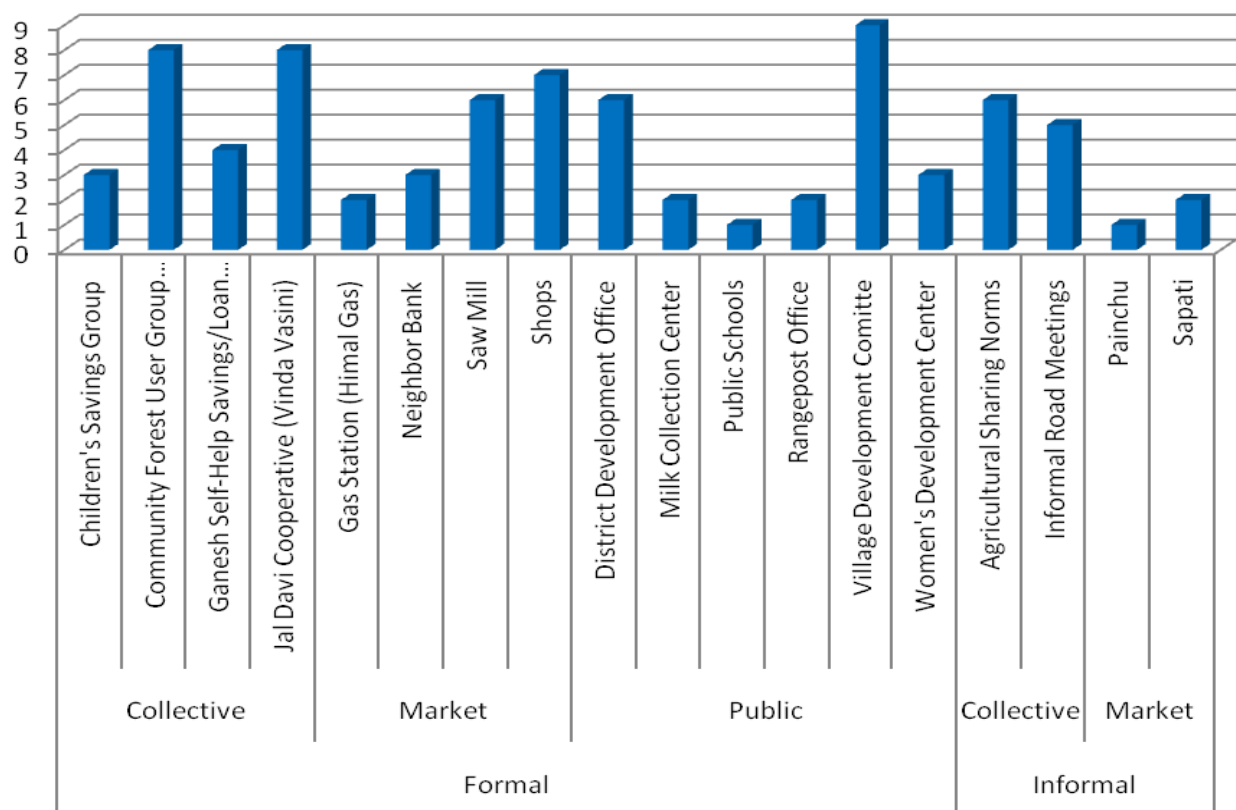
Figure 8.22 Institutions and Adaptation in the Market Site



Institutions and Adaptation in Semi-Market Site

Figure 8.23 below shows the direct role that each institution plays in facilitating adaptation practices in the semi-market site. The graph shows that varied types of institutions, present in semi-market site, facilitate adaption more evenly across than the market site. However, as in the market site, not all institutions facilitate adaptation equally. In contrast to the market site, a larger number of institutions play a role in facilitating a greater number of adaptation practices, while there are fewer institutions that only have a connection with one or two adaptation practices.

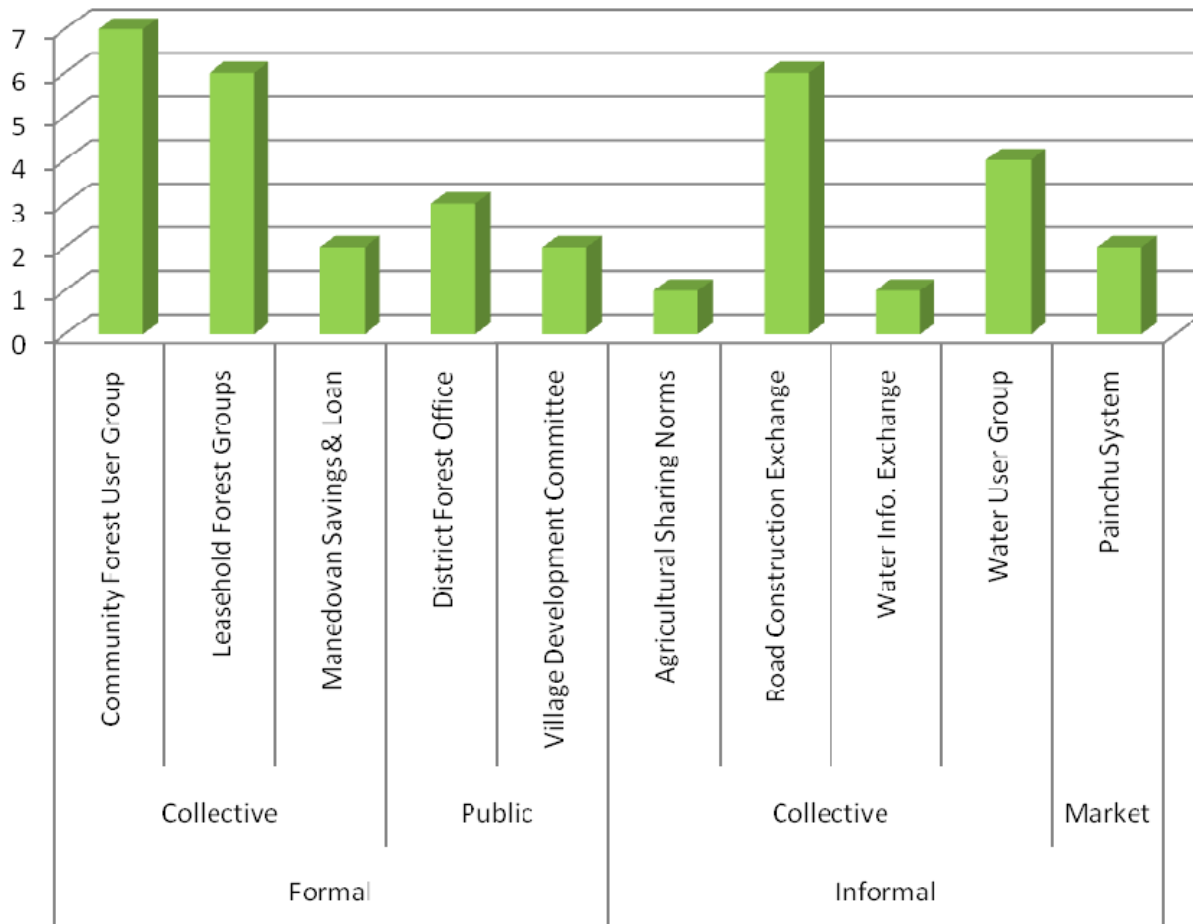
Figure 8.23 Institutions and Adaptation in Semi-Market Site



Institutions and Adaptation in Non-Market Site

Figure 8.24 below shows the direct role that each institution plays in facilitating adaptation in the non-market site. More specifically, the figure below shows that there is a fewer number of institutions influencing adaptation practices in the non-market site. This is most likely due to the fact that the non-market site has significantly fewer institutions than both the market and semi-market site. In comparison to both market and semi-market site, variation between institutional types can be found in non-market site as well, with collective institutions playing the largest role in facilitating adaptation practices.

Table 8.24 Institutions and Adaptation in Non-Market Site



Central Institutions and Facilitating Institutions

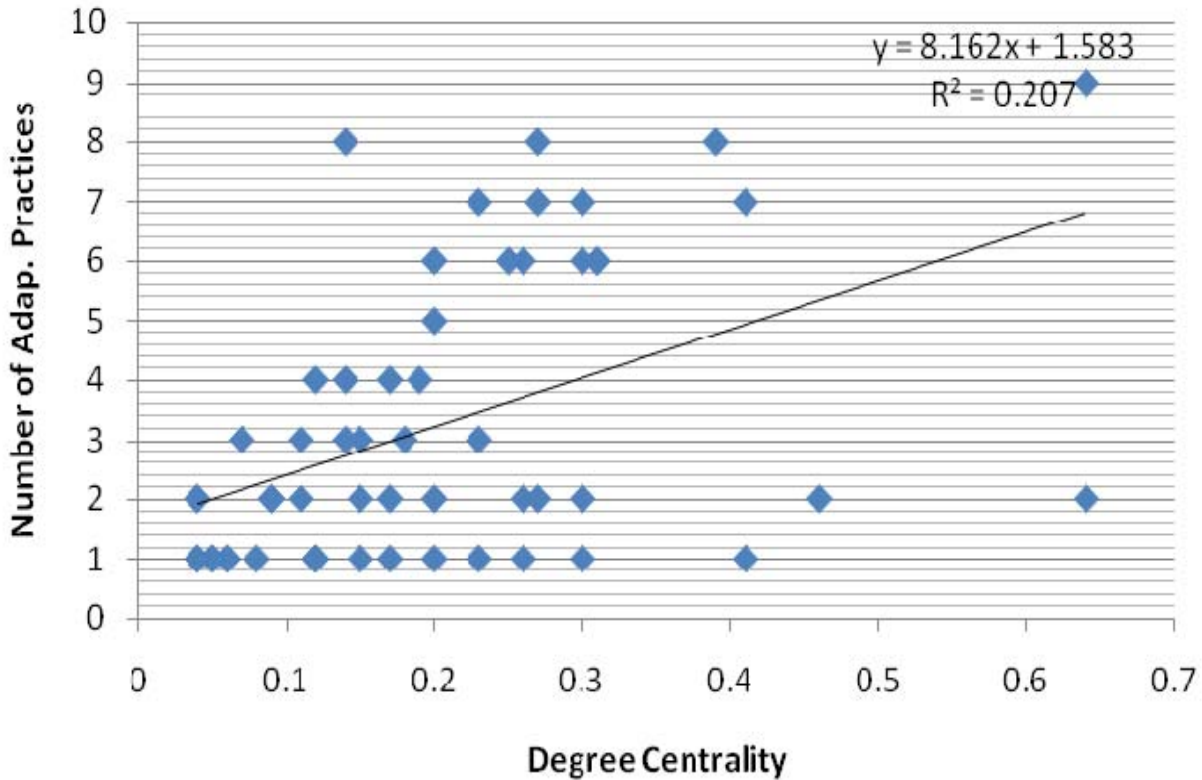
Our hypothesis would assume that the institutions which facilitate a large number of adaptation practices would also have a high centrality score. We use correlation analysis as a statistical tool to establish relationship between an institutions centrality and the number of adaptation practices it facilitates.

To select one of the independent variable, a correlation was run between number of clusters, degree centrality and betweenness centrality to see if there is any sizable difference. All the three variables showed high positive correlation of 0.9 or greater. As such any one variable among these three variables would have been a perfect candidate as an independent variable. However, we used degree centrality as our independent variable since it is the measure of how central an institution is to the network on the basis of its role in facilitating information, resource and influence with the highest number of institution in the network.

Figure 8.24 shows the correlation between an institution's degree centrality and the number of adaption practices it facilitates. A weak positive correlation was observed between variables of

institutional centrality and adaption, with a correlation coefficient of 0.46. The correlation was found to be significant ($p < 0.05$) at 95% significance level.

Table 8.25 Correlation Analysis between an Institution’s Degree Centrality and the Number of Adaptation Practices it Facilitates



Correlation = 0.46
p – value = 0.0005

The analysis above shows that there was a weak correlation between an institution’s degree centrality and the number of adaptation practices it facilitates. In order to explore this more, Table 8.13 identifies the five most central institutions and the five institutions which facilitated the most adaptation practices in each site. The colors in the graphs represent the institutions which meet both criteria. As the table shows, it is not necessarily true that these institutions are the same. More specifically, the non-market site has more institutions which play the dual role, while an increase in market access reduces the number who meet both criteria.

Table 8.13 High Institutional Connectivity and Institutions with High Adaptation Facilitation

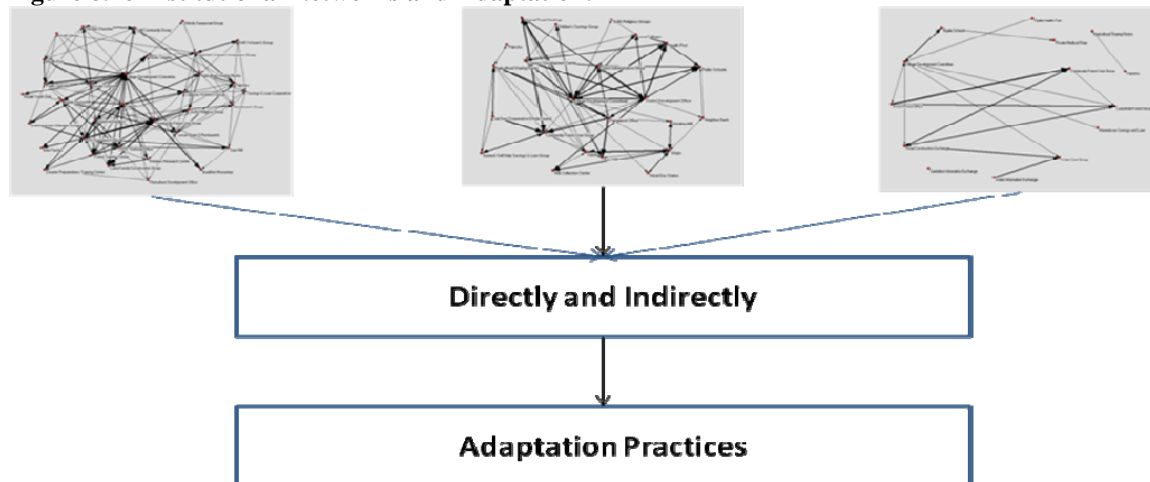
Institutions	Centrality Score	Rank	Institution	# of Adapt. Practices
Market				
Village Develop. Committee	0.64	1	Ag Sharing Norms	8
DFO Rangepost Office	0.41	2	Comm. Forest User Grp.	7
Comm. Forest User Grp.	0.41	3	Local Shops & Restaurant	7
Botanical Gardens	0.30	4	Phulchowki Womens Grp.	6
ICIMOD	0.30	5	Laligoras Womens Grp.	4
Semi-Market				
Village Develop. Committee	0.64	1	Village Develop. Comm.	9
District Develop. Office	0.45	2	Comm. Forest User Grp.	8
Comm. Forest User Grp.	0.39	3	Jal Davi Cooperative	8
Ag Sharing Norms	0.30	4	Shops	7
Shops	0.30	5	Saw Mill	6
Non-Market				
Village Develop. Committee	0.46	1	Comm. Forest User Grp.	7
Rd Construction Exchange	0.31	2	Leasehold Forest Grp.	6
Leasehold Forest Grp.	0.31	3	Rd. Construction Exchange	6
District Forest Office	0.23	4	Water User Group	4
Comm. Forest User Grp.	0.23	5	District Forest Office	3

Institutional Networks and Adaptation

The analysis above shows it is not necessarily for the same institutions to be both highly central in an institutional network and also facilitate a larger number of adaptation practices. Instead, we can see that institutions work in complex networks to share information, resources, technology and influence each other's actions. This leads us to assume that important institutions do not necessarily need to directly facilitate a large number of adaptation practices but can also play an indirect role by strengthening the institutions which have a direct facilitation role.

Figure 8.27 provides a strategic framework which can be used to guide the discussion between directly and indirectly influencing adaptation to climate change impacts. By stating that institutions within the institutional network have a role in either directly and indirectly influencing adaptation practices within a community, we understand that there is a specific niche for institutions to play within that network. Either by indirectly or directly influencing adaptation, institutions are building village and household resilience to climate change impacts, therefore, both types of institutions play essential roles.

Figure 8.26 Institutional Networks and Adaptation:



More specifically, the indirect institutions were found to play a supportive role, instead of an instrumental role, in facilitating adaptation practices. These institutions are supportive based on their centrality within their respective institutional network. By being better connected, they are able to provide critical information and resources to the other institutions that directly facilitate adaptation practices and strategies. The connection between the indirect and direct institutions is critical because without indirect institutions providing resources and information to the institutions that are directly influencing adaptation it is unlikely that adaptation facilitation would be effective.

Therefore, we define a focal institution as an institution that facilitates adaptation practices, as either 1) containing a high centrality score or 2) facilitating a large amount of adaptation practices. It should be noted that there is a diverse set of ways to define a focal institutions, which can possibly including the number of adaptation strategies that an institution facilitates; the high quality adaptation practices it facilitates; the number of clusters of each institution and their betweenness scores.

Our analysis shows that larger the number of institutions a site has and the more complex the institutional network and more specialize the institution involved. For example, we saw in the market site, which contained a large amount of institutions, that there was only one institution which met both of the focal institution criteria. In contrast, our non-market site was found to have four institutions which were ranked by both of the criteria. This suggests that the institutions in the market site, which were found to have high centrality scores, were more influential by spreading information and resources. In contrast, the institutions which facilitated a larger number of adaptation practices were more efficient in implementation. Therefore, this demonstrates that as a community accrues more institutions, those institutions find a particular niche as a direct or indirect adaptation facilitator. They either directly provide many goods and services, or they convey information and resources throughout the community while provisioning only a few goods and services.

Types of Focal Institutions

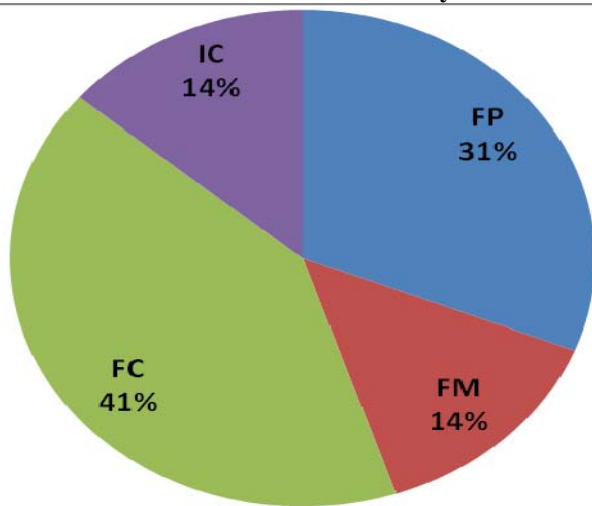
Interestingly, the types of focal institutions are relatively similar across sites. Formal Collective and formal public are the categories where the most focal institutions are found. More specifically, they are also the most important institutions for sharing information and resources throughout their respective communities. Within these two institutional categories, each community is strongly dependent on the VDC and CFUG as focal institutions. The CFUG provides important information and resources on and from forest resources, one of the most important resources for each community. The VDC serves as liaison between the national and local level, which means that they have strong influence on determining funding priorities and what sectors and section of community receive trainings. They are also mandated to conduct developmental activities and implement programs.

Table 8.14 shows that the number of informal focal institutions is the highest in the non-market site. This is most likely due to its highly developed informal institutions, in addition, to its successful collective institutions. Furthermore, all the three sites were found to have the same number of focal formal public institutions. Finally, the semi-market site has a larger number of focal formal market institutions, followed by the market site while no focal formal institutions were found in the non-market site. Figure 8.28 also shows that formal collective institutions were found to be the focal institutions most of the time (frequently).

Table 8.14 Number of Focal Institutions by Institutional Type

Type of Institution	Market	Semi-Market	Non-Market	Total
Formal Public (FP)	3	3	3	9
Formal Market (FM)	1	3	0	4
Formal Collective (FC)	5	3	4	12
Informal Collective (IC)	1	1	3	5

Figure 8.27 Percent of Focal Institutions by Institutional Type



Alternative Analysis

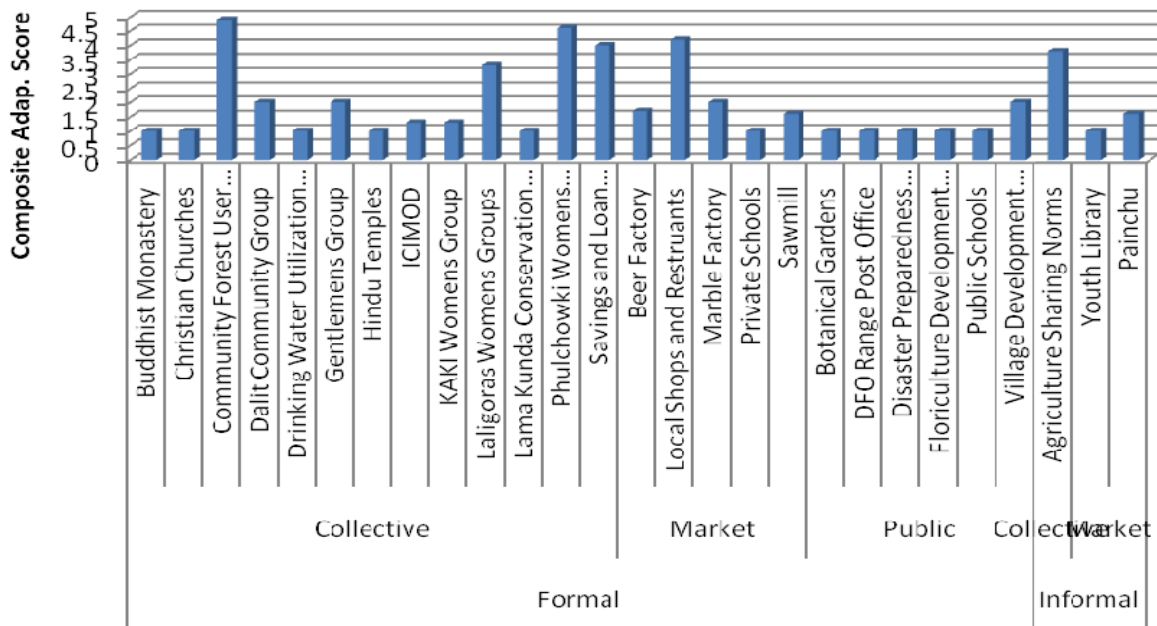
As mentioned above, there are a variety of ways in which important institutions in a community can be identified. This section provides an alternative approach to measure important (focal) institutions for each site. This analysis takes into account that if only the number of adaptation practices is used as an indicator of institutional facilitation, the depth of adaptation facilitation by these institutions would not be explored completely. On the other hand, if only the number of adaptation practices was used, it would have restricted the breadth of adaptation facilitation by the institution. For example, if either of the scores were used separately, then there would be a greater probability of losing important adaptation–institution relationship information since neither of them presents the perfect picture of true adaptation involvement. Therefore, a composite adaptation score was generated from both total number of adaptation strategies and adaptation practices for each institution that facilitates them.

The composite adaptation score was determined by a weighted average with each adaptation strategy given a 70% weight while each adaptation practice was given a 30% weight. A higher weight was given to adaptation strategies because an institution that is involved in facilitating more than one adaptation strategy can fulfill a community's needs according to a particular circumstance. For example, in draught incidences, such institutions can help by providing draught resistant seeds (diversification); while in floods, the same institutions can help a community to relocate (mobility). On the other hand an institution that facilitates a large number of practices belonging to, for example, one strategy was given a relatively lower weight because if the community stops to use this adaptation strategy, the institutional role will become irrelevant.

Market

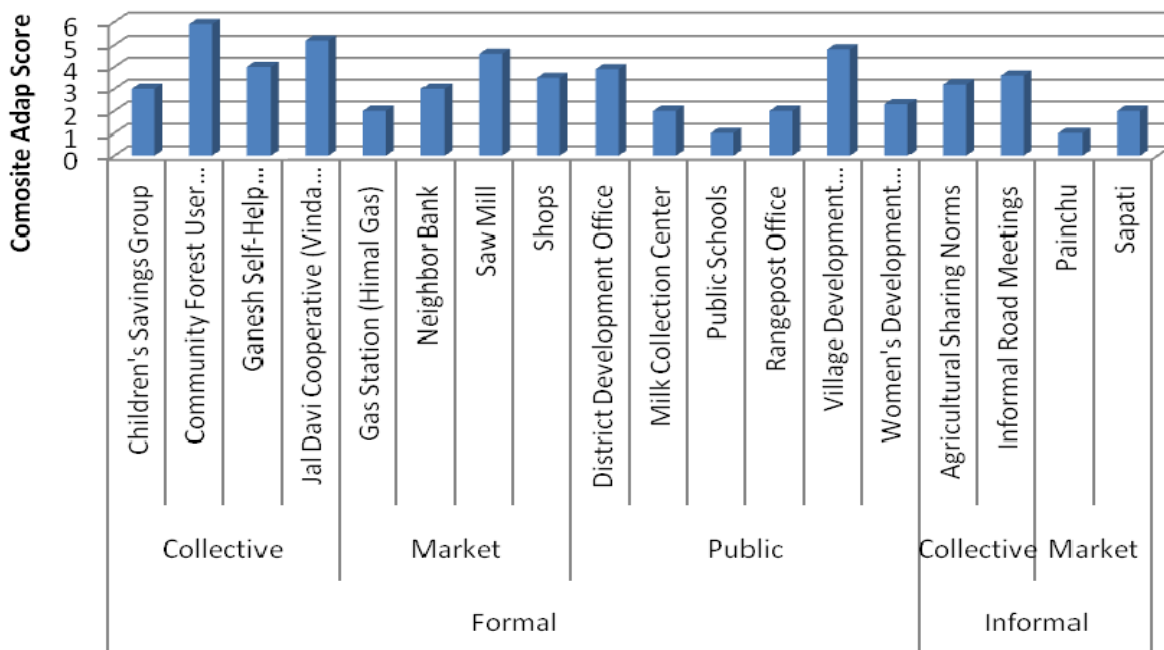
A composite adaptation score of greater than or equal to 3 is used to identify the important institutions. The graph reveals that the Community Forest User Group, Phulchowki Women's Awareness Group, Local Shops and Restaurants, Savings and Loan Cooperative, Agriculture Sharing Norms, and Laliguras Women's Group are the six most important institutions that facilitate a higher number of adaptation strategies and practices as reflected in their composite adaptation score. Four of these institutions are formal collective institutions while one is informal collective and one is formal market institution. The importance of formal institutions, particularly formal collective institutions, is evident in this case.

Figure 8.28 Focal Institutions measured by Composite Score by Institutional Type in Market Site



Semi-Market

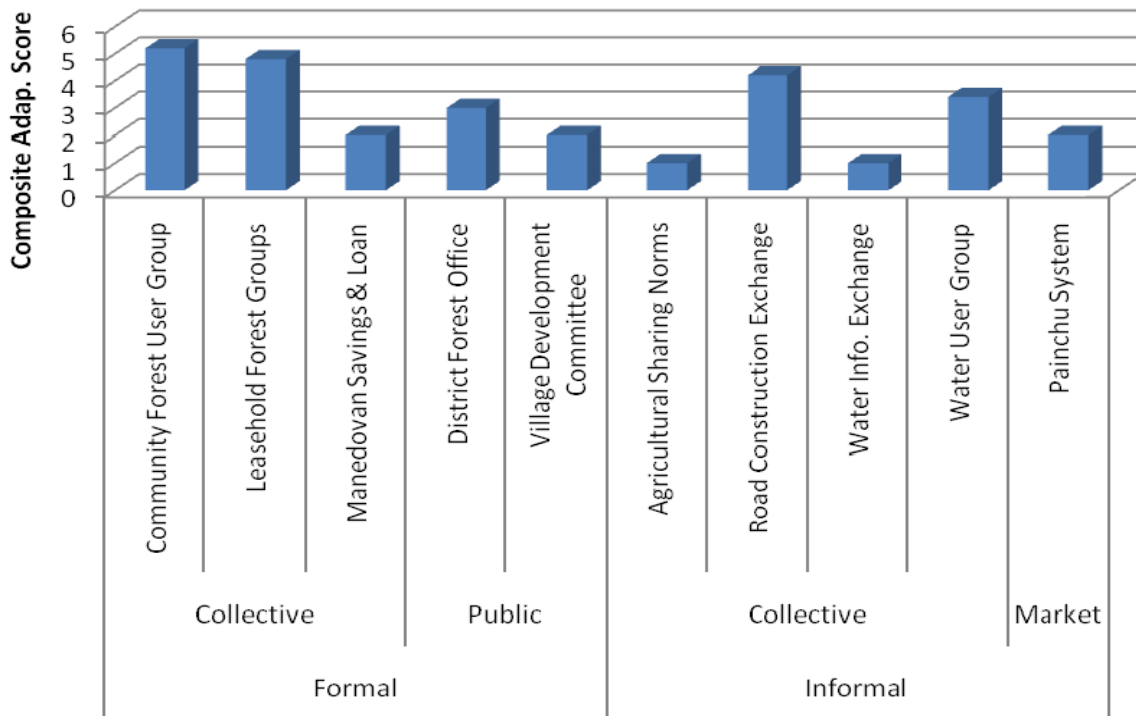
Figure 8.29 Focal Institutions measured by Composite Score by Institutional Type in Semi-Market Site



A composite adaptation score of greater than or equal to 3 is used to identify the important institutions for semi-market site as well. The graph reveals that Community Forest User Group, Jal Devi Cooperative (Vindi Vasni), Village Development Committee (VDC), Saw Mill, Ganesh Self Help Group, District Development Office (DDO), Informal Road Meetings, Shops,

Agriculture Sharing Norms and Children Saving Group are the eleven most important institutions that facilitate higher number of adaptation strategies and practices as reflected in their composite adaption score. Four of these institutions are in formal collective category where as three are in formal market category and two institutions each are in formal public and informal collective category. As in market community, greater traction is towards formal institutions, however, equally distributed between collective, market and public subcategories.

Figure 8.30 Focal Institutions measured by Composite Score by Institutional Type in Non-Market Site



A composite adaptation score of greater than or equal to 3 is used to identify the important institutions. The graph reveals that Community Forest User Group, Leasehold Forest Group, Road Construction Exchange, Water User Group and District Forest Office (DFO) are the five most important institutions that facilitate higher number of adaptation strategies and practices as reflected in their composite adaption score. Two of these institutions fall in both formal and informal collective category. Despite the less number of institutions, collective institutions come up as most important group of institutions facilitating adaptation directly in the non-market site.

This alternative focal institution analysis shows the myriad of potential ways to evaluate a focal institution. We can see by the results above that many of the same institutions are still considered focal institutions by this alternative analysis, with a few minor exceptions. As it turns out, the institutions which facilitate a large number of adaptation practices also facilitate practices over a larger number of strategies.

Summary of Institution-Adaptation Nexus Analysis

Our analysis shows that not all institutions play a role in facilitating climate change adaptation practices. Across our three sites, approximately 70-80% of institutions did not directly facilitate an adaptation practice. Likewise, there are some adaptation practices for which there is no institution to facilitate it (i.e. mostly in mobility and storage strategies). This suggests that the link between institutions and adaptation practices is strong, but not universal.

Our analysis also demonstrates that an institution's centrality within the institutional network does not always dictate how many adaptation practices that institution will facilitate. This suggests that institutions have varied roles as either facilitators of information and resources or direct facilitators of adaptation practices. Some institutions, however, do exhibit both characteristics. This trend decreases across the market gradient (Table 8.13). Our non-market site has the greatest number of institutions with a high centrality and number of adaptation practices, while our market site has the least. This supports the idea that as a community accrues more institutions, these institutions find particular niches, either as conveyor of information and resources or direct facilitator of adaptation practices.

In order to identify those institutions that are particularly important for a community's ability to adapt to climate change, we identified a list of focal institutions. These focal institutions were based three criteria. First, a focal institution can be any institution that is highly central to the institutional network and therefore could actually, or hypothetically, convey critical information and resources to other community institutions that directly facilitate adaptation practices. Second, a focal institution can be any institution that facilitates a large number of adaptation practices within the community. Third, focal institutions can be any institution that facilitates an indispensable adaptation practice within the community. Due to research limitations, we were only able to investigate the first two criteria.

After compiling the top five institutions in these two areas, we saw that across market sites there is little variation in the type of focal institutions within the community. First, formal public and formal collective institutions were the two most prominent focal institutional types. Within these two categories, VDCs and CFUGs were common to all three communities. Second, informal and market institutions were less focal. While both can play an instrumental role in facilitating critical adaptation practices, neither is as highly central or facilitates as many adaptation practices as formal public and formal collective institutions.

Chapter 9. Conclusion

Summary Observations
The Role of Equity
Steps Forward



SUMMARY OBSERVATIONS

The negative effects on human livelihoods as a direct result of anthropogenic global climate change are vast and far-reaching. These particular effects are magnified for vulnerable populations, such as the community members of our three field sites in the Middle Hills of Nepal. Our research sought to determine the relationship between market access, institutions and climate change adaptation practices. This research was particularly important because identifying key determinants to adaptation will be helpful as future impacts become more severe.

Our choice of communities, based on a market access gradient, would act as a snapshot of similar villages throughout Nepal. From this research we hoped to find general trends concerning these three variables, which could be extrapolated across a wide range of villages. The outcomes and conclusions we found were not specifically village dependent but more pertaining to foundational community characteristics. Our research found that these three communities varied greatly in terms of social, economic, and resource makeup. Therefore, although specific observations were made for each community based on market access, we found that market access may be only one of a multitude of determinants for adaptation practices.

The original research framework provided in Chapter 3 highlights the hypothesis that market access has a positive relationship to the quantity and strength of institutions and the number and quality of adaptation practices. Furthermore, we hypothesized that institutions also positively influenced the number and quality of adaptation practices. Although not all results were conclusive, this research was able to prove that:

- (1) Market access is positively related to the quantity of institutions observed at a particular site.
- (2) Market access was also found to have a positive relationship between the strength and connectivity of institutional networks.
- (3) There was a weak positive correlation between an institution's centrality score and the number of adaptation practices it facilitated.

Conversely, considering this research's original hypothesis, we were not able to find conclusive evidence to prove the following:

- (1) Due to the small sample size, our research did not find a highly significant relationship between the number of adaptation practices and market access.
- (2) Market access was not found to have a positive relationship with the quality of adaptation practice. Most specifically, other factors, such as equity may more intensely influence the quality of adaptation practices.

Although the findings pertaining to the above two hypotheses proved inconclusive, this is by no means a signal that these trends do not exist. Instead, this research may have been confined by the sample size, especially since only three communities were surveyed. In addition, it should be noted that the methods for determining the connectivity of institutions, quality of adaptation practice, and definition of focal institutions can be explained in a variety of ways. These results will tend to show small differences from the results obtained from our methodology but the same large trends will mostly likely be consistent.

Due to the weak positive correlation between an institutions centrality score and the number of adaptation practices it facilitates, our research dug deeper into this discussion. Upon analyzing the reason for this weak relationship, we determined that sites with higher market access, which also possessed a larger amount of institutions and a more complex institutional network, were the cause of this weak relationship.

Furthermore, our research concludes that focal institutions, institutions which are intimately involved with facilitating adaptation at the community level, can play two roles in influencing adaptation. First, an institution which facilitates a large amount of adaptation practices plays a direct role to the implementation of these practices. Second, an institution with a high centrality score plays a more indirect role in facilitating adaptation by disseminating resources, information and decision-making power to institutions that more directly influence the implementation of adaptation practices. Moreover, our research found that communities a lower degree of market access, few institutions, and a less complex institutional network had a large number of institutions who play both of these roles. In contrast, in communities with a higher degree of market access, although there was a larger number of institutions and had a more complex institutional network, fewer institutions playing this dual role. This finding is particularly important because institutions in communities with a high institutional presence must find their particular niche in order to effectively influence adaptation. By identifying and capitalizing on this niche, the institutional network will be more successful in facilitating adaptation practices.

Lastly, the bottom-line of our observations found that communication and community-structure are crucial for high-quality adaptation practices. Hence, an assumption for further research maybe that strong, established, and equitable communication venues can facilitate high quality adaptation practices and thus are more effective in addressing and responding to environmental hazards.

An unexpected finding from this research was the role equity played in determining the quality of climate change adaptation strategies. Equity seemed to be a factor that is just as important in determining the effectiveness of adaptation strategies as market accessibility and institutional capacity. Many adaptation practices scored high on both the level of sustainability and livelihood

benefits, but the fluctuating levels of equity seemed to deflate the overall quality of adaptation strategies.

THE ROLE OF EQUITY

The substantial difference in Dibdol's, our semi-market site, adaptation quality when compared to the other sites was found to mainly be caused by the equity score. More importantly our study found that equity was actually a more intense determinant of the quality of adaptation practice than market access. These findings led allowed a more thoroughly analysis of this particular relationship.

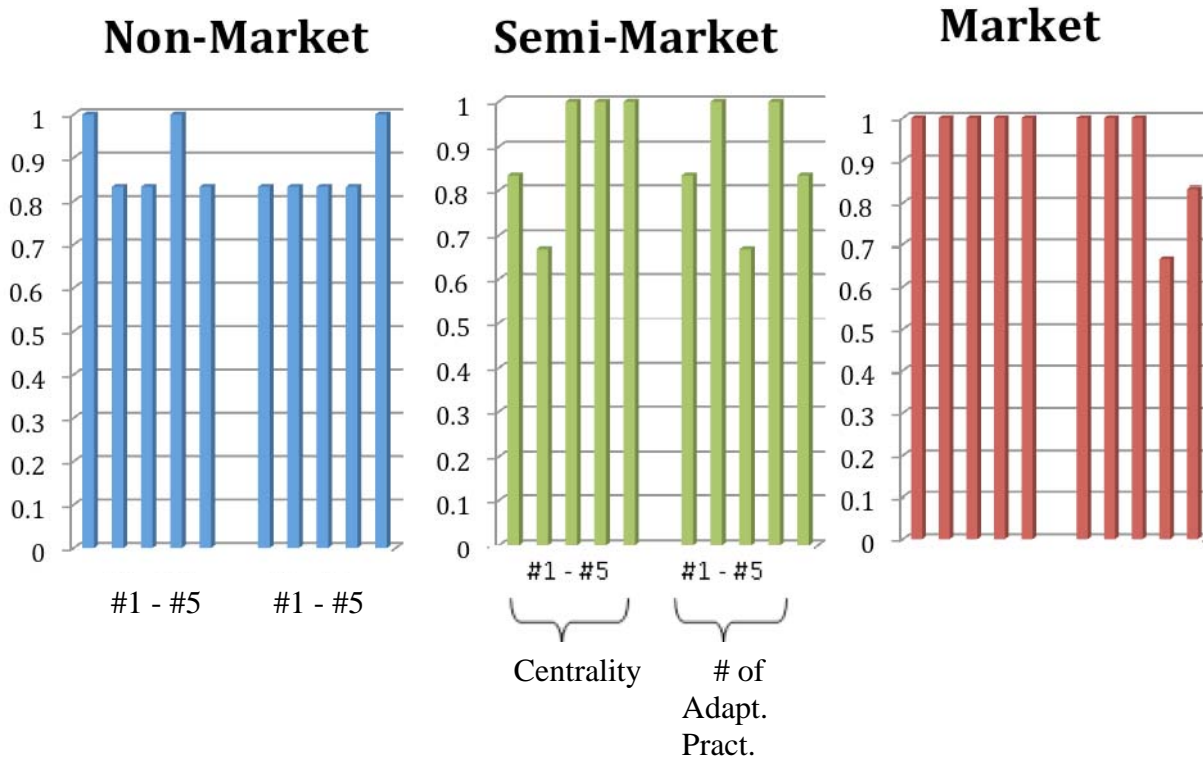
Table 9.1 Number of zero scores found in each strategy by site

	Non-Market			Semi-Market			Market		
	E	S	LB	E	S	LB	E	S	LB
Market Exchange	0	0	0	2	1	0	0	0	0
Diversification	0	0	0	1	0	0	1	0	0
Mobility	2	1	0	0	0	0	1	0	0
Common Pooling	0	0	0	1	1	0	0	0	0
Total	2	1	0	4	2	0	2	0	0

Table 9.1 displays the number of zero scores found in each strategy by site, meaning these practices were inequitable, unsustainable and provided no livelihood benefits. The results illustrate that Dibdol was found to have significantly more adaptation practices which scored a zero in one of the three parameters, with a focus in the equity of market exchange practices. A zero was found in the equity parameter in four of these six practices, which is equivalent to 50% more inequality in Dibdol's adaptation practices compared to Riyale, non-market site, and Godawari, market site.

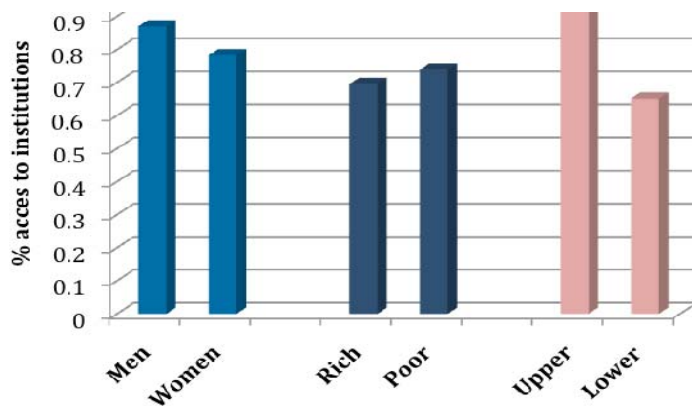
In an effort to take this one step further, the research then looked at the focal institutions defined in the analysis section of the report. Both the top five focal institutions in terms of centrality and in terms of the number of adaptation practices it facilitates were evaluated based on the proportion of social groups who were able to access them. The graphs below show proportionally how each of the social groups had access to individual focal institutions. The results show that there was almost a uniform distribution of equal access to institutions in the market site. More importantly, many of these focal institutions provided equal access to all social groups. Furthermore, we see a similar scenario in our non-market site. Although, the distribution is not as uniform, there still exist a large majority of focal institutions which access the six social groups. Finally, the results show that there is much more volatility in terms of social groups access to these focal institutions in our semi-market site.

Figure 9.1 Institutional centrality and number of adaptation practices



Digging even deeper into these equity issue we can look at the distribution of institutional access between specific groups in Dibdol. Figure 9.2 illustrates each social group’s proportional access to resources. The results clearly show that there are not large differences in gender and wealth. But there are significant differences in access to institutions between castes.

Figure 9.2 Social groups proportional access to institutions



Looking through the field data we find that the lowest caste had less access to microfinance institutions, such as banks, savings and loan cooperatives and self help groups. The lack of access to microfinance institutions may have caused these groups have less monetary capital which they needed to interact with the market. In response these groups were forced to rely on more traditional forms of market exchange mechanisms such as sharecropping and exchanging labor for goods, both of which were found to be

extremely inequitable market exchange practices in the Dibdol site.

Our results show that lack of access to these focal institutions could significantly affect the ability to obtain resources, information, and decision-making power in addition to facilitating adaptation practices. These focal institutions are therefore the keys to determining the where and how resources are directed and in result influence the ability of equitable adaptation practices.

STEPS FORWARD

Equity seems to be just as influential in shaping a community's adaptive capacity as market accessibility and institutional capacity. Therefore, local and national level policies must address the growing dichotomy between groups of differing social and economic classes. The research was conclusive in observing continued differences between high and low caste populations. In particular, lower caste groups tended to be far worse in accessing resources and capital. Therefore, a continued equity problem would put already vulnerable populations at an even more precarious state. Focal institutions, then, should concentrate on aiding already vulnerable populations and seek to develop strategies that would increase their resilience against impending climate effects.

More research must be done to gather information on the social consequences and human dimensions of climate change on the micro-level, especially for vulnerable communities in Nepal. This research also recommends broad objectives for local, regional, national, and international institutions to build more effective adaptation strategies. Although this research has shown that market accessibility, institutional capacity, and equity all play a major role in determining the quality of adaptation strategies, many other factors may also play a role in shaping micro-level adaptation strategies.

10. Recommendations

Climate Change and Development

Mico-Level Capacity Building

Institutions

Communication

Constraints

Building Stronger Adaptation Strategies

Forestry Institutions and Adaptation

National Level Assessments and Capacity Building

International Interventions



CLIMATE CHANGE AND DEVELOPMENT

The UNFCCC background paper on impacts, vulnerability, and climate change in Asia addresses the implementation of general adaptation strategies. The paper reinforces that adaptation strategies are complementary to national development goals and objectives (UNFCCC Asian Workshop Background Paper). Climate change is only one of a multitude of problems Nepal is facing. Other pressing issues include poverty, hunger, inequality, pollution, and disease. However, climate change has the potential to exacerbate all of these issues. Due to the complex interactions of all of these issues and limited resources, advances in adaptation should be developed in parallel to long-term development goals. Furthermore, capacity building, identification of focal institutions, and the inclusion of local people and community perceptions in decision making, should be more thoroughly developed. Finally, a greater emphasis must be focused on mainstreaming adaptation to climate change in national policy. National-level climate change institutions must be developed to provide important information, resources, and direction to address climate change impacts (UNFCCC Asian Workshop Background Paper).

Research has identified that vulnerability to climate change is a complex concept. Similar to mitigation, there is no “silver bullet” for adaptation (UNFCCC Asian Workshop Background Paper). Therefore, economics, sustainability, risk, and equity are important factors to be considered when making choices related to adaptation. To ensure an integrated approach all levels -- village, regional, national, and international -- must work cohesively when designing and implementing adaptation strategies (UNFCCC Asian Workshop Background Paper). The Nepal NAPA Case Study identified some important institutional issues that may hinder the ability to move forward in climate change adaptation. These include:

- 1) *Lack of information and data*- Although research often includes climate change and sustainable development issues there is still a large magnitude of data which must be collected in order to fully address the issue (Nepal NAPA Case Study). In addition, the lack of certainty regarding climate impacts also poses a problem to developing solutions.
- 2) *Lack of public awareness*- Addressing public awareness is an effective venue for minimizing vulnerability to climate change and increasing the effectiveness of adaptation options (Nepal NAPA Case Study). A large proportion of Nepali communities do not have access to information concerning climate change impacts and adaptation practices.

Increasing public awareness about this global issue may facilitate more information exchange and generate increased dialogue.

3) *Need for inter-departmental coordination-* Dialogue should be coordinated between community-based organizations and governmental agencies working on rural development and sustainable livelihoods (Nepal NAPA Case Study). Climate change adaptation is a highly integrated process, which often involves the participation of a variety of sectors. For example, agriculture, forestry, construction, and economics all play an active role in a majority of Nepali communities. Increased communication between organizations working in these integrated fields will ensure a more valuable and cost-effective approach.

4) *Need for regional collaboration-* The solutions to tackle these problems will often require regional cooperation and information-sharing about a variety of natural resources. Comprehensive collaboration on watershed, forest, and mountain system management will more thoroughly address both climate change and future growth (Nepal NAPA Case Study).

5) *Need for international partnerships, capacity building, and assistance-* International assistance will be required for a variety of reasons, including funding, information exchange, sustainable development techniques, technical expertise, and human resource development (Nepal NAPA Case Study). Many international development NGOs and inter-governmental agencies have the ability to provide resources and funding, which will facilitate adaptation on the local community level. These resources should be strategically utilized in order to maximize the capacity of community adaptation.

The following recommendation's section will address these various institutional issues and generate ideas for how to overcome them. In addition, more specific adaptation practices will be addressed, focusing on the most vulnerable sectors of the Middle Hills region.

MICRO-LEVEL CAPACITY BUILDING

The results of this research showed that local-level indicators have a strong bearing on the quantity and quality of institutions and adaptation strategies. Micro-level capacity building would then entail processes such as increasing community cohesion, reducing social inequality, increasing institutional effectiveness, and increasing cross-level communication and information sharing.

Equity

The results of this research identified equity as a major hindrance to institutional-effectiveness; high quality adaptation practices; and information, resource and decision-making access for marginalized households. More specifically, the analysis found that communities who were more integrated and worked comprehensively as a group to address village issues had much higher quality adaptation practices. The analysis also showed that different villages had different root problems with equity. One village was found to have a larger inequity between gender, another between wealth, and the third between castes. Regardless of the type of the particular

marginalized social group, inequity within communities must be minimized. Addressing the issue of equity will ensure a more stable, organized and cohesive community.

The largest barrier to solving inequality is overcoming the fact that inequity is a social phenomenon engrained within the culture of these villages. For decades villages have discriminated based on caste, gender, and wealth. In order to solve the basic fundamental root causes of this inequality, education is essential. One of our studied sites conveyed a new understanding of women's equality, which they were introduced to through radio commercials and intra-community education initiatives. In addition, certain programs had to be established to build the decision-making power of these groups. As seen through microfinance institutions, women's stature in the household has changed due to institutions providing them with the ability to save and understand finance.



Furthermore, institutions have the ability to address inequality by first recognizing marginalized populations and second, by providing them with resources, information, and a voice within the community. By identifying focal institutions within the community and then challenging them to reach a wide range of social groups, the conversation on equity will be brought out into the open. More importantly, community leaders should be educated and introduced to the idea of equity challenges. These community leaders have the ability to influence other community members through their

actions and their inherent respect. Once the most important institutions and leaders are committed to promoting equality, other community member will follow. Also, if barriers to equality within institutions are too strong, external organizations should seek to create focal institutions that include all social groups.

Finally, the inclusion of all social groups in community-wide decision-making will more fully address village-level inequality. By encouraging diverse group discussions and including the voice of all marginalized populations, other community members will reposition their values. Even more important is this process occurring at the national level, such as including the voice of all populations in national government decision-making. National-level exposure, such as women's inclusion in the Nepalese Constitutional Assembly, will set a precedent by showing how each group should be valued. This will then most likely diffuse to the local level.

Therefore, expanding education, developing programs for marginalized groups, challenging focal institutions, and educating community leaders will create greater inclusivity in institutions and resource access. The effects of dismantling marginalization within a community are substantial. Creating an atmosphere of equitable decision-making power and resource distribution will bring all group members' needs and insights to bear on the group. This in turn will allow for a more

cohesive and well-functioning community, which is especially important as the impacts of climate change will affect all groups within a community. The more integrated and cohesive a community, the greater their ability to respond to threats by supporting one another and exchanging information and resources across a broad range of households.

Institutions

Our results showed that focal institutions played a crucial role in facilitating the dissemination of resources, information, and exercising decision-making power. The institutional network analysis confirmed that there are often two types of focal institutions found within a community—those that directly facilitate climate change adaptation practices and those who play an indirect role in funneling resources and information for these initiatives. Institutions often played these dual roles in communities that had a smaller number of institutions. Thus, through the identification of these focal institutions, national, regional, and local authorities will then be better able to more effectively channel resources directly at building community institutional capacity.

The research results specifically showed that several dominant focal institutions dictated much of the facilitating and disseminating of information and resources. Although this research was unable to prove any conclusive relationship between focal institutions and the quality of adaptation strategies, there may be indirect channels of support in play. Since this research did not focus on the level of indirect support focal institutions yielded on particular adaptation strategies, the research was conclusive in showing some level of positive relationship in this regard. Therefore, by facilitating and promoting focal institutions, communities can more effectively and efficiently channel resources and information for climate change adaptation.

By designating the role of some focal institutions specifically for channeling resources for climate change adaptation, communities would be better equipped, prepared, and responsive in times of social, economic, or environmental stressors. Moreover, communities that showed a higher density of institutions as a whole exhibited higher quality adaptation strategies. Therefore, by promoting the number of social support, service-oriented, and infrastructure-building organizations in a particular community, the built-upon institutional strength would yield positive benefits for developing effective adaptation strategies.

Increasing Effectiveness through Community Groups

Effective community groups should focus on enhancing good governance by strengthening internal capacity while forging linkages with other community, regional, and national institutions. A strong, sustainable institution should have a variety of qualities in order for it to achieve maximum effectiveness, including:

1. The group needs to be focused on a particular issue and establish a group mission. The mission should specifically address the core work and goals of the group as it relates to their topic, albeit forests, agriculture, microfinance, or climate change adaptation among a variety of others.

2. A group should also have rules or guiding principles in order for it to operate efficiently. It is important for these rules to be established at the onset of the institution and be adaptable in nature. Rules may include issues such as how decisions are made and by whom (i.e. governance structure). Also, group conflict is inevitable. The group should determine an appropriate process for handling conflict situations. Establishing an agreed-upon procedure for dealing with group conflict can keep groups intact during difficult or disagreeable periods.
3. The group should have an established leader and leadership body. The leader will take responsibility to organize and conduct meetings, provide guidance when needed, facilitate the exchange of information, and establish connections with other organizations. A disorganized organization can often dismantle due to lack of a dedicated leader. A leadership body should also be determined by group decision. The leadership body should enforce group rules and also manage internal issues, such as budgeting and information storage.
4. Ongoing and committed membership is important for a strong and stable community group. Group members should be committed to attending meetings, following through on tasks, and supporting the leader. It is often found that the stronger a group's membership the more effective the organization.
5. Particularly helpful in strengthening community groups is an established regular time and location for meeting as well as an effective way of informing all members of details. These details create a more organized process, which will more likely allow community members to remember and therefore attend the meetings.
6. The group should create a comfortable and inclusive space for community members to express their thoughts, opinions, and needs openly. The group should also not exclude members, unless it is specific to a particular group (i.e. Women's Group).
7. The group should collaborate and make connections with other institutions on the community, district, and national level. Connecting across other institutions within the community and with regional and national organizations/agencies with similar missions will strengthen the group. By exchanging information and resources among these groups, the organization can be strengthened through increased community problem-solving capabilities, additional information for decision-making, and overall community cohesion.

Communication

The Exchange of Information & Local Knowledge

Information and knowledge exchange are potentially the most important tools for building household and community level resilience to climate change. Households are already feeling the effects of climate change and although these impacts may be subtle, the impacts will gradually become more severe over time. Additionally, many households are unknowingly adapting to the impacts of climate variability on a daily basis, by changing habits in response to stressors.

Although these adaptation practices may seem trivial, they often provide substantial livelihood benefits and disaster preparedness techniques to households.

Exchanging information about the various stressors households have experienced and their respective adaptation or response to these stressors will allow other households to respond more efficiently and effectively to impacts or potentially avoid any stress at all. Increasing information exchanges through more sustainable and methodical mechanisms for communication will allow households to build resilience to climate impacts.

There are a variety of ways the exchange of information and knowledge can be used to facilitate adaptation and use of best practices. First, stable intra-community communication venues can serve as an important way to exchange information between households. Second, inter-community communication venues can also increase resilience. Third, exchange of information between institutions, and fourth, exchanging information between households and external institutions, including government and NGOs. Either using pre-existing informal collective institutions or creating new ones, which focus the conversation on impacts and adaptation practices, will promote the free flow of information between households.

Interview (Godawari, 2008)



Intra-community

In order to maximize effectiveness, stable institutions should establish group conversations focusing on household's experiences with stressors and their respective coping or response methods. This conversation would allow a variety of households to be exposed to valuable information both in terms of what can they expect and how they can respond to problems. This conversation would also allow household members to discuss alternative response strategies to threats and encourage group problem solving. Additionally, these meetings will stimulate group-thinking exercises and expand the realm of knowledge, which will catalyze more powerful and valuable strategies.

Inter-Community

In order to expand the knowledge base and provide additional options for households, communication venues should also be established between communities. By creating ongoing sustainable inter-community meetings, even more diverse and greater amounts of information can be exchanged. These ties can be forged through district-level offices that can provide the venue for such conversations.

Inter-Institutions

Whether information is exchanged between community-specific institutions or institutions across communities, this type of information-flow can be beneficial. As we saw from the analysis of focal institutions, certain institutions are connected to a large amount of other institutions, which in turn contain a wide array of community households. This allows for information exchange to occur on a variety of scales (i.e. district, community, household). As long as clear lines of communication exist between institutions and households new information received by institutions will reach a large population of community members.

External Institutions

Clear lines of communication will establish mutually beneficial information exchange between households and external organizations. NGO's and governmental organizations are acquiring important climate change information, which can be used by communities to build climate change resilience and progress sustainable development. Nepal's highly dispersed villages, unreliable forms of communication, and underdeveloped transportation information, exchange between external organizations and households have been particularly difficult. In order for this information to serve its purpose, clear lines of communication must be developed.

Information and knowledge gathered by local communities should also be exchanged with external institutions. By providing external organizations with accurate, and current local knowledge, the decisions made by governments can be more practical and programs created by NGOs more pertinent. Local knowledge is particularly important when making decisions about climate change adaptation and development on a larger-level national policy scale. Specifically local knowledge will facilitate the creation of more effective and valuable policies, which will avoid wasted resources and lead to better outcomes. There is a wide-body of literature in the area local knowledge to policy-making, which should be explored in the context of climate change adaptation.

Recording and Storing Information

Important information is often lost through a lack of recording, often brought about by unsustainable and unorganized institutions. Recording information that is exchanged in group settings, both in formal and informal institutions, will eliminate informational leakage. Lost information often occurs between generational gaps but also proves to be a problem between group members in terms of accountability and transparency.

Institutions will avoid information leakage by designating a members of the leadership committee to record notes during important meetings. Recording information enables important decisions to be reviewed at a later time, which avoids confusion and increases transparency. In addition, it avoids inefficiencies, progresses accurate accounting, and allows important information to be stored and accessed when needed.

Recording information exchanged about impacts, adaptation strategies and resources is especially important in the climate change conversation. As we know, the effects of climate change will be volatile and become more severe over time; by recording this information

households can refer to records when solutions need to be found. This will avoid wasting resources and ensures important indigenous knowledge is maintained for future generations.

Furthermore, creating a common storage area where information can be aggregated, such as an organizational office or library, would provide further benefits to the community. Books, references, newspaper articles, meeting notes, etc. could be stored at this common pooled resource, where community members could access it if they are in need of important information. This would also be an additional communication venue for information exchange.

Resources

Many of the households who were interviewed during the research expressed an interest in increasing the amount and type of resources which were available to them. Households were well-informed that the resources they were seeking, which were mostly new innovations, could be provided by external organizations and institutions but they did not have access to these institutions. There is a significant amount of information being exchanged between NGOs and government agencies concerning recent advancements occurring in Nepal. This knowledge is difficult to disperse to rural communities due to Nepal's topography and communication failures. In addition, a lack of resources inhibits these organizations from more implementing new innovations in communities.

Therefore, it is important that communities more proactively engage in conversations with external institutions concerning these innovations. This will facilitate an increased exchange of both pertinent knowledge and resources. In addition, storing and recording this information can prove to be extremely beneficial to communities during times of crisis. When confronted with a challenge, communities will then know which organizations have the ability to assist them and provide them with resources.

Women carrying firewood



In addition, recording and storing the use of resources will allow communities to keep an organized account of where and to whom the resources are going. This will allow community members to approach these organizations and households during times of need to seek advice or ask for assistance.

Working with the VDC

More specific to Nepal, the VDC can serve as an effective information and resource-dispersing institution within the community. Nepal's Local Development Ministry established the VDC as its decentralized administrative unit to facilitate greater community-government interaction and administration. The VDC acts as a direct link between local villages and the national government and has the potential to be an extremely effective tool in bringing together national and local priorities. As evidenced from our institutional mapping exercise, the VDC is one of the

few institutions that has connections to all three institutional types: public, collective, and private. In this way, they have one of the broadest reaches of any local institutions in facilitating information and resources to appropriate institutions.

However, households in the communities under study often expressed distrust, unhappiness, and disengagement with the VDC, despite its integral role in the community. In order to capitalize on the potential benefit households could receive from the VDC, the VDC and households should cultivate and nurture a more agreeable relationship.

Community institution leaders should cultivate better communication with VDC officials. They would benefit from this in two ways. First, the VDC is integral to the flow of information throughout the community and access to community information can only strengthen institutional decision-making and effectiveness. In addition, the VDC should capitalize on its role as the key information-sharing institution in the community by serving as a place for storing village knowledge. Second, greater communication will allow institutions to bring pressing village issues before VDC officials. Since the VDC serves as the liaison between national and community levels, better communication allows the VDC to better understand the needs of the community when they advocate for more effective policies and programs. They will be able to more accurately address the issues at the community level. Additionally, national and regional government and international, national, and regional NGOs should recognize that the VDC has the capacity to provide important resources and information for community projects. If village institutions forge a strong relationship with the VDC, critical resources and information will more likely be distributed.

Livelihoods

Indigenous knowledge may be used in a variety of ways to diversify livelihoods. This is especially important if climate change impacts may significantly impact the sectors of village life where the majority of livelihood pursuits are found. Using a variety of natural resources found in the communities, men and women have the ability to use their knowledge and experience to develop innovations which can increase their incomes or ability to trade within villages. In addition, these innovations can decrease the workload around the household.

Innovations can be developed from livestock, cropping, handicrafts, use of medicinal plants, efficient use of energy for charcoal-making and improved stoves and food processing (International Food Policy Research Institute Water Harvesting) among a variety of others. Through research, we have seen a variety of these innovations in the studied villages. One site created briquette, a more efficient fuel source made from a combination of forest and agriculture products. In addition, households would make brooms and mats from forest products. These types of handicrafts have the potential to generate a large amount of income, especially if there is access to a local market, where consumers do not have access to the resources to create these goods. Other types of innovations and small enterprise initiatives may include pottery, weaving, shoe making, blacksmithing, tailoring, preservation of garlic and onions, producing mats with local materials, and carpentry (International Food Policy Research Institute Water Harvesting).

Villagers also expressed a desire to expand their realm of skills. Community groups should seek local organizations or external organizations, which specialize in skill building in order for these

community members to improve life skills and adapt to more efficient technologies. Important skills to develop include saving and financing, interpersonal skills, vocational training, and improved skills in agriculture and community building.

Constraints

The above recommendations have the potential to significantly enhance the organization and structure of a community, which results in increasing the adaptive capacity of the community. It is important to point out certain constraints, however, which could potentially inhibit the implementation of these recommendations. This section describes these constraints and proposes potential solutions, which could allow the above recommendations to be better implemented.

Time Constraints

It is well documented that village life is not easy; it requires extensive amounts of physical labor, which is often extremely time consuming. This strenuous household work leaves little time for activities in the community, such as participating in community groups. As demonstrated above, many of these extra groups provide significant livelihood benefits for households by exchanging important information, which introduce village members to new skills, practices and strategies, which may ease their lives.

The adaptation strategy of storage temporally alleviates time constraints. By storing important household resources periodically households are able to depend on this storage for a short amount of time.

Childcare Constraints

In addition, childcare was often a problem in the villages. Families often have three, four, or five children that cannot be left alone for long periods of time. The lack of childcare in the community thwarted community members, especially women, from performing important household's tasks, such as forest product collection or agriculture work, especially during times of crisis. In addition, it hindered community members from attending group organization meetings or participating in community conversations.

One way to alleviate the problem of childcare is to organize a community group around this issue. Forming a group, composed of a multitude of community members who often experience this problem, and rotating the position of caretaker allows for households to only periodically be prevented from performing tasks. These small groups would be required to organize a time where one member would watch the children, which would allow the other members to complete these important tasks leaving less stress on households.

Alternatively, childcare could become a specific daily wage job. Providing resources, either monetary or household goods, in exchange for childcare could provide mutual benefit to the parties involved. For example, women are forced to travel far distances to collect forest products, which leaves them with the option of either taking care of their children or collecting forest products. If one woman was to watch a group of women's children while they traveled to the forest, a small portion of each woman's collected forest products could be provided in

exchange for childcare services. This process could also be used for community group meetings or agriculture harvesting.

BUILDING STRONGER ADAPTATION STRATEGIES

Storage

As seen in the analysis section of the report, storage was a particularly high quality adaptation strategy. It was found to be equitable across social groups, have extremely high livelihood benefits, and be economically and ecologically sustainable. Although the storage strategy was particularly high quality, households did not utilize a large number of these practices mostly due to household space limitations. Households were found to focus their storage practices on goods, which were necessary for survival, such as food, forest products, water and money. Enhancing

Forest products stored at households



storage techniques to ensure more space effective practices would increase the amount and further diversify the goods stored in households.

One particular method of enhancing storage techniques is to build household infrastructure to organize stored goods. For example, households often would store goods on porches or in specific rooms of their house, by building shelving or more efficient storage units, households would be able to store these products more efficiently, enabling them to store a greater amount of goods.

Alternatively, many households did not possess a shed or barn, building a small structure near the household to store forest products or food would also increase the space available to store goods. Finally, more appropriate food storing techniques could be utilized in households, which would enable households to diversify the food they were storing. For example, canning or packaging methods could be introduced to households.

Water scarcity, in particular, will be a climate change impact felt by a large portion of Nepali communities. Therefore, water storage techniques will be an important to develop. Water storage will be addressed in more details in the future hazards portion of this report but generally households will need to build more efficient ways to store water, whether it is through rooftop or pond rainfall collection, groundwater collection, or surface runoff accumulation. These practices may also aid in reducing the vulnerability of landslides.

Diversification

Households used diversification practices most frequently. Diversification practices were found to be of varying quality and were also found to be practiced over a wide range of village livelihood sectors (e.g. diversifying crops, cooking mechanisms, forest products, and sources of

income). These practices also provide a substantial amount of livelihood benefits to households. Facilitating the exchange of information is especially important to expanding and creating more effective diversification practices. The more communication that occurs concerning these practices the more valuable and helpful they will be.

Especially important to agriculture-dependent communities is the diversification of various agricultural practices. Information should be exchange about the quality of agriculture crops, intercropping, and the storage and exchange of seeds. More specific adaptation practices will be addressed later in the recommendations sections. In addition, water diversification practices are important due to the vulnerability of water resources to villages. These practices may include various water storage techniques or the use of an assortment of water sources.

An extremely beneficial diversification strategy is practicing the diversification of adaptation strategies. This practice is especially important during times of crisis because it allows for alternative strategies to be used if one fails to succeed. More specifically, practicing a variety of adaptation strategies on a specific topic is extremely beneficial. For example, if households practice the diversification of food, storage of food, market exchanges practices of food, and the common pooling of food they will have the ability to use a variety of practices in case the use of one particular practice is hindered due to a crisis.

Mobility

Although household-level mobility practices are resource and time consuming, this particular practice allows households accessibility and maneuverability across geographic and time scales. Especially in terms of potential climate and environmental hazards, vulnerable communities must have mobility and accessibility to areas that are less prone to disasters.

In order to achieve greater local-level mobility needs, comprehensive road and transit plans must be put in place in coordination with the village, district, and regional levels. This particular initiative must be spearheaded by the national government, who is in charge of road construction and transportation planning. Local communities, in this case, play a crucial role in communicating transportation and mobility needs.

In order to understand local-level mobility needs, the Nepali government must conduct a comprehensive transit needs assessment, particularly focusing on equipping more vulnerable sectors of the population with increased capacity in mobility.

Common Pooling

Although common pooling was found to be a difficult practice to use in highly dispersed villages, it provides extremely important livelihood benefits and avoids the squandering of essential resources. Common pooling also advances other benefits such as enhancing community cohesion, decision making structures, and cooperation. These additional benefits can prove to be useful when villages are confronted with a crisis, and they are more likely to reduce equity issues within the community.

More specifically, with climate change impacts threatening to alter important natural resources,

common pooling natural resources allows villages to more efficiently manage these resources and provide benefits to a wide range of households. For example, our research finds that the common pooling of community forest was an extremely beneficial livelihood practice, especially because forest use was sustained by the use of a jointly created management plan. During a time of crisis, the collective management of these common pooled resources allows for the exchange of a larger quantity of options. The more diverse set of ideas generated by the collective body will most likely yield better quality decisions.

The common pooling of savings was found to be particularly useful. This is more thoroughly addressed in the market exchange recommendations below. In addition, the common pooling of labor was also found to be useful, especially in agriculture-dependent villages. This practice allowed for a more productive cropping season. Finally, the common pooling of water could be a practice implemented in many communities who do not have a surplus of water. Practices could both address water storage and irrigations methods.

Market Exchange

The type of market exchange practice that can be used highly depends on the location of the communities. For example, communities with high market access, whose lives are integrated with daily interactions with the market, will probably need to develop different market exchange practices than communities who have minimal access to the market.

One common theme identified across all three communities was the benefit of microfinance and insurance practices. Savings and credit systems make available small investment loans to poor households. These loans are extremely important to pursuing economic opportunities and also give households options when they are confronted with a crisis. In addition, microfinance institutions are often focused on women and marginalized groups in the community, which allow them to have more decision-making power in the household.

Many of these microfinance practices organize small savings groups and pursue training to support and encourage economic activities. In addition, these groups typically promote technical and savings skills, business planning, and basic accounting. They allow group members to develop capital, which they can use in the market during times of need and often allow households to avoid unethical loans from more wealthy community members who charge unreasonable interest rates. Finally, microfinance groups were also found to promote cooperation, community building, responsibility and trust. The communities and groups without access to these types of practices and institutions were often extremely marginalized and in turn were forced to use inequitable forms of market exchange practices.

In addition to savings and loan groups, insurance is also extremely important, as the impacts of climate change will become more severe. Climate change impacts on agriculture or water sources may cause detrimental shocks to villages. Insurance has been found to be beneficial in a variety of ways for village households. First, if agriculture production is destroyed due to climate change impacts, possessing insurance significantly minimizes the impact on their livelihoods. Second, households may fear the use of new technologies or adaptation practices introduced into communities; in order to ease this fear insurance can be included to offset risk.

Finally, although market exchange mechanisms used directly in the local market were found to be of a higher quality than more traditional practices, both types should be used as a complement to one another. Informal trading and exchange mechanisms can prove to be extremely beneficial during times of market failure or turmoil. The good's value is weighed with respect to each individual's need and the exchange of goods acts like a free market.

Additionally, more sustainable trading mechanisms can also prove to be beneficial and can often allow more efficient products to be created. For example, a household who has developed a more productive maize crop can exchange their maize for a household who has developed an effective production of beans. This process allows household to maximize on their relative strengths and receive better overall quality products. These sustainable trading practices may be more beneficial for communities which do not have direct access to markets, but could also be an alternative for market associated villages.

Potential Adaptation Practice for Nepal's Vulnerable Sectors

Water

The UNFCCC's background paper on impacts, vulnerability and climate change in Asia has identified water to be a vulnerable sector in Nepal. The UNFCCC provided general adaptation recommendations for the region specifically related to water. These include:

1. Establishing a modern water conservancy management system and strengthening the unified management and protection of water resources
2. Increasing the capacity of reservoirs and river dams (prevent floods, tapping water sources to increase water-supply capacity)
3. Enhancing the protection and building of ecosystems (restoring vegetation cover, preventing and controlling soil erosion and loss)
4. Collection of rainwater for domestic use
5. Develop flood-and drought-control management systems
6. Reduce future developments in flood plains
7. Use appropriate measures for protection against soil erosion
8. Conserve groundwater supply, water impoundments, and efficient water resource systems
9. Improve preparedness for water related natural disasters (UNFCCC Asian Background Paper)

Agriculture

Many Nepali villages are highly dependent on agriculture to support their livelihoods. Climate Change impacts are projected to change agricultural production in the middle hills area. Therefore, adaptation practices should focus on sustainable, resilient agriculture production. General adaptation practices related to agriculture listed from the UNFCCC are found below:

- 1) "Building up a water-saving agriculture and industry (popularizing water-saving irrigation, developing sprinkle irrigation and dripping irrigation, extending the use of water-saving facilities so as to increase water use efficiency)
- 2) Adjustment of the structure of agricultural production (introduce early-maturing crops with short growing period, selection and cultivation of new varieties)

- 3) Improve land cultivation management
- 4) Studies on new crop varieties, cultivation of alternative crop species
- 5) Set appropriate sowing and planting dates according to expected seasons
- 6) Adjust cropping calendar and crop rotation to deal with climatic variability and extremes
- 7) Develop and promote use of high-yielding varieties and sustainable technological applications (drought and saline tolerant varieties)” (UNFCC Asian Background Paper)

FORESTRY INSTITUTIONS AND ADAPTATION

Forests are one of the most critical resources to rural households in the Middle Hills. They are also highly susceptible to changes due to climate change. The following recommendations address critical information needs through new research, institutional capacity-building, and important adaptation practices to ensure that communities are well-prepared to cope with forest changes.

Future Research

Investigate expected forest type and cover changes at varying altitudes as a result of climate changes

Research into the expected impacts on different forest types will be instrumental in assisting DFO, DFO Rangepost, CFUGs, and Leasehold groups in managing their forests in an effective way. The expected impacts of climate change on forest ecosystems in the Middle Hills regions are not well-understood in Nepal. Impacts could be highly varied by altitude and North/South slope orientation.

A research program should model expected seasonal changes in precipitation and temperature and their impacts on the distribution and growth of dominant forest species throughout the Middle Hills region. Due to the Middle Hills topography, species will migrate up hillsides, but it important to understand where their migration paths may take them. If climate changes come too quickly, species may not have the ability to migrate to a new and suitable habitat. It may also be that species distributed at high elevations will disappear because they cannot migrate any higher. The loss of important tree species in a forest ecosystem has the ability to extensively thin forests and reduce forest biomass, which has cascading impacts throughout the community and ecosystem. Reduced biomass means less forest products, such as firewood, fodder, and leaf-bedding, as well as greater propensity for soil erosion, which can lead to landslides and detrimental impacts on hydrology.

Forests above settlements



Information gathered from this data can be transferred to DFO, DFO Rangepost, CFUG and Leasehold groups to incorporate into forest management plans. Since forest impacts also impact water resources and livelihood pursuits (i.e. fodder for livestock), these institutions, which tend to be highly connected, can transmit this information to institutions and households throughout the community for effective planning.

Account for Ecosystem Services provided by community and leasehold forests

Community and leasehold forests provide a number of positive externalities for which they are not compensated. Forests protect water resources, prevent floods and landslides, conserve soil, preserve biodiversity, store carbon, and regulate local climate. However, CFUGs and leasehold groups fail to capture and be adequately compensated for all of these benefits. For example, in Godawari, the community forest use group partly managed its forests to protect the watershed. However, the VDC laid claim to water resources within Godawari and trucked water from the community into Kathmandu every day. Godawari received neither compensation for the water resources themselves nor remuneration for preserving those watershed resources through effective forest management practices.

Research into forest ecosystem services in Middle Hills community and leasehold forests would help CFUGs and leasehold groups capture all the benefits associated with effective forest management. Our research has demonstrated that community and leasehold user groups can be effective conveyors of community resources to important adaptation projects. Thus, their ability to capture greater capital benefits allows those benefits to be spread throughout the community.

Institutional Capacity-Building

Implement a Community-Based Fire Management System

With global climate change, forest fires are one of the principle concerns in Nepal. Unfortunately, fire management is mostly contained to Kathmandu Valley with little support for rural communities. Most communities must address forest fires themselves, often with inadequate equipment and training. Our Riyale and Godawari sites both experienced forest fires for which they were inadequately prepared. It took them days and lots of hard labor to fully extinguish it. It also means that they have less forested land from which they can collect forest products.

Forest fires have the potential to grow in frequency and intensity as the non-monsoon season, especially March to May, become even drier. Forest fires have detrimental consequences for communities and forest ecosystems. They lead to a loss of timber and non-timber forest products, especially firewood and fodder, which households require for cooking, agriculture, and livestock rearing. These types of products can take a few years to accumulate after a forest fire takes place. Also, if native species do not require periodic fire management, it can make their regeneration difficult, which slows regeneration times or allows non-native species to encroach on the land. It also increases opportunities for soil erosion and altered hydrological regimes.

Nepal's Department of Forests should develop a community-based fire management system (CBFM), with CFUGs serving as the principle agents in fire prevention, management, and

suppression. CFUGs will need additional capacity-building from the DFO and Range-post Offices to accomplish this task. CFUGs should designate a group of individuals within the user group to direct fire response and management activities. These individuals would be trained and direct other community members in responding to forest fires. In addition, negligent behavior, such as smoking, and mismanagement are the leading cause of forest fires in Nepal. CFUGs should review safety and management protocols at the annual or biannual CFUG assembly meetings. They should also be taught in local schools. These measures should protect forests from small- to moderate-scale fires. Large-scale fires will require the assistance of DFO and DF-Range-post Office.

Manage forest ecosystems to reduce pine plantation forest and restore native species

The impacts of pine forests on ecosystems and communities have been well-documented since non-native pine planting began over twenty-five years ago. However, global climate change accentuates non-native pine forest impacts. Of particular concern are impacts on water resources and fire susceptibility. We received concern from our Dibdol community amongst others that pine forest absorbs more water resources than native species. With higher temperatures resulting in greater evapo-transpiration and with greater seasonal precipitation extremes, non-native pine forests could impact water resource availability within communities. Also, due to pine resins and necessary fire regimes for pine regeneration, non-native pine forests make forests more prone to forest fires. With the dry season expected to become drier, pine forests in Middle Hills region make important forest resources more susceptible to fire outbreaks.

Community, leasehold, and government forests with non-native pine plantations should build the restoration of native vegetation into their management plans. The DFO is critical in providing technical assistance in managing non-native pine forest for restoring native vegetation. Native vegetation plantings need to account for all the changes pine forests create, such as soil acidity and limited undergrowth, which means that technical assistance is necessary. Already, DFOs have been engaging in this work, but the Department of Forestry should necessitate training in this area and create a list of best practices. Outside organizations can be particularly helpful in supplying saplings and seeds. Harvesting pine timber can also bring revenue into community and leasehold forests user groups which enhance their ability to execute important community projects.

Forge connections for forest management across sectors and scales on climate change impacts and adaptation, especially regarding agricultural production and water resources

In most communities, forests and forest products have strong ties with agricultural production and watershed protection. The Department of Forests, Ministry of Water Resources, and Department of Agriculture should create cross-office partnerships to address climate change impacts and adaptation across sectors. These partnerships should not take place only at the national level, however. Partnerships between the District Forest Office, District Water Supply and Sewerage Office, District Irrigation Office, and District Agriculture Office as well as partnerships between CFUGs, Leasehold groups, Water User Groups, and community agricultural institutions should be forged. Communication, resource-sharing, and knowledge-creation between these departments will be vital to strengthening institutions and forging mutually-beneficial plans for addressing climate change impacts.

Integrating climate change data into forest management plans

DFO and DF-Range Post Offices should incorporate climate change-relevant data that they gather from the CFUG when constructing CFUG 5-year management plans. Information related to precipitation levels, relative temperature changes, changes in forest composition, and any natural disaster occurrences (i.e. forest fire, flood, and landslide) along with year of occurrence, need to be documented. In light of a national monitoring system, a verified, participatory approach should be developed to collecting as accurate data as possible. This information should complement the first climate change research recommendation – modeling forest change -- and inform changes in management practices.

Incorporating this information into the CFUG 5-year management plan requires CFUGs to evaluate their practices in light of present and future information about climate change impacts. At the very least, it will periodically remind communities of potential climate change impacts so they can be attentive to these impacts. A separate section in the management plan for “Climate Change Activities and Management Practices” would help DFO and CFUGs to explicitly think through the ways that they address climate change in the management plan.

Inclusive Process for Determining CFUG Community Projects

Our research has shown that CFUGs and leasehold groups can be important facilitators of climate change adaptation practices throughout the community. FECOFUN (Federal of Community Forest Users, Nepal) points out that revenue generated by CFUGs must be dispersed throughout the community in a particular way: 25% for forest management, 35% for poorest people in the community, and 40% for community development activities. While these distribution percentages attempt to account for community social disparities and preferences, it is important that each community has an inclusive process for determining community projects. A diverse CFUG committee, made up of different caste, gender, and socioeconomic status, is crucial for ensuring that CFUGs direct community funds towards projects that benefit all CFUG members equitably.

Creation of a FECOFUN Climate Change Committee to research legislative measures for climate change adaptation

As the voice for CFUGs in Nepal, FECOFUN should convene a Climate Change Committee, possibly made up of other non-governmental organizations as well, to investigate legislation, programs, and effective training measures for CFUGs. As the umbrella organization for most CFUGs, FECOFUN can have a powerful influence on local initiatives and domestic policy measures that help to prepare forest-dependent communities for climate change impacts.

Adaptation Practices

Create forest species nurseries to mitigate forest disasters, such as landslides and fires, and anticipated forest changes due to climate change

Since restoration and forest disaster mitigation is a growing role for CFUGs due to climate change, effective practices for executing restoration and mitigation attempts are necessary.

Community forest plant nurseries can be an effective way for CFUGs to restore native vegetation, begin planting new species that are expected to migrate into their community forest, and mitigate landslide and forest fires. Nurseries are a community-response mechanism when DFO resources or response-time is lacking. It also gives CFUGs the opportunity to experiment with different tree types, and allows CFUGs to diversify native tree species within the forest (pool risks across tree species). If common land cannot be found to establish a nursery, CFUGs may pay a local household with extra land to establish the nursery on their land and manage it.

Find alternative measures to relieve pressures on community forests

By not harvesting forest products, households decrease disturbances from trafficking through the forest and cultivating forest products that may be important for effective ecosystem function. Our three communities employed two main practices to reduce their reliance on forest products from community forests. First, some members of the communities had alternative fuels, including kerosene, biogas, LPG, and saw dust, that they used for cooking and heating purposes. However, most of these measures were cost-prohibitive. Even with government subsidies, households with biogas at one of our research sites needed to pay NRS 25,000 for a biogas plant to be installed. Additionally, kerosene and liquefied petroleum gas (LPG) fluctuate in price, which can keep households out of the market when prices are high. Public-private, public-collective, and/or collective-private partnerships should be formed to make these alternative fuels more affordable.

Second, households with private forest land can use forest products from their private forest to decrease pressure on community forests. Private forests give households the option of selling forest products in the market or using them for household use. It also allows them to grow beneficial species that may not be present in the community forest. Institutional support for private forest can come from CFUGs and the DFO. Programs that link trainings on creating and managing private forests with seed and sapling dispersal could encourage private forest plantings.

NATIONAL LEVEL RECOMMENDATIONS

Many of the potential hazards of climate change are not confined to the local level. Since Nepal is geographically vulnerable, the national government can undoubtedly play a crucial role in designing policies and plans that directly address some of these environmental risks.

Governance

Nepal's current environmental legislation and hazard response mechanisms are out-of-date. The nature of Nepal's national-level decision-making process facilitates bureaucratic layering, which in turn, hampers relief and aid processes in times of disaster.

Update Nepal's 1983 Natural Disaster Relief Act (NDRA)

Nepal's 1983 Natural Disaster Relief Act (NDRA) stipulates specific responsibilities for each level of government. This twenty-five year old document needs to be updated. This research has shown that the bulk of environmental hazards responses originate from the local level. Therefore, adding numerous layers to the decision-making process prohibits an effective and equal distribution of resources. Research has further shown that resources tied to increasing capacity for climate change adaptation are most effective if distributed at the local level. Therefore, the NDRA should be updated to give local-level authorities more power and responsibility when addressing environmental hazards.

Integrate local capacity-building into the 1996 National Action Plan

Nepal also has a National Action Plan (1996) that deals directly with the process of reacting to natural disasters. Again, the focus should be on how increasing local-level institutional capacity can strengthen a community's response to climate change, rather than centralizing decision-making power to the national level.

Table 10.1 Selected support agencies and types of assistance provided

Agencies	Status	Nature of Support
District Development Committee	Elected body	Activates Disaster Relief Committee and mobilize government resources following the disaster.
District Administration Office	Lead government office	Coordinates government offices including police and mobilize them as recommended by the Disaster Relief Committee.
District Irrigation Office	Government	Identifies water logging and submerged areas and keep its record. Also builds very limited drainage works. Undertakes river training activities.
District Drinking Water Supply Office	Government	Rehabilitation of the damaged drinking water supply system.
Municipality and Village Development Committees	Elected body	Re-construction and rehabilitation works within their jurisdiction.
Nepal Red Cross Society	INGO	Provides emergency and technical help with food, shelter, and clothes.
Action Aid, Oxfam, Lutheran World Service	INGO	Work with partner organizations for awareness and capacity build up for local people in the disaster prone area.
Water Users' Association	CBOs	Rehabilitation of damaged canals and irrigation management.
Nepal Food Corporation	Parastatal	Distribute food as per the quote of government.

Organizations that have a particularly integral role in addressing potential climate change impacts include the district and village-level government entities. These institutions have an inherent advantage for reaching local communities because of the nature of local governments.

Although the VDCs and DDCs are primarily focused on simple tasks such as citizenship registration and the dissemination of local government funds, local governments could exploit this existing relationship with local communities and influence their institutional and adaptation effectiveness.

More clearly define bureaucratic structure for response mechanisms to environmental stressors

Local governments are in a position to facilitate the creation of social networks and organizations that create community cohesion and support. Local governments are particularly strong in creating more institutions in the formal public sector and in creating partnerships to form civic organizations. Both of these institutional sections, as proven by this research, play a crucial role in determining the quality and quantity of community-level adaptation strategies. By expanding the reach of local government and in creating public-civic and public-private partnership regimes, communities would gain access to more capital, support, and organizational resources for bolstering their own institutions and adaptation strategies.

The district level governments, unlike the local-level, lack direct access to communities. Since the organizational structure of Nepal's democratic system stipulates a certain level of bureaucratic layering and redundancy, the full potential for district-level government to channel funds and coordinate initiatives has not been realized. District-level government entities facilitate communication and coordination between local-level and national-government levels. Since most of the funds for dealing with environmental hazards originate from the national level, districts play a crucial role in effectively and efficiently channeling such resources to the most vulnerable sectors of their constituency. Therefore, the varying roles performed by the village and district level governments are synergistic. Local governments facilitate direct interaction and access to vulnerable populations and district governments channel national resources to perform local level functions.

Recommendations for village-level and district-level governments in terms of facilitating better adaptation strategies and community structure mainly revolve around the need for efficiency and accountability. Efficiency is needed for the proper dissemination of resources and information, especially since Nepal does not possess a large supply of resources in the first place. Therefore, in order to be most effective in the use of funding that is devoted to building local institutions and adaptability, district and local-level governments must be streamlined to reduce administrative costs while retaining efficiency and administrative quality. Moreover, because resources go through so many different levels of government before reaching the populations most in need, there needs to be a system of "checks and balances" to ensure that these resources do eventually reach the most vulnerable. Hence, initiatives for bolstering local level institutions and adaptation must be accompanied by a more stringent monitoring of government accountability.

Lastly, governments can facilitate the formation of public-civic and public-private partnership that exploits the benefits of multiple governance sectors for additional resources. More available resources often translate into better institutions and adaptation practices. The government can then promote these hybrid institutions to more effectively address areas of need whilst receiving simultaneously receiving external support for bolstering these efforts. These hybrid institutions include the Nepal Food Corporation and Water Users' Association, which provide basic

infrastructure and services to communities with government-sponsored hybrid entities. This not only ensures a more effective way of governance and service-providing, but it also increases the level of accountability and resource-reach.

INTERNATIONAL INTERVENTIONS

Climate Change has become an extremely pressing globalized issue over the past fifteen years, with countries of all types participating in the climate change conversations. The United Nations Framework Convention for Climate Change (UNFCCC) began the thinking about potential ways the world could reduce climate change impacts by either developing innovations for mitigation and adaptation. The UNFCCC has three separate entities: the UNFCCC Secretariat; the negotiating countries; and the Subsidiary Bodies, who produce expert research and focus on specific UNFCCC entities (UNFCCC Essential Background).

The UNFCCC is a source of important information concerning both adaptation and mitigation. The issues that are important for Nepal are the UNFCCC's resources and information concerning both adaptation and alternative mechanisms for carbon mitigation. The most recent UNFCCC agreement focuses heavily on its commitment to adaptation, financing for least developed countries, and commitment to technology sharing.

The UNFCCC has dedicated massive amounts of time and energy to both listen to the concerns of vulnerable countries and to conduct research on adaptation to climate change. This important institution has developed a myriad of partnerships with other organizations working on the same topic. The UNFCCC acts as an important communication venue for information sharing and exchanging resources.

The Subsidiary Body for Implementation addresses a variety of issues including:

- 1) “Improving information on accessing existing funds for adaptation, including for the implementation of national adaptation programmes of action (NAPAs), through, inter alia, creating a web-based interface on funding on the UNFCCC website;
- 2) Enhancing access to existing funds for adaptation, including through integrating adaptation into development cooperation programmes to the extent feasible, disseminating information on modalities for access, and building capacity for the preparation of project proposals and for project implementation;
- 3) Enhancing national planning for adaptation, including through integrating adaptation into the planning process, disseminating information on, and building upon, lessons learned from the NAPA process, and drawing upon information in national communications from Parties and other relevant documents;
- 4) Promoting risk management approaches and other appropriate responses to the adverse effects of climate change, building upon the practical experience of international, regional and national organizations and the private sector, including through disseminating information on best practices and lessons learned.” (UNFCCC Implementing Adaptation)

Since Nepal is categorized as one of the most vulnerable countries to climate change, both in terms of the environment and in terms of population, the international community must recognize the need for external assistance for building infrastructure, facilitating more effective organizations, and in providing more resources for enhancing adaptation at the national and local levels.

Although at the time of writing Nepal has yet to publish its NAPA, this research has shown that funding adaptation and promoting effective institutional responses is complicated. Populations of Nepal generally have very little access to resources and information that may aid community-level adaptation.

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To: Mr. Eric Chu

From:

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Subject: Initial Study Approval for [HUM00020213]--**Two Year Approval**

SUBMISSION INFORMATION:

Study Title: Climate Change Adaptation & Rural Institutions in the Hindu Kush Himalaya: Towards Effective Governance of Forest-Dependent Communities

Full Study Title (if applicable):

Study eResearch ID: [HUM00020213](#)

Date of this Notification from IRB: 7/10/2008

Initial IRB Approval Date: 6/8/2008

Current IRB Approval Period: 6/8/2008 - 6/7/2010

Expiration Date: Approval for this expires at **11:59 p.m. on 6/7/2010**

UM Federalwide Assurance (FWA): FWA00004969 expiring on 4/18/2011

OHRP IRB Registration Number(s): IRB00000246

NOTICE OF IRB APPROVAL AND CONDITIONS:

The IRB Behavioral Sciences has reviewed and approved the study referenced above. The IRB determined that the proposed research conforms with applicable guidelines, State and federal regulations, and the University of Michigan's Federalwide Assurance (FWA) with the Department of Health and Human Services (HHS). You must conduct this study in accordance with the description and information provided in the approved application and associated documents.

APPROVAL PERIOD AND EXPIRATION:

The approval period for this study is listed above. **Note that this study has been granted a two year approval period as the research poses no more than minimal risk to subjects and there is no federal funding associated with this research effort.** If your funding source should change to include federal funding, please notify the IRB. Federally funded research must follow federal regulations, one of which is an approval period not to exceed one year. Please note the expiration date. If the approval lapses, you may not conduct work on this study until appropriate approval has been re-established, except as necessary to eliminate apparent immediate hazards to research subjects. Should the latter occur, you must notify the IRB Office as soon as possible.

IMPORTANT REMINDERS AND ADDITIONAL INFORMATION FOR INVESTIGATORS

APPROVED STUDY DOCUMENTS:

You must use any date-stamped versions of recruitment materials and informed consent

documents available in the eResearch workspace (referenced above). Date-stamped materials are available in the “Currently Approved Documents” section on the “Documents” tab.

RENEWAL/TERMINATION:

At least two months prior to the expiration date, you should submit a continuing review application either to renew or terminate the study. Failure to allow sufficient time for IRB review may result in a lapse of approval that may also affect any funding associated with the study.

AMENDMENTS:

All proposed changes to the study (e.g., personnel, procedures, or documents), must be approved in advance by the IRB through the amendment process, except as necessary to eliminate apparent immediate hazards to research subjects. Should the latter occur, you must notify the IRB Office as soon as possible.

AEs/ORIOs:

You must inform the IRB of all unanticipated events, adverse events (AEs), and other reportable information and occurrences (ORIOs). These include but are not limited to events and/or information that may have physical, psychological, social, legal, or economic impact on the research subjects or others.

Investigators and research staff are responsible for reporting information concerning the approved research to the IRB in a timely fashion, understanding and adhering to the reporting guidance (http://www.med.umich.edu/irbmed/ae_orio/index.htm), and not implementing any changes to the research without IRB approval of the change via an amendment submission. When changes are necessary to eliminate apparent immediate hazards to the subject, implement the change and report via an ORIO and/or amendment submission within 7 days after the action is taken. This includes all information with the potential to impact the risk or benefit assessments of the research.

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You can access the online forms for continuing review, amendments, and AEs/ORIOs in the eResearch workspace for this approved study (referenced above).

MORE INFORMATION:

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Co-chair, IRB Behavioral Sciences



"आजको आवश्यकता स्वच्छ वातावरण"

गोदावरी कुण्ड सामुदायिक वन उपभोक्ता समूह



पत्र संख्या:-
चलानी नं.

मिति.. June. 14. 08

विषय :- To whom It May concern:

we give permission to students of the School of Natural Resources & Environment at the University of Michigan to conduct research according to their objectives in our community Forest User Group area for Godawari Kunda Community Forest User Group. The data collected may be used for master's project Research purposes, publication & dissemination.

Sincerely,

CFUG Chairman

J. Prakash
की प्रकाश बहादुर मिश्रा



डिपडोल इटापु सामुदायिक वन उपभोक्ता समिति

नासिकास्थान-६, साँगा, काभ्रे

स्था: २०४८

पत्र संख्या:

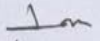
चलानी नं.:

मिति: 5 July, 2008

To whom it may concern:

We, the Dipdol Community Forest User Group, give permission to students at the School of Natural Resources and Environment at the University of Michigan to conduct research according to their objectives in our community forest user group area.

The data collected may be used for Master's Project research purposes, publication, and dissemination.


Sincerely,
C. Kamal Bahadur Bista
Chairman



निग्रे पाखा सामूदायिक वन उपभोक्ता समिति

रयाले-४

प. सं.
ब. न.

मिति - July 6, 2008

विषय- To Whom It May Concern,

We, the Riyale Community Forest User Group, give permission to students at the School of Natural Resources and Environment at the University of Michigan to conduct research according to their objectives in our community forest user group area. The data collected may be used for Master's Project research purposes, publication, and dissemination.

Sincerely,

Buddhi B. Tamang

Buddhi B. Tamang
CFUG Chairman

IFRI Related Questionnaire (Part I)

A. Site Overview

1. Name of district:
2. Name of VDC:
3. Name of site:
4. Dates of visit:
5. What are the names of the forest(s), settlement(s), and user group(s), for this site?
6. List the three most predominant ethnic groups/castes of this settlement.
7. Are there large variations in the slope and vegetation around the settlement?

B. Geographic & Local Information

1. What are the general climatic features of the region in which the settlement is located?
What watershed is this CF located in?
2. What is the latitude of this site?
3. What is the longitude of this site?
4. What is the elevation of this site?
5. What is (are) the local language(s) spoken by most people in this site?
6. What is the current standard wage labor rate per day in this site? For women? For men?
7. How do most residents of the settlement derive most of their basic income?
8. What is the topography of the land on which this forest is located?
9. **(Participatory map making)** Please draw a site overview map and include management boundaries.

D. Forest History

1. What is the name of the CF?
2. What is the size of the CF?
3. How many households use the CF?
4. Approximately how old is this forest?

5. Has the density of trees on the forest land changed in the past five years?
6. Was most of the vegetation in the forest planted, or is it a result of natural growth?
7. Was this forest originally planted? If yes, who planted this forest?
8. Is there an indigenous forest management system currently in place?
9. Describe the history of this forest.
10. Was there support/assistance if this forest system was planted? If yes, who was the supporter?
11. Has there been any reforestation/improvement project related to this forest? If yes, describe briefly who initiated it, when, and what was done.
12. Please list any plant species that were harvested from this forest approximately 5 years ago that are no longer available, and list the reasons for their disappearance.
13. What kind of silviculture operation system is applied in the CF? Has the transition into CF caused the disappearance of plant species?
14. How about wildlife? How has the composition of wildlife changed after the establishment of the CF?

E. Forest Settlement

1. What is the average elevation of the settlement?
2. What year did this settlement come into being?
3. How did this settlement come into existence?
4. What have been the **major changes** that the settlement has seen in the course of its existence (major changes with regard to population, economic activity, etc., as the result of war, droughts, disease, market price changes, development projects, changes of jurisdiction, etc.)? If yes, what do the local residents see as causes of these changes?
5. How has the number of households changed in the past 5 years? 10 years? 15 years?
6. What is the current population of this settlement in terms of households, nuclear families, and individuals?
8. Where is this market (in a village, town, etc.)?
9. **On average**, how frequently do most residents of the settlement go to a market?
10. How do most residents of the settlement travel to the market?.
11. On average, how long does it take a resident to **walk** to the market?

12. How far is an administrative center from the settlement?
13. How frequently do most residents of the settlement travel to the administrative center?
14. How do most residents of the settlement go to the administrative center?
15. In general, how frequently do most residents interact with government officials?
16. Describe the economic activities of most residents of this settlement and their dependence on the forest for inputs into their major activities
17. Is the settlement nucleated or dispersed?
18. On average, how many residents of the settlement reside in or very close to the forest(s) (within 5 km)? What is the average distance residents of the settlement live from the forest? How long on average does it take the residents of the settlement to reach the forest by **walking**?
19. What are other settlement-owned resources apart from the forest resource that are located in or close to the settlement and used regularly by settlement residents?
20. Is the settlement using other forests for product extraction?
21. Do any kind of local organizations exist that regulate the use of the other resources by settlement residents?

F. Forest products/species

1. What forest products/species are being harvested from this forest?
2. How are these products used by the group?
3. What are the seasonal variations regarding product harvesting?
4. What is the monetary value of each of these products?

IFRI Related Questionnaire (Part II)

G. Policy & Legislation Information

1. Are there, or have there been, any recent major policy shifts that affect the utilization of forests by local users? If yes, please describe.
2. Are any policies pending that may impact the Forest User Group/Forest Associations and/or other governance relationships? If yes, please describe.

H. Forest System Information

1. Has this forest been divided into forest management blocks? If yes, how many and what size?
2. Are the boundaries of these units related to ecological regions (such as catchment areas)?
3. Are any of these units permanently distinguished from others for special uses? If yes, please describe.
4. Is there a system of regeneration and harvesting that rotates through these units? If yes, please describe.
5. Who is the legal (de jure) owner of the land on which this forest is located?
6. Who is responsible (de facto) for the operational management of this forest? Is it the FUG?
7. What is the role of the Forest Department and/or District Forest Office vis-à-vis the FUG?
8. Does the legal owner of this forest also hold the rights to harvest all of the forest products from this forest?
9. Can the owner of the forest land sell all or part of the forest land to other individuals or groups?
10. During the last five years, has there been any change in the area over which vegetation exists/existed?
11. If the forest area has increased/decreased, what are the reasons for the increase/decrease in the area?
12. Are there points within the forest where the main flow of forest products can be controlled?
13. Does harvesting of one forest product interfere with the harvesting of other forest products?

I. Forest rules related to entry

1. What are the main management objectives for the CF?

2. If more than one group uses this forest, are rules for using this forest well defined between different groups? That is, are there rules that specify the actions that different groups follow? If yes, do the different groups generally follow the prescribed rules?

3. Are there different rules for different interest groups / stakeholders?

J. Rules related to maintaining and monitoring the forest

1. What types of penalties are imposed on users if they break maintenance or monitoring rule related to this forest the first time? How about the second time? How about if they break a maintenance or monitoring rule many times?

2. Who decides what kind of penalty is appropriate when a maintenance or monitoring rule about this forest is observed to be broken the first time? How about the second time? How about when a maintenance or monitoring rule is observed to be broken many times?

3. Are harvesters of forest products from different user groups readily observed by each other while harvesting?

4. If a cash fine is imposed, who collects the fine?

5. How is this cash fine used?

6. If penalties are imposed, what is the level of compliance by the users?

7. What types of records are kept concerning penalties imposed and compliance with them?

K. Forest User Group

1. When was this user group first formed?

2. What was the most important reason for forming this group?

3. Is the group's present structure the same as it was in the beginning?

4. How has the user group changed over time?

5. What is the nature of the user group? (Cooperative? For-profit? Non-profit? Family/clan?)

6. What is the number of individuals in the user group?

7. How many individuals in the user group, including adults and children, are female?

8. What is the number of households (as locally defined) in this group?

9. Approximately how many **households** (as locally defined) in this user group have members who work outside the settlement?

10. How many **individuals** in the user group work outside the settlement?

11. How many of these **individuals** are women?
12. How many of the **individuals** in the user group (men and women) are employed in full-time jobs?
13. Do members of the user group receive any type of assistance from family or friends who do not live locally?
14. Approximately how many types of animals are owned by the **individuals** in the entire user group?
15. Do other grazing areas exist in this site outside the forest(s) in this site?
16. During the past year, have individuals in this user group adopted any technologies that reduce their need for forest products? If yes, please describe.
17. Has any individual in this group acted as a leader (entrepreneur)—investing time, energy, and perhaps money—in trying to work out coordinated strategies within the group concerning maintenance, investment in upgrading the forest(s), or harvesting forest products? If yes, what types of activities are undertaken by this individual?
18. Name the ethnic groups in the user group and the number of individuals within each ethnic group.
19. Name the religious groups in the user group and the number of individuals within each religious group.
20. Name the castes (or other social hierarchy that is specific to the country) in the user group and the number of individuals in each caste.
21. How do individuals in the user group define wealth? Poverty?
22. Given the local definition of wealth, is there a great difference in wealth among households (as locally defined) in the user group? If yes, describe.
23. If yes, how many households (as locally defined) in the user group are usually regarded as being wealthy? How many households (as locally defined) are usually regarded as being poor?
24. How many individuals in the user group are literate?
25. How many **households** (as locally defined) in the user group own agricultural land?
26. How many **households** (as locally defined) in the user group own agricultural land, but the land is not sufficient to meet their subsistence food needs?
27. For how many months of a year do most **households** (as locally defined) in the user group consume their own food crops?
28. How many **households** (as locally defined) in the user group have surplus food?
29. What is the most frequent kind of house lived in by the user group?

30. What type of fuel do most individuals in the user group utilize for cooking?
31. During the last two years, have individuals in this group faced any issues that have engendered conflict within the user group? If yes, please describe the nature of this conflict.

H. FUG Relationship

1. On average, how far do the individuals in the user group live from this forest?
2. Have individuals in this group tried to limit usage of this forest by harvesting forest products from other communal or government forests? If yes, what kinds of other forests have been used more intensively so as to limit usage of this forest listed on the front of this form?
3. Are there other user groups who harvest from this forest? If yes, do these groups have use rights to harvest from this forest?
4. Describe how individuals in the user group interact with other groups using this forest.
5. What percentage of the user group's needs does this forest supply? (For fodder, firewood, housing timber, green manure, food, etc.?)
6. How do most individuals in the user group feel about the type of conservation measures adopted in relation to this forest?
7. Please comment on the user group's estimate of the most serious problems that they and those responsible for managing this forest are facing during the next five years.
8. Please comment on the user group's estimate of the greatest opportunities that they and those responsible for managing this forest are looking forward to during the next five years.
9. How many **individuals/households** in this user group depend significantly on this forest for their own subsistence?
10. How many **individuals/households** in this user group depend significantly on this forest for their family income arising from commercial activities?
11. How many **individuals** in the user group graze their animals in this forest?
12. Do the users think it is more advantageous to feed the animals inside this forest? Why?
13. Have individuals in this user group undertaken any of the following management or regeneration activities, and if so, how frequently? (Planted seedlings? Planted trees? Planted bushes? Built fences or other barriers to protect parts of the forest? Cleared undergrowth (burning or pulling)?)
14. What kinds of activities is the user group doing to improve the forest condition? What are specific planning mechanisms and procedures?

15. During the past year, have individuals in this user group undertaken any of the following activities? (Attempted to remove encroachments (e.g., vines, twigs, branches, etc.) from the forest? Created a nursery to distribute seedlings? Removed leaf or needle litter from the floor of the forest? Sought help from external authorities to improve vegetation growth? Reduced harvesting levels for medicinal plants?)

16. During the past year, have individuals in this user group invested in any of the following new technologies that improve the productivity of this forest? (Adopting improved bee-keeping techniques? Planting seedlings that alter species mix? Other technology for improving the productivity of the forest? Are there any other methods that the user group is following to protect, maintain, or improve the resources of the forest?)

17. Does this user group include the owner(s) of the forest (if privately owned)?

18. Are any individuals in this user group responsible for making rules about the forest?

19. Are there any individuals in this user group who do not participate in rule making for the forest? If yes, how would you describe these individuals who do not make rules? Are these individuals primarily from one religious group, one ethnic group, and one gender?

20. What are the cultural views of the individuals in this user group about this forest? In what ways do these views affect the use of this forest?

NEPAL CLIMATE CHANGE ADAPTATION QUESTIONNAIRE

*University of Michigan, School of Natural Resources & Environment
Project Himalaya*

Over the next 4 months, our research team will be creating and issuing a report. The report will be on climate change adaptation research and strategies for the Middle Hills in Nepal. We are very pleased that your organization has agreed to partner with us at the University of Michigan to ensure that our report addresses the specific issues that are most important to your organization. To facilitate this process, we would appreciate your feedback through this form. Please complete the form and return it to Mr. Eric Chu (erickchu@umich.edu) by December 31, 2008.

Organizational Name:

Programs/Projects at our organization related to Climate Change Adaptation include:

What areas of climate change adaptation would your organization be most interested in (Please check all that apply):

<u><i>MAINSTREAMING CLIMATE CHANGE ADAPTATION THROUGH DOMESTIC POLICY AND PROGRAMS</i></u>				
Poverty Reduction <input type="checkbox"/>	Forestry <input type="checkbox"/>	Agriculture <input type="checkbox"/>	Social Welfare <input type="checkbox"/>	Water <input type="checkbox"/>
<u><i>INTERNATIONAL INTERVENTION PROGRAMS</i></u>				
Carbon Credit Market and Emissions Trading <input type="checkbox"/>	Kyoto Protocol Mechanisms: Clean Development Mechanisms <input type="checkbox"/>	Joint Implementation <input type="checkbox"/>	Avoided Deforestation <input type="checkbox"/>	

Out of the preceding areas that you listed, which are three most important ones that your organization is interested in and how do they correspond to your current projects/research interests?

Top Areas of Interest	Current Projects/Research	Project/Research Description
1.)		
2.)		
3.)		

What resources would you suggest we look towards on Climate Change Adaptation in Nepal as we work on our Report?

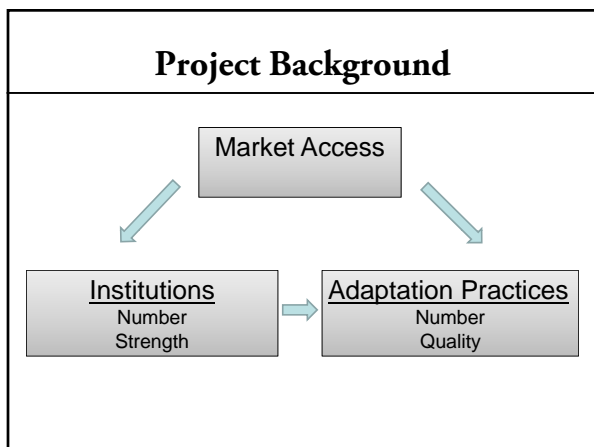
Institutions and Market Access as Determinants of the Effectiveness of Climate Change Adaptation Strategies:

The Case of Three Communities in the Middle Hills of Nepal

Dietrich Bouma, Eric Chu, Charlotte Mack, and Parvaiz Parry
Advisors: Arun Agrawal and Rosina Bierbaum

Outline

- Project Background
- Research Frameworks
- Case Studies
- Methodology
- Analysis
- Conclusion
- Recommendations



Why Nepal?

Indicator	Nepal	Ranking (179)
Population	29,519,114	40
Population density	184 ppl/km ²	56
Per Capita nominal GDP	\$377	167
HDI	0.534	142
GINI index	47.2	high
Unemployment Rate	46%	-
Poverty Rate (% pop < US\$1/day)	30.9%	-

Source: CIA World Factbook

Source: www.globetourist.com

Projected Climate Change Impacts

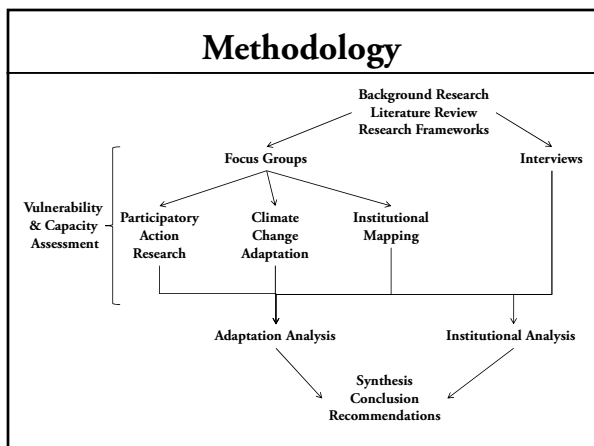
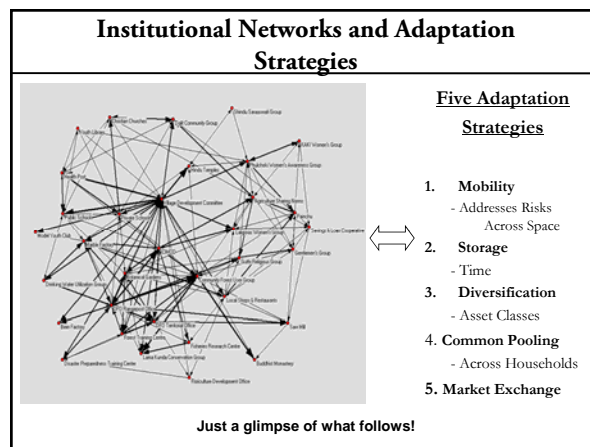
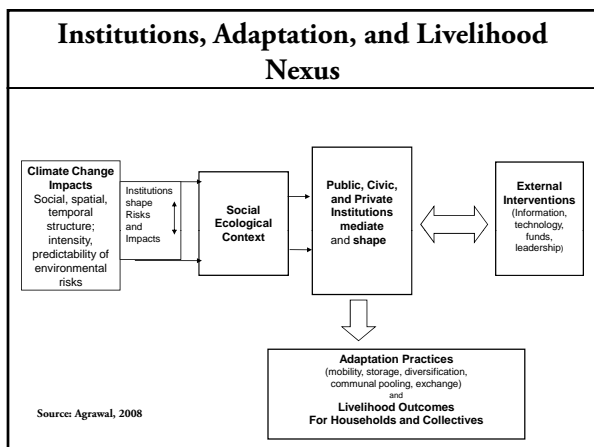
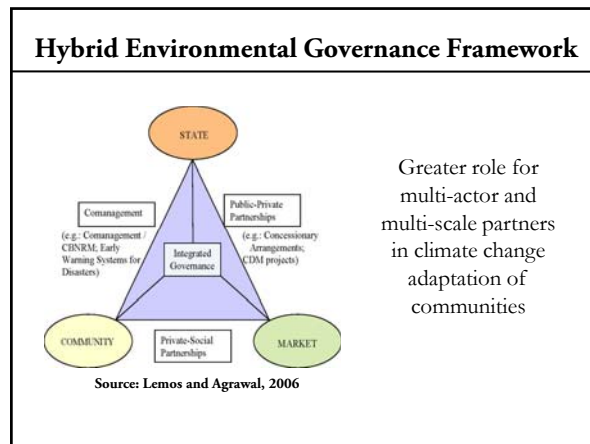
Projected Impacts	Vulnerable Sectors
Heat waves	Water Resources
Glacial Lake Floods	Agriculture
Flash Floods	Forestry
Plain Floods	Biodiversity
Malaria	Health
Temperature Change	
Japanese Encephalitis	
Water-Born Diseases	
Precipitation Change	
Water Scarcity, quality	

=

Source: USCSPP, 1997 & Nepal Case Study- NADA Workshop, 2003

Definitions

- **Vulnerability** = *f(exposure, sensitivity, adaptive capacity)* (Adger et al., 2003).
- **Resilience** is “the amount of change a system can undergo and still retain the same function and structure while maintaining options to develop” (Nelson et al., 2007).
- **Adaptation** is “the decision-making process and set of actions undertaken to maintain the capacity to deal with current/future predicted change or perturbations to a social-ecological system without undergoing significant changes in function, structural identity, or feedbacks of that system while maintaining the option to develop” (Nelson et al., 2007).
- **Institutions** are “humanly created formal and informal mechanisms that shape social and individual expectations, interactions, and behavior” (Ostrom, 1990).



Site Selection

Three sites of varying market access


Other criteria:

- presence of CFUG
- similar number of households


Criteria	Non-Market	Semi-Market	Market
Year-round access to paved road	0	1	1
Proximity to local market	1	1	1
Proximity to large market	0	1	2
Frequency of market visit	0	0	1
TOTAL	1	3	5

Year-round access to paved road: 0=No, 1=Yes.
 * Access to local market: 0=It takes more than 30 minutes to reach local market; 1=It takes less than 30 minutes.
 * Access to large market: 0=It takes more than 1 hour; 1=It takes 30 minutes to 1 hour; 2=It takes less than 30 minutes.
 * Frequency of market visit: 0=Non-daily; 1=Daily.


Survey Methods




Institutional Mapping



Adaptation Focus Groups



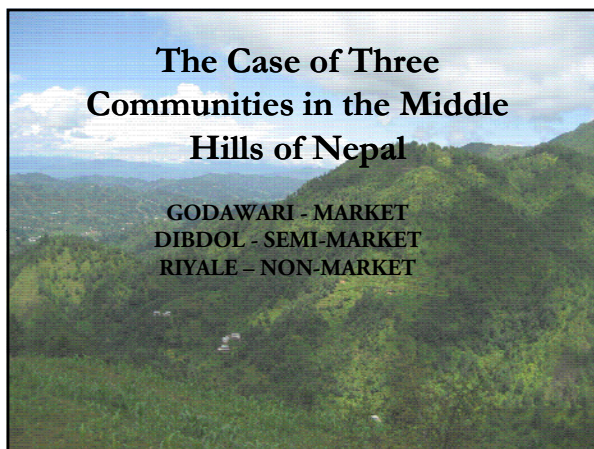
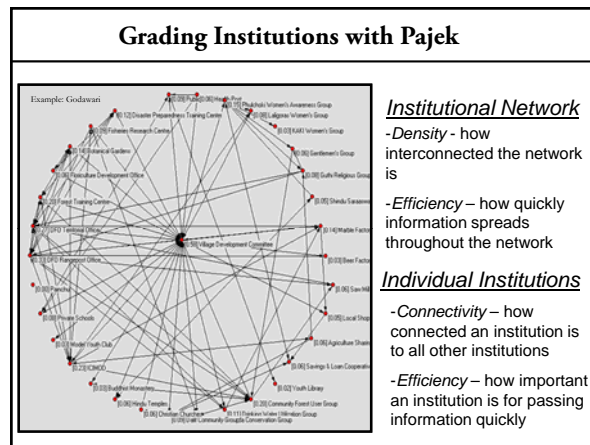
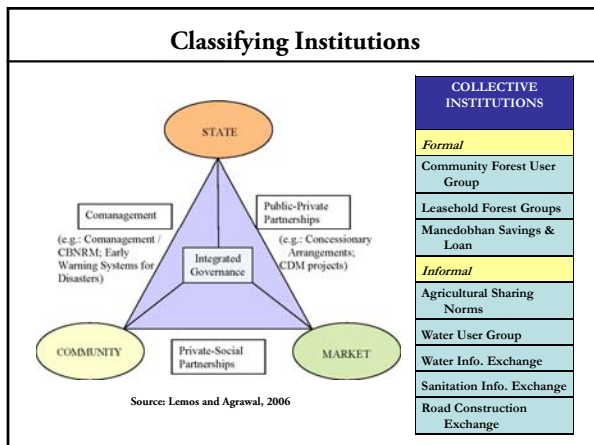
Participatory Action Research



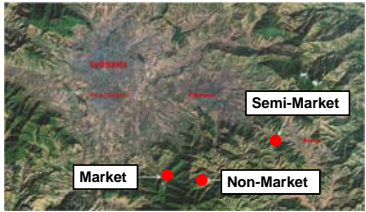
Interviews- IFRI Questionnaire

Data Analysis

	Equity	Sustainability	Livelihood Benefits	Total
Market Exchange				
1. Agricultural products for money	1	1	2	4
2. Forest products for money	1	1	1	3
3. Ag products for other ag products	2	2	2	6
4. Labor for money	1	1	2	4
Total	5	5	7	17
Grading Adaptation Strategies:				
Explanation of Numbering System				
Equity				
2 = Equity among <u>caste, gender, and income.</u>				
1 = Equity among one or two of the criteria.				
0 = No Equity				
Sustainability				
2 = Environmentally and economically sustainable.				
1 = Only sustainable under one criteria.				
0 = Neither environmentally or economically sustainable.				
Livelihoods Benefits				
2 = Large livelihood benefits				
1 = Some livelihood benefits				
0 = No livelihood benefits				
Diversification				
1. Income generation	1	2	2	5
2. Agricultural crops	1	2	2	5
3. Agricultural livestock	1	2	2	5
4. Forest Use	2	1	2	5
5. Fuel Sources	1	2	2	5
6. Food Sources	1	2	2	5
7. Waste Sources	1	2	2	5
Total	8	13	14	35
Mobility				
1. Improved road access	2	1	2	5
2. Within community to a higher location	1	0	1	2
3. Migration	0	1	2	3
4. Seasonal mobility	0	1	2	3
Total	3	3	7	13
Storage				
1. Fuel	2	2	2	6
2. Water	2	2	2	6
3. Food	2	2	2	6
4. Money	1	2	2	5
Total	7	8	8	23

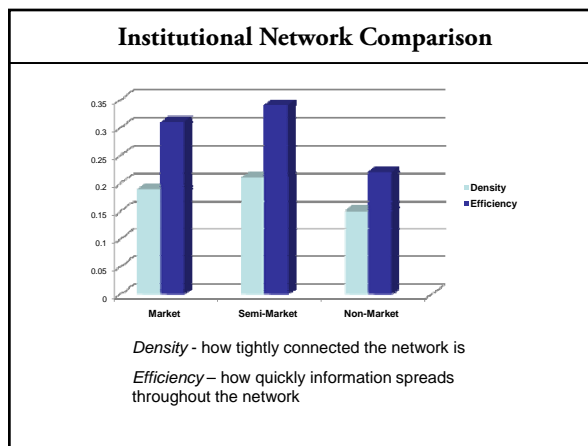
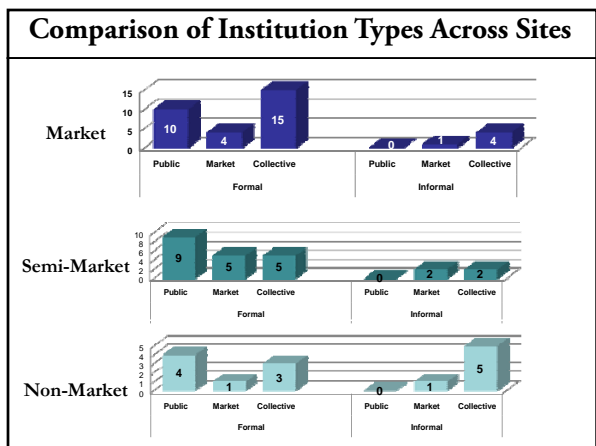
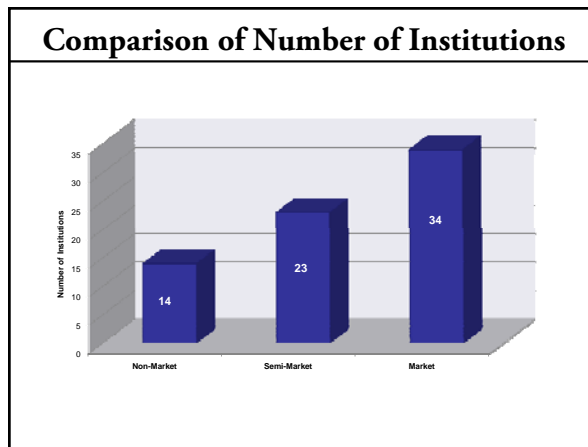
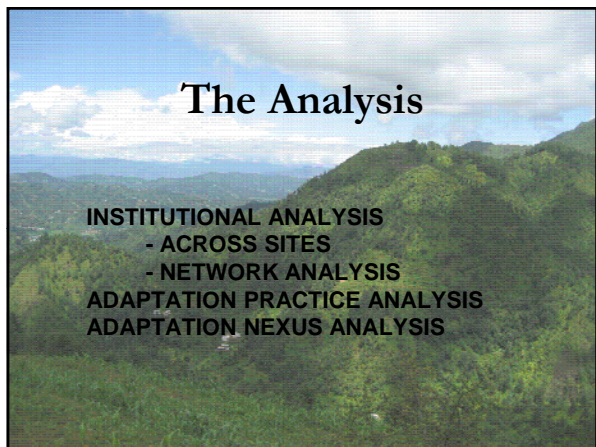
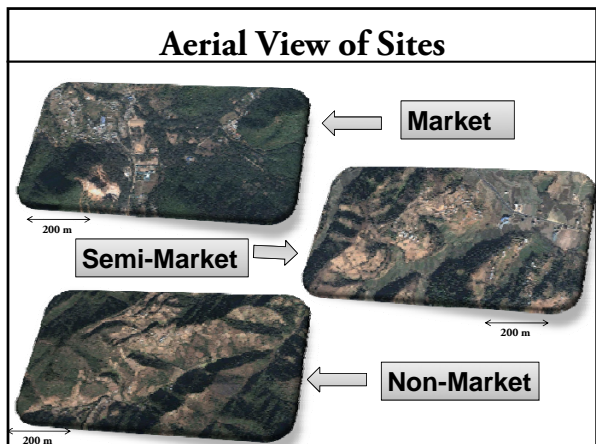


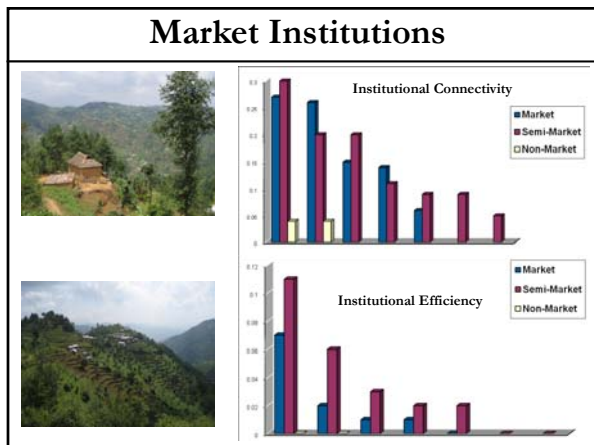
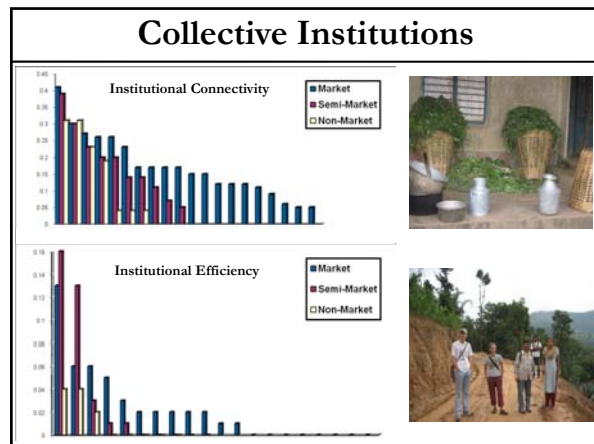
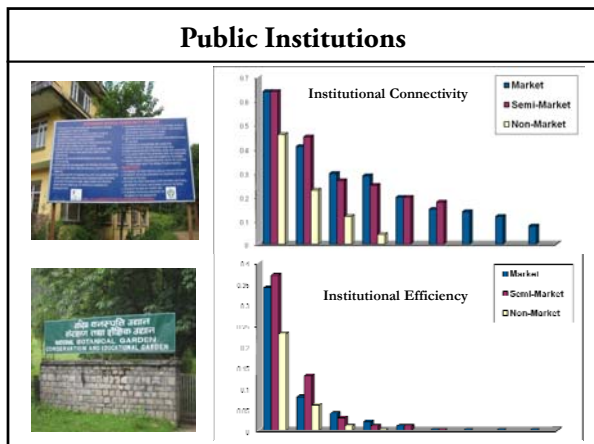
SITE



	Rivale Non-Market		Dibdol Semi-Market		Godawari Market	
District Name	Kavre		Kavre		Lalitpur	
VDC	Riyale		Nashikashim Sanga		Godawari	
Population	700		810		990	
Literacy Rate	~30%		~50%		~75%	
Daily Wage for Construction (r/day)	Men 120	Women 60	Men 200	Women 100	Men 300	Women 120
Major Castes	Brahmin/Chhetri, Tamang		Brahmin/Chhetri, Tamang; Dalit;		Brahmin/Chhetri, Tamang; Dalit	
# CFUG Households	115		135		120	

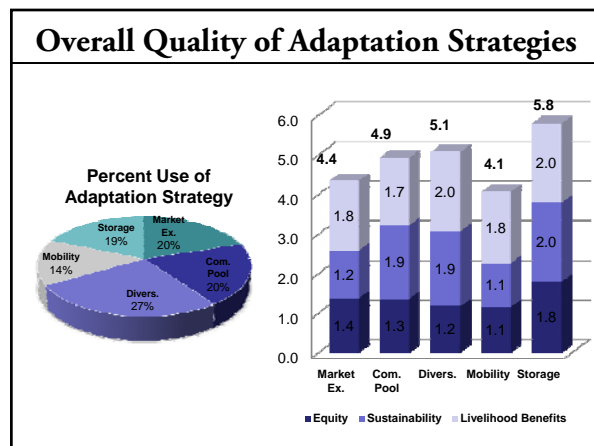
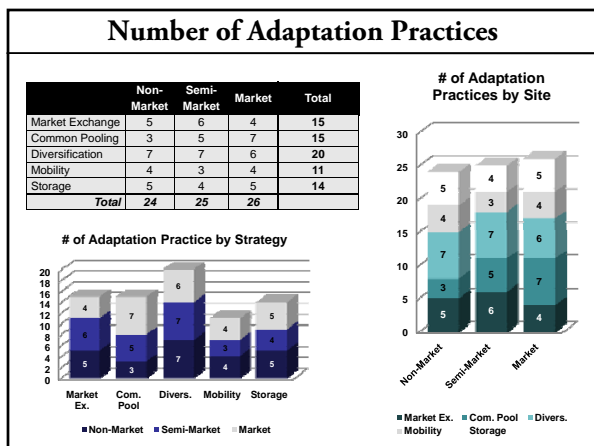
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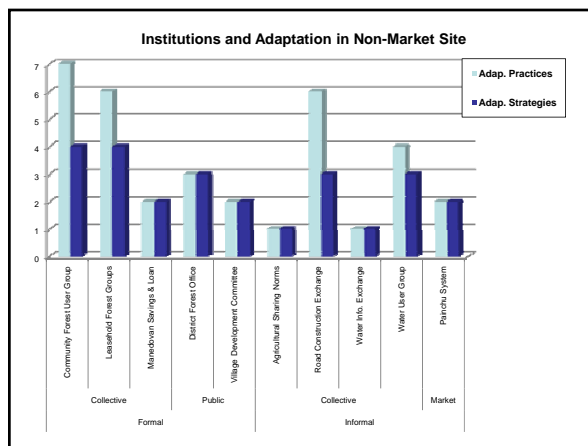
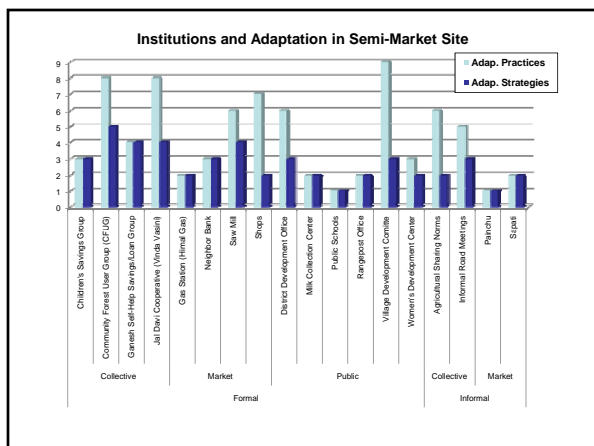
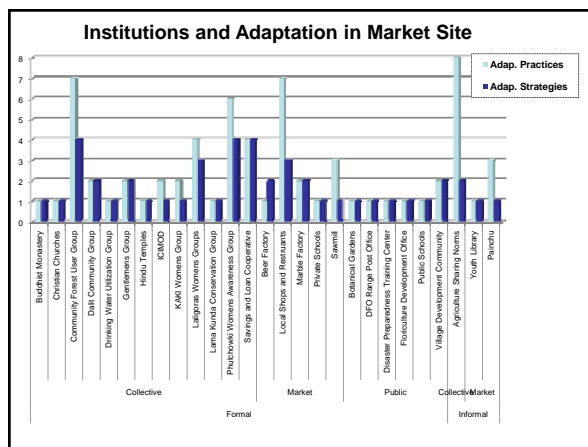
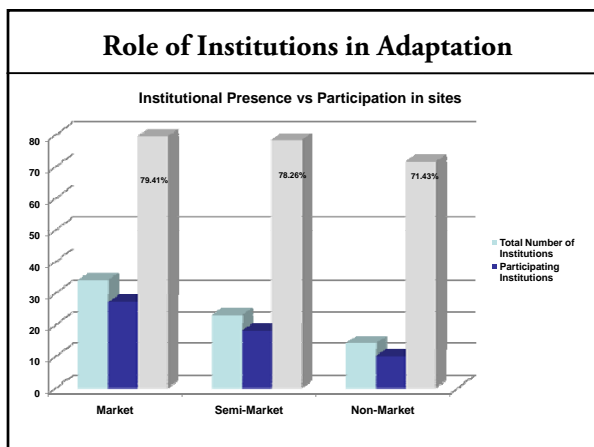
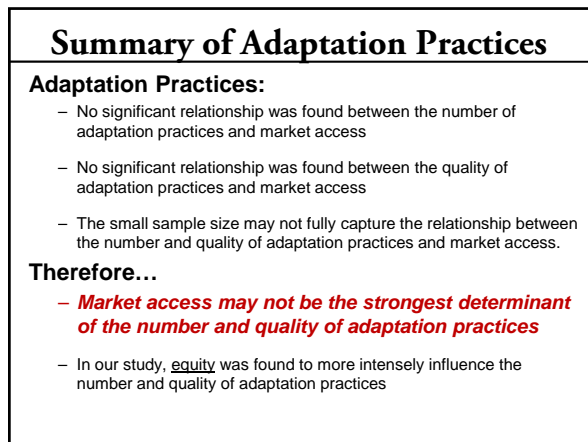
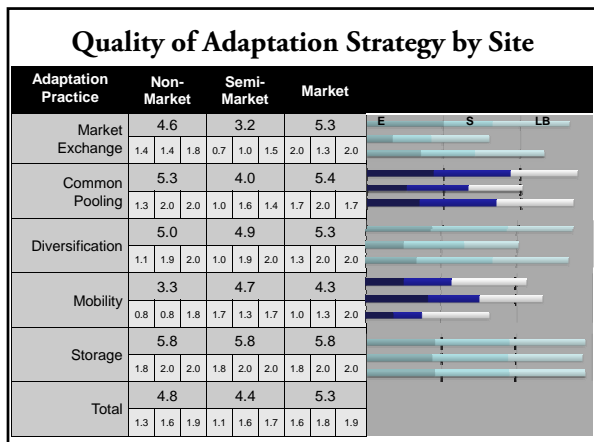


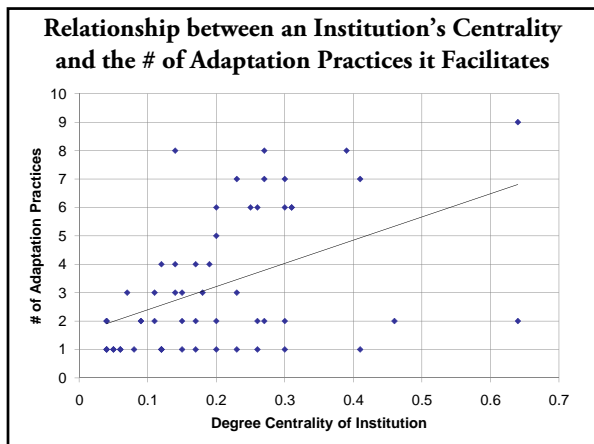


Summary of Institutional Comparison

- **Access to market** greatly affects number and type of institutions at a particular site.
- **Formal collective** and **formal public** institutions are two largest institutional groups in market and semi-market sites.
- There is little difference in institutional network density and efficiency between market and semi-market sites.
 - The largest difference is found in collective institutions.
 - Market access creates the necessary **capital** for a robust collective sector and greater access to public institutions.
- Overall, **public and collective institutions facilitate the greatest degree of information and resource dispersal.**
 - Most of those connections are within and between public and collective institutions.
 - Local government is the most important conveyor of information, resources, and decision-making throughout the communities.







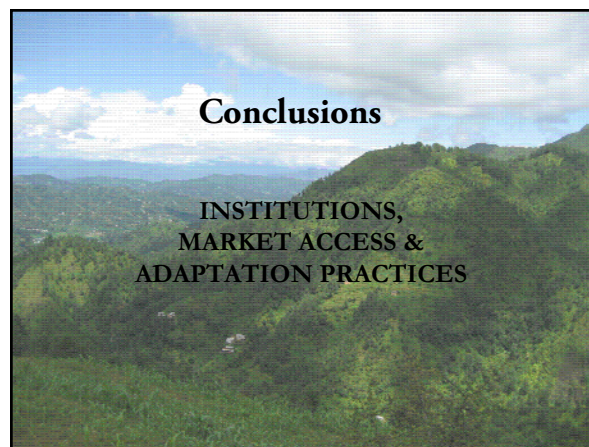
Identification of Focal Institutions

Criteria Used

1. Central location in the institutional network
 - Connectivity and Efficiency
2. Facilitates several adaptation practices

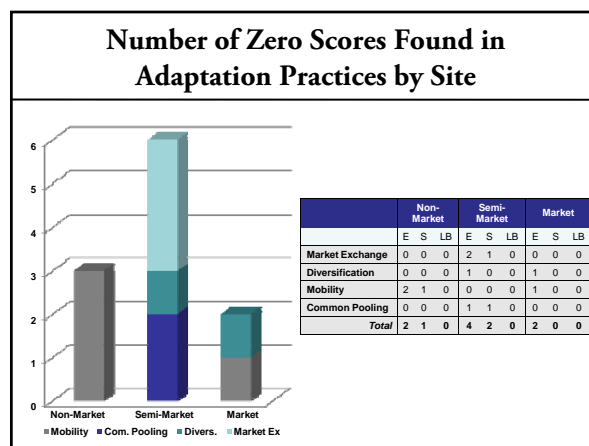
Correlating Centrality Score with Number of Adaptation Practices

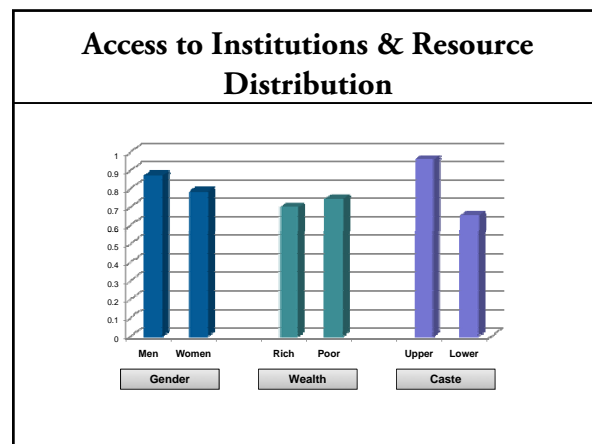
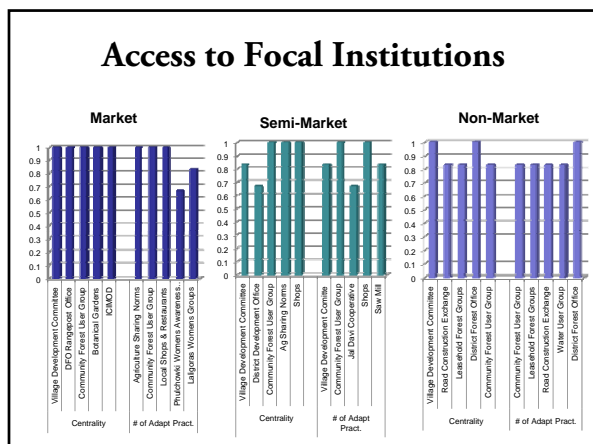
Institution	Centrality Score Ranking	Market	Institution	# of Adap. Pract. Ranking	
Village Development Committee	1	0.64	Agriculture Sharing Norms	1	8
DFO Rangepost Office	2	0.41	Community Forest User Group	2	7
Community Forest User Group	3	0.41	Local Shops and Restaurants	3	7
Botanical Gardens	4	0.30	Phukchowki Women's Awareness Grp.	4	6
ICIMOD	5	0.30	Lalgoras Women's Group	5	4
Semi-Market					
Village Development Committee	1	0.64	Village Development Committee	1	9
District Development Office	2	0.45	Community Forest User Group	2	8
Community Forest User Group	3	0.39	Jai Devi Cooperative	3	8
Air Sharing Norms	4	0.30	Shops	4	7
Shops	5	0.30	Saw Mill	5	6
Non-Market					
Village Development Committee	1	0.46	Community Forest User Group	1	7
Road Construction Exchange	2	0.31	Leasehold Forest Groups	2	6
Leasehold Forest Groups	3	0.31	Road Construction Exchange	3	6
District Forest Office	4	0.23	Water User Group	4	4
Community Forest User Group	5	0.23	District Forest Office	5	3



Concluding Observations

- This research showed a positive relationship between market access and the quality and quantity of institutions.
- There was no clear relationship between market accessibility and the quality and quantity of adaptation practices.
- All three sites did not solely rely on one specific adaptation strategy but diversified their use
 - Equity as a measurement of quality was found to more intensely influence the quality of adaptation practices
- Some key institutions seem to be facilitating good adaptation practices; but no conclusive trend was found between the centrality of a particular institution and the quantity of adaptation practices it facilitates.
- Two types Focal institutions were identified
 - 1) Those which were well-connected to other institutions and facilitated the transfer of resources, information, and decision making power
 - 2) Those which directly facilitated a large quantity of adaptation strategies





Household & Village Level

- **Increase Effectiveness of Community Groups**
 - Leadership
 - Guiding Rule & Principles
 - Committed Membership
 - Inclusion
- **Exchange of Information & Knowledge**
 - **Communication**
 - Intra-Community
 - Inter-Community
 - Inter-Institutions
 - External Institutions
 - NGO & Government
 - **Recording and Storing Information**
 - Information Leakage
 - Indigenous Knowledge
 - Common Storage & Access

Building Stronger Adaptation Practices

- **Storage**
 - Build **stable infrastructure** to support more storage practices
 - Develop **water storage** strategies
- **Diversification**
 - Increase the **diversification of microcredit**
 - Work with institutions to exchange knowledge on crop diversification
 - Hybrid
 - Crop rotation
 - Seek institutions to provide skill diversification
 - Lead to income generation diversification
- **Mobility**
 - Pave roads to increase market accessibility
 - Transportation needs assessment
- **Common Pooling**
 - Further develop savings and loans group
 - Embrace common pooling of natural resources / management plan
 - General community resources
 - Tools
 - Skills
- **Market Exchange**

Building Stronger Institutions

Identification of Focal Institutions

- Direct institutions - number of adaptation practices
- Indirect institutions - network centrality

Build institutional capacity through...

- financial opportunities,
- strong leadership,
- better training,
- **inclusion of all social groups**

Support

- Create connections between different institutional types (public, collective, market) and different scales (Forestry Office, District Forest Office and CFUG) for greater support
- Support the formation and longevity of focal institutions
 - Village Development Committee, Community Forest User Group, Cooperatives, and Local Shops

Regional/National Level Recommendations

Governance

- *Rid the bureaucratic layering of disaster response mechanisms* that are currently supported by the National Disaster Relief Act (1983). At the same time, *strengthening role of regional disaster relief committees* to coordinate response across a larger scale and to ensure efficient and effective distribution and use of relief resources.
- Create a *national action plan* for long-term water conservation and consumption.
- Create incentives for *boosting micro-finance opportunities*.
- Conduct a national environmental *vulnerability assessment* that includes an analysis of local response mechanisms.
- Increase rural accessibility.

Coordination

- *Increase coordination* between Nepal's climate change adaptation program and international efforts (integrate with international development organizations, NGOs, aid agencies, etc.).

