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Capitalizing on Assets: Vulnerability and Adaptation to Climate Change in Nepal

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Table of Contents

Abstract	5
1. Introduction.....	6
1.1. Case Study of Nepal.....	7
2. Study Area	9
3. Framework of the Study	10
3.1. External Factors	11
3.2. Endowments and Entitlements	11
3.2.1. Human Capital	12
3.2.2. Natural Capital.....	12
3.2.3. Physical Capital.....	13
3.2.4. Social Capital	14
3.2.5. Financial Capital	14
3.3. Institutions and Processes	14
4. Discussion.....	16
5. Conclusion.....	18
References	19
Figure 1. Vulnerability Framework.....	10

Abstract

Nepal's geographical landscape of plains, hills and mountains exposes it to severe climatic conditions. Out of the three regions, the plain, also called Terai, has the greatest risk of flooding, especially during the monsoon season when heavy precipitation coincides with snow and glacier melting from the mountains and hills. In recent years, greater water availability has increased the frequency of flooding, destroying farms, livestock, and infrastructure, hence, reducing agricultural productivity and disrupting economic activities. Considering Nepal's richness in water resources, its propensity to flood, the percentage of poor people living in the flood prone region, and their dependency on natural resources, this study seeks to examine the ability of the poor to adapt to climatic change. This study also explores the adaptive capacity of communities in the Koshi Tappu area, by examining whether or not they have the required capital assets (human, social, natural, physical, and financial capital) to remain resilient in the face of continues climate events impacts.

1. Introduction

Climate change is a source of concern to both developed and developing worlds in recent times. It has led to changes in temperature, precipitations and frequent extreme weather events. Evidence of extreme weather events is seen in the retreat of global glaciers, snow melting, excessive rainfall, flooding, drought, and cyclones, to mention but a few. According to the IPCC (2001), global snow cover has decreased by 10 percent, while thermal expansion of sea water, melted glaciers and ice sheets have increased the annual global mean sea level by 1 to 2mm. The IPCC warns that if this trend of temperature variation and global warming is sustained over thousands of years, it could result in sea level rise of up to 7m and an increase in the frequency of flooding. This growing concern has led developed countries to implement regulations and policies that offer early warning signs and back-up plans (stronger social safety nets, insurance and emergency evacuation units), to protect citizens and enhance their ability to recover from the impact of climatic events when they do occur. However, most developing countries simply do not have such regulations, the required funds to carry out large scale climate change adaptation initiatives, nor the technical ability to warn communities or implement back-up policies to cushion their shock after impact.

The most vulnerable groups are the poor in developing countries (Clark et al., 1998; Nicholls et al., 1999; Mirza, 2004; Tubiello and Fischer, 2007; DFID, 2004), where high levels of poverty, lack of social safety nets and access to education and healthcare have increased their vulnerability to climatic change. Even though everyone is potentially affected by climate change, the poor in the developing world are more likely to suffer a disproportionate share of the impacts of climate change induced extreme events. If the growth rate in fossil fuel consumption continues and no adaptation measures were implemented, by 2080, the number of additional people exposed to frequent flooding in the river delta areas such as the Nile, the Mekong, and Bangladesh, and from coastline cities of India, Japan, and the Philippines could be in hundreds of millions (Nicholls et al., 1999). Whereas, in drier parts of the World, approximately 135 million environmental refugees have been predicted for 2020 due to desertification, where sixty million are expected to be from Saharan Africa alone (FAO, 2007). According to World Bank, (2001) over 90% of the global poor population reside in developing countries, where their livelihood depends on agricultural activities. In the absence of regulations, policies, and institutions to protect them when extreme events strike, they are defenceless, insecure and exposed to risk, shocks and stress (Adger, 1999; 2003; Chambers, 1989).

Poor in the developing countries are deprived of their entitlements and necessities of life, and therefore, heavily depend on natural capital for sustenance (Scoones, 1998; IPCC, 2001; Adger, 2003;). While identifying the importance of entitlement, Sen (1984, pp.497) described it as a "set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces"; according to Devereux, (2001), the commodity referred to is their legal right, not their moral or human rights. However, as this right and opportunity to an alternative livelihood is denied, often, they are left with no housing, little or no education, skills, sustainable source of fuel or energy, basic infrastructure nor financial security/insurance and are then faced with the challenge of acquiring goods and services. Although deprived, most impoverished people try to devise a means of survival that would reduce risk, increase adaptability and minimise the irreversible loss of livelihood.

This is achieved through willingness to diversify into different areas of cultivation, livestock rearing, agricultural labouring, buying and selling. The strategy has sustained them in the past. Notwithstanding, with the emergence of climate change, these strategies face a major challenge because they are easily destroyed by climate induced extreme events such as floods, cyclones and droughts.

1.1. CASE STUDY OF NEPAL

Nepal's geographical landscape of plains, hills, and mountains (Mala, 2008), in addition to its numerous rivers and lakes, exposes it to severe climatic conditions and events such as floods. A review of the literature revealed that, the continued annual rises in temperature and increases in precipitation (Regmi and Adhikari, 2007; Lohani, 2007) are already having a significant impact on agricultural productivity and other economic related activities in the country (Mala, 2008; Regmi, 2007; Lohani, 2007; Yogacharya and Shrestha 1997) It also revealed that, out of the three regions in Nepal, the plain has the greatest risk of flooding especially during the monsoon season when heavy precipitation coincides with snow and glacier melting from the mountains and hills (Mala, 2008). Water from these events has sustained the lakes and rivers for years, but has sometimes caused lakes to burst their banks and flood the plain region, thereby destroying lives and properties (Rana et al., 2000; Mool et al., 2001; Agrawala et al., 2003, Lohani, 2007). In August 18, 2008, Koshi River broke its banks displacing millions of people. Around three million people were rendered homeless and over one million cattle were affected by the flood in India alone (Government of India, 2008).

Although Nepal is heavily endowed with rich natural resources, a diverse culture and a considerable population size of 27 million (Do and Iyer, 2007), it is one of the poorest countries in the world (ADB, 2008). Just like other developing countries, the poor in Nepal depend on agriculture and natural resources for their livelihood (Chhetry, 2002; Maltsoğlu and Taniguchi, 2004; Regmi and Adhikari, 2007; Mala, 2008; Lohani, 2007). However, these resources are vulnerable to climate change. . Impact of rising temperature on wheat and maize are expected to be negative (Kelkar and Bhadwal, 2007). Whereas, soil loss which is a major cause of decline in agriculture production in Nepal may be further aggravate by climate change.. Hence the agricultural sector is expected to experience a significant impact as climate induced floods, generated by excess water, continue to increase in frequency and magnitude. There has been a steady increase in climate induced extreme events in Nepal. From 1998 to 2002, floods and landslides affected families on the average of about 24, 264. In 2007, floods and landslides rendered more than half a million people food-insecure (IDMC, 2008). While in 2008, the Koshi River broke its banks displacing seventy thousand people in Nepal (OCHA, 2008) resulting in devastation for more than three million people living in north and east Bihar, India (Mishra, 2008; Government of India, 2008). It is estimated that approximately 29% of the country's total annual deaths and 43% of the total loss of properties by various disasters are water-induced (Khanal, 2005:181).

Considering Nepal's richness in water resources (over 6000 rivers), its propensity to flood, the percentage of poor people living in the flood prone region, and their dependency on natural resources and agricultural production for livelihood, this study seeks to examine whether the poor in Nepal have the necessary means to adapt to climatic change. Climate change may have already affected major river

basins such as the Karnali, Koshi, Gandaki and Bagmati basins in Nepal (Sharma and Shakya, 2006). The study will examine the livelihood of the impoverished people in the Koshi Tappu river floodplain and their ability to recover from losses after climate change induced events. The study argues that, the adaptive capacity of these people is dependent on their livelihood options and strategies, which is determined by a combination of external factors, endowment they possessed and their ability to use it to acquire entitlement, as well as the role played by different institutions.

2. Study Area

Koshi Tappu was originally a river floodplain of the Sapta Koshi River. Tappu is a derivative Sanskrit word of 'Tapu,' which means an isle. During the rainy season, it resembles an oceanic view of expanded water as if it was an island, which might be the reason why the area is called a 'Tappu' - an Island.

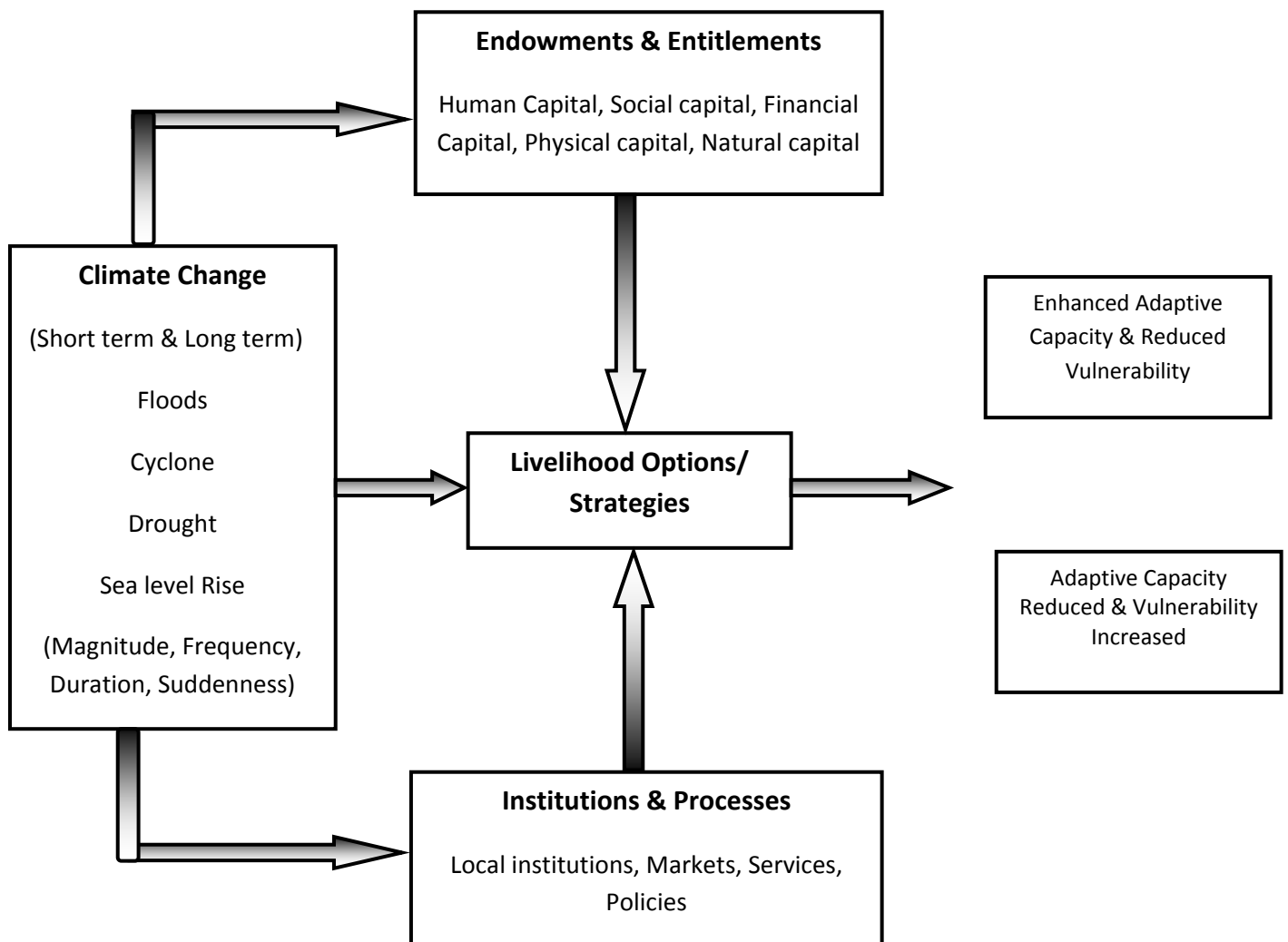
After the abolition of the Authoritarian Rana Regime in 1950, the main focus was the eradication of malaria from the sub-tropical Nepal Terai. Once the area was free of this epidemic, people moved in and settled wherever they felt was best. The migration tide to the area seemed to originate from different areas, particularly from the hills of the country and neighbouring India. Forests were cleared to make way for houses and agriculture. People eventually became dependent on the surrounding natural resources for their livelihood. Ever since then, the entire flood plain has been deemed the natural capital of the region. The Koshi Tappu Wetlands were created after the construction of the Koshi Barrage in 1962, in order to protect the downstream flood prone Indian Territory of Bihar. A giant river, fed by seven tributaries with a huge watershed area, was confined to an area of 175 sq miles.

The floodplain is surrounded by a dense population, comprising of a large number of poor people, who are illiterate and deprived of the state's obvious benefit. To the west is the Saptari district comprising Kamalpur, Odraha, Pipra-Purwa, Ghoganpur, Dharampur, Barmajhiya, Badgama, Bairwa and the Jagatpur Village Development Committees (VDCs). Likewise, the eastern part is bordered by the Sunsari district of Prakashpur, Madhuban, Kushaha (west), Laukahi, Shreepur and Haripur VDCs. In the north, there is the Udaypur district with the Tapeshwori VDC.

3. Framework of the Study

This study is based on the argument that the adaptive capacity of the poor depends on their endowments and entitlements and available institutions and processes as they shape livelihood options/strategies that poor often pursue in advent of climate induced extreme events and long term climate change (see figure 1). As adaptation outcomes depend upon the livelihood options/strategies that poor undertake, understanding poor's endowments and entitlements along with institutional hierarchies and processes surrounding them is crucial to better understand the vulnerabilities of poor to climate change and devise effective vulnerability reduction strategies. In addition to climatic factors, there are wide range of economic, socio-political, demographic, technological, and institutional factors that can affect the sensitivity of both physical and human systems and influence adaptive capacity (Smit and Pilifosova, 2001; Yohe and Tol, 2002). It also helps understand when recovery effort should cease and livelihood building start aftermath of climate induced extreme events.

Figure 1. Vulnerability Framework



3.1. EXTERNAL FACTORS

Vulnerability has two sides: external and internal. The external side includes risks, shocks, and stress to which an individual or household are subjected, whereas internal side mainly constitute lack of means to cope without damaging loss (Chambers, 1989). The temporal properties such as frequency, magnitude, duration, and suddenness of extreme climatic events, which constitutes external side of vulnerabilities, significantly influence adaptive capacity of individual or household. The aforementioned temporal properties determine the extent of damage inflicted. For example, extended extreme events are likely to inflict greater damage compared to the shorter ones. Whereas compared to extreme events that take long time to form, sudden events with the high speed of onset causes more damage. It does not provide any opportunities for “preventative” forms of adaptation (Smithers and Smit, 1997).

Due to its geographic location, especially the flat land called the “Terai”, Nepal is exposed to increased climate change induced events. However, the short and long time impacts are dependent on the frequency of occurrences, as well as the magnitude, and duration of the events. The complexity of the geography and the seasonality in rainfall are combinations that increase Nepal’s tendency to suffer extreme climate events. Flash floods, floods due to glacier outburst, landslide dam outburst and floods caused by rapid snow and ice melt are common external factors that frequently affect the population’s livelihood (CIMOD, 2008; Mala, 2008; Lohani, 2007; Regmi, 2007). It is expected that the suddenness, frequency and magnitude of these events will increase with continued climatic change; and will destroy properties and the livelihood of the poor who are most vulnerable. The magnitude of short and the long term impacts of these external factors, however, depend on the people’s livelihood, which in turn, determines their resilience. In addition to its impact on livelihood, external factors also directly affect other capital assets of the people and institutions, which in turn, directly affect their livelihood. For example, flash floods destroy farmlands and livestock (physical capital), or decimate forests, causing soil erosion, reducing fish stocks (natural capital), destroying hydropower plant and dams (Institutional services) and polluting drinking water. Therefore, understanding the impact of external factors such as floods on endowment and institutions are crucial to the understanding of livelihood options available to them and their ability to adapt and remain resilience after accumulated impacts from external factors. This can only be achieved through analysis of capital assets differentials of the people and institutions that affect them.

3.2. ENDOWMENTS AND ENTITLEMENTS

Endowments and entitlements are important resources required by every society or group to enable them achieve a sustainable livelihood (Scoones, 1998, Osbahr, Twyman, et al., 2008). Endowment is a combination of all resources legally owned by a person that conform to established norms and practices. Entitlement is a set of all possible combinations of goods and services that can be legally obtained by a person using endowment. This includes capital assets of individuals, households, communities, or groups, such as human, physical, natural, financial and social capital.

Since capital assets play a crucial role in determining the livelihood options available for adaptation, we focused on the endowments held by the people of Koshi Tappu in Nepal, and their ability to achieve a

sustainable livelihood that will enhance their adaptive capacity and resilience in the face of increasing climate change threat.

3.2.1. Human Capital

Human capital refers to the level of education and productive skills of the people. It is vital to every society and enhances human capabilities. A good level of education will increase available livelihood options and enhance adaptive capacity. Human capital is described as “the acquired and useful abilities of all the inhabitants” of a place (Smith and Skinner, 1982:69). It includes knowledge, skills, competencies and attributes embodied in people that facilitate creation of personal, social and economic well-being; as well as motivation, behaviour, physical and emotional attributes and mental health (OECD, 2001; Sen, 1997). Along with range of other things such as the availability and distribution of resources across the population; the structure of critical institutions; decision-makers’ ability to manage information; the public's perception of the significance of exposure, implementation of effective adaptation options also depends on the stock of human and social capital (Smit et al., 2001). It is central to planning livelihood strategies; therefore we also examined the level of education and skills of these people through our survey.

The survey shows that only 25% of our participants are educated, 44.72% can read and write. These data reflect the composition of Nepal, where only 44.65% of the population have basic education, 18% are considered to be educated, while 37% are illiterate. Based on these intellectual assets, employment is centred mostly on agricultural activities where, over 66% of participants are land-owning farmers, 21% are farm labourers who do not own land, while 3.25% are traditional fishermen. Students, who hail from agro-based families, make up 24.37% of the population, whereas 6% have jobs outside agriculture (teaching and other government jobs).

3.2.2. Natural Capital

Natural capital refers to natural resources such as soil, water, air, fish, forest and environmental services, like the hydrological cycle, pollution sinks from which resources flow and the services used for livelihoods are developed (Scoones, 1998). A high percentage of rural dwellers – such as those in the Koshi Tappu area of Nepal- rely mainly on natural resources for their livelihood. Therefore, continued sustenance from these natural resources is vital to their livelihood strategies and adaptation. The ability of this natural base to maintain its productivity -even after an impact from a climate ‘shock’ - is important. In Nepal, in particular, a significant percentage of the population depends on firewood collected from the forest and farmlands for fuel, soil fertility for agricultural cultivation, water from the surroundings for irrigation and fishing for food and funds. This study looked at the various natural resource bases available to the people and examined the ability to protect these resources from irreversible depletion after a climate change induced impact.

The survey showed that the resources obtained from their surroundings include wood fuel for cooking and reed grasses for roofing and fencing. Logs were collected from the forest and during the rainy season, from the flowing river. Around 32% of the population are self-sufficient and able to fulfil their requirement of wood from their own farmlands. Nearly half of the population, 41.58%, clearly expressed their dependency on, and desire for, utilisation of the natural resources of the flood plain. The area has

some community forests both inside and out of the declared buffer zone that is looked after by the locals. About 15% of the population buy wood for fuel from these community forests at subsidised rates. Approximately 11.23% of the population buy logs from elsewhere. Most house roofs across the region are made of tall grass, availed from the restricted area of the flood plain. The requirement for the reed grass is also high because of its multiple uses. Primarily, people need it to thatch their house every year before the start of the monsoon rain. It is also used for fencing their compound and for cooking.

Our survey showed that 13.11% do not need thatching grass as their houses are made of solid (concrete or asbestos) roofs. However, it was revealed that 26.22% people do not have grass as they do not wish to collect it from the flood plain.

The Wildlife Reserve in Koshi Tappu has been a point of conflict between the people and the government. Whether general public or conservationists, people have long been harbouring grievances about the Reserve (the area protected to shelter the Asiatic Wild Buffalo, *Bubalus bubalus*) ever since it was declared a Wildlife Reserve in 1976. The people were barred from constantly harvesting the natural resources previously available to them. In addition, people were often angry that wild animals from the Reserve raided their crops. The survey also shows that over 82% endured wild animals entering their crop fields, while 97% have their domestic animals barred from grazing inside the reserved area. In the event that the Reserve officials find domestic animals inside the protected area, the owners are unfairly penalized.

3.2.3. Physical Capital

In order to engage in effective productivity, people need physical capital, namely assets such as land, other forms of infrastructure, livestock, cash/savings and machinery (Scoones, 1998; Remi and Adhikari, 2007) used in production. A society, family, group or person with limited or no physical capital, is at risk of non-productiveness which is likely to affect their livelihood. For the people of Nepal to develop a livelihood strategy that would enhance their adaptive capacity, they need physical capital. The farmers need farmland for agricultural production, grazing of livestock and wood for cooking, along with cash and savings to be able to fall back on after a disaster, enabling them to replace what has been lost. Physical capital allows people to develop livelihood strategies that improve their resilience. But, do these people have enough physical capital to pursue livelihood strategies that could help them adapt to climatic change in the face of a sudden and increased frequency of floods?

Our survey revealed that, in terms of physical capital, the people own farmlands of different sizes, which are mostly transferred from generation to generation, hence the land size reduces as it is passed down to subsequent heirs. This group constitutes over 16% of land owners, while 19% possessed no land. 40.47% are small farmers and 14% are land owners with a considerable size of property ownership.

Livestock ownership and size also reflects the social status of a person or family. In the area of study, people who own cattle and larger livestock are considered to be rich and those who own goats and smaller animals considered to be poor. The more large animals they own, the more respect they command from the community. 4% own large animals, 10% possess no livestock, 76.83% of the population have 1 to 15 domestic animals and 9% of the population own 16 to 30 domestic animals.

3.2.4. Social Capital

In pursuing different livelihood strategies, people, groups, communities and families draw from the resources available to them, through their association with others, clubs, networks and affiliations. Adaptation is a social process that requires collective action and social capital provides such an opportunity according to Adger, (2003). It enables the society to effectively interact with other capital assets and appropriate institutions, like the state, civil societies and financial institutions that can help formulate livelihood strategies that would enhance their ability to cope with extreme weather conditions (Bebbington, 1999; Adger, 2003). Through association and relationships, communities could learn from each other and review past and present strategies and adaptation processes that could lead to better resilience.

The composition of the different ethnic groups in the Koshi Tappu region revealed the kind of social interactions among the people. Inhabitants who migrated to the area and have been living there for generations represent about 78%. Those who have been living there on permanent basis for less than 35 years were 13.82%, while 8.13% declined giving information about their immigration status. Among the tribes that dominated the demography, 26.02% are Tharu, 10.57% Yadav, 9.76% Dusadh and Musahar, and 9.76% are Muslim. The Brahmins (Hilly and Madhesh), Newar and Rai & Limbu were found to be better educated. Tharus and Yadavs are the local owners of agriculture farms and livestock of various size and scale. Most Dusadh and Musahar do not have any animals and represent a greater percentage of the illiterate population.

3.2.5. Financial Capital

Financial capital plays a very important role in determining livelihood options and strategies available to the people (Hoff, et al., 2005; Hammill, et al., 2008; Dowla, 2006; GMF, 2008; Islam, 2008). It also pulls together other forms of capital assets (human capital, natural capital, social capital) needed for a successful livelihood strategy in climate high risk areas of developing countries. Therefore, access to formal financial services from banks, and microfinance industry (microcredit, micro insurance and micro savings) improve adaptive capacity, and reduce the vulnerability of the poor to climate induced extreme events (Hoff, et al., 2005; Hammill, et al., 2008; Dawla, 2006).

Government reserves, commercial and non-commercial insurance, contingent credit and catastrophe bonds that will ensure capital availability for relief and recovery after climate events impact are necessary requirement for better livelihood options and adaptation to climate change.

The survey shows that, like most developing countries, the poor in Koshi Tappu floodplain have no government supported insurance team and other microfinance services, and cannot independently finance measures that would deal with the sudden-onset of climate related events.

3.3. INSTITUTIONS AND PROCESSES

The livelihood strategies of the people also depend on the activities of other institutions. These activities include the laws, rules, regulations, services and policies upheld by the State, private sector, civil society organizations, the markets and agencies at local, national and international level. The activities of these

institutions determine the livelihood strategy of the poor so much so, that their adaptive capacity greatly depends upon the impact created by institutions on the environment in which they live. The survey shows that, like most developing countries, the poor in this area are excluded from major decision processes that concern them. They lack infrastructural development and face strong State restrictions on the natural resources in their surroundings. For example, the Kushi Tappu Wildlife Reserve, in an attempt to protect the reserve's natural resources, people and their livestock were banned from accessing the protected areas. However, animals from the reserve are able to raid crops on small farmlands every year. This encroachment by wild animals into farmlands affects productivity to such an extent that the accumulated effect of a climate change related flood may lead to complete devastation and probably to an irrecoverable situation.

The survey shows the absence of critical institutional services in this area. Their literacy level is low; they lack financial security and insurance. This could be due to the shortage of schools, or a lack of finance for families to sponsor their children through education and State supported financial services. They also face unemployment, low skills and health related issues. Combining these problems with the destruction resulting from floods would affect their livelihood and ability to recover from losses.

4. Discussion

The results of this survey suggest that, the poor people in Koshi Tappu communities face various challenges that directly or indirectly affect their adaptive capacity. These challenges include, the: lack of capital assets, sudden displacement by flood and other climate change related events, and institutional barriers from the state, market and their likes. The livelihood options available to people along with the strategies already in place, determines their adaptive capacity and level of resilience in the face of climate impact. However, these people have limited livelihood options due to the direct impact caused by lack of capital assets, institutional barriers and the increase in the frequency, suddenness and magnitude of flooding in these areas. Limited livelihood options also mean limited strategies, which can lead to reduced adaptive capacity and increased vulnerability. The State, as an institution, has the mandate to formulate policies and regulations that govern the establishment and administration of resources needed for the livelihood of the poor in Nepal. It includes access to natural resources, the provision of education (schools and vocational training centres), land ownership, financial services assistance and freedom of association. This makes the State the most important institution for the poor. Every other actor has to work within the structure that the State has put in place to be able to help the poor. There is a need for the State to liaise with other institutions to offer people better livelihood options that will improve their adaptive capacity. This will involve adopting measures that will help the poor to diversify in their livelihood options and strategies, which in turn would increase adaptive capacity and reduce vulnerability. This can be achieved through policy formulation and action by State institutions and their allies thereby giving people access to capital assets (human, physical, natural, social and financial capital). Although the government of Nepal has put in place agencies such as the Department of Water Induced Disaster Prevention (DWIDP), Department of Soil Conservation and Watershed Management (DSCWM), and the Department of Hydrology and Metrology (DHM) - all with the mandate of distributing information and assisting in flood related issues (Moench and Dixit, 2004) - they can only make considerable impact where the targeted population has the required skills and knowledge to access such information. Adequate education and skills could increase their chance of accumulation and encourage the proper use of other forms of capital assets. For example, as their major source of income is agriculture, targeted educational programmes that will enable them to read and write can offer them the opportunity to access information on crops type, varieties of flood resistant seeds, advice on planting times, crop rotation and soil conservation (Bryan, et al., 2009). Specific programmes that can improve the literacy level of the people can also help them access other forms of building materials and use of technology for alternative source of energy that are more environmentally friendly. On the other hand, specific programmes that would allow payment of ecosystem can help save guide Nepal's natural resources and offer advice on improving standard construction methods, access to energy resources, provide more livelihood options, improve adaptability and reduced vulnerability.

The poor in the Koshi Tappu floodplain also lack financial service support and cannot independently finance measures that would compensate for the sudden-onset of floods. The absence of government supported insurance teams and microfinance services (microcredit, micro insurance, micro savings) in this high flood prone area, present a major challenge to the poor who are most vulnerable. There is a need for the government to liaise with both State and privately owned financial service providers, willing to

partner with the poor, and introduce financial service schemes, that would protect them from the direct impacts of climate induced events and also reduce their vulnerability. Financial service providers can partner with energy providers to develop sustainable, affordable and environmental friendly fuel sources using agricultural waste. A typical example is the work of Green Microfinance with Approtech Asia in Manila, Philippines; where they promote the conversion of agricultural waste into cooking fuel (briquette). This initiative encourages the use of renewable energy technology, reduces global warming and provides the poor with cleaner sources of energy (GMF, 2008). These initiatives can probably help farmers without collateral, to obtain loans (Dawla, 2006) and build trust; hence, improving social capital. Providing microcredit would allow them to exploit their capabilities for production, build assets and reduce vulnerability. Micro insurance would protect their assets against flooding, whilst, micro savings would give them access to lump sums of money to help them deal with both predictable and unpredictable expenses, and also re-investment after a climate extreme events. Financial service providers in Nepal can also initiate life skills training in literacy and health, financial management and entrepreneurial skills to further strengthen the ability of the poor to build and diversify assets and provide more livelihood strategies in the high flood risk area of the plain. The current lack of these services and the inability of the poor living in these areas to finance themselves have increased their vulnerability and reduced their adaptive capacity.

With the right support from government, civil societies, and international organizations, communities will be able to access the financial service sector - through partnership with both public and private financial service providers - and via the integration of a comprehensive climatic adaptation and disaster management system to provide support for livelihood adjustments for unexpected changes through social protection funds programmes, and microfinance schemes that would enable the poor diversify climate risk (Hoff et al., 2005; Hammill, et al., 2008).

5. Conclusion

As climate induced floods generated by excess water continue to have negative impacts on the people and economy of Nepal, the poor communities in the Koshi Tappu floodplain lack capital assets and other vital institutional support needed for climate change adaptation. Low levels of literacy, the ongoing depletion of natural resources; lack of land and livestock ownership; and inadequate financial services (in the form of microcredit, micro insurance and micro savings) limits their livelihood options and strategies. Therefore, there is a need to implement measures that would enhance capital asset accumulation, increase institutional support and the role of microfinance service providers. This can be achieved through policy formulation and action by the State to give the people access to capital assets. It is suggested that targeted literacy acquisition programmes, partnering with financial service providers in the public and the private sectors, integration of a comprehensive climatic adaptation and disaster management system and the payment of ecosystem services, will enable the poor build a capital base, offer them greater livelihood options, improve their adaptive capacity and resilience.

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