

Practice of Community Adaptation to Climate Change: A Case of Community Forestry User Groups of Nepal

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List of Abbreviation

| | |
|---------|---|
| CC: | Climate Change |
| CBFRM | Community based forest resource management |
| CBNRM | Community Based Natural Resource Management |
| DDC: | District Development Committee |
| CF | Community Forestry |
| CFUGs | Community Forest User Groups |
| DFID | Department for International Development of United Kingdoms |
| DFO | District Forest Officer |
| FUG | Forest User Group |
| FECOFUN | Federations of Community Forestry User Groups, Nepal |
| GHG: | Greenhouse Gas |
| HH | Households |
| Hec | Hectare |
| IPCC: | Intergovernmental Panel on Climate Change |
| LFP | Livelihoods and Forestry Programme |
| NGOs | Non Governmental Organization |
| No. | Number |
| OP | Operational Plan |
| PFM | Participatory Forest management |
| PPSIS | Pro-poor and Social Inclusion Strategy |
| PRA | Participatory Rural Appraisal |
| PRSP | Poverty Reduction Strategy Paper |
| RRA | Rapid Rural Appraisal |
| SAC | Socially Advantaged Caste |
| SPSS | Statistical Package for Social System |
| VDC | Village Development Committee |
| UNFCCC: | United Nation Framework Convention on Climate Change |
| UN | United Nations |
| USAID | United State's Agencies for International Development |

Clients of the Report

The report looks at key climate change incidences in global and country level of Nepal and analyse their impacts on the livelihoods of the rural people of the country. This report tries to assess the climate change vulnerability to forestry and community level in rural setting of the country. Also, the report compile different concepts of vulnerability and adaptation to climate change and focus on the community based adaptation practices so far. More importantly, the report documents the community based adaptation practiced by community forestry user groups and promoted by UK aid Livelihoods and Forestry Programme in Nepal.

I expect that the report is fruitful for development professional and researcher who work in forest resource management and community based adaptation to climate change. As the report document the best practices of community based adaptation in community forestry programme of the country, it seems effective to replicate the practices in other sectors and areas of community based natural resource management groups.

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1. Backgrounds

Global climate change Scenario

Climate change is now recognized as one of the most serious challenges facing the world - its people, the environment and its economies (EC, 2008). The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007) cleared that global warming is mostly due to man-made emissions of greenhouse gases (mostly CO₂). It is believed that most global warming we can now observe is attributable to emissions of (green house gas) GHGs that result from human activities, in particular land use changes such as deforestation particularly from developing countries, and the burning of fossil fuels specifically from developed countries. There is consensus among many scientists that the anthropogenic cause of increment of green house gas (GHGs) in the atmosphere is the main cause of the climate changes incidences experienced (Robledo and Forner, 2005; Louman and et all, 2009). These Global green house gases (Carbon die oxide (Co₂), Mithene (CH₄), N₂O, HFCs, PFCs and SF₆) emissions have grown since industrial time with increase of 70% between 1970s and 2004 (IPCC, 2007).

Over the last century, atmospheric concentrations of carbon dioxide increased from a pre-industrial value of 278 parts per million to 379 parts per million in 2005, and the average global temperature rose by 0.74° C. (UNFCCC, 2007). It is evidence that the average temperatures are increasing, and extreme weather patterns resulted in unprecedented extent and/or frequency of drought, flooding and storm events and these developments are projected to intensify (Meehl and Tebaldi, 2004; Tebaldi et al., 2006, UNFCC 2007). The most studied climate variable in the context of climate change is temperature. Its average value has increased by approximately 0.6 °C from the end of the nineteenth century. The warmest decade since data have been registered was the 1990s. Most of this increment took place during two periods: between 1910 and 1945, and from 1976. Average rainfall in the subtropical belt has

decreased. Precipitation in the tropics has increased slowly, but a measure of the increase has not been apparent in recent decades. Monitoring data show that the sea level has risen by about 1 to 2 mm per year, with a mean value of 1.5 mm/year. The best estimates indicate that the Earth could warm by 3° C by 2100. Even if countries reduce their greenhouse gas emissions, the Earth will continue to warm. Predictions by 2100 range from a minimum of 1.8° C to as much as 4° C rise in global average temperatures (UNFCCC, 2007). As a result of global warming, the type, frequency and intensity of extreme events, such as tropical cyclones (including hurricanes and typhoons), floods, droughts and heavy precipitation events, are expected to rise even with relatively small average temperature increases (UNFCCC, 2007).

Climate change and its impact on natural and social system are critical issues of equity. Though developing countries have very nominal contribution to the climate change incidences, they face greater negative impacts due to their location towards climate change risk and exposure, lower level of capability to resist the impacts and more vulnerable from the incidences. Also, the people in the countries face different kinds of the impacts. Low-latitude, less-developed areas are generally at greatest risk due to both higher sensitivity and lower adaptive capacity; but there is new evidence that vulnerability to climate change is also highly variable within countries, including developed countries (Schneider and et all , 2007). Richer societies in industrialized countries have the means for dealing with the more immediate effects of climate change and are less prone to suffer in the short term. In contrast, the economic and human welfare impact of climate change can be severe for the many poor communities in developing and least developed countries that depend on forests for food, fodder, fuel wood, medicines and ecosystem services (Bernier and Schoene, 2009). Climate change has the potential to undermine sustainable development, increase poverty, and delay or prevent the realization of the Millennium Development Goals (UNFCCC, 2007). The world's poorest countries and people, those who contributed least to the atmospheric buildup of greenhouse gases, are the least equipped to deal with the negative impacts of climate change, therefore more

vulnerable than rich countries and people. On the other hand wealthier nations and people that have historically contributed the most to GHG emissions are better able to adapt to the impacts (UNFCCC, 2007; Bernier and Schoene, 2009; Osman-Elasha, 2009). Simultaneously, the geographical distribution of these cause differ these developed and developing countries (). The evidences show that the industrial lifestyles of rich countries burns more fossil fuel that contribute approximately 80% of total GHG emissions in the atmosphere and while the people of poor countries contribute about 20% of total emissions through the land use change and deforestation (Houghton, 2003; Houghton, 2005; Robledo and Forner, 2005; Denman et al., 2007; IPCC, 2007c; UNFCCC, 2007; Louman,B. et all , 2009). The people in later categories of the countries also heavily depend upon the land and forest for their daily livelihoods.

The increase of the climate change incidences and negative impacts of these risks depends upon how the emissions of the GHGs are reduced to the atmosphere and how the systems adjust with the negative impacts of the incidences. The former address to the climate change is termed as the mitigation to the climate change and the later is termed as the adaptation to the impacts of the change. However, there are evidences that with current climate change mitigation policies and related sustainable development practices, global GHGs emissions will continue to grow over the next few decades. Therefore, the magnitude of future climate change and its impact will be affected by extends to which these emissions are reduced globally. On the other hands, the emission of these GHGs have already exceeded in the atmosphere and therefore how people will adapt to the negative impacts of the climate change will have crucial role to reduce the bad effects on different system. As a result, adaptation to climate change seems very important aspect to address the climate change challengesThe scientific literature on adaptation is less well developed than for mitigation, and the conclusions are more speculative in many cases (Schneider et all, 2007). In these regards, what is the potential for, and limitations of, adaptation to reduce impacts and to reduce or avoid key vulnerabilities is very important aspect of further study.

The Nepalese Context

Nepal is a small (147181 Km²), landlocked rural country of South Asia. It occupies three physiographic regions namely Himalaya, Hills and Terai that covers 17%, 68% and 15% of total land of the nation respectively. The regions have different socio-economic setting. More than 85% of total population of the country live in rural setting in forest environment and pull out their livelihoods strategies through gathering fuel wood, timber and non timber forest products and fodder . Most of them are wood workers, local healer, herder etc. It is their major source of expanding income, fulfilling subsistence goods and services, reducing risk during hardships .In summary, forests are an alienable part of Nepalese livelihood systems, as is recognized by existing policies and reflected in the legislative instruments currently in force (Sing and Chapagain, 2006).

Though Nepal and Nepalis contribute very little to global climate change through emission of green house gases, they and their development endeavors are victims of unbridled emissions everywhere (NCVST, 2009). It is in the top 8 low income countries for green house gas emission. This is due to its ranking as both one of the poorest countries in the world and its listing as one of the 20 most multi-hazard prone. In addition, Nepal is one of the most vulnerable countries in South Asia to climate change, yet it has limited capacity to address its impacts or to take advantage of any opportunities. Nepal is one of the ten most vulnerable developing countries because of its geography, poor physical infrastructure and the low level of development of its social sectors (OECD, 2003). The temperature of the Nepal is increasing rapidly than other countries. Between 1977 and 1994, Nepal's average temperature rose at a rate of 0.03-0.06 Celsius per annum, with a higher rate in the mountains than in lowlands (Shrestha et al. 1999). Also, the evidences show that there is increase of 0.08 degree Celsius per annum in the mountainous region and 0.04 degree Celsius per annum in Terai region of the country. Another report of the Government of Nepal, based on an analysis of the temperatures recorded between 1981 and 1998, shows an increase of it 0.41⁰ Celsius per decade (HMGN 2004). Although the analysis is based on data for a

relatively short period, it shows that Nepal is warming at a significantly higher rate compared to the global average of 0.74^o Celsius, recorded in the twentieth century (IPCC 2007). Meanwhile the evidences show considerable convergence on continued warming in the nation , with country averaged mean temperature increases of 1.2°C and 3°C projected by 2050 and 2100 AD (OECD, 2003). In addition to increase in annual averages, extreme temperatures have been observed in recent years. Both days and nights are becoming warmer, while cool days and nights are becoming less frequent (Baidya et al. 2008). The precipitation extremes show increasing trend in intense precipitation events at most of the stations (Baidya et al. 2008). The Stern report states that under an optimistic scenario (a 2-3^oc increase in global temperature), the developing countries like Nepal would lose more than 3 percent of their GDP, and if the temperature rise reached 4-5^o C, the loss would exceed 10 percent (NCVST, 2009). The data show that between half and two-thirds of all development activities in Nepal in monetary terms could be affected by climate change incidences (OECD, 2003).

Nepal is vulnerable to several types of climate change induced natural disasters, including droughts, floods, landslides, windstorms, hailstorms, cold waves, disease epidemics, glacial lake outburst flood (GLOF), fires and earthquakes. The middle Hills are mainly prone to landslides and hailstorms while the Terai region is prone to floods and fire. Windstorms, thunderbolts (lightening strikes) and heavy snowfall also affect many areas of the country on a regular basis, causing loss of human lives and considerable damage to the standing crops (WFP, 2007). Following are some of the documented climate change incidences and their impacts in the country.

Drought: In the periods of 36 years, from 1971 to 2007, more than 150 drought events were reported in Nepal affecting more than 330000 hectare of agriculture land mainly in Terai and western hills/mountainous (NSET, 2009). The evidence of greater climatic variability and increase in temperature over the country suggest that the frequency of winter droughts will increase (NCVST, 2009). Within drought-affected

areas in far western region of Nepal, more than 85 percent of households claimed that the food shortages were more severe than last year and that the majority of households within these areas have depleted most of their food stocks (WFP, 2007).

Forest fire: In the periods of 36 years, from 1971 to 2007, more than 3880 forest fire events were reported in Nepal lead to 1108 death, 186 missing person, and affecting more than 218,278 people (NSET, 2009). During the spring of 2009, forest fire blanketed much of Nepal raging in 634 places and damaging 105, 350 hectare of forest land (NCVST, 2009).

Flood and Landslide: Across Nepal each year natural disasters will cause the loss of 1,000 lives, including 300 lives from flooding and landslides⁵. Droughts, floods, hailstorms and landslides are by far the most serious and recurrent natural disasters and annually cause significant material and human losses. Based on official disaster statistics, floods and landslides from 1998 to 2002 occurred some 256 times on average in one year and affected on average 24 264 families annually. Climate scientists predict existing trends of increasingly more severe and frequent natural disaster in Nepal will continue - particularly more frequent floods⁶ (NCVST, 2009). One recent study in Nepal has roughly estimated the current and future costs of recurrent flooding to households in the Terai. The estimation suggests that the annual cost spread across all households could increase from a current estimate of NPRs 2,813 per year to NPRs 5,581 per year due to climate change. In 2009, an excessive rainfall was observed during the 4-8th October, which caused floods and landslides in the Mid- and the Far-Western districts (MOAC/WFP, 2010).

Precipitation variability: There are evidences of temporal and spatial variation of rainfall in the country. Also, there are data about excessive and low amount of rainfall in the country. The monsoon rains normally start around 10 June and continue up to around 23 September in the country. About 80% of the annual rainfall in the country occurs during this period. Though August is the most crucial time when crops needs more rain, the month has been a particularly dry month with the entire country

facing a shortage of rain during a critical time for crop growth (MOAC, 2006). Also there are evidences of heavy rainfall received in the last week of August and during the second and third week of September - too late to support a productive harvest. The late start of monsoon in 2009 affected the paddy crop adversely: paddy plantation occurred only in 95% of the areas as a whole; farmers had to plant mature seedling excessively especially in the hills and mountains, which resulted in low paddy productivity (MOAC/WFP, 2010).

To address abovementioned negative impacts of the climate change incidences some planned and autonomous adaptation have been undergoing in the country. However, Research on adaptation to climate change is relatively recent; while many promising experiences exist, only a few studies have documented evidence of successful adaptation strategies (Seppälä et al, 2009). NCVST (2009) analyse eight key signature events (extreme events) of climate change. These are: floods, cloudbursts, winter drought, forest fire, cholera epidemics. This reports outlined the major impacts of the incidences and some of the practices implemented in the country. More importantly, rural people including farmers have already struggling to change their livelihoods strategies in response the events. They have been utilizing their indigenous knowledge and technologies to fight against the negative impacts of the incidences. Also, there are various types and process of adaptation in the rural area of the country. As 80 percent of Nepal's population relies on farming as their primary livelihood in forest environment and community forestry is the major programme to address the forest management and livelihoods issues, the practices of adaptation through the community forestry intervention seems very crucial to document. Therefore, the article looks at adaptation in the light of Community Based Forest Resource Management (CBFRM), collective action, sustainable development of community and forest. Also this paper will discusses the feasibility, reliability and cost-effectiveness of community based adaptation options practiced in Nepal. This paper outlines how rural communities through the community forestry programme participate in analyzing the impacts of climate change and identifying options to adapt to the negative effects of the climate change incidences. Also, the paper

explores the different kinds of the barriers and limitations that limit the actual adaptation of the most marginalized community with in community forestry user groups.

2. Adaptation Strategies to Climate Change

Needs of adaptation strategies to climate change

Since the Third Assessment Report (IPCC, 2001), policy-makers and the scientific community have increasingly turned their attention to climate change impacts, vulnerabilities and associated risks that may be considered 'key' because of their magnitude, persistence and other characteristics (Schneider and et all, 2007). Then, the policies and practices have been focusing on the adaptation aspect to address the climate change concentrating on reducing the impacts and vulnerability of people induced through its events. Then, vulnerability and adaptation assessments were identified as vital tools for developing countries to evaluate and implement responses to climate change (UNFCCC, 2007). In the area and sectors where impact of the climate change is critical, the adaptation strategy to respond the climate change has proved very important. It can significantly reduce many potentially dangerous impacts of climate change and reduce the risk of many key vulnerabilities (Schneider et all, 2007). Thus, adaptation to climate change in developing countries is vital and has been highlighted by them as having a high or urgent priority (UNFCCC, 2007). However, Research on adaptation to climate change is relatively recent. While many promising experiences exist, only a few studies have documented on evidence of successful adaptation strategies (Seppälä et all, 2009). Many forest-dependent communities are well known for their knowledge of the natural world, and often possess keen insights into meteorological phenomena, animal behavior and forest phenology. Although uncertainty remains about the extent of climate change impacts, in many developing countries there is sufficient information and knowledge available on strategies and plans to implement adaptation activities now (UNFCCC, 2007).

Globally, mitigation (reduction of greenhouse gas emissions and carbon sequestration) and adaptation (ways and means of reducing the impacts of, and vulnerability to, climate change) aspects are two major policy dialogue and practices that have been undergoing to address the climate change issues. According to the UNFCCC, there is a clear difference between mitigation and adaptation. Until recently, UNFCCC negotiations have focused primarily on mitigation; however, it is now clear that objectives of human well-being in the future should be addressed, stressing the importance of adaptation (European Commission, 2008). Though, the international community has placed greater emphasis on mitigation, the adaptation strategies to address the climate change impacts is also gaining importance particularly in developing countries (Rodledo et al., 2005). Also, there are arguments that adaptation to climate change and mitigation are often linked together to provide greater benefit to the people (Bernier et al., 2009). The climate change mitigation which focuses on the reducing the source/amount of GHG emission is long vision. It is suitable with developed countries because their contribution to the greenhouse gas emission is high. Also, the benefit from mitigation expected to be global and it is applicable in the initial period of the climate change. On the other hand, the climate change adaptation focuses on the reducing the impacts derived from climate change incidences. It is very applicable in developing countries because their contribution to the global greenhouse gas emission is very nominal but the climate change incidences and their impacts are high in these countries. Also, the benefit from adaptation is local. It is the very much suitable strategies in this time because the stock of the gas that has already in the atmosphere have been affecting now.

The countries like Nepal have been contributing less in the atmospheric GHGs but these countries are becoming more vulnerable than the developed countries whose contribution to the gases are high. Nepal has historically had lower emission of carbon dioxide or other greenhouse gases from energy or industrial sources (LFP, 2009). However, the country is labeled as one of the top ten countries most likely to be impacted by global climate change (WFP, 2009). As a result it is appropriate to reduce the impact of the climate change instead of the reducing greenhouse gas in the

nations including in Nepal. Following are major thrust by which adaptation response to climate change is necessary condition for countries like Nepal.

Adaptation as development issues: There is debate that climate change policies can be considered as climate first or development first (Barker et al, 2007). People in developing countries have strong priority on the sustainable development focusing on the reducing vulnerability and poverty, improving resiliency and capacity, ensuring community right, governance, social policies etc.

People/Local focused: There are wider evidences that adaptation measure particularly relevant to developing poor countries. Also, while the benefits from mitigation are expected to be global and benefit from adaptation are expected to be local and to some extent more immediate (Sergio et al, 2008). Also, it gives priority to local needs.

Easy to Implement: The mitigation requires global collective action and thus the solution of immense political challenges, it is possible to address adaptation through local actions (Sergio et al , 2008).

Cost Effectiveness: Many adaptations can be implemented at low cost, but comprehensive estimates of adaptation costs and benefits are currently lacking (Adger and et al 2007). In the rural and local setting small amount of investment in adaptation project may exerts large amount of results. The UNFCCC estimated that the investment and financial flows needed for adaptation are likely to be tens of billions of dollars per year several decades from now and could be more than USD 100 billion per year. Other studies (World Bank 2006b, Oxfam 2007) also estimate adaptation costs at tens of billions of dollars per year. On the other hands, global additional investment and financial flows of US\$200-210 billion will be needed in 2030 to return global greenhouse gas (GHG) emissions to 2005 levels with about US\$75 billion of this funding needed in developing countries (IISD,2009)

It emphasize on holistic approach: The adaptation approach attempts to identify the most pressing problems faced by, and promising opportunities open to, people regardless of where these occur. It builds upon people's own definitions of these risks and

opportunities and, where feasible, it then supports people to address/realise them. The adaptation approach needs non-sectoral and recognizes multiple actors, influences and outcomes on people.

It is dynamic process: The capacity to adapt is dynamic and influenced by economic and natural resources, social networks, entitlements, institutions and governance, human resources, and technology (Adger and et all 2007). As climate change incidences and their impacts are highly dynamic, the adaptation process learns from change so that it can support positive patterns of change and help mitigate negative patterns. It explicitly recognises the effects on livelihoods of external shocks and more predictable, but not necessarily less damaging, trends.

Increase resilience to long-term climate change : These linkages suggest that adaptation measures span the spectrum from discrete adaptation (defined as projects for which “adaptation to climate change is the primary objective), to development-as-usual (defined as projects undertaken to achieve development objectives that also enhance climate resilience), to development-not-as-usual (defined as projects that carry the potential to exacerbate the impacts of climate change and therefore should not be undertaken). The implications for purposive intervention then vary from doing the same thing (‘things’ meaning policy and investment choices) or more of the same things, to doing different things, to doing things differently.

Micro-macro linkages: Adaptation options include both top-down and bottom-up approaches (UNFCC, 2007). Top-down methodologies include the use of modelling and scenario analysis. This can provide useful background to decision making and is strong in terms of the biophysical aspects of impacts. Bottom-up, approach recognizes and builds upon local coping strategies and indigenous knowledge and technologies, and the capacity and coping range of communities, local institutions and sectors in responding to current climate variability.

Concept of Adaptation

In the Third Assessment Report (TAR) of IPCC adaptation and vulnerability were defined, types of adaptation were identified, and the role of adaptive capacity was recognised (Smit et al., 2001). Notable developments that occurred since the TAR include insights on: a) actual adaptations to observed climate changes and variability; b) planned adaptations to climate change in infrastructure design, coastal zone management, and other activities; c) the variable nature of vulnerability and adaptive capacity; and d) policy developments, under the United Nations Framework Convention on Climate Change (UNFCCC) and other international, national and local initiatives, that facilitate adaptation processes and action programmes (Adger et al., 2005; Tompkins et al., 2005; West and Gawith, 2005). Since, then the concept of adaptation has been focus on the climate change responses. The concepts of it have been defined variously by different experts. However, following definitions have been mostly used in the literatures.

Climate adaptation is about recognizing altered risks, and taking decisions that allow the likely impacts to be reduced or managed, and the opportunities to be exploited (Willows and Connell, 2003).

Adaptation practices refer to actual adjustments, or changes in decision environments, which might ultimately enhance resilience or reduce vulnerability to observed or expected changes in climate (Adger, 2007)

Adaptation is defined as adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2007).

Adaptation is processes through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes (UNFCCC, 2007).

Adaptation to climate change encompasses broad term including vulnerability to climate change risks and adaptive capacity of system to adjustment (Rodledo et al., 2005). Vulnerability to climate change refers to the propensity of human and ecological systems to suffer harm and their ability to respond to stresses imposed as a result of climate change effects. The vulnerability of system depends upon the

exposure to and resiliency to climatic risks ie climate change variability, extreme events, climatic shocks and climatic risks (Schneider et al, 2007). If there is greater exposure to the climatic risks, it has greater negative impacts on the system which cause the loss of livelihoods assets of the people. Simultaneously, is there is improved resiliency of the system; it has competent adaptive capacity of the system. Therefore, more adaptive capacity of the system is more adaptation. In summary, the concept of adaptation includes following variables:

- It is adjustment of the system to climate change incidences
- It reduces the exposure to the climate change risks
- It promotes the resiliency of the system to negative impact
- It reduces negative impacts from climate change events and increase beneficial opportunities
- It removes or prevents mal-adaptation practices: Mal-adaptation refers to adaptation measures that do not succeed in reducing vulnerability but increase it instead (UNFCCC, 2007).
- It is decision making process for better alternatives to cope with negative impacts: Another important adaptation strategy is economic diversification within sectors to reduce dependence on climate-sensitive resources (UNFCCC, 2007).

Types and Dimensions of Adaptation

The social and natural system have been naturally adapting to climate change historically. These adaptation responses vary in different places and time scales. Also, there are different types of adaptation practiced and promoted in different places of the world. These , adaptation practices can be differentiated along several dimensions:

- By spatial scale (local, regional, national)
- By sector (water resources, agriculture, tourism, public health, and so on)

- By type of action (physical, technological, investment, regulatory, market)
- By actor (national or local government, international donors, private sector, NGOs, local communities and individuals)
- By climatic zone (dry land, floodplains, mountains, Arctic, and so on)
- By baseline income/development level of the systems in which they are implemented (least-developed countries, middle income countries, and developed countries)
- Private and public action
- By some combination of these and other categories

However, most of the literatures defined following types of adaptation.

A) Autonomous (spontaneous adaptation) or planned adaptation: adaptation by households and communities acting on their own without public-policy interventions but within an existing public-policy framework is defined as autonomous adaptation. While adaptation that is the result of a deliberate policy decision is known as the planned adaptation (Sergio M., and et all 2008). Autonomous adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or *welfare* changes in *human systems*. While planned adaptation based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

Autonomous adaptation refers to the automatic responses that every system generates to respond to a stimulus (Robledo and Forner, 2005).

A system's vulnerability is determined by its autonomous adaptation capacity in such a way that: vulnerability = potential impacts - adaptation capacity.

Planned adaptation is defined as conscious actions to minimize foreseen impacts (Robledo and Forner, 2005).

Planned adaptation determines the vulnerability of a system in the following way: Vulnerability = impacts - autonomous adaptation capacity - planned adaptation.

B) Proactive (anticipatory) and reactive (ex-post) adaptation takes place before the climate change impact is defined as proactive adaptation while adaptation practices after the impacts of climate change have been felt is known as the reactive adaptation, (Sergio M., and et all 2008). Proactive strategies ('anticipatory adaptation') must also deal explicitly with the uncertainty inherent in projections of future climate change and their impacts (Roberts and et all, 2009). To date, forest-sector responses to climate change have mostly been reactive. The diverse values and interests of stakeholders, which can impede efforts to reach consensus on adaptation goals, need to be addressed in efforts to encourage proactive adaptation (Roberts and et all , 2009).

More importantly, within the countries spatial dimension of adaptation types have crucial role in planning, implementation and monitoring of the effectiveness of the response. Based on the spatial or level of adaptation following adaptation types can be distinguished.

- A. **National adaptation:** National adaptation plan and practices formulates policies and guidelines for different sectors to enable them to reduce the negative impacts of climate change. It also identifies and priorities the priority area of the adaptation activities. The practices of National Adaptation Plan of Action (NAPA) prepared and practiced through the developing countries are based on these types of adaptation.
- B. **Local adaptation:** It is sub national or regional or area level adaptation plan. It may be landscape level planning and practices. In the case of Nepal adaptation plan of Terai region may be local or sub national plan.
- C. **Community Adaptation:** Community has been defined as a group of individual who live in given area and share the basic condition of common life. It may be based on given geographical area (Dhankuta) or as a local social/cultural system (Janjaties, dalits, women) or as a types of relationships (Hindu, Muslim) or as economic classes or occupation (black smith, wage labors etc). This community has more or less common form of adaptation practices.

3. Global and Local adaptation practices

Global

Adaptation to climate change takes place through adjustments to reduce vulnerability or enhance resilience in response to observed or expected changes in climate and associated extreme weather events. These adaptations have been occurring in both natural and human system. However, the Nairobi work programme under UNFCCC formulated in 2005 has made special decision about planned adaptation response to climate change. Since then, the UNFCCC supported to increase promotion of information base about climate change incidences, impacts, vulnerability and adaptation. Action Plans were subsequently developed and are now being implemented for developing country regions. To develop the capacities of the nation, it has organized various training and workshops at regional and global level. It has been playing catalytic role and financial support to prepare and implement National Adaptation Programmes of Action (NAPAs) of developing countries. The Least Developed Countries Fund (LDCF) was partly established to support projects addressing urgent and immediate adaptation needs in the least developed countries as identified by their National Adaptation Programmes of Action (NAPAs). Also, it has been supporting transfer of technologies for adaptation including hard technologies such as sea walls in Island of the Maldives and soft technologies such as low cost irrigation, embankment cropping, floating gardens and integrated farming systems in Bangladesh. Only about 180 identified planned adaptation projects have been identified so far. Also through the Least Developed Countries Fund (LDCF) different community based adaptation projects have been implementing including coastal afforestation and community based adaptation project in Bangladesh; a project to integrate climate change risks into community-based livestock management in the northwest lowlands of Eritrea.

Also, there is a long record of practices of proactive and reactive practices to adapt to the impacts of weather as well as natural climate variability. These include

proactive measures such as crop and livelihood diversification, seasonal climate forecasting, community-based disaster risk reduction, famine early warning systems, insurance, water storage, supplementary irrigation and so on. They also include reactive adaptations, for example, emergency response, disaster recovery, and migration (Sperling and Szekely, 2005). Recent reviews indicate that these reactive responses are often inefficient and unsuccessful to address fully the climate change impacts (Adger, 2007). Proactive practices to adapt to climate variability have advanced significantly in recent decades with the development of operational capability to climate forecast several months in advance as well as improvements in climate monitoring and remote sensing to provide better early warnings on complex climate-related hazards (Dilley, 2000). Since the mid 1990s, a number of mechanisms have also been established to facilitate proactive adaptation to seasonal to inter-annual climate variability. These include institutions that generate and disseminate regular seasonal climate forecasts (NOAA, 1999), and the regular regional and national forums and implementation projects worldwide to engage with local and national decision makers to design and implement anticipatory adaptation measures in agriculture, water resource management, food security, and a number of other sectors (Basher et al., 2000). Recent research also highlights that technological solutions such as seasonal forecasting are not sufficient to address the underlying social drivers of vulnerabilities to climate (Agrawala and Broad, 2002). Furthermore, social inequities in access to climate information and the lack of resources to respond can severely constrain anticipatory adaptation (Pfaff et al., 1999).

Local

To address the issues of climate change in Nepal, a high level coordination committee under the coordination of Prime Minister has been formulated in the country. To address the adaptation issues at the national level, National Adaptation Plan for Action (NAPA) has been prepared. This plan has identified different six sectors ie forest and biodiversity, agriculture, health, water sources, energy. Additionally, DFID, World Bank and other national and international organizations have been implementing different adaptation activities in the country. DFID has been piloting the initiation of

local adaptation plan in 10 district of the country. Simultaneously, Practical Action in Chitwan, WWF in Rasuwa and LIBIRD in Bara-Jhapa have been initiating community based adaptation plan preparation and implementation.

In Nepal, here are also different kinds of proactive or reactive and spontaneous or planned adaptation. In Nepal farmers have traditionally observed a number of practices to adapt to climate variability, for example intercropping, mixed cropping, agro-forestry, animal husbandry, and developing new seed varieties to cope with local climate variability. Various water use and conservation strategies include terracing, surface water and groundwater irrigation; and diversification in agriculture to deal with drought. Both structural and non-structural measures are used across the country. WFP survey (2009) analyse the household and community based food security adaptation to climate change. The practices show that almost all households (96.6 percent) in the drought-affected areas shifted their consumption to less preferred and expensive food. More than three-quarters had to borrow money for consumption purposes and almost 73 percent reduced their food intake. More than half of the households have one or more family members who have migrated in search of jobs. Irreversible coping strategies were also widespread, with over one-third of the households selling agricultural and household assets. A very high number of households (18.5 percent) reported sale of land. However, Nepalese people face a number of barriers in their attempts to adapt to the changing environment they face. This includes a lack of financial assets, poor basic and agricultural infrastructure, and few opportunities for income diversification.

Simultaneously, groups of community based natural resource management have practices of household and community based adaptation practices in Nepal. The farmer managed irrigation system in the country developed to store the water through making ponds to deal with the water scarcity in rural area of the country. These groups have also practices of conservation plantation around the water sources and channels. More importantly, community forestry user groups of the country have very systematic practices of wider adaptation to climate change variability in country.

However, individuals are limited by a lack of information and awareness of the most effective ways to adapt to climate change. The learning of this group may be very fruitful for effective community based adaptation practices.

4. Adaptation Practices in Community Forestry of Nepal

4.1 Concept and practices of community based adaptation

Adapting to climate change will entail adjustments and changes at every level - from community to national and international (UNFCC, 2007). There are no simple comprehensive response to the adaptation and are often place-specific and very nuanced, and are likely to become more so as research advances (Schneider et al, 2007). The community level adaptation have been adopting appropriate technologies while making the most of traditional knowledge, and diversifying their livelihoods to cope with current and future climate stress. There is numerous autonomous and planned community based adaptation to climate change. Also, there are large body of knowledge and experience within local communities on coping with climatic variability and extreme weather events (UNFCC, 2007). To do so, they have made preparations based on their resources and their knowledge accumulated through experience of past weather patterns. This includes times when they have also been forced to react to and recover from extreme events, such as floods, drought and hurricanes (UNFCC, 2007).

UNFCC has been supporting to these adaptation process. UNFCC has been funding number of community-based adaptation plans and projects. Indonesia has been implementing monitoring system for food security and livelihood through Community Based Disaster Risk Management to prevent food shortage in the eastern part of NusaTenggara(UNFCC, 2007). These bottom-up initiatives include community-based water harvesting or allocation systems, supplying mosquito nets, and community-based disaster risk reduction (UNFCC, 2007). The national Community Based Flood

Early Warning System in Philippines which aims at helping local communities prevents losses from increasing floods (UNFCC, 2007).

Evidences shows that community based approaches provide the most effective capacity-building for practical adaptation actions through implementation and a 'learning by doing' process (UNFCC, 2007). Community-based adaptation is an important tool for developing adaptation options and it is important to share the knowledge gained from these experiences (UNFCC, 2007). The lessons learned from the CBFEWS that can be replicated for many community based adaptation activities include the importance of involving grassroots organizations, transferring decision making power to local communities; and combining advanced technologies with indigenous knowledge (UNFCC, 2007). Local coping strategies are an important element of planning for adaptation (UNFCC, 2007). Traditional knowledge can help to provide efficient, appropriate and time-tested ways of advising and enabling adaptation to climate change in communities who are feeling the effects of climate changes due to global warming (UNFCC, 2007).

Across Nepal informal community-based climate adaptation practices are already undertaken For example, subsistence farmers located in the Mid- to Far-Western regions have started to adjust their cropping calendar and many have coped with drought through increasing collection of local medicinal herbs (WFP, 2009). Communities in flood prone areas have been known to purchase boats and rebuild houses on stilts in preparation for future flooding (Regmi, 2009). The farmer managed irrigation system in the country developed to store the water through making ponds to deal with the water scarcity in rural area of the country. More importantly, community forestry user groups of the country have very systematic practices of wider adaptation to climate change variability in country.

4.2 Adaptation practices in Community Forest User Groups of Nepal

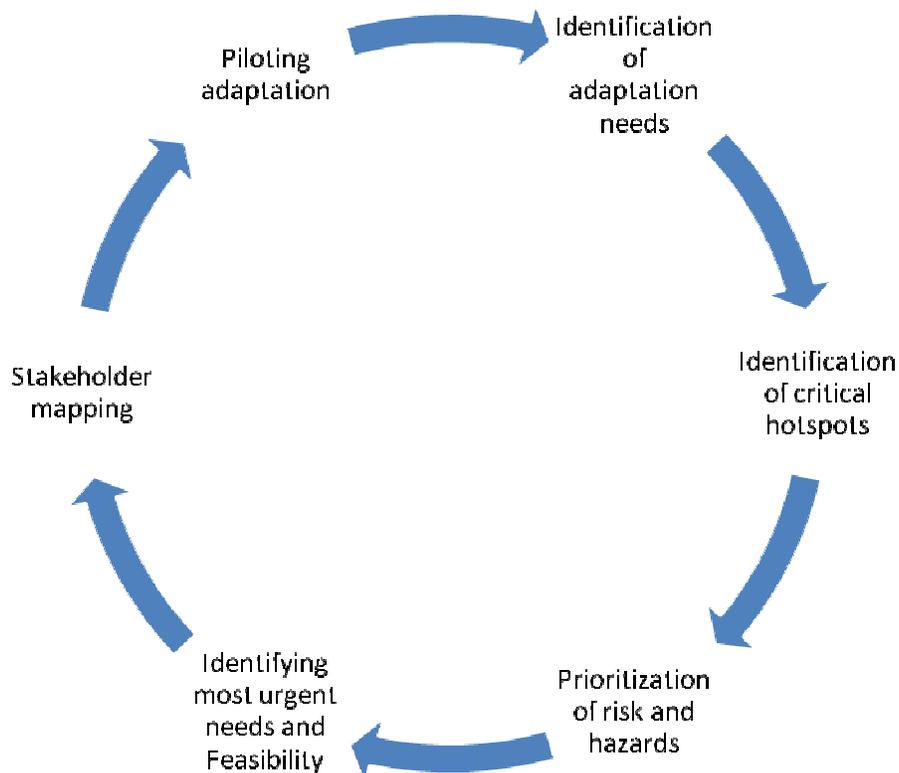
Community based forest resource management in the form of community forestry has been underway in Nepal since 1980 under which national forest are handed over to local forest user groups (FUGs). Community forestry User Groups of Nepal now considered as self regulated, autonomous institution in rural area of the country. The programme is considered as one of the success in decentralized forest resource management not only within in Nepal but also in the globe. The programs do not just seek to involve local people in decisions made by outsiders, but imply that local actors themselves make decisions about forest management and utilizations (Sikor and Nguyen, 2007). In the country, here are about 14500 community Forest User Groups (CFUGs) which are managing around 1.3 million hectares of forest (25% of total forest) in Nepal (NPC, 2007). The groups are widely distributed across the country in the hills that covers about 40% of the total households of the country who manage their forest resources.

The adaptation to climate change in community forestry has been occurring both at natural and social system in the rural area of the country. As community forestry has generally been taken as a panacea for both forest conservation and poverty reduction in Nepal (Dev and Adhikari, 2007), it has supported to both types of adaptation practices. After hand over of forest to local community, the growing stock of forest has been improving increasingly. At a time, the biodiversity of the resources has been increasing. There is also increasing trends of the group fund. Rural poor are those who rely more heavily on natural resources to sustain their livelihoods, the potential role of decentralization and community based natural resource management reforms can be remarkably effective to improve the livelihoods of the poor (Bene et al., 2009).

In addition to the autonomous and discrete adaptation practiced by community forestry user groups (CFUGs) in Nepal, the CFUGs in Livelihoods and Forestry Programme of DFID/UK support area have been initiated the planned community

based participatory vulnerability assessment, identification and implementation of ranges of adaptation activities and building capacity of their members.

The practices show that community forest User Groups are considered as the most suitable mechanism that support better to their resources and members to cope and adapt with bad impacts from climate change incidences and exploit the potentialities, if emerged from the changes. Now the groups have been preparing vulnerability map of people and forest resources, formulation of the adaptation plan at different level and establishment of adaptation mechanism and fund to support to the most vulnerable section of their users and area of their forest resources. DFID UK's Livelihoods and Forestry Programme has been supporting and speeding up the adaptation process of the groups. As the adaptation process includes three essential stages: 1) Vulnerability assessment; 2) capacity building; and 3) implementation of adaptation measures (Robledo and Forner, 2005), following major steps the CFUGs have been adopting in the Livelihoods and Forestry Programme supported area of Nepal.



4.2.1 Adaptation Plan preparation:

For better adaptation mechanism, local coping strategies and traditional knowledge need to be used in synergy with government and local interventions (UNFCCC, 2007). Community forest user groups of Nepal have been considered as the vehicle for the wider community development of the country and provide better opportunities of linkages between formal and informal knowledge regarding coping with climate change. The operational plan and constitutions of the groups, which are major guiding documents of the groups, covers wider plan of the community development. Also, the adaptation plan the CFUGs have been preparing covering wide level vulnerability and adaptation activities suitable to their area. This plan also have clear linkages with national level adaptation plan (NAPA), area level adaptation plan (AAPA) and Village level adaptation plan of action.

Area level Adaptation Plan (LAPA) preparation:

LFP has been promoting different area level coordination mechanism to coordinate and synthesize the area (spatial) level forestry and climate change intervention. Majority of these are: area level forestry user groups network which coordinate the plan and activities of FECOFUN, area level technical forestry coordination committee which coordinate the intervention and learning of sustainable forest management, area level civil society coordination committee which coordinate the activities of NGO partners of the programme. Joint meeting and discussion of these coordination mechanisms provides essential forum to make the area level adaptation plan of the community forestry user groups. This adaptation plan primarily identifies hot spot of climate change incidence and major intervention in the area. The plan is primarily based on two major indicators

Poverty index of the Village development committee: All CFUGs in the area has wealth ranking process which categories all the members of the groups into the poor and non poor categories. Based on the compilation of number of poor households at village development committee level, the forum identifies the percentage of poor people in the area and compile poverty index of all VDC.

Poverty index of the VDC= Number of households of poor people/Total households in the VDC

Prevalence of natural hazards: The forum also compile major climatic incidences ie drought, forest fire, land slide, flood etc occurred from last five years in all VDCs of the area. The VDCs which have higher frequencies of the events gets higher score in the analysis.

Local level Adaptation Plan (LAPA) preparation:

The community forestry user groups in LFP working area have been networking at village development committee level to coordinate the forestry activities at that level. Also, these networks have been supporting to derive funds from village development committee for forestry and climate change activities of community forestry user groups formed in the area. The evidences show that more than 75% CFUGs have networked with VDCs and FECOFUN and 75% CFUGs have linkage of their plans to local bodies and wider stakeholders in LFP eastern development region. Also, 30% CFUGs are leveraging resources from other organisation themselves including Village development committee fund.

All networks in LFP working area have been preparing local adaptation plan at VDC level. These networks also organise village level awareness programme to their members about climate change and its impacts.

Community Level Adaptation Plan (CAPA) Preparation

Community Forest User Groups based on area and local level adaptation plan, prepare specific and broader level adaptation plan of the community forest and its members. It includes the individual household and site specific level vulnerability and adaptation plan of the community. It follows the following participatory process to prepare adaptation plan

- Identification, listing and prioritization of climatic risk to people and in the site.
- Identification and listing of specific risk to specific households and community
- Identification, listing and prioritization of impact on different people and sectors
- Identification and prioritization of coping and adaptation activities
- Listing of traditional coping mechanism practiced in the area.
- Identification and prioritization of institution that can support in the activities.
- Tentative budget for each activities, budget they have and needs external support
- Needs of the capacity development activities.

These activities and process are the parts of their regular planning process. These plans are included in operational plan of the groups. Based on the plan they implement their activities in the groups to adapt to climate change. Now they have been preparing their plan for three years.

4.2.2 Implementation of adaptation plan

To implement the plan prepared through the participatory way, they have established following mechanisms:

Establishment of Community Adaptation fund at VDC net and CFUG level: 95% of total VDCs (150 out of 158 VDCs) in LFP supported Koshi hills have established the adaptation fund at that level. This is matching types of fund and support to the adaptation activities included in the plan. Major sources of the fund are grants received from LFP, VDC and CFUGs. There is provision that at least 10% of total fund is allocated through community forestry user groups. There is regular and emergency fund in this fund. Emergency fund supports to the activities that occurred haphazardly due to climate change incidences like forest fire, land slide, drought etc. They have prepared forest development fund mobilisaiton guidelines based on which they expend their money in the community forestry.

Linkages of adaptation plan with ongoing CFUG activities: Community forestry user groups are well established community development institutions in rural area of Nepal. They have their own established structural and financial mechanism. A record shows that they expend 500 million Nepali Rupee annually in development sectors of the country. Most of the community forestry user groups in LFP supported area have been including adaptation activities in their annual plan.

Promotion of traditional community based resiliency and adaptation: Now community forestry user groups have been promoting traditional knowledge and practices that are effective to deal with climate change impacts. They are supporting traditional grain collection system (bhakari system) which is effective for food security in lean season. Also, they are developing traditional pond conservation practices which is very effective to for water storage can be used in summer period.

Inclusion of adaptation activities into VDC plan: In LFP area there is practice of submission of plan of community forestry into the plan of local bodies. They prepare the CFUG plan and submit it into the VDC council. The practices attract the VDC fund in forestry development and climate change adaptation process.

4.2.3 Capacity building of the team and members

Livelihoods and Forestry Programme (LFP) through its partners (District Forest Office, NGOs, and FECOFUN) has been building the capacity of its partners and community forestry user groups. It has been preparing local resource person who support in adaptation plan preparation process of the networks and community. These resource people are requited from the partner organization. Simultaneously, they regularly coach and build the capacity of the community.

The capacity development activities in LFP area have been organized at regional, district, village and community level. At regional level the training event has been organized for leader of NGOs, FECOFUN and DFO. The training develops the concept of climate change prevalence at national and international level. The district level capacity development activities prepare a land scape level trainer and planner. This is a training of trainer (TOT) types of training and participant selected from different partners of LFP. After training, a cluster level team comprising representative from DFO, NGOs including representation from organization of women, dalits and janjaties, federation of community forestry user groups is formed for different cluster of the district. The team then organizes village and community level training in different cluster of the district. Therefore, the capacity development activity in LFP supported area is organized at different level and to different categories of the people.

4.3 What facilitate the impact of climate change at community level?

The distribution of impacts and vulnerabilities is still considered to be uneven, also there is new evidence that vulnerability to climate change is also highly variable within countries, including developed countries (Schneider and et all , 2007). Richer societies in industrialized countries have the means for dealing with the more immediate effects of climate change and are less prone to suffer in the short term. Simultaneously, the rich people within communities have means for dealing with the more immediate effects of the climate change incidence and are less prone to suffer in the short term. At a time, the economic and human welfare impact of climate change can be severe for the many poor communities in developing and least developed countries that depend on forests for food, fodder, fuel wood, medicines and ecosystem services (Bernier and Schoene, 2009). Therefore, climate change has the potential to undermine sustainable development, increase poverty, and delay or prevent the realization of the Millennium Development Goals (UNFCCC, 2007). The evidences show that women and low caste groups (dalits, who are regarded as untouchable), whose livelihoods and food security objective highly depends upon natural resources, experience severely and frequently extreme climatic events

because of prevailing rigid institutional barriers in the country. The evidences show formal intuitions like market, property right, education, service providers plan and informal institution like settlements, untochability, and caste based patron-client relations increase livelihoods and food vulnerability from climate change variability and extreme events. Also, it shows that institutional constraints make their livelihoods assets and strategies more exposure and sensitive to climatic trends of increasing temperature and late monsoon and extreme events of forest fire, drought, disease and pests and heavy rainfall.

Case-1: The case of Dhap CFUGs

The dalit of Dhap community forestry user groups experience that they are more vulnerable from climate change because most of them are wage labour mostly exposed to natural environment, they and their land are located in marginal land prone to climate change induced natural disaster. Also, they have fewer opportunities to aware about the incidences and its impacts. In addition, they have less capacity to cope because of caste based discrimination and poverty.

5. Strength and Limitations of adaptation practices of community forestry in Nepal

5.1 Why Community forestry is suitable institution for adaptation to climate change

Forests provide a number of ecological services such as climate regulation, hazard protection, and water conservation. They are not only at the frontline in mitigating adverse climate impacts but also increasing social resilience to major disturbances such as floods, heat waves, large scale forest fires and intense drought. Forest based adaptation strategy especially community forestry have the potential not only to protect land and people from some of the harmful effects of climate change, but also to provide opportunities for sustainable rural development and poverty alleviation through income generation and employment opportunities (Patosaari 2007).

Adaptation to climate change is not only technical but also social and political issues. The evidences show that adaptation measures must go beyond single technical solutions and address also the human institutional dimensions of the problem (Seppälä et al, 2009). As community forestry user groups have been planning and implementing the wider community development activities in the rural area and includes households from all section of the society, the institutions is crucial for planning and implementing broader level of adaptation activities in rural setting.

In this regard, also how people co-operate each other is essential gradient of adaptation issues. The concept of community forestry based on concepts of homogeneous communities with locally evolved rules for resource access, is proved very important mechanism that cooperate and support sustainable adaptation practices at community level. As the resources and the peoples are managed based on (1) collective action (2) information about the resource system and with whom they share the resource; and (3) rules that would regulate the ways in which they use the resource (Broomley et al, 1993; Liecap. 1995; Ostrom, 1990) it provides better resources for the poor and excluded community to cope and adapt with climate change extreme events and variability.

The assumption promotes the collective action to fight against the climate change impacts, have high chances of the enhancements of the traditional technology and knowledge to reduce the risk through extreme climatic events and mobilization of the common resources to increase the adaptive capacity of the vulnerable groups. Following are the major logic that support that community forestry user groups as viable mechanism to support community level adaptation to climate change.

Actual vulnerability analysis:

The well-being ranking is a founding step to identify the assets of the users and explore opportunity for their better livelihoods through community forestry. This also provides basis for making special provisions for the poor and marginalized groups through CF. In the context of Koshi Hills, Altogether 85% of the total CFUGs have carried out the process where 23%, 25% and 52% are catagorised in very poor, poor and others respectively through participatory well-being ranking. Due to participatory relative well-being assessment, the criteria, used by CFUG, is found different in terms of food security, social status, education etc. Community forestry programme of Nepal has been practicing participatory development practices in the rural area. This participatory approach of development empowers local people including the marginalized section of society to identify the climatic risk and appropriate adaptation activities for them (Case-2).

Case-2: Inclusive adaptation plan preparation

Pathibhara community forestry user group of Telia VDC of Dhankuta district has prepared very inclusive and broad community based adaptation plan through rigorous discussion at different level. I was prepared at village development committee level. Firstly, the VDC level network has done meeting to identify the vulnerable groups and hot spots in the community. They identified poor dalit and women are more vulnerable groups. Then they formed a subcommittee of women and dalits within VDC level forestry network to identify the possible risks and impacts and coping and adaptation strategies. Also, they formed a team to visit the climate change risk hot spot in the area. It identified the possible impacts and adaptation strategies for the area. After completion of this work a orientation and adaptation plan prepration workshop was done at VDC level. This workshop did wider discussion and compiled the work of different thematic team. Through the workshop VDC level community based adaptation plan of community forestry was made.

Greater recognition of local institutions and the individual actors involved in decision-making processes for planning adaptation may enable successful adaptive forest governance (Roberts and et all , 2009).

Targeting most vulnerable section of society: Community forestry user group has already established strategy of pro-poor and social inclusion. The evidences show that the trend of fund allocation in poor focused activities is higher than before (17% in 2006). Also, CFUGs have given priority in favor of poor and excluded in community development activities (65% poor). Also, LFP promoted 'inclusive targeting' which means working with whole communities whilst actively addressing the priorities of poor and excluded people. It developed indicators to illustrate qualitative changes in three domains of change - rules of the game; voice, influence and agency; access to assets and services. These were used in conjunction with Gender Poverty and Social Equity indicators that were developed by Ministry of Forests and Soil Conservation. All sort of these mentioned strategies are very fruitful for coping and adaptation strategies of the poor and excluded section of the community forestry.

Use of indigenous knowledge to cope with climate change: Local forest-related knowledge, practices and associated social institutions, developed under changing environmental conditions by indigenous and local communities over generations, represent an important source of adaptive capacity for local forest-dependent communities in the face of climate-change impacts on forest ecosystems (Roberts and et all , 2009). Although local forest-related knowledge is declining in most regions of the world, its importance for strengthening local and indigenous community adaptation to climate change should be recognized, and supportive actions taken to preserve, protect and foster its further development(Roberts and et all , 2009). In the community forestry practices of Nepal, it promotes the traditional knowledge and practices for forest resource management and organizing the people.

Better linkages adaptation with mitigation strategies: The international community has placed greater emphasis on mitigation, the adaptation strategies to address the climate change impacts is also gaining importance particularly in developing countries (Rodledo et all, 2005). Also, there are arguments that adaptation to climate change

and mitigation are often linked together to provide greater benefit to the people (Bernier et al, 2009). In LFP are it is linked with mitigation strategies (Case-3)

Case-3: Sifting Cultivation control

The adaptation practices to climate change in community forestry are better linked with sustainable forest management practices. In Num VDC of Shankhuwasabha district of Koshi hills area of LFP it has been linked with sifting cultivation control programme. The VDC located in Himalayan range of the country where the data shows the increasing the temperature more than other phygiographic region of the area. It is perceived that sifting cultivation practices have been a cause of this. Local communities in the area have started to control the sifting cultivation and implementing the income generation activities to the community who practice the sifting cultivation.

Better adaptive capacity of the vulnerable groups: Adaptation is a dynamic process that takes place over time. Similar to the development process, it must be focused towards continuous improvement; in other words, it must aim to diminish vulnerability to climate change over time (Robledo and Forner, 2005). As the focus of the community forestry programme in Nepal is building the natural and social capital of the community focusing more vulnerable groups , it enhance the capability of these groups to cope with climate change impacts more sustainable way.

Collective action to climate change impacts: The assumption of community forestry promotes the collective action to fight against the climate change impacts, have high chances of the enhancements of the traditional technology and knowledge to reduce the risk through extreme climatic events and mobilization of the common resources to increase the adaptive capacity of the vulnerable groups.

Cost Effective: It is estimated that the agriculture, forestry and fisheries sector is estimated to need an additional investment of US\$11 billion annually in new capital, such as irrigation systems, equipment for new crops and fishing practices, and relocation and modification of processing facilities (IISD, 2009) An additional US\$3

billion will be needed annually for research and extension activities to facilitate adaptation. About half of the total requirement will be for developing countries. If community based adaptation practices through community forestry are promoted, it will reduce the estimated cost of the adaptation in developing countries.

Provide social capitals, knowledge and other resources to poor and excluded communities to enable them to adapt: Social capital is based on the memberships of the groups and networks/relationships between them. As community forestry user groups of the country based on the cohesiveness and cooperativeness among the users, it enables all users to develop and adapt more effectively. The community forestry user groups have been dealing the climate change matters collectively in rural area of the country.

5.2 Limitations of adaptation practices of community forestry in Nepal

Though community forestry is viable mechanism for community based adaptation to climate change, some limitations exist in the rural area of Nepal. For better adaptation these weaknesses should be solved. Following are these limitations.

Elite capture: The practices of adaptation bounded with the existing social structure and cultural politics of community forestry user groups. The adaptation concept is as a contested, negotiated and power-laden process (Nightingale, 2009) and these processes block the adaptation of marginalized community of community forestry. There are evidences that there are very less participation from the dalit and women members in capacity development activities organized by forestry networks. This will limit the capacity of these groups to predict the climate change incidences and its impacts on their livelihoods. As a result they may unable to implement planned adaptation activities and my follow the reactive activities can cause loss of their important livelihoods assets.

Possibility of focus on non climatic coping and adaptation strategies: There is need of which impacts are from climate change incidences and which are from other activities. For example the land slide may be due to the bad road construction methods or through climate change induced natural calamities ie flooding, drought, heavy rainfall etc. However, plan of some community focus on the land slide caused through the road construction.

Capacity of the community forest user group members: Members of community forestry has skill and knowledge learned through their daily life experiences. They have very less scientific concept and skills about climate change. How the informal and formal knowledge make synergy does is important aspects of the adaptation process. Also, how the knowledge and skills of the marginalized community is crucial issue in the process.

6. Conclusion and Recommendations

Climate change is now recognized as one of the most serious challenges facing the world - its people, the environment and its economies (EC, 2008). It is believed that most global warming we can now observe is attributable to emissions of GHGs that result from human activities, in particular land use changes such as deforestation particularly from developing countries, and the burning of fossil fuels specifically from developed countries.

Climate change and its impact on natural and social system are critical issues of equity. The world's poorest countries and people, those who contributed least to the atmospheric buildup of greenhouse gases, are the least equipped to deal with the negative impacts of climate change, therefore more vulnerable than rich countries and people. On the other hand wealthier nations and people that have historically contributed the most to GHG emissions are better able to adapt to the impacts (Osman-Elasha, 2009; Bernier and Schoene, 2009; UNFCC, 2007).

Though Nepal and Nepalese contribute very little to global climate change through emission of green house gases, they and their development endeavors are victims of unbridled emissions everywhere (NCVST, 2009). In addition, Nepal is one of the most vulnerable countries in South Asia to climate change, yet it has limited capacity to address its impacts or to take advantage of any opportunities. Nepal is one of the ten most vulnerable developing countries because of its geography, poor physical infrastructure and the low level of development of its social sectors (OECD, 2003).

Since the Third Assessment Report (IPCC, 2001), policy-makers and the scientific community have increasingly turned their attention to climate change impacts, vulnerabilities and associated risks that may be considered 'key' because of their magnitude, persistence and other characteristics (Schneider and et all, 2007). Then, the policies and practices has been focusing on the reducing the impacts and vulnerability of people induced through climate change events. Vulnerability and adaptation assessments were identified as vital tools for developing countries to evaluate and implement responses to climate change (UNFCCC, 2007).

Adaptation is processes through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes. There are many options and opportunities to adapt. These may be technological as flood-proof houses or behavior change at the individual level such as reducing water use in times of drought or early warning systems for extreme events, better water management, improved risk management, various insurance options and biodiversity conservation (UNFCCC, 2007).

Community forest User Groups are considered as the most suitable mechanism that support better to their resources and members to cope and adapt with the bad impacts from climate change incidences. Now the groups have been preparing vulnerability map of people and forest resources through climate change incidences, formulation of the adaptation plan at different level and establishment of adaptation

fund to support to the most vulnerable section of their users and area of their forest resources. DFID UK's Livelihoods and Forestry Programme has been supporting and speeding up the adaptation process of the groups.

The practices show that community forestry user groups as viable mechanism to support community level adaptation to climate change because it supports actual vulnerability analysis, targeting most vulnerable section of society, use of indigenous knowledge to cope with climate change, better linkages adaptation with mitigation strategies and adaptive capacity of the vulnerable groups. Policy measures employed include coordination with the local government, organizing training, sharing information, monitoring rain and water levels, mapping and providing legislative support to local communities (UNFCCC, 2007).

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