

## **Communities, Commons and Climate change adaptation: some empirical evidences from Nepal**

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### **Abstract**

Recent studies demonstrate that rural communities dependent on agriculture and forest resources are particularly vulnerable to the impacts of climate change in Nepal, since about 25% of the population still live under poverty (<\$1.25), and a major percentage of this section of population is forest and agricultural dependent. There are tremendous impacts of climate change, which local people experience in Nepal. Such impacts make the socio-ecological and economic system vulnerable in particular. The main impacts recorded by various studies conducted in Nepal are declining of agricultural productivity, disappearance or extinction of medicinal and aromatic plants, melting of glaciers, floods, change in rain pattern and shift of rainy season, and rise in temperature. The impacts on ecological and biological systems have serious consequences on the lives and livelihoods of people, particularly those living in poor rural areas and whose livelihood is connected to local commons.

The study is based on a review of 516 Community Adaptation Plan of Action (CAPAs) and Local Adaptation plan of Action (LAPAs) prepared between 2009-2011 in 15 districts of Nepal, the baseline study of the Multi Stakeholder Forestry Programme (MSFP), and a review study conducted in late 2012 on community adaptation in order to understand the local adaptation practices in three districts. A total of 516 adaptation plans were reviewed and more than 175 variables were defined for database preparation. The adaptation plans were first categorized into three broad categories: CAPA prepared at Terai districts (96 CAPA), CAPA prepared at hilly districts (274 CAPA), and LAPA prepared at hilly districts (146). These studies bring a number of insightful reflections and linkages between local commons, communities and climate change. Preliminary findings from the analysis of 516 CAPs revealed that community people have given high priority for climate education (37%), flood control (14%), use of low emission energy products like bio-gas, improved cooking stoves (17%), water security (15%), and food security (12%). While from a recent study, it has shown that a number of local adaptation practices - such as on- and off-farm quick impact related activities, rainwater harvesting, agri-cooperatives were initiated for managing local commons and securing livelihoods. Community Adaptation Plans of Action (CAPA) and Local Adaptation Plan of Actions (LAPA) is an adaptation plan prepared at community and VDC level respectively and is considered as the best practice to ensure the bottom up planning process.

**Key words:** Local commons, Forest, Adaptation, Livelihoods, Community, users

## INTRODUCTION

### Background

Around 40% of total land of Nepal is covered by forests. Most rural people (about 70%) depend on forests for meeting their daily livelihood needs. Study says that Nepal's forests contribute 9% to GDP. There are about 29000 Community Based forest management groups managing forest and other common pool resources in Nepal, which are managing about 1.9 Million Ha of forests resources. Climate change posing a serious threat: flooding and landslides, low agricultural productivity, change of visitation, melting of glacier are the main impacts of climate change. Though, Nepal has negligible global share (0.025 %) in GHGs emission (MoPE, 2004), it is highly vulnerable to climate change due to fragile landscape, poverty and diverse climate. Nepal is ranked as 4th most vulnerable country in the world by the Climate Change Risk Atlas 2010 and top ten countries most likely to be impacted by global climate change (WFP, 2009). More than 4,000 people died in Nepal over the last ten years in climate induced disasters, which caused economic losses of USD 5.34 billion. Every year more than 1 million people are directly impacted by climate-induced disasters such as drought, landslides and floods in the mid- and far-west Nepal. Climate change might induce similar events with increased frequency in the future (Uprety, 2011). Hence, the above evidences justified that Nepal is a climate vulnerable country and has to develop adaptive capacity.

Climate change adaptation and reducing social and environmental vulnerability are the recent up- and -coming issues that need to be addressed through national policy. Climate Change Adaptation can be defined as adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts (IPCC 2001). Adapting to the changes has consequently emerged as a solution to address the impacts of climate change that are already evident in some regions. It involves adjustments to reduce the vulnerability of communities, regions, or activities to climatic change and variability. Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report states that "adaptation will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions" (IPCC, 2007: 18). Adaptation to climate change is considered especially relevant for developing countries where societies are already struggling to meet the challenges posed by existing climate variability (Yamin et al. 2005; Adger et al. 2003; Handmer 2003), and are therefore expected to be the most adversely affected by climate change (McCarthy et al. 2001).

Realizing the increasing impacts of climate change, Government of Nepal (GoN) prepared and promulgated National Adaptation Programme of Action (NAPA) 2010; climate change Policy 2011, and National Framework on Local Adaptation Plan for Action 2011 (LAPA framework). These policy documents address the national deliberation regarding the impact of climate change and suggest developing coping strategies. All these policy documents unanimously identified rural communities as most vulnerable to the impacts of climate change and emphasize to elevate their adaptive capacity to cope against climatic hazards.

Community Adaptation Plans of Action (CAPA) is an adaptation plan prepared at community level and is considered as the best practice to ensure the bottom up planning process (CADPN 2011). The concept of CAPA was coined to: identify the impacts of climate change; identify best possible adaptation options (suited to local condition); prepare adaptation plans; integrate the prepared community level plans in Village Development Committee (VDC) level planning process; and to make local development process more climate change sensitive and climate proofed. Community Forests (CF) is a successful intervention of Nepal's forestry sector with more than 40% population involved, enhanced forest management, ensuring equitable benefit sharing and gender and social inclusiveness. Therefore most of the CAPA in the hilly regions are prepared at CF level. Further, CF is a resourceful institution and identified as the effective way to reach to the climate vulnerable communities.

However, Terai regions especially southern Terai have limited forests. As a result, most of the CAPA in Terai are prepared using other institutions like User Groups, Public and Institutional Land Management Groups (PILMG), Collaborative Forest Management etc. Adaptation plans prepared at the VDC level is known as Local Adaptation Plan of Actions (LAPA) while those prepared at community level are called CAPA (CADPN 2011).

A total of 274 CAPA and 146 LAPA prepared in 12 hilly districts were reviewed and analyzed in a separate database. Chronological analysis showed that climate induced disasters in the form of flood/landslides/erosion, drought, fire, hailstone, snowfall, storm, diseases, food crisis, drying of springs, introduction of invasive species and forest degradations were more prominent after 2050. All these incidents were very low before 2030, which might be due to the impacts of climate change and communities unable to remember the past incidents.

Decline in agricultural productivity was recorded from 406 out of 420 adaptation plans prepared at hilly districts. Similarly, other identified impacts are pests and diseases, decline in soil fertility, loss of local breeds, and early flowering and fruiting. The impact of climate change is visible in forests and biodiversity sector with decline in flora and fauna, outbreak of invasive species, increased incidents of forest fire, increased incidents of landslides and erosion and early flowering. The most prominent and visible impact of climate change in water is decrease in water source and drying off of springs. 345 out of 420 adaptation plans have indicated the decrease in water source. Other impacts related to water are inadequate water for all purposes, decline in water level and erratic rainfall.

With the technical and financial support from the Government and Non-Governmental Organizations, local communities of 15 districts<sup>1</sup> have prepared about 1500 CAPA (MSFP 2011). Livelihoods and Forestry Programme (LFP) and later Interim Forestry Project (IFP) were the key organizations to support the CAPA and LAPA initiative. Most of the CAPA had been endorsed by the assembly of each community and are in the process of implementation.

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<sup>1</sup> LFP has initiated the CAPA and LAPA process in 15 districts viz: Dhankuta, Tehrathum, Sankhuasabha, Bhojpur, Baglung, Parbat, Rukum, Rolpa, Pyuthan, Salyan, Dang, Myagdi, Rupendehi, Nawalparasi, Kapilbastu

## Methodology

### Approach and Framework

A total of 516 CAPA and LAPA were first categorized into three broad categories: (a) CAPA prepared at Terai districts, (b) CAPA prepared at hilly districts, and (c) LAPA prepared at hilly districts. There was limited information on CAPA prepared at Terai therefore separate database and variables were designed. Finally, the information of CAPA ( total 370) and LAPA (146) were coded based on the defined variables. Finally, the outcomes of the database were analyzed from different perspectives; focusing on impact of Climate change and adaptation interventions on water, agriculture, and forests and biodiversity and final report was prepared. Moreover, these CAPA and LAPA prepared by CFUGs and VFCC respectively were rigorously reviewed to identify and prioritize adaptation interventions, sectoral impacts of Climate Change and to integrate these adaptation options for MSFP reference

Relevant literatures mainly the National Adaptation Programme of Action to Climate Change (2010); Climate Change Policy (2011); National LAPA Framework (2011), Participatory Tools and Techniques for Assessing Climate Change Impact and Exploring Adaptation Options (2010); Mainstreaming Climate Change Adaptation through Community Based Planning (2010) etc.

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## FINDINGS AND ANALYSIS

### Looking into the CAPA and LAPA Preparation Process

The CAPA preparation process started with awareness creation, followed by capacity building of communities and local stakeholders, then vulnerability assessment and mapping with the active participation of local communities and then adaptation plan preparation. The prepared plans after endorsed by Village Development Committee (VDC) council were integrated with VDC level plans and finally to some extent considered at DDC level planning process. Existing practices shows that, CAPA are prepared at CFUG level whereas most LAPA are prepared by VFCC at VDC level. Therefore there is substantial difference between the reviewed LAPA and National Framework for LAPA prepared by government.

It was observed that participatory, inclusive and gender sensitive approach was followed during adaptation plan development and implementation process. The process involved wide range of stakeholders such as local communities (especially most vulnerable segments), local government offices and service centres, government line agencies, local representatives from political parties, civil societies, CBOs and private sectors. Wider participation ensures ownership of all stakeholders on the plan resulting to the successful implementation of the plan.

Community and local adaptation plans prepared with the support of LFP and IFP by following the “*Participatory Tools and Techniques for Assessing Climate Change Impacts and Exploring Adaptation Options*” published by UKaid and LFP in 2010. It helps

communities and planners to understand the climate change hazards and risks and analyse the methods of coping and adapting and then develop adaptation plans to increase resilience. It also helps CBOs (CFUGs, water management groups, PILMG, soil conservation groups) to analyse the methods of coping and adapting and then develop adaptation plans to increase resilience. A total of 13 different tools have been incorporated in the toolkit that helps to prepare adaptation plans (table 1).

*Table 1: Set of 13 tools and their objectives for CAPA preparation*

Tool	Name	Objectives
1	Climatic Hazard Mapping	<ul style="list-style-type: none"> <li>Map the local climatic hazards and assess their risk.</li> </ul>
2	Climatic Hazard Trend Analysis	<ul style="list-style-type: none"> <li>Gain insight into past climatic hazards and identify trends in their nature.</li> </ul>
3	Climatic Hazard Ranking	<ul style="list-style-type: none"> <li>Compare and prioritise the most critical local climatic hazards.</li> </ul>
4	Climatic Hazard Impact Assessment	<ul style="list-style-type: none"> <li>Identify the most likely impacts of local climatic hazards.</li> </ul>
5	Livelihood Resources Assessment	<ul style="list-style-type: none"> <li>Identify and categorise local livelihood assets and resources.</li> </ul>
6	Livelihood Resource Vulnerability Assessment	<ul style="list-style-type: none"> <li>Assess the intensity of impacts of climatic hazards on livelihood resources</li> </ul>
7	Assessing Climatic Hazard Impacts on Livelihoods	<ul style="list-style-type: none"> <li>Compare and Contrast the impacts of major climatic hazards on livelihoods of the community.</li> </ul>
8.	Vulnerability Assessment	<ul style="list-style-type: none"> <li>Differentiate vulnerability to climatic hazards across different sectors and social groups, and</li> <li>Identify the most vulnerable people and groups within a community and the most vulnerable sectors.</li> </ul>
9.	Vulnerability matrix	<ul style="list-style-type: none"> <li>Gain an overview and quantify climatic hazard risk and resilience capacity of local communities.</li> </ul>
10.	Coping and Adaptation strategies Assessment	<ul style="list-style-type: none"> <li>Identify and assess the effectiveness of the current coping mechanisms practiced by communities to secure and improve their livelihoods and conserve ecosystem bio-diversity in the context of climate change.</li> </ul>
11.	Assessing the Effectiveness of Coping and Adaptation Strategies	<ul style="list-style-type: none"> <li>Analyse the effectiveness of existing coping and adaptation strategies against the severity of climatic hazards.</li> </ul>
12.	Mapping Adaptation Partnerships	<ul style="list-style-type: none"> <li>Explore the institutional context in which the community operates and identify appropriate institutional partners for adaptation.</li> </ul>
13.	Community Based Adaptation Planning	<ul style="list-style-type: none"> <li>Develop urgent and immediate short term and long term adaptation priorities for district, regional and national level planning, and</li> <li>Develop community level plans of action which will help them become more resilient to effect of climate change.</li> </ul>

## Looking inside of CAPA of Terai region and threat identified

The major climate induced threats documented in CAPA prepared at three Terai districts were flood and river cutting, fire, drought, cold wave, storms, diseases to human and livestock, decline in agricultural productivity and spreading of invasive species (figure 1). River bank erosion and flooding were identified as the major threat in majority of CAPA analyzed (75 out of 96 CAPA). Nepal has been experiencing a consistent and continuous increase in temperature at an annual rate of 0.06°C which is more prominent in mountains and high hills rather than in Terai (MoEnv 2010). Increased temperature causes melting of snow at an alarming rate which triggers the landslide and soil erosion in the hilly regions and flood and water logging in the lower flatlands of Terai. Flood and river cutting was identified as major climatic threats in 32 out of 40, 19 out of 22 and 24 out of 34 CAPA prepared at Rupendehi, Nawalparasi and Kapilbastu districts respectively.

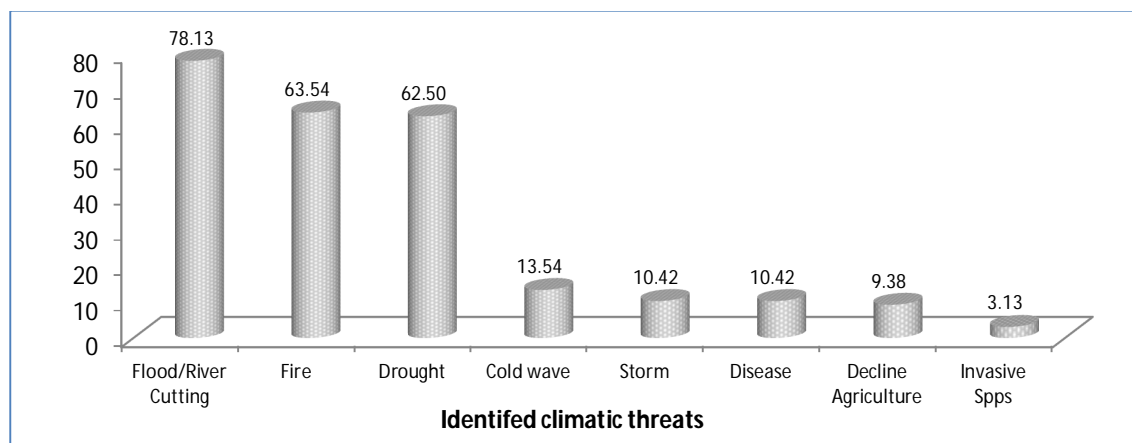


Figure 1: Identification of major climatic threats of Western Terai

Likewise, forest fire and fire at villages and agricultural fields and drought were identified as frequent climatic threats encountered in Terai region. Rise in temperature and scarce winter rain results the drought which has become more and more prominent during April-May. These factors, together with anthropogenic causes trigger fire both in forest and in the villages. Along with forest fire, drought results springs and water sources to shrink and disappear which pose direct threat to livelihoods and agriculture. Spreading of invasive species was reported in few of the CAPA analyzed (3 out of 96). Superficially, it refer that spreading of invasive species was not the major threat among the analyzed CAPA. Having said so, it cannot be said that CAPA ruled out invasive species as major threat. Involvement of different organizations during CAPA preparation, knowledge of facilitator and their facilitation skills, and specific geographical conditions are responsible for the identification and prioritization of threats. The latter statement can be verified from the fact that *Mikania micrantha* is the most outspread invasive species of Terai region that invade on *Shorea robusta* (Nepali: Sal) forest.

9 out of 96 CAPA identified decline in agricultural productivity as climatic threat. This data, however, did not refer that prioritization did not identify agricultural productivity decline as major threat. It simply shows that few of the CAPA raise the agricultural productivity decline



issue. Communities who prepare these 9 CAPA might have more agricultural land and they perceive decline as major threat. Reasons for other CAPA not to address agricultural productivity decline issue might be due to lack of their experience, inadequate exposure with the issue, and they might have limited information and knowledge to report the issue.

Likewise, cold wave, storm and disease on human and livestock are also identified as major climatic threat in some CAPA. Adaptation plans prepared in the Terai regions should give emphasize on activities that resist cold wave and storm so that the plans are resilient to such climatic hazards.

### Chronological Analysis of climate induced Threats

Chronological analysis of threats showed that climate induced disasters in the form of flood/landslides/erosion, drought, fire, hailstone, diseases, drying of springs and forest degradations were more prominent after 2050. Out of the 420 adaptation plans analyzed, the incident of flood/landslides/erosion after 2050 was recorded in 256 adaptation plans. However, frequency of flood/landslides/erosion was less within 2030-2050 (180 out of 420 adaptation plans) and was minimal before 2030 (recorded in only 67 adaptation plans). Likewise, climate induced disaster in the form of drought after 2050 was recorded from 294 adaptation plans (Figure 2).

There should be two reasons about the outcomes. Most evident reason is the impact of climate change that triggers climate induced disasters in recently years. Secondly, communities remember recent incidents but past incidents are not easy to remember therefore there are more chances of missing these information.

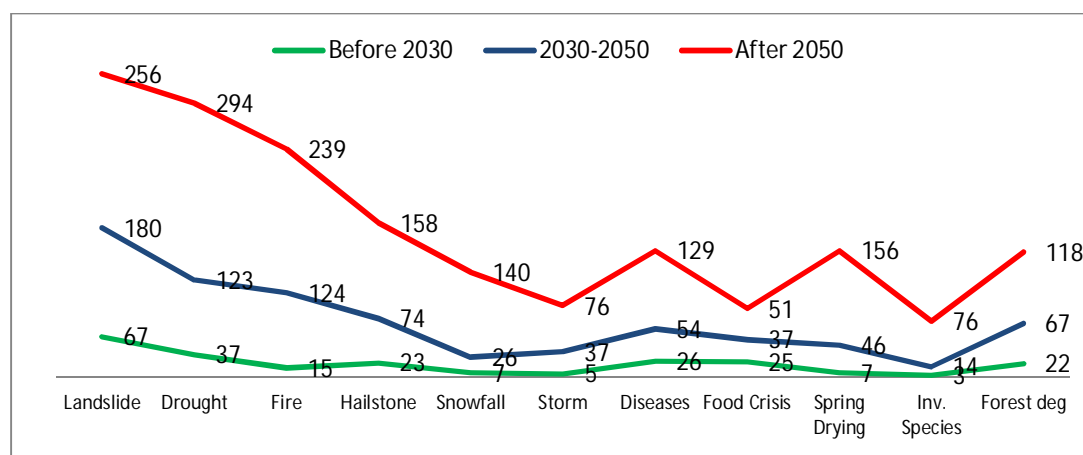


Figure 1: Chronological threats of CAPA and LAPA (count) n=420

### Key sectorial impacts

#### Impact of Climate Change in Agriculture

Decline in agricultural productivity was recorded from 406 adaptation plans. Similarly, increased incidents of pests and disease were recorded from 310 adaptation plans. Decline in

soil fertility was recorded from 306 adaptation plans (Picture 3). The revision showed that records of loss of local breeds and early flowering, fruiting and ripening was least recorded in the analyzed adaptation plans.

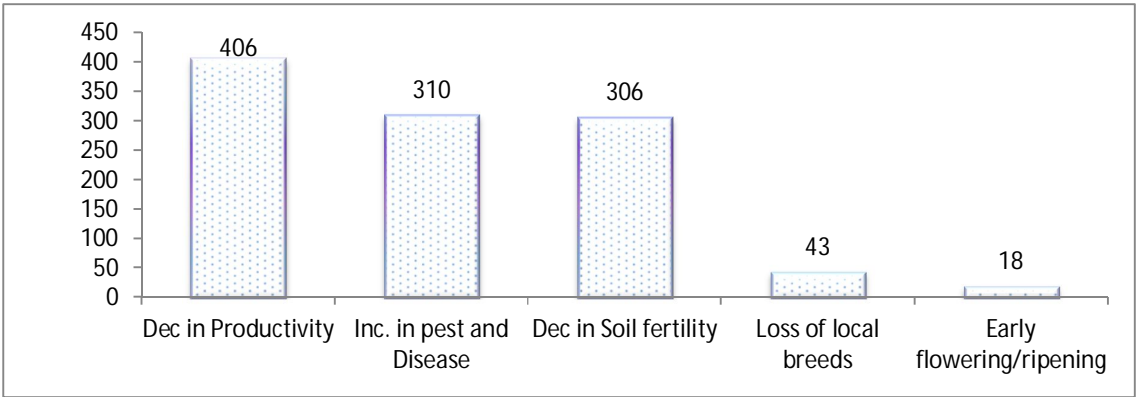


Figure 2: Impact of Climate Change in Agriculture

**Impact of Climate Change in Forests and Biodiversity**

The impact of climate change is visible in forests and biodiversity sector with decline in flora and fauna, outbreak of invasive species, increased incidents of forest fire, increased incidents of landslides and erosion and early flowering. There are still other impacts such as morphological change, habitat shrinkage but these are not mentioned in the adaptation plans. Decline in wild flora and fauna was recorded from 336 adaptation plans. Similarly invasive or alien species was recorded from 323 adaptation plans (Figure 4). Early flowering was recorded from only 12 adaptation plans.

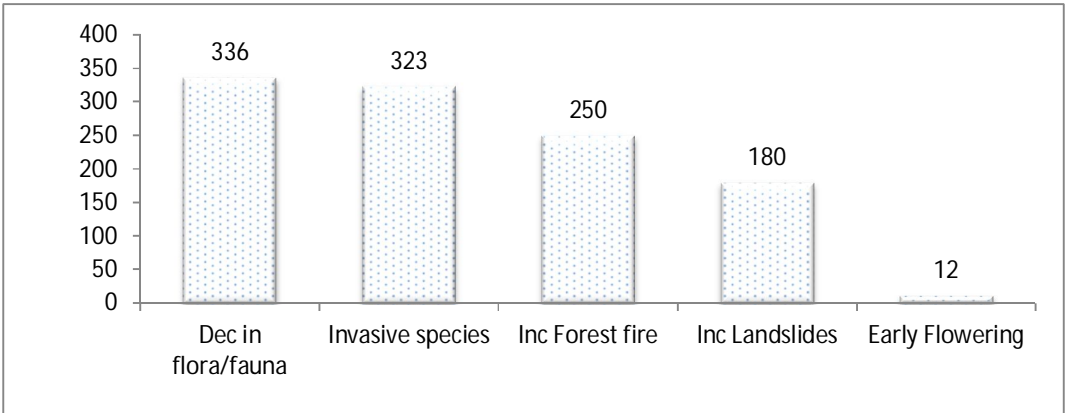


Figure 4: Impact of Climate Change in Forests and Biodiversity

**Impact of Climate Change in water**

The most prominent and visible impact of climate change in water is decrease in water source and drying off of springs. 345 out of 420 adaptation plans have indicated the decrease in water source. Likewise, 301 adaptation plants have mentioned the lack of water for all purposes. Decline in water level was recorded in 291 adaptation plans (Figure 5). Erratic rainfall, however was recorded from only 32 adaptation plans. Water sources in the hilly



areas are shrinking at fast pace due to increased drought incidents and erratic rainfall. Use of chemical fertilizers to increase agricultural productivity lead to deterioration of soil quality and consequently loses water holding capacity. Similarly, clearing of forests decreased the water holding capacity of forests.

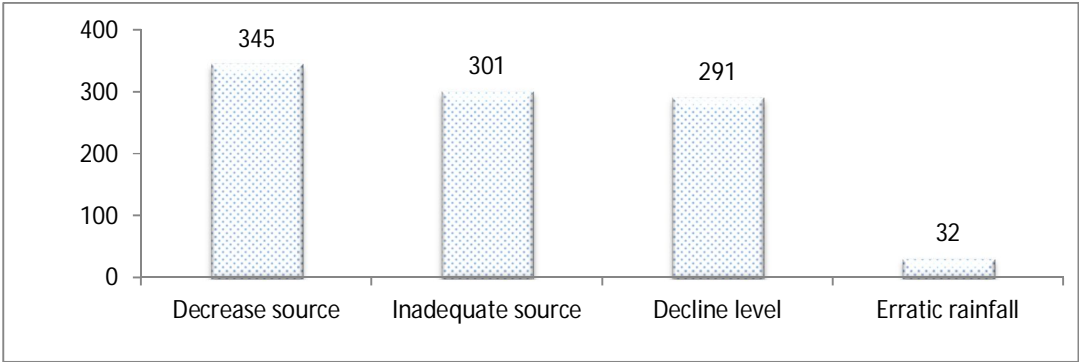


Figure 5: Impact of Climate Change in Water

### Local response and Adaptation Interventions

Adaptation activities as identified by CAPA prepared at three Terai districts were awareness, embankment, plantation, fire line construction, water and forest management, diversification of crops and alternative energy (Figure 6).

Majority of CAPAs (75 out of 96) identified awareness to climate change as one of the adaption options. Climate change adaptation awareness and sensitisation amongst the communities, development workers, stakeholders, politicians, journalist and civil society helps them to become resilient. Awareness and embankment are effective and efficient adaptation interventions and have scientific basis. It is well understood fact that inadequate awareness restricts communities to get better preparedness against climate induced hazards. Similarly, river cutting is the prominent issue of Terai and embankment is the identified mitigation measure. Awareness programme is also effective in improving the communities' understanding to the CC and to develop adaptation strategies at local level.

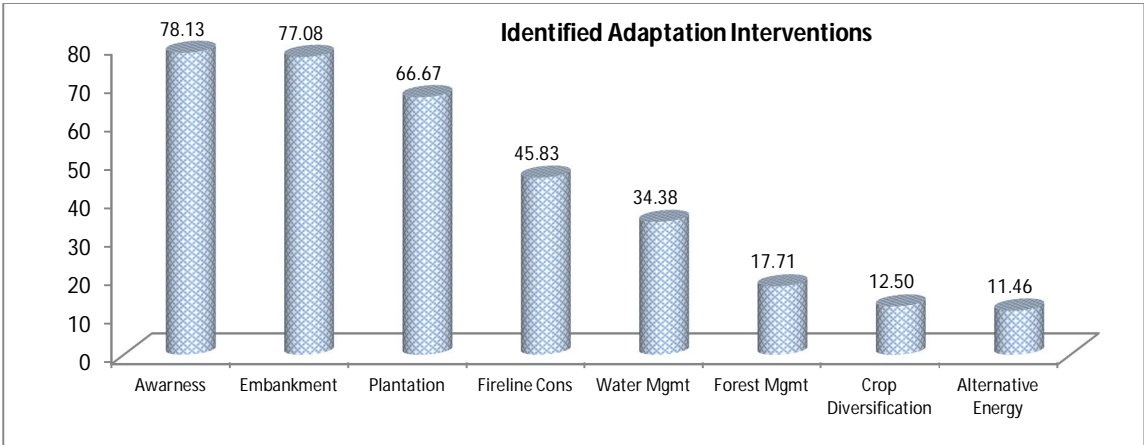


Figure 6: Identification of adaptation interventions

Likewise, embankment using the bamboos and sand sacs is an effective and efficient locally adopted method to control river cutting, especially in the lower flatlands.

Conversion of bare or cultivated land into forest by plantation was identified as one of the options to deal with climate change impacts. Plantation not only provides clean air to breathe but also helps to sequester carbon and helps to maintain ecological resiliency. An extensive reforestation campaign and forest management practice is needed to convert the barren lands to forest for environment and economy.

Fireline construction is also identified as one of the crucial means of adaptation against emerging incidences of forest fire. Scientific forest management that focuses on effective fireline contributed to conserve forests in several CFUGs. Similarly management of water for drinking purposes, personal hygiene and for irrigation is identified as adaption option in few CAPAs. Likewise, use of alternative energy and crop diversification is also identified as means of adaptation.

The adaptation options listed above are based on risk and vulnerability context and local people's perception. By analyzing the adaptation options identified in 96 CAPAs, it cannot be said that those listed options are effective. Their effectiveness should be evaluated when these options are tested and implemented in the field.

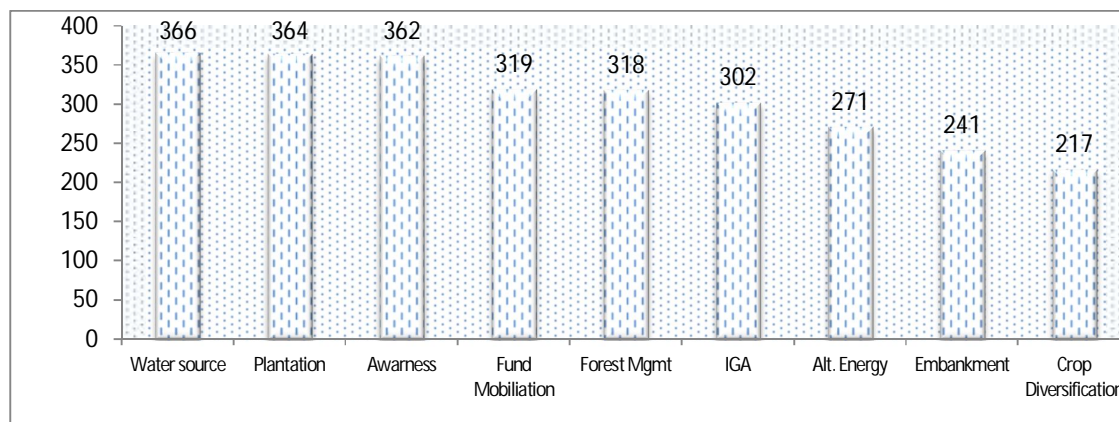
Similarly, adaptation strategies adapted by few CAPAs (such as forest management, crop diversification and use of alternative energy) does not mean they are less effective. Since CAPAs are prepared by different NGOs, the trend shows that there is an influence and uniformity in the identification of adaptation priorities.

Adaptation activities as identified by CAPA and LAPA prepared at hilly districts were irrigation/drinking water, plantation, awareness, awareness creation, fund mobilization, forest management (silvicultural practices, forest cleaning, fireline construction etc), income generation activities, alternative energy, embankment and crop diversification (Figure 6).

Most of the adaptation plans (366 out of 420) identified the management of water for drinking purpose and irrigation as one of the adaptation options. Most of the plan address the water related issues and allocate budget accordingly.

Plantation was identified as another adaptation intervention against CC impacts. An extensive reforestation campaign is needed to convert the barren lands to forest for environment and economy.

Majority of CAPAs (362 out of 420) identified awareness to climate change as one of the adaption options.



*Figure 7: Identification of adaptation interventions (count) n=420*

Mobilization of adaptation and emergency funds (established in the adaptation plans) was another identified adaptation interventions in 319 adaptation plans. Adaptation and emergency fund is most effective adaptation means as it provide immediate support to the affected households.

Similarly, forest management via fireline construction and silvicultural practices are identified as means of adaptation. Other adaptation interventions are income generating activities, use of alternative energy (solar, electricity, wind mills), embankment and crop diversification. The adaptation options listed above are based on risk and vulnerability context and local people's perception. By analyzing the adaptation options identified in 420 adaptation plans, it cannot be said that those listed options are effective. Their effectiveness should be evaluated when these options are tested and implemented in the field.

Similarly, adaptation strategies adapted by few adaptation plans (such as embankment, use of alternative energy, crop diversification) does not mean they are less effective. Since adaptation plans are prepared by different NGOs, the trend shows that there is sectorial influence towards the identification of adaptation priorities.

## CONCLUSION AND RECOMMENDATIONS

Analysis of 370 CAPAs (96 in Terai, 274 in the hills) and 146 LAPAs illustrates many dimension embedded with community, commons, and climate change adaptation. Analysis shows that drought, river cutting, erosion, fire, flood and decrease in agricultural productivity are major climatic threats. Identified adaptation options are awareness, plantation, water resource management (for irrigation and drinking purpose), IGA, fund mobilization and alternative energy. Most of the identified activities are genuine whereas some are highly ambitious and some are irrelevant to link with adaptation. Budget assessment for community planning for adaptation shows that higher costs are required for the water resource management, embankment and bio engineering. Fewer budgets are allocated for activities such as awareness, forest management, plantation, crop diversification, health etc.

The main conclusions drawn by the review of CAPA and LAPA are:

- Both CAPA and LAPA follow similar process and approach, thus intervention, plan and activities envisioned in CAPA and LAPA are alike but the degree and extend was different. LAPA covered larger area with larger households where as CAPA covered smaller area and households. LAPA and CAPA both are very useful in terms of sustainable forest and natural resources management.
- Institutional mapping was very well developed and presented in the adaptation plans but very few plans are owned by these institutions. Ownership of other line agencies except VDC and District Forest Office is insufficient. Major responsibility of planned activities revolves round the development agencies with undefined roles and responsibilities
- Analysis of CAPA and LAPA revealed that there was sectoral biasness during plan preparation. The organizations that facilitate to prepare adaptation plans first orient their staff or local resource persons and during the orientation, the strength of organizations is logical to influence facilitators (LRPs) and their staffs. Level of exposure and enhanced understanding of Climate Change issues to LRPs will help to reduce the sectorial biasness.
- The skills and knowledge of facilitator largely drives the adaptation plans. In some cases, the most evident impacts were not documented. For example spreading of invasive species was reported in few only three CAPA prepared at Terai. However, it cannot be said that CAPA ruled out invasive species as major threat. Involvement of different organizations during CAPA preparation, knowledge of facilitator and their facilitation skills, and inadequate exposure to the issues is responsible for the identification and prioritization of threats.
- Activities of some adaptation plans are more ambitious and are difficult to differentiate between development and adaptation activities.

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