Stocktaking Report on Climate Vulnerability on Water Resources Sector for NAP Process

Final Report

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DISCLAIMER

The findings, interpretations and conclusions expressed herein are those of the author(s) and do not necessarily reflect the views of the institutions.

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ACRONYMS

AEPC	Alternative Energy Promotion Centre
CAF	Cancun Adaptation Framework
CCA	Climate Change Adaptation
COPs	Conference of Parties
DDC	District Development Committee
DWSS	Department of Water Supply and Sewerage
GDP	Gross Domestic Product
GLOFs	Glacier Lake Outburst Floods
GoN	Government of Nepal
GWRDB	Ground Water Resources Development Board
INGO	International Non-Government Organization
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
LAPA	Local Adaptation Plan for Action
LDCF	Least Developed Countries Fund
LDCs	Least Developed Countries
LEG	LDC Expert Group
M&E	Monitoring and Evaluation
MCCICC	Multi-Stakeholder Climate Change Initiative Coordination Committee
MDGs	Millennium Development Goals
MWSDB	Melamchi Water Supply and Development Board
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NCCKMC	Nepal Climate Change Knowledge Management Centre
NEA	Nepal Electricity Authority
NGO	Non-Government Organization
NOC	Nepal Oil Corporation
NWSC	Nepal Water Supply Corporation
PPCR	Pilot Programme on Climate Resilience
PRSP	Poverty Reduction Strategy Paper
SNAP	Stocktaking for National Adaptation Planning
SPCR	Strategic Programme for Climate Resilience
STWSSDB	Small Towns Water Supply and Sanitation Development Board
TWG	Thematic Working Group
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VDC	Village Development Committee
WECS	Water & Energy Commission Secretariat
WUA	Water Users Association

MEASUREMENT UNITS AND CURRENCIES

BCM	Billion Cubic Meter
Km^2	Square kilometer
mm	Millimeter
MW	Mega Watt
USD	United States Dollar

EXECUTIVE SUMMARY

Nepal is adversely affected by the climate change phenomena. According to the Climate Change Vulnerability Index 2011, Nepal is ranked as the 4th most vulnerable country worldwide (out of 170 countries) to climate change (Maplecroft, 2011). The change in climate system and/or observed and projected rising trend of temperature has impacted water and energy sector. Hydrological cycle is intimately linked with changes in the atmospheric temperature and radiation balance (IPCC, 2007). Thus, the water resources sector is one of the most vulnerable sectors to climate change. Therefore, it is very important to quantify and/or qualify such impacts in order to identify the adaptation options and thereby minimize the potential damage magnitude of climate change on a local and regional scale within the country.

The objective of this study is to document adaptation activities pertaining to climate vulnerability to water resources sector in Nepal; synthesize available knowledge on climate change impacts, vulnerability and adaptation; and identify capacity gaps and barriers in order to help facilitate an enabling environment for the NAP process. This Stocktaking report in the context of NAP process is the starting point and thus is directed towards identifying adaptation needs and therefore answering the following questions (LEG, 2012):

i. What impacts on the water sector may be expected under climate change in Nepal?
ii. What are the stakeholders' or actors' vulnerabilities and capacities?
iii. What major issues need to be addressed?
iv. Where do we stand regarding effective short- and long-term adaptation activities?
v. What data and knowledge are available to assess current and future climate risks, vulnerability and adaptation?
vi. How can the storage and management of this data and knowledge best be coordinated?
vii. What gaps can be identified regarding the capacity, adequacy of data and information, and required resources to engage in the NAP process?
viii. What barriers exist to effectively plan for, design and implement adaptation?
ix. What are the next steps to be taken in the NAP Process after stocktaking?

GAPS ON INSTITUTIONAL MECHANISM, POLICIES, CAPACITY, AND DATA AND INFORMATION

Some of the barriers to effectively plan, design and implement NAPs in the context of the Nepalese water resources sector were identified as follows:

- *Institutional Mechanism and Policies*
    - Nepal has adopted a multitude of approaches for optimal allocation and management of its water resources in the past. In the process, it has come up with a number of policies, strategies and plans. However, the implementation of these policy documents and monitoring of the process have been subjected to scrutiny. The regulatory bases at the institutional level need to be revised in the light of integrated water resources management.
    - Sustainability of existing infrastructures and promotion of transparent, equitable, and financially sustainable water services within the country are other areas where

institutional and regulatory reforms are needed in Nepal. This ought to go hand-in-hand with human resource development and capacity building of the institutions and concerned stakeholders.

- Reinstatement of the Ministry of Water Resources, legal recognition to basin/sub-basin level stakeholders' organizations and implementation capacity building along with targeted program execution are therefore fundamental for competent water governance (*see Section 4.3*).

- Most of the planned adaptation actions of the government, INGOs and NGOs in the water and energy sector are related with the poverty alleviation programs under the framework of government's Poverty Reduction Strategy Paper (PRSP) and Millennium Development Goals (MDGs). These programs and activities are not tuned to the climate stimuli to have long term sustainability. Therefore, an urgent need is felt to reframe the government's PRSP through integrating climate and poverty for a sustained long term social and economic growth.

- *Capacity*
  - Water managers are adept and possess the experience of adapting to climate change. Many techniques exist to assess and implement adaptive options. However, the pervasiveness of climate change may preclude or prevent some traditional adaptive strategies, and available adaptations often are not used.
  - Climate change is just one of numerous pressures facing water managers. Nowhere are water management decisions taken solely to cope with climate change, although it is increasingly considered for future resource management. Some vulnerabilities are often outside the conventional responsibility of water managers.
  - Estimates of the economic costs of climate change impacts on water resources depend on assumptions made about CCA. Economically optimum CCA may be prevented by constraints associated with uncertainty, institutions, and equity.
  - Ability to adapt is affected by institutional capacity, wealth, management philosophy, planning time scale, organizational and legal framework, technology, and population mobility.
  - Water managers need research and management tools aimed at adapting to uncertainty and change, rather than improving climate scenarios.
- *Data and Information*
  - Monitoring and verification require baseline data. Plus, data need to be updated on a regular basis and made available for concerned stakeholders and researchers alike. However, data pertaining to water resources of Nepal are very difficult to find. In Nepal, numerous paper based district water and sanitation profiles have been prepared throughout the last decade but all have used different terms of reference. There is no uniformity in the formats and data analysis, so comparison and consolidation is impossible (Sugden, 2003). Therefore, investment in establishing baseline data and institutional mechanism for gathering and updating data should be top priority programs that ought to be proposed.

- In this regard, if WECS takes the supervisory role in collection, compilation, processing and maintaining a strong data base and has to take a lead role in conducting the above activities, the problem could be reduced by a significant degree.
- Nepal will need to make ample investment in the three I's: better and more accessible *Information*, stronger and more adaptable *Institutions*, and natural and man-made *Infrastructure* to store, transport and treat water and to maintain energy production base, expand and integrate transport/transmission and distribution networks (Sadoff and Muller, 2009). A suitable combination of three I's (*Information*, *Institutions*, and *infrastructures*) with the three E's (*equity*, *environment* and *economics*) is justified for a vigorous adaptation planning in water management.

INITIATIVES TO BE UNDERTAKEN TO ENHANCE ADAPTIVE CAPACITY

- *At the national level:*
  - Development of a Step-by-Step Approach for the NAP Process (*as discussed in Chapter 5*) can lead to active addressing of the request in the NAP Technical Guidelines to identify and assess serious gaps and important needs for effective adaptation. It therefore has the potential to provide a valuable basis for sound adaptation planning at national level.
  - Establishment of broadly based monitoring and communication systems (e.g. integrated drought monitoring and information system)
  - Pursuit of sustainable economic growth—which, in turn, allows for greater dedication of resources to development of adaptive technologies and innovations (Goklany, 1995).
  - Current systems of national routine data collection are disorganized, underfunded and largely unused in national planning. There are also still many problems of routine data collection. Computer based technologies should be used to make work easier and more efficient as well as to make systems more transparent and accessible.
  - One of the biggest concerns to Nepal, based on the NAPA experience, is whether adequate amount of climate finance will be available to support NAPs (and pre-existing NAPAs), the timing of finance delivery, and the modalities for access. Given this uncertainty regarding whether funding levels will be sufficient or not, methods for differentiating adaptation support from development aid will be vital. Nepal will benefit from developing M&E framework as part of the NAP process, or which the NAP can fit into, that benefits the broader economic development, social and policy-making needs.

- *At the local levels:*
  - Arrangements need to consider representativeness of decision making bodies and maintenance of flexibility in the functioning of local institutions
  - Identification and prioritization of local adaptation measures and provision of feedback to higher levels of government. These efforts would have to be reinforced by the adequate provision of knowledge, technology, policy, and financial support.

STEPS TO BE TAKEN AFTER THE STOCKTAKING EXERCISE

After stocktaking, the question now remains as to what the next steps ought to be in order to move ahead with the NAPs process.

The Step-by-Step Approach which has been discussed in length in *Chapter 5* has four steps and this has been created by keeping in mind the technical guidelines of the NAPs process. Therefore, upon completing the stocktaking exercise, it is recommended that activities under Steps 3 and 4 of the Step-by-Step approach (*Chapter 5*) be carried out. In other words, given the complimentary nature of the Step-by-Step approach and the elements under the technical guidelines of the NAPs process, it is suggested that activities being suggested under Elements C and D (*see Figure 1*) be carried out.

Some questions that might be useful after completing the stocktaking exercise and before further moving into NAP process are listed below:

- Has the stage in which Nepal is in with regard to the NAP process been identified?
- Has the GoN been informed about the participatory nature of the NAP and the importance of having various NGOs, INGOs, civil societies, research institutions and relevant stakeholders as part of the process?
- Have information generated from Steps (1), (2) and (3) (*Step-by-Step Approach*, *Chapter 5*) been shared with the GoN that can be used to complement existing information?
- Has the need to include local level organizations in NAP planning been advocated for?
- If there is no multi-stakeholder steering committee, has such an establishment been recommended?

The four elements (*see Figure 1*) and steps under each of them may be undertaken as appropriate. In the context of Nepal, involvement of a particular group of stakeholders for each of these elements can be distinguished. For *Element A*, involvement of the government would be the most practical of options. For *Element B*, involvement of the academia and think-tanks would be beneficial. As for *Element C*, involvement of district level line agencies and non-government organizations might be the most plausible option whilst independent auditing institutions for *Element D* would make most sense.

In sum, water is fundamental for sustainability. No section or actor of society is an outsider when it comes to water. Therefore, the NAP Process in Nepal pertaining to water ought to be built on the parallel work of all relevant major stakeholder groups. Governments, non-government and international organizations, academics, civil society and youth representatives should work alongside business leaders, private philanthropists and development institutions in order to find common grounds for the main components of a future water-related Sustainable Development Goal.

1 Chapter

1. INTRODUCTION

1.1 Background

Nepal is adversely affected by the climate change phenomena. According to the Climate Change Vulnerability Index 2011, Nepal was ranked as the 4th most vulnerable country worldwide (out of 170 countries) to climate change (Maplecroft, 2011). Nepal's NAPA (National Adaptation Programme of Action), 2010 has identified mid- and far-west Nepal climate vulnerable, taking into consideration the combination of landslides, flood, drought, and glacier lake outburst floods (GLOFs) vulnerabilities (MoE, 2010).

Climate variability has augmented threats. There is an increment in the number of extreme events – floods, droughts and avalanches. Climate Change has visibly impacted a number of sectors like water, agriculture, forests, tourism, infrastructure and human health and, in turn, livelihoods of the climate vulnerable communities. Floods in the river systems of Nepal in the past have affected many people, resources, ecosystems and livelihood opportunities in the river basin areas. Climate variability, extreme weather events, floods and droughts have direct impacts on food production, and energy security. In other words, climate change has imposed additional burden to poor people, vulnerable communities and natural resources of the country.

The change in climate system and/or observed and projected rising trend of temperature has impacted water and energy sector. Hydrological cycle is intimately linked with changes in the atmospheric temperature and radiation balance (IPCC, 2007). The potential impacts on water sector will ultimately affect the energy, agriculture, biodiversity, human health and will accelerate water induced disasters such as floods and landslides, including accelerated snow melts and formation of glacier lakes. Untimely precipitation and decrease in river and stream discharges in the winter and summer months will continue to affect electricity generation, water mills, irrigation and drinking water.

In this regard, Nepal analysed the impacts of the Climate Change on water and energy sector through a Thematic Working Group (TWG) during the NAPA preparation. It identified the following generic potential impacts of the climate change on water and energy sector (Table 1):

Table 1 Climate Variables and Potential Climate Change Impacts on Water Sector

SN	Climate Variables	Potential Climate Change Impacts
1	**Temperature**	• Decrease in spring discharge, surface water flow and water level of natural or artificial lake/storage • Lowering of groundwater table • Increase in water demand for irrigation/industry and domestic uses • Increase in bacterial activities in the water bodies • Increase in snow melt resulting to increase in surface water flow, and low volume of glaciers leading to decrease in surface water flow • Shift of snow line and permafrost to further higher altitude
	Increase in temperature	
2	**Rainfall Variation**	• Frequent flash floods • Increase in frequency and incidence of landslides, and other forms of water-induced land degradation • Degradation of water quality • Decline in groundwater recharge • Degradation of water quality due to increased sediment load
	High amount of rainfall in short period (high intensity rainfall)	

(Source: MoE, 2010)

The Stern Review Report (2006) recognized that adaptation to climate change will, in most cases, provide local benefits (including economic benefits). Adaptation actions should be integrated into development policy and planning at every level, and as Stern emphasizes *'ignoring climate change is not a viable option – inaction will be far more costly than adaptation'* (Stern, 2006; pp.48). In fact, much of the work of adaptation is an extension of sound governance and management structures, particularly in the water and water-related sectors.

Water resources sector is one of the most vulnerable sectors to climate change. Therefore, it is very important to quantify and/or qualify such impacts in order to identify the adaptation options and thereby minimize the potential damage magnitude of climate change on a local and regional scale within the country.

1.2 Study Rationale

Adaptation to climate change has become an indispensable component of planning at all levels, especially for a country like Nepal. At its sixteenth session in Cancun, the Conference of the Parties (COPs) to the United Nations Framework Convention on Climate Change (UNFCCC)

acknowledged that national adaptation planning can empower all developing and least developed countries (LDCs) Parties to:

i. assess their vulnerabilities;
ii. mainstream climate change risks; and
iii. address adaptation.

The COP also acknowledged that, because of their development status, climate change risks magnify development challenges for LDCs, and recognized the need to address adaptation planning in the broader context of sustainable development planning. With this in mind, the COP established the National Adaptation Plan (NAP) process with the following agreed objectives[1]:

a) To reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience;
b) To facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate.

Initial guidelines for the formulation of NAPs by LDCs contain four elements (*A, B, C,* and *D*) which have been depicted in Figure 1 (LEG, 2012).

1UNFCCC COP Decision 5/CP.17, paragraph 2

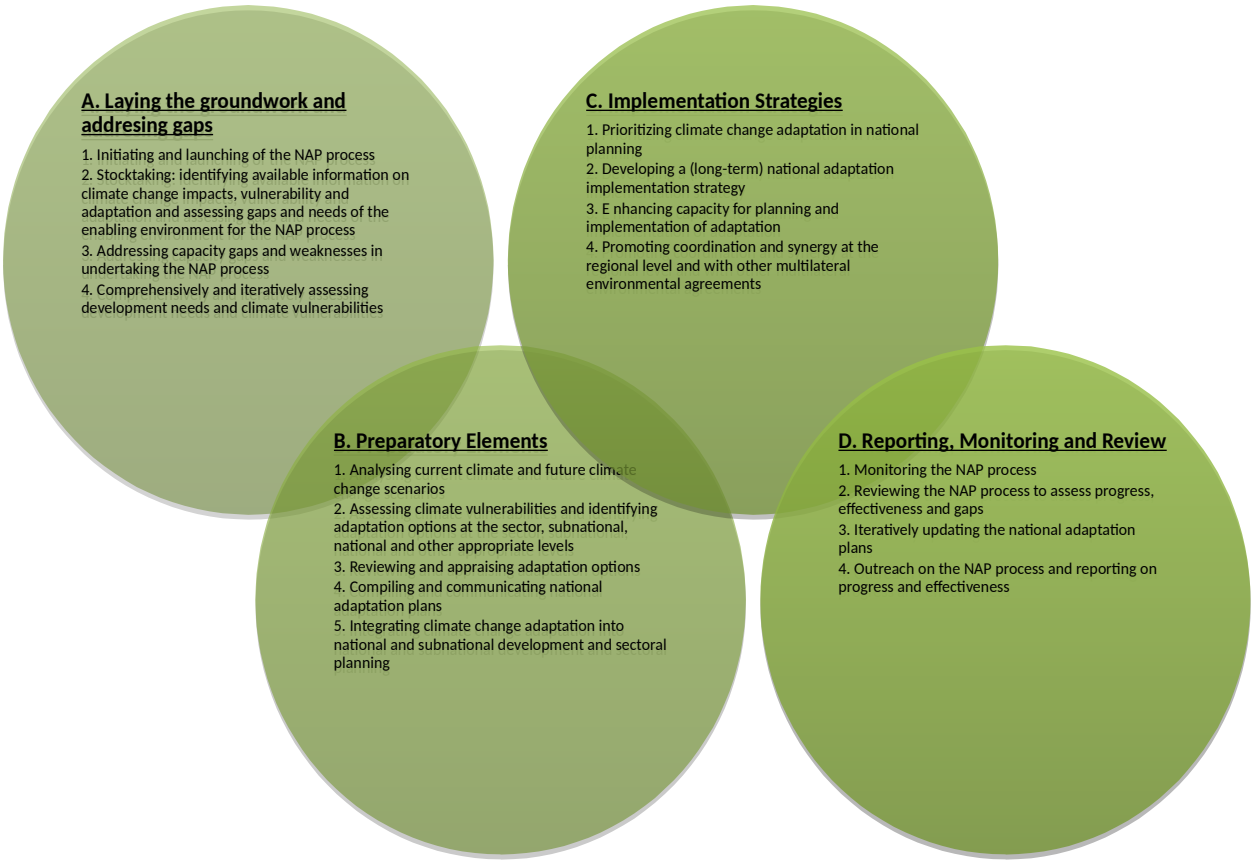

Figure 1 Elements of the NAPs Process

The initial guidelines urge to assess weaknesses and capacity gaps, development needs, climate vulnerabilities and address them as deemed necessary to support the formulation of comprehensive adaptation plans, programmes and policies. To proceed with the NAP process, the following activities ought to be carried out:

- Identification of specific needs related to capacity and vulnerability
- Direct the process with respect to the needs of the nation and priority area(s) or sector(s)
- Adapt iterative process of identification and prioritization of mid-term and long-term adaptation actions and integrate them into regional and national plans
- Organize stakeholder consultations, workshops, awareness raising and capacity building activities

For the purpose of this study, the focus will be on *Element A*: Laying the Groundwork and Addressing Gaps (*see Figure 1*). As per Element A of the Technical Guidelines on NAP Formulation, the Stocktaking component ought to cover the following and thus will be the basis for the fulfilment of this Study's objectives:

i. Conduct a stocktaking of on-going and past adaptation activities

ii. Synthesize available analyses of current and future climate at the broad national/regional level
iii. Coordinate compilation and development of a (distributed) database for the NAP process
iv. Conduct a gap analysis to assess strengths and weaknesses regarding the capacity, data and information, and resources required to effectively engage in the NAP process
v. Assess potential barriers to the design and implementation of adaptation activities

Against this backdrop coupled with the vulnerability assessment of Nepal with regard to its water resources, it is desirable to ***"stock take"*** the Nepalese water sector-specific climate change impacts, vulnerabilities and adaptation needs, identify and review adaptation options, compile and communicate NAP and integrate into sub-national and national development and sectoral planning. Upon integrating adaptation actions pertaining to the water sector of Nepal and climate change into the planning processes, a strategy could be developed for effective implementation of those plans. The strategy ought to contain capacity building components such as institutional strengthening and regulatory frameworks.

1.3 Objectives of the Study

The objective of this study is to document adaptation activities pertaining to climate vulnerability to water resources sector in Nepal; synthesize available knowledge on climate change impacts, vulnerability and adaptation; and identify capacity gaps and barriers in order to help facilitate an enabling environment for the NAP process. The Study outcome could be used by those who are leading the NAP process at the national level in Nepal and by water planners and managers responsible for addressing adaptation in water resource management and key water use sectors. In a nutshell, this report is meant to provide support for water planners who are contributing to the NAP process on the activities and tools which can be used to identify water related adaptation options which can be integrated and implemented through planning process.

This Stocktaking report in the context of NAP process is the starting point and thus is directed towards identifying adaptation needs and therefore answering the following questions (LEG, 2012):

x. What impacts on the water sector may be expected under climate change in Nepal?
xi. What are the stakeholders' or actors' vulnerabilities and capacities?
xii. What major issues need to be addressed?
xiii. Where do we stand regarding effective short- and long-term adaptation activities?
xiv. What data and knowledge are available to assess current and future climate risks, vulnerability and adaptation?
xv. How can the storage and management of this data and knowledge best be coordinated?
xvi. What gaps can be identified regarding the capacity, adequacy of data and information, and required resources to engage in the NAP process?
xvii. What barriers exist to effectively plan for, design and implement adaptation?
xviii. What are the next steps to be taken in the NAP Process after stocktaking?

1.4 Methodology

Climate change resiliency is a very dynamic area, and even during the relatively short period of project implementation, a variety of new assessment, planning, and monitoring tools can become available. The overall methodology for the purpose of this Study involved literature review, stakeholder consultations and an in-depth analysis of existing water instruments, legislations, policies, procedures and institutional structures in Nepal.

1.5 Limitations of the Study

The Study only assesses the stocktaking aspect within "*Element A: Laying the Groundwork and addressing gaps*" of the NAP process. Furthermore, the focus of the study within the stocktaking is on water resources of Nepal. This study is prepared based on review of available and accessible literatures.

2 Chapter

2 Water Resources: Usage Pattern and Climate Change Vulnerability

2.1 Water Resources

The major water sources of Nepal are rainfall, glaciers, rivers, and groundwater. Nepal's rivers can be broadly classified as perennial and non-perennial rivers. The perennial rivers originate in the *Himalayas* and carry snow-fed water with substantial discharge. Hence the perennial rivers have a remarkable potential as a source of irrigation and hydropower development in Nepal. A large number of small or non-perennial rivers in the Terai mostly originate in the *Siwalik Range*. These rivers have limited flow during the dry season. The river system in Nepal is divided into 4 major river basins: (i) Koshi; (ii) Gandaki; (iii) Karnali; and (iv) Mahakali. 74 % of the river basins lie within Nepal whereas 22% lie in China and 4% in India. There are approximately 6000 rivers and rivulets in Nepal- majority of them being fed by snow and glacier melts- draining 225 billion cubic meter (BCM) of water annually (WECS, 2002).

Nepal's annual average rainfall is about 1700mm and about 75% of which occurs during the summer monsoon season (June-September). The rivers in Nepal experience a wide seasonal fluctuation in their respective water volumes. The monthly flows generally reach their maximum in July-August and decline to their minimum in February-March. About 80% of the total flow occurs during five months (June - October) and the rest during the remaining months (WECS, 2002).

The glaciers in the High Himalayan region of Nepal have significant ramifications to the water structure in the country with nearly 4% of Nepal's total area being covered by glaciers (Mool P. et al., 2001). The glacier contribution to the total stream flow of the river basins in which they are situated varies widely among the basins (WECS, 2011). Enclosed water bodies such as lakes, ponds, dams serve as habitats for varied species of flora and fauna. There are a total of 5,358 natural lakes in Nepal (WECS, 2013) including glacial lakes. Furthermore, Nepal has around 660 lakes of more than 1 hectare (ha) in size (ADB/ICIMOD, 2006).

The hydro-geological investigation has shown that there is a tremendous potential of groundwater resources in the Terai region and the inner valleys within the hills and mountains. Groundwater recharge at specific area is estimated to be as high as 600mm per annum. In general, the annual recharge estimates range from 124 to 685mm (NENCID, 1999).

2.1 Water Usage Pattern

Nepal has an estimated amount of 225 BCM of water available annually and yet only a small portion (15 BCM) of it has been utilized for economic and social purposes. Out of this, 95.9% has been used for agriculture, 3.8% for domestic purposes and only about 0.3% for industry use (ADB/ICIMOD, 2006). Until now, Nepal has only managed to utilize its medium and small rivers for the purposes of drinking water, irrigation and hydropower. An estimate of Nepal's current consumptive water use in 2011 is shown in Table 2.

Table 2 Estimated national Consumptive Water Use in 2011

Water Demand/Use	Water Volume Million (m^3/yr)
Irrigation	24,900
Domestic	520
Industrial	16
Total Demand/Use	**25,436**

(Source: WECS, 2013)

i. Irrigation

Irrigation is the largest water use sub-sector in Nepal with around 35% contribution to the country's Gross Domestic Product (GDP) (MOF, 2013). The government, from the very beginning, has thus given due importance to irrigation in its yearly, five-year and three-year interim plans. Out of Nepal's total land area, 18% of it qualifies as a cultivated area (2,642,000 ha). Out of this total cultivated area, two-thirds (1,766,000 ha) is potentially irrigable (WECS, 2011). In the Terai region, 76.3% of irrigable land has already been developed in contrast to 51.3% in the mid-hills. In the mountains, 84.1% of the potential area has already been developed. The remaining irrigable land (510,966 ha) is still under rain-fed cultivation (WECS, 2013).

ii. *Hydropower*

Nepal's theoretical hydropower potential has been estimated to be about 83,000MW. However, only 42,000MW hydropower capacity is deemed to be technically and economically feasible. Table 3 summarizes the theoretical hydropower potential classified within the major river system in Nepal and Table 4 illustrates the technically feasible potential of hydropower in Nepal (*These estimates are based on Dr. Hariman Shrestha's doctoral thesis prepared in 1966 (Shrestha,1966)*.

Table 3 Theoretical Hydropower Potential

River	Potential in MW		Total
	Major river courses having catchments areas above 1000 km^2	Small river courses having catchments areas 300-1000 km^2	
Sapta Koshi	18750	3600	22350
Sapta Gandaki	17950	2700	20650

Karnali and Mahakali	32680	3500	36180
Southern River	3070	1040	4110
Country Total	**72450**	**10840**	**83290**

Table 4 Technical Hydropower Potential

River Basin	Number of Project Sites	Technical Potential Capacity in MW
SaptaKoshi	53	11400
SaptaGandaki	18	6660
Karnali	30	25410
Mahakali	4	1160
Southern Rivers	9	980
Country Total	**114**	**45610**

At present, a total of 22 Hydropower projects are operating in Nepal with capacities ranging from 1MW to 144MW. Among these projects, the Kali Gandaki Hydropower Project in the Western Development Region has the highest capacity of 144MW. Currently, Nepal has a total installed capacity of 665.111MW of hydropower out of which, 477.530MW is contributed by Nepal Electricity Authority and 187.581MW by Independent Power Producer (IPP) (WECS, 2013).

iii. Water Supply and Sanitation

In 2007, the water supply and sanitation coverage were in the region of 80% and 43% respectively (MOPPW, 2011). A more recent census data shows that the water supply and sanitation coverage in Nepal have improved to 85% and 62 % respectively (CBS, 2011). MOPPW (2011) has cited that the access to improved drinking water and improved sanitation is higher among urban households- 94% and 78% respectively.

iv. Other Uses

Apart from above water uses, water resources in Nepal are also used for other purposes such as fisheries, tourism and cultural uses. In-stream fishing and fisheries have direct link with livelihood, food production and poverty reduction. The Nepalese fisheries sector could produce about 50,000 tons of fish (WECS, 2013). Moreover, tourism being the second largest contributor to Nepal's foreign currency reserve and/or earning, water bodies such as the rivers and lakes offer opportunities for conducting water-based cultural, recreational and adventure tourism. Water transport, if developed, could be an important mode of transportation because of the factors like low cost, safety and reliability (WECS, 2013).

2.2 Climate Change and Vulnerability: Impacts on Water Resources

The Intergovernmental Panel on Climate Change (IPCC) defines *vulnerability* as:

"the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity".

Vulnerability results from a combination of processes that shape the degree of exposure, sensitivity to stress and impacts, and resilience in the face of those effects. Sensitivity refers to the degree to which a household, group or system is affected by exposure to any set of stresses and reflects the capacity of a population (or system) to anticipate and withstand the immediate impacts of a hazard (Pelling, 2003). Sensitivity is characterized by pre-existing conditions of the exposure unit that adaptation may improve or exacerbate. A successful adaptation process will require adequately addressing the underlying causes of vulnerability. An effective adaptation process would therefore hinge on the ability of livelihoods, which includes social networks, cultural traditions and activities that provide food and income, to be sufficiently flexible so that no adverse impacts of climate change on the social system are discernible.

Climate change has been a critical reason for building pressure in hydrological systems and water resources. Changes in the annual rainfall cycle, intense rainfall, flash floods and repeated droughts, retreating and expanding of glacial lakes are some of the commonly observed phenomenon. Some of the visible impacts of climate change on water resources are briefly discussed below:

i. The northern Himalayan region of Nepal is covered by permafrost and glaciers. In 2010, a total of 3,808 glaciers were identified with a total area of 3,902 km^2 and estimated ice reserves of 312 km^3 (Bajracharya et al., 2014). The average area of individual glacier was 1 km^2. The total estimated ice reserve between 1977 and 2010 has decreased by 29% (129 km^3). The number of glaciers has increased by 11 percent. Data showed that glaciers recede on an average by 38 km^2 per year. Therefore, climate change has had visible and pronounced impacts on snows and glaciers that might increase GLOFs which in turn might also wash away agricultural lands, cities and towns located along the riverbanks. Studies carried out in Imja, TshoRolpa and Thulagi Glacial Lakes in 2009 indicate serious risks of possible GLOFs, requiring risk reduction measures to the earliest possible. Some of the visible effects of climate change in the mountains are as follows:
    a. Existing rate of snow and glacier melting might increase water in Nepal's river system by about 5.7% till 2030, and decrease by 28% by the end of this century (Chaulagain, 2007).

b. The number of climate-induced internal migration has increased. About 150 people in the Mustang district migrated from uplands to the lowlands due to water scarcity. Drinking water scarcity has been emerging as a major threat in many hilly regions of Nepal such as in the Ramechhap district.
c. About 1.9 million people are vulnerable to climate change and additional 10 million Nepali people are increasingly at climate risks (MoE, 2010). Every year more than 1 million people are directly impacted by climate-induced disasters such as floods, landslides and droughts in the mid- and far-west Nepal. More than 4,000 people died in the last ten years due to climate-induced disasters, which caused economic losses of about USD 5.34 billion (MoE, 2010).

ii. Unpredictable, inconsistent and erratic precipitation has a remarkable effect on the river discharge in Nepal. The precipitation records revealed a decreasing trend in the number of rainy days without decline on total amount of precipitation indicating more intense precipitation in lesser number of days. It indicates a shorter winter and earlier snowmelt, thus affecting river hydrograph and water availability (WECS, 2013).

iii. Climate change is directly proportional to the increment in intra-annual variability of river/stream flow. Assuming a temperature rise of 4°C and a precipitation increase of 10%, the water flow in the Bagmati River, located in the Kathmandu valley, would increase from the present 268 m^3/s to 371.6 m^3/s (Chaulagain, 2006). This will increase incidences of flash flood, affect surface water drainage and reduce water storage or percolation capacity.

iv. Increased population and decreased surface water flow has accelerated stress on groundwater resources and water conflict in the urban areas. Decline in natural recharge of the aquifers and over exploitation of groundwater have led to rapid drop down in groundwater tables. Groundwater extraction in the Kathmandu Valley sufficiently exceeds withdrawal capacity as compared to its recharge capacity.

v. Intense rainfall within a short period has added stress on storm water drainage facilities and road blockage due to accumulation of more water. Although, there are no science-based studies on impact of climate change on different uses of water such as micro-hydro projects and water mills, memory of the local people about the past and present rainfall pattern indicates increasing water-induced disasters which will flow more sediment with quartz content. This is bound to significantly damage hydraulic machineries in the hydropower plants in Nepal.

vi. Changes in temperature and precipitation will: (i) increase crop water use due to evaporation; (ii) increase drying up of drinking water sources; (iii) induce flooding and/or damage water supply structures; and (iv) affect water quantity and quality. Major impacts include: (i) high water demand and haphazard water distribution system; (ii) discharge of untreated sewerage into rivers and loss of riverine flora and fauna; and (iii) reduced amount of water in the river and deterioration of historical and cultural assets of riverbanks.

vii. A recent study on Economic Assessment of Climate Change in Key Sectors (agriculture, hydropower and water-induced disasters) has estimated direct cost of current climate variability and extreme events equivalent to 1.5 to 2 percent of current GDP/year (approximately USD 270-360 million/year in 2013 prices) and much higher in extreme years (IDS-Nepal, PAC and GCAP, 2014). In case of hydropower, the model projected lower dry season flows and thus lower energy availability. The additional generation capacity needed to meet future demand under this scenario, due to climate change, was estimated at 2800MW by 2050 with an increase in costs of USD 2.6 billion (present value) for the period through to 2050. This clearly indicates high economic loss from climate change.

The June 2013 flood and landslides in Far-West Nepal could be considered a glaring example of water-induced disasters. In a nutshell, climate variability has affected and will continue to affect water resources and water-dependent people and communities including natural resources will be greatly affected.

3 Chapter

3.1 Climate Change Adaptation and NAPs

Due to the long-term nature of climate change and its impacts, it is necessary to also consider medium- and long-term adaptation needs. Therefore, to complement the short-term focus of NAPAs, a process was established in 2010 as part of the Cancún Adaptation Framework to support all developing countries, and especially LDCs, in identifying the medium- and long-term adaptation needs by formulating and implementing NAPs. At the Conference of Parties in Durban in December 2011, a decision on NAPs was adopted addressing their formulation, implementation, and financing.

The UNFCCC NAP process is designed specifically for LDCs, but invites all developing countries to follow the agreed initial guidance. It assists developing countries in assessing their climate vulnerabilities, building adaptive capacity and resilience and mainstreaming adaptation to climate change risks into all general and sector-specific development planning. This support can be in the form of technical guidelines, workshops, expert meetings, and regional exchange.

3.2 Nepal's NAPA

In 2010, the Government of Nepal approved the NAPA which was developed as a requirement under the UNFCCC to access funding for the most urgent and immediate adaptation needs from the Least Developed Countries Fund (LDCF). The NAPA has had broad objectives of mainstreaming climate change agenda into national development to reduce poverty, improve and diversity livelihoods, and build resilience. In Nepal, NAPA developed with three components: (i) Preparation and dissemination of NAPA document, (ii) Development and maintenance of Nepal Climate Change Knowledge Management Centre (NCCKMC), and (iii) Development of Multi-Stakeholder Climate Change Initiative Coordination Committee (MCCICC). In the NAPA of Nepal, the following integrated projects have been identified as the most urgent and immediate national adaptation priorities (MoE, 2010):

i. Promoting Community-based Adaptation through Integrated Management of Agriculture, Water, Forest and Biodiversity Sector
ii. Building and Enhancing Adaptive Capacity of Vulnerable Communities Through Improved System and Access to Services Related to Agriculture Development
iii. Community-Based Disaster Management for Facilitating Climate Adaptation
iv. GLOF Monitoring and Disaster Risk Reduction
v. Forest and Ecosystem Management for Supporting Climate-led Adaptation Innovations
vi. Adapting to Climate Challenges in Public Health
vii. Ecosystem Management for Climate Adaptation

viii. Empowering Vulnerable Communities through Sustainable Management of Water Resource and Clean Energy Supply
ix. Promoting Climate Smart Urban Settlement

The integrated programme on sustainable management of water resources (*(viii) above*) has objectives of, *inter alia*, managing water resources and supplies using a combination of climate proofing, climate risk management and water use technologies; and ensuring sustainable supply of clean energy. The NAPA proposed activities also include:

1. Conservation of lakes supplying water and ecological services to urban areas;
2. Water supply source conservation and strengthening programmes of existing projects affected by source reduction;
3. Piloting rainwater harvesting structures;
4. Promoting clean and low carbon energy technologies;
5. Development of nationwide urban groundwater monitoring system;
6. Establishment and improvement of micro-hydropower projects being affected by acute water shortage;
7. Improve multi-purpose water mills; and
8. Facilitate and implementation of local adaptation plans for efficient water and energy management.

The NAPA outlines list of theme-based priority adaptation options for the water sector. NAPA's implementation framework envisages that the operating costs will be kept to a minimum and at least 80% of the available financial resources will reach the local level to fund activities on the ground. Stakeholders in Nepal have also started discussing NAP (CEN, 2014a).

In order to implement NAPA prioritized adaptation actions, Nepal is implementing National Framework on Local Adaptation Plan for Action (LAPA). As of October 2014, GoN is implementing 100 LAPAs in climate vulnerable 14 districts of mid- and far-west Nepal. The Jalsrot Vikas Sanstha (JVS) under its Water and Climate Resilience Programme (WACREP) of the Global Water Partnership (GWP) South Asia has prepared a water-focused LAPA for Lamatar Village Development Committee (VDC) in the Kathmandu Valley. This LAPA has prioritized the following location-specific adaptation actions to address the adverse impacts of climate change in water sector in Lamatar VDC:

- Rainwater harvesting

- Wastewater management
- Conservation of streams
- Construction of water collection tanks
- Seeking of the new water sources
- Conservation and management of water resources

3.3 The Evolution of NAPs

Natural resources, human capital and people are more vulnerable to the negative impacts of climate change in LDCs than the industrialized nations. In the recent few years, there has been a shift in policies and practices advocating for Climate Change Adaptation (CCA) as opposed to mitigating and curbing climate change. CCA can be defined an adjustment in natural or human systems in response to actual or anticipated climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. The LDC Expert Group (LEG) in 2011 defined adaptation as "*human-driven adjustments in ecological, sectoral or economic systems or policy processes, in response to actual or expected climate stimuli or their effects or impacts"*. Adaptive capacity could be considered to be an *acquired capacity*- capacity developed during the course of time to adapt to shocks posed by climate change- and is related to climate vulnerability, extreme weather or risks, any system or individual to adjust to the adverse effects of climate change. Adaptation is embedded in the UNFCCC and has been getting priority as extreme events are on the rise over the years. Article 4.9 of the UNFCCC states that:

"…the Parties shall take full account of the specific needs and special situations of the LDCs in their actions with regard to funding and transfer of technology".

For LDCs, this provision provides multiple opportunities to get involved in, and benefit from, adaptation. In 2010, Parties established the Cancun Adaptation Framework (CAF) that is aimed at providing opportunities to address medium and long-term adaptation needs in the developing countries (both LDCs and non-LDCs). Furthermore, the CAF established a process to enable LDC Parties to formulate and implement NAPs. The COP16 extended the mandate of the LEG to provide technical guidance to LDCs in matters related to the identification of medium and long-term adaptation needs. By November 2013, 49 LDCs Parties had already prepared their country-specific NAPA and few LDCs have also initiated NAPs.

CCA has been identified as an appropriate option for the poor people in LDCs who have low capacity to cope with ongoing and emerging challenges posed by climate change and have limited (or zero) exposure to technological innovations and economic resources. Promotion of

sustainable development and integration of CCA into development planning and process has become a priority due to the climate change crisis especially in LDCs. Because NAPA was the prioritized adaptation scheme for Nepal for a long time, the introduction of NAPs has, however, put a number of doubts concerning NAPA amongst the relevant stakeholders. In Nepal, lessons learned from NAPA and differences between NAPA and NAPs need to be clarified so that people, especially those belonging to vulnerable communities within Nepal, can be protected against risks and vulnerabilities put forward by climate change so that their livelihoods can be positively impacted upon.

A NAP Technical Guideline to support LDCs who wish to be engaged in the NAP process has been prepared and published by the LEG. The United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP) in collaboration with numerous other partners have also initiated the Global Support Programme to assist LDCs in the NAP Process.

3.4 Differences Between NAPAs and NAPs

Before proceeding further, it is useful to recognize the use of the terms "NAPA" and "NAP process" in the UNFCCC decisions and guidelines and the subtle but important differences between the two. The NAP process is seen as a larger process for enabling the planning and implementation of adaptation at the country level. It is directed towards producing a range of outputs stretching from actions to assess and fill capacity gaps and needs for building climate resilience and mainstreaming adaptation, to outputs such as NAPs or a series of plans that contain adaptation priorities and strategies for implementation. Table 5 summarizes the differences between NAPAs and NAPs.

Table 5 Differences between NAPAs and NAPs

SN	Particulars	NAPAs	NAPs
1	*Scope*	Identification and prioritization of most urgent and immediate adaptation options	Identification and prioritization of medium and long-term adaptation options and their integration into development plans
2	*COP Decisions*	• COP 7 in 2001 at Marrakesh, Morocco • Issuance of NAPA preparation guidelines	• COP 16 in 2010 at Cancún, Mexico for NAP formulation process • Issuance of initial guidelines for NAP formulation at COP 17 in 2011 at Durban, South Africa
3	*Intended for*	LDCs	Developing countries including the LDCs
4	*To be prepared by*	LDCs through country-driven process	Developing countries including LDCs through country-driven process

5	*Funding Support*	LDC Fund	LDC Fund for LDCs and Special Climate Change Fund for developing countries
6	*Channeling of Funds*	GEF Implementing Agencies	GEF Implementing Agencies
7	*Technical Support*	LDC Expert Group (LEG)	LEG for LDCs and developing countries to prepare themselves
8	*Present State (as of February 2014)*	• 49 LDCs (including Cape Verde and Maldives who graduated from LDCs) • NAPA at different stages of implementation in LDCs	• NAP formulation process started in several LDCs by preparing roadmap and using LEG prepared Technical Guidelines • Few developing countries also engaged in NAP formulation process

Source: *Adapted from CEN, 2014b*

3.5 Nepal's Initiatives on Climate Change Adaptation

Nepal became a party to the UNFCCC in 1994 and the Kyoto Protocol in 2005. During the last few decades, Nepal has been actively participating in events conducted by Subsidiary Bodies and COPs. Since Nepal as a nation has been deemed to be vulnerable to climate change impacts, it has actively been engaged in processes aimed towards developing a process and making investments to respond and adapt to the adverse impacts of climate change.

A timeline highlighting some of the key initiatives and milestones with regard to CCA in Nepal has been depicted in Figure 2.

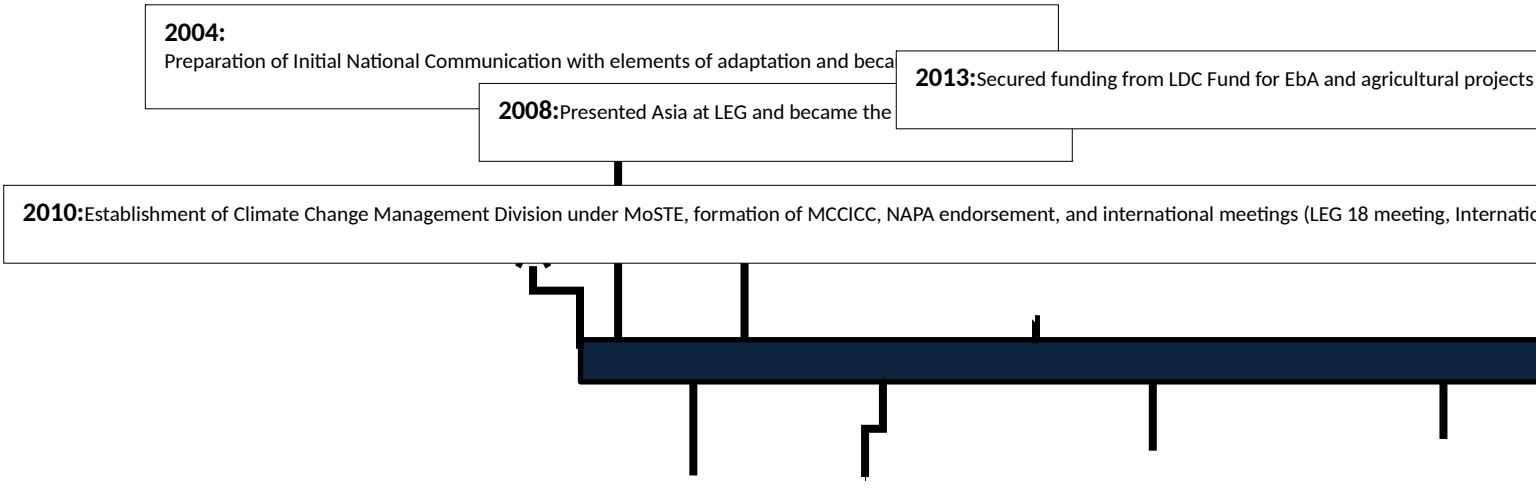

Figure 2. Timeline highlighting Nepal's key CCA initiatives and milestones

3.6 State of Adaptation Activities

A wide range of adaptation measures are in practice in different eco-geographical zones of Nepal. Nepal's adaptation measures and/or activities can be broadly classified as (i) *Autonomous*, and (ii) *Planned*. *Autonomous* adaptation measures, in practice, are the responses that have been put into place in order to sustain prevailing livelihood. *Planned* adaptation measures, mostly of a makeshift nature, applied in response to the climate change by the government, INGOs, NGOs, and communities. Table 6 provides a snapshot concerning the state of adaptation activities pertaining to the water sector in Nepal:

Table 6 State of Adaptation Activities in Water Sector

SN	Type of Adaptation Measure	State of Adaptation Activities: Some Practices
1	**Autonomous**	• Traveling longer distance for domestic and livestock water collection (Hill and Mountain Ecological Zones); • Roof top rain water harvesting (Hill and Mountain Ecological Zones); • Improvement in the household water management (use of kitchen waste water for livestock); • Use of water filtration system for drinking purpose at household level (Hill, Mountain and Terai Ecological Zones); • Collection of available snow for irrigation (Mountain Ecological Zone); • Diversion of available run off to agricultural fields for maintaining soil moisture and irrigation (Hill, Mountain and Terai Ecological Zones); • Use of overhead and underground tanks for domestic water collection (urban areas of Hill and Terai Ecological Zones); • Installation of dug well, hand pumps, shallow tube well and deep tube well (Terai Ecological Zone and intermountain basins of Hill Ecological Zone); • Use of drip irrigation (Terai and Hill Ecological Zones); • Shift to water stress resistant crops and horticulture (Hill, Mountain and Terai Ecological Zones); • Plantation of water conserving plant species around water holes

		(Hill and Mountain Ecological Zones); • Restrictions on open defecation and construction of toilet at household level to improve sanitation conditions and safeguard pathogen water pollution (Hill, Mountain and Terai Ecological Zones) • Use of improved cooking stoves (Hill, Mountain and Terai Ecological Zones); • Use of solar lantern for lighting and solar water heater for water heating (Hill, and Mountain Ecological Zones); • Use of residual biomass and animal dung for cooking and household heating (Terai and Mountain Ecological Zones); • Use of biogas for cooking and lighting (Terai Ecological Zone and low lying areas of Hill Ecological Zones); • Installation of Solar Home Systems for lighting energy etc. • Seasonal migration for additional income out of the homeland
2	**Planned**	• Investments and subsidies on micro-hydro, improved water mill, and peltric sets for lighting energy but lack climatic screening in the design and operation modalities (Hill and Mountain Ecological Zones); • Investments and subsidies on rural water supply schemes but lack climate screening in the selection of water taping points (Hill and Mountain Ecological Zones); • Investment in the small irrigation systems but lack climate screening in the selection and design of intake, canal lining etc (Hill, Mountain and Terai Ecological Zones); • Investment in rainwater harvesting ponds for livestock and irrigation (Hill and Terai Ecological Zones); • Rationing of water for domestic supply and irrigation through supply side management (Hill and Terai Ecological Zone) • Promotion of forest conservation through community, leasehold, and collaborative forestry programs (Hill, Mountain and Terai Ecological Zones) • Afforestation of the degraded areas for water conservation (Hill, Mountain and Terai Ecological Zones); • Watershed conservation programs (Hill and Mountain Ecological Zones); • Establishment of early warning systems for GLOF and floods (Hill, Mountain and Terai Ecological Zones); • Draining of glacier lakes (Mountain Ecological Zone); • River training works including bio-engineering along the roads for extreme precipitation and associated flood related erosion (Hill and Terai Ecological Zone); • Subsidies for autonomous adaptation programs such as biogas, improved cooking stoves, solar home systems, shallow tube wells,

		hand pumps, improved seeds, food grain in draught areas etc. (Hill, Mountain and Terai Ecological Zones)

(Source: MOE, 2010; Pp.57-58)

3.7 Moving Towards NAP

Nepal should engage in the NAP Process because of the following reasons:

i. The NAP process can become a powerful policy instrument for facilitating the paradigm shift towards climate resilient development. Effectiveness of individual domestic adaptation activities is expected to be enhanced by providing a comprehensive national policy framework for coordination, mainstreaming, implementation, monitoring and review.
ii. Nepal can gain access to adaptation experiences and lessons learnt within the international community and share its own experience at a global platform.
iii. Establishing a coherent, integrated approach to adaptation is expected to provide Nepal with a good basis to mobilize international support for adaptation.

By taking into consideration the experience and lessons learned from the NAPA process, it is imperative that a process is established in order to formulate NAPs for Nepal in order for it to enable to address the risks and vulnerabilities posed by climate change.

Development of a NAP tool (*for each element A,B, C, and D; see Figure 1*) taking into consideration the contextual settings of Nepal could be an effective way forward. For s*tocktaking* of water resources sector, creating and implementing such a tool at the national level could not only help to gather and present data pertaining to a specific field which is vulnerable to climate change but also aid to present such information with uniformity. Such a tool ought to be built upon the technical guidelines of NAPs as well as Nepal's own work supporting adaptation planning pertaining to the water resources sector.

For example, GIZ has developed the Stocktaking for National Adaptation Planning (SNAP) tool. The tool provides a snapshot of the planning capacities that are currently available and intended in a country. It thus helps to identify the country's point of departure for initiating the NAP process. The SNAP tool assesses the seven success factors of adaptation in a country. These factors were defined based on the Technical Guidelines for NAPs as well as GIZ's experience in adaptation to climate change worldwide. For each success factor outlined in Table 6, the SNAP tool provides several test questions to appraise the national adaptation performance in detail.

Table 7 Success factors for adaptation planning at national level for SNAP tool

Success factor	Description	UNFCCC guidance

Climate information	Data about climate impacts, vulnerabilities and adaptation options that provide the basis for solid decision-making on responses to climate change	*"Guided by the best available science and, as appropriate, traditional knowledge"* (5/CP.17, 3rd para)
Human and institutional capacities	The ability of stakeholders and institutions to coordinate adaptation processes as well as use and manage climate information	*"Institutional arrangements and capacities for overall coordination and leadership on adaptation"* (5/CP.17, Annex, 2nd para)
Long term vision and mandate	Common understanding on long-term objectives for national development taking climate change into account, as well as a mandate to align key processes with this vision	*"Identify and address medium- and long-term adaptation needs"* (1/CP.16, 15th para)
Implementation	The quality, quantity and strategic orientation of measures implemented on the ground to enhance resilience and/or reduce vulnerability to changes in climate	*"Based on nationally identified priorities"* (5/CP.17, 1st para)
Mainstreaming	The process of integrating adaptation into development processes at all planning levels,including national, sectoral and communal policy documents and programmes	*"Integrate adaptation to climate change into all sector-specific and general development planning"* (5/CP.17, 1stpara)
Participation	The involvement of representatives from private entities, different sectoral public administrations, as well as civil society and NGOs. Involving women's representatives is especially important since women are often disproportionally affected by climate change.	*"Gender-sensitive, participatory and fully transparent approach"* (5/CP.17, 3rd para)
Monitoring &Evaluation	Monitoring climate change impacts, financial resources, and adaptation performance, as well as monitoring and evaluating adaptation results provides valuable information for adaptation planning and decision making. M&E systems for adaptation ensure effective resource allocation, improve accountability, strengthen steering adaptation plans and activities and foster learning on adaptation.	*"Address inefficiencies; reflect lessons learned; monitor and review efforts; report on effectiveness"*(5/CP.17, Annex, 6th para)

(Source: GIZ, 2014)

In a nutshell, development of a NAP tool or a series of steps to be followed when engaging in the NAP process can lead to active addressing of the request in the NAP Technical Guidelines to identify and assess serious gaps and important needs for effective adaptation in the Nepalese context. It therefore has the potential to provide a valuable basis for sound adaptation planning at national level.

4 Chapter

4.1 Institutional Framework, Policy and Legislative Analysis

Water laws play an important role in determining the availability of water, and in the social, economic and institutional aspects of water governance and development since provisions for, and limitations on, the institutional arrangements affect how water is used, developed and managed. The overall purpose of this section is to provide a consolidated summary of the most important contents of the institutional arrangements and various laws of Nepal that influence the rights of citizens to water. More specifically, the purpose of this chapter is to bring together the most relevant clauses, rules and requirements of the various water legislations in the Nepalese context; provide a clear definition of the entitlements, roles, processes, obligations etc. stated in the laws; provide a tool for civil society and others to analyze the existing legislation for any gaps and omissions *(gap/situational analysis)*, inconsistencies, out-of-date aspects and ambiguities and thus form the basis for advocating for legal reforms.

4.2 Relevant Institutions

The institutions in the water (and energy sector) has three levels, namely *(i) coordination and policy, (ii) implementation and operational,* and *(iii) regulatory*. At the *coordination and policy level*, the following organizations are in place:

- National Development Council (NDC)
- National Planning commission (NPC)
- National Water Resources Development Council (NWRDC)
- Water & Energy Commission (WEC),
- Environment Protection Council (EPC),
- Parliamentary committee on Environment (PCE),
- National Commission on Sustainable Development (NCSD)

The following Ministries are by and large involved in *coordination and policy formulation*:

- Ministry of Energy (MoEr)
- Ministry of Irrigation (MOI)
- Ministry of Urban Development (MoUD)
- Ministry of Science, Technology and Environment (MoSTE)
- Ministry of Federal Affairs and Local Development (MoFALD)
- Ministry of Agriculture Development(MoAD)

At the *implementation and operational level*, the following government departments and agencies are involved:

- Department of Irrigation (DoI)
- Department of Electricity Development (DoED)
- Department of Water Induced Disaster Prevention (DWIDP)
- Department of Water Supply and Sewerage (DWSS)
- Department of Agriculture (DoA)
- Department of Hydrology and Meteorology (DHM)
- Department of Local Infrastructure Development & Agricultural Roads (DoLIDAR)
- Department of Soil Conservation & Watershed Management (DSCWM)

Similarly, at the *operational level*, there are a few parastratal organizations such as the Nepal Electricity Authority (NEA) and Nepal Water Supply Corporation (NWSC), besides the regional and district offices of the government and especially constituted boards such as the Melamchi Water Supply and Development Board (MWSDB), Rural Water Supply and Sanitation Development Fund Board (RWSSFB), Small Towns Water Supply and Sanitation Development Board (STWSSDB), Alternative Energy Promotion Center (AEPC), and Ground Water Resources Development Board (GWRDB). Local government bodies such as DDCs, VDCs and municipalities as well as Water Users Associations (WUAs) also operate at the operational level.

The regulatory function is performed by the Government body such as from Ministry, Department or district offices. The DDC, VDC and municipality also regulate functions. There are committees and commission such as the District Water Resources Committee (DWRC), Water Resources Utilization Investigation Committee and Electricity Tariff Fixation Commission (ETFC), established under different Acts, to regulate tariff fixation and to resolve disputes in the water sector.

4.3 Major Policies and Legislations

There are currently numerous sets of policies within the water (and energy) sector and they are being listed below:

- Hydropower Development Policy (2001),
- Rural Energy Policy (2006),
- Water Resource Strategy (2002),
- Nepal Water Plan (2005),
- Irrigation Policy (2003),
- National Water Supply Policy (1997),
- National Sanitation Policy (1998),
- Rural Water Supply and Sanitation Policy (2003),
- Rural Water Supply and Sanitation Strategy (2003),
- Urban Water Supply and Sanitation Policy (2005),
- Water Induced Disaster Management Policy (2003)

Similarly, a number of legislations relating to water (and energy) sector are in place.

- Water Resource Act and Regulation (1992) - umbrella legislation for hydropower, irrigation, drinking water and other water uses
- Electricity Act (1992) -legislation for power sector emphasizing on hydropower and transmission lines
- Drinking Water Supply Regulation (1998) – Regulation under Water Resource Act
- Irrigation Regulation (2000) – Regulation under Water Resource Regulation
- Nepal Water Supply Corporation Act (1989)
- Water Supply management Board Act (2007)
- Environmental Protection Act (1997) and Regulation
- Local Self-Governance Act (1999) and Regulation
- Soil and Watershed Conservation Act (1982) etc.

In principle, the Water Resource Act is considered as the umbrella act in the water and energy sector. Issues of overlap and often contradicting clauses of the various act provisions are of serious concern at the implementation, operation and regulation levels. Lack of updating the act provisions in compliance to the recent policies of the government is one of the problems in facilitating regulatory functions.

4.4 Institutional and Policy Gaps

Review of the existing government organizations and policies in the water resources sector indicates the absence of an appropriate institutional framework for integrated management. Problems relating to institutional framework and policies are (MOE, 2010):

- Inadequate effective central planning process (despite mandating WECS);
- Absence of an institutional framework for coordinated and integrated development;
- Jurisdictional overlaps and challenges of maintaining coordination between public and local bodies; and
- Absence of an effective mechanism for institutional cooperation for the development of international watercourses. An integrated and comprehensive water and energy policy isn't yet in place. Many of the above policies do not complement each other and often contradict.

5 Chapter

5.1 Engaging in the NAP Process: A Step-by-Step Approach

This chapter contains a step-by-step guidance on how to engage in the NAP process in general. Four key steps can be identified that support engagement of organizations such as JVS/GWP and other organizations that operate in the areas concerning the water sector in the NAP process. While these are also useful for engagement in other national level climate change planning processes, this guidance refers specifically to the NAP process. The steps need to be seen as an overall guidance and should be tailored to meet specific national and local level experiences and capacity, while also taking into account the contextual setting of Nepal. An overview of the steps is provided by Figure 3.

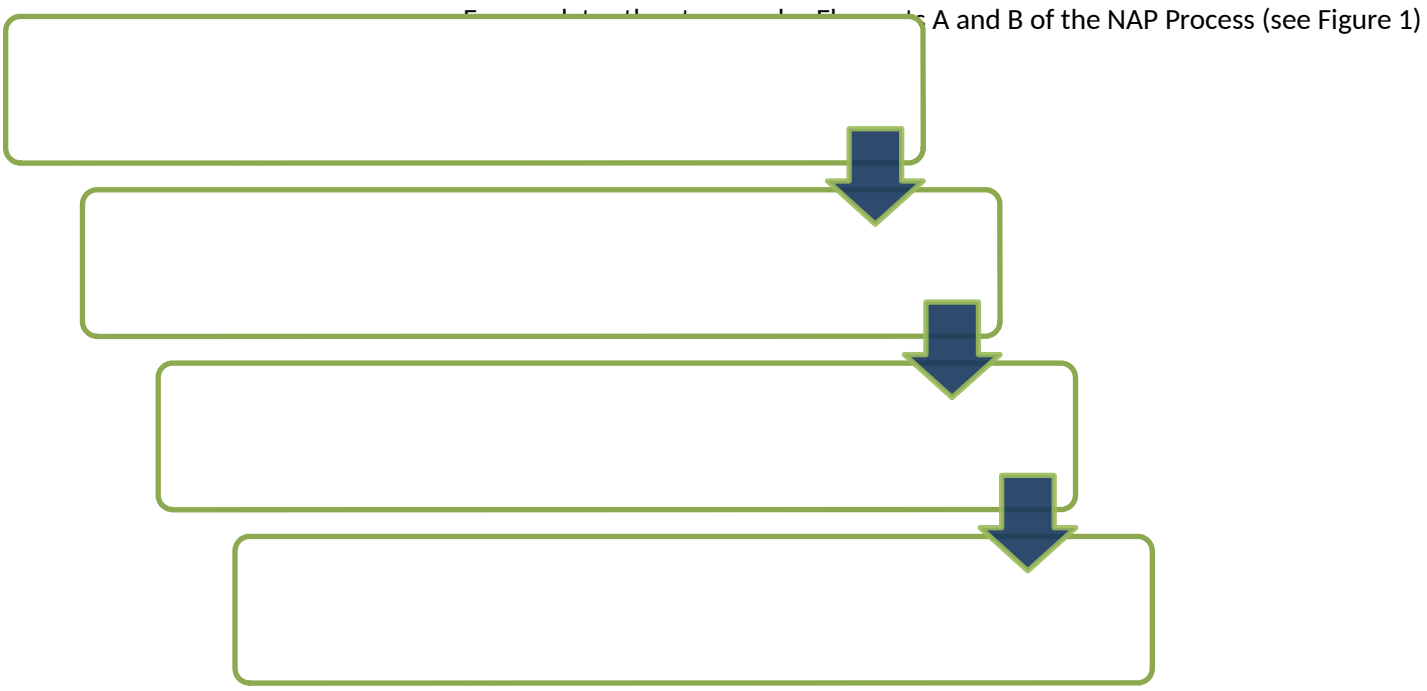

Figure 2 Steps to prepare for and engage in the NAP Process

Stocktaking encapsulates Step 1 in Figure 3 and provides information to be evaluated for Step 2. For each of these steps, there are different activities that should be carried out- the detailed explanations of which are provided in the subsequent sections.

5.2 Step 1: Understanding Key Climate Change Issues Affecting the Water Sector of Nepal

To begin with, it is important to gain a better understanding surrounding the key issues related to climate change in Nepal and focus on the water sector thereafter. In addition, the activities of other agencies and the government in relation to these specific issues also ought to be reviewed. To sum, the following should be the focus of this step:

- Understanding climate change in general
- Understanding climate change in Nepal and its impacts on its water sector
- Understanding climate change adaptation policies in Nepal pertaining to the water sector
- Getting access to relevant public documents on adaptation policies in Nepal

In addition to the aforementioned, recognition of a NAP focal point at the government level would be useful. This will allow for opportunities to ask questions on subjects that are still not well understood pertaining to the water sector and its vulnerabilities associated with climate change and to assess the level of knowledge and interest in being engaged in the NAP process. It is equally important to identify other active stakeholders in the NAP process and to assess their areas of expertise. This may open doors or possibilities for partnerships, and using the NAP process to develop cooperation in policy and programme development.

Information needed for engagement with the NAP process can be evaluated by focusing on the questions below:

- Do you know what the key issues are related to climate change in Nepal?
- Are you familiar with the key terminologies related to climate change?
- Do you know what climate change impacts are expected pertaining to the water sector in Nepal?
- Do you know where the government stands in the NAP process?
- Do you know about the climate change priorities and strategies of the government?
- Do you know what other organizations are doing to address climate change's impacts on the water resources?
- Who is the national climate change focal point and in which government ministry is he/she located?
- Who are the other key stakeholders working on climate change issues in your country?

Such information could be accessed by answering the following questions:

- Did you contact resource/research centres and universities based in Nepal to obtain more information?
- Did you contact the National Meteorological Office and asked for further information?
- Were you able to access government documents on climate change?

- Is your country one of the LDCs that has developed a NAPA? If yes, did you review it?
- Did you try to get in touch with your national focal point? Do you know people working in the ministries that could help you contact him/her?

5.3 Step 2: Evaluating the Information

After having collected and analyzed information on expected impacts of climate change on the water sector, the next step should be to evaluate how the Government of Nepal (GoN) is planning to address them. A key factor is using evidence derived from various scientific studies concerning climate change and its impacts on the water sector of Nepal. This will enable to better understand the scope of changes that are already taking place, specifically the impacts most felt by communities and key actions needed to address people's vulnerability and hence, build greater resilience to such impacts. Information gathered from processes and tools such as SNAP by GiZ and Vulnerability and Capacity Assessment (VCA) by International Federation of Red Cross and Red Crescent Societies can be very valuable to contribute to and inform national level planning, since it provides a snapshot of the situation at the local level, what communities are already doing to address it and what activities are needed to strengthen community-based initiatives and capacities.

Experience gained from the NAPAs can give insight on which sectors the GoN might focus in the NAPs. Some entry points in sectors that are usually part of the NAPAs are listed[2] below:

- Food Security
- Health
- Water and Sanitation
- Disaster Risk Management
- Capacity building, public awareness and education

With regard to the "*Water and Sanitation*" sector, an important aspect will be to evaluate how far the following have been (or will be) considered in the GoN's adaptation planning:

i. Is the programme targeting the most vulnerable?
ii. Is the programme designed to provide water to private households or agricultural production?
iii. What implications does this have for the most vulnerable?
iv. In what way can organizations such as JVS/GWP and like-minded stakeholders and institutions support these activities? How can they be used to support the integration of climate change issues into water and sanitation activities?

2 The information on NAPA priority sectors is taken from the UNFCCC NAPA Priority Database (Please click **here** for the direct link).

5.4 Step 3: Interacting with the Government/Policymakers, Experts and other Stakeholders, and Gaining Support from the Government of Nepal

Steps 1 and 2 focused on understanding the government's climate change adaptation priorities and identifying key priorities for adaptation from the water sector's perspective. The next step is to initiate a dialogue with the government. The GoN can be approached in different ways, depending on the context and also on existing relations/dialogue with the NAP focal point or the government. What might be helpful is the preparation of a document that clearly states why Nepal should actively engage in the NAPs process. For instance, a document synthesizing empirical evidence, such as data generated and complied from Steps 1 and 2 above, to illustrate specific needs for adaptation at the community level.

5.5 Step 4: The NAP Process

There is a set of technical guidelines which have been developed by the LEG on how to develop NAPs. It includes recommendations on the main elements *(see Figure 1)* and steps regarding the NAP process. The steps being recommended as per the technical guidelines developed by the LEG are as follows (LEG, 2012):

a. Initiating and launching of the NAP process
b. Preparation of the NAP
c. Implementation strategy
d. Reporting, monitoring and review

The activities to be undertaken within steps (a) and (b) and the information thus generated from them will be similar to Steps 1 and 2 discussed earlier in this Step-by-Step approach. Therefore, we will now focus only on steps (c) and (d) and provide recommendations for interaction with governments.

In step (c), the GoN will have to decide which activities are going to be implemented first. Thus, development of an implementation strategy with specifies timeframes, target groups, sequencing and responsible authorities for the different activities should be a top priority. It will be important for organizations such as JVS/GWP to be involved in the consultation process that develops the implementation strategy and to continue advocating for community-based adaptation activities.

When the first activities are implemented, ideally, the GoN will continue to review and re-assess the NAP process (Step (d)). By being actively involved in the review of the activities, organizations such as JVS/GWP could, for example, advocate for the inclusion of activities that have been missed out in the current NAP. Since NAP is designed as a continuous and progressive planning process, there will always be an opportunity to push for a revision and the inclusion of certain aspects.

To conclude, the structure of the NAPs will be quite similar to that of the NAPA and shall:

- contain a list of key priorities usually identified in terms of sectors such as agriculture, infrastructures, coastal zone protection or management of water resources
- tend to focus on ‘hardware’ solutions (such as infrastructure) as well as on approaches related to capacity building of communities, education and disaster risk reduction.

6 Chapter

6.1 Conclusion and Additional Aspects for Consideration

Managing water is largely about managing ambiguity, both in terms of climatic and non-climatic factors, and actions which can deliver benefits for a wide range of future uncertainties should be identified as a high priority for early implementation. Because vulnerabilities associated with climate change and water may differ at various scales, a successful CCA will depend on actions taken at both national and local levels. Some initiatives to enhance adaptive capacity at these two scales could be as follows:

At the national level:

- Development of a Step-by-Step Approach for the NAP Process (*as discussed in Chapter 5*) can lead to active addressing of the request in the NAP Technical Guidelines to identify and assess serious gaps and important needs for effective adaptation. It therefore has the potential to provide a valuable basis for sound adaptation planning at national level.
- Establishment of broadly based monitoring and communication systems (e.g., integrated drought monitoring and information system)
- Establishment of public policy that encourages and supports adaptation at local or community levels and in the private sector (Burton, 1996)
- Pursuit of sustainable economic growth—which, in turn, allows for greater dedication of resources to development of adaptive technologies and innovations (Goklany, 1995).
- Current systems of national routine data collection are disorganized, underfunded and largely unused in national planning. There are also still many problems of routine data collection. Computer based technologies should be used to make work easier and more efficient as well as to make systems more transparent and accessible.

At the Local Levels:

- Arrangements need to consider representativeness of decision making bodies and maintenance of flexibility in the functioning of local institutions
- Encouragement of diversification of income sources (and therefore risk-spreading), particularly for poorer sectors of society (Wang'ati, 1996; Adger and Kelly, 1999)
- Identification and prioritization of local adaptation measures and provision of feedback to higher levels of government. These efforts would have to be reinforced by the adequate provision of knowledge, technology, policy, and financial support.

Adaptation is an important part of societal response to global climate change. Planned, anticipatory adaptation has the potential to reduce vulnerability and realize opportunities

associated with climate change effects and hazards. With regard to adaptation and adaptive capacity of the water resources sector in Nepal, the following were found:

- Water managers are adept and possess the experience of adapting to climate change. Many techniques exist to assess and implement adaptive options. However, the pervasiveness of climate change may preclude or prevent some traditional adaptive strategies, and available adaptations often are not used.
- Adaptation can involve management on the supply side (e.g., altering infrastructure or institutional arrangements) and on the demand side (changing demand or risk reduction).
- Climate change is just one of numerous pressures facing water managers. Nowhere are water management decisions taken solely to cope with climate change, although it is increasingly considered for future resource management. Some vulnerabilities are often outside the conventional responsibility of water managers.
- Estimates of the economic costs of climate change impacts on water resources depend on assumptions made about CCA. Economically optimum CCA may be prevented by constraints associated with uncertainty, institutions, and equity.
- Extreme events often are catalysts for changes in water management, by exposing vulnerabilities and raising awareness of climate risks. Climate change modifies indicators of extremes and variability, complicating adaptation decisions.
- Ability to adapt is affected by institutional capacity, wealth, management philosophy, planning time scale, organizational and legal framework, technology, and population mobility.
- Water managers need research and management tools aimed at adapting to uncertainty and change, rather than improving climate scenarios.

6.2 Barriers to effectively Plan, Design and Implement Adaptation

- Upon revising, studying and analyzing laws, policies and strategies pertaining to water in Nepal, it can be said that opportunities exist for NAP processes to mainstream climate plans into national development and sector plans. The Climate Investment Funds' Pilot Programme on Climate Resilience (PPCR) is projected to contribute towards building national capacity and institutions considerably, and aid to develop and implement a Strategic Programme for Climate Resilience (SPCR) for Nepal. Nepal's current five-year plan and the Medium-Term Expenditure Framework focus on poverty reduction but lack explicit consideration of climate change risks (such as risks posed by water disasters) and suggestions for possible responses (World Bank et al., 2011). Nepal could identify NAP pathways to integrate climate adaptation into the next (or revisions to the current) five-year plan, and to harmonize the SPCR with NAP.

- Most of the planned adaptation actions of the government, INGOs and NGOs in the water and energy sector are related with the poverty alleviation programs under the framework

of government's Poverty Reduction Strategy Paper (PRSP) and Millennium Development Goals (MDGs). These programs and activities are not tuned to the climate stimuli to have long term sustainability. It is therefore an urgent need is felt to reframe the government's PRSP through integrating climate and poverty for a sustained long term social and economic growth.

6.3 Identified gaps on capacity, data and information

- In the past, Nepal has adopted a multitude of approaches for optimal allocation and management of its water resources. In the process, it has come up with a number of policies, strategies and plans. However, the implementation of these policy documents and monitoring of the process have been subjected to scrutiny. One of the main reasons for this deficiency could be attributed to a lack of institutional arrangement and mechanism to implement such policies and strategies. There is neither a clear mechanism nor an institutional framework for water allocation or re-allocation in Nepal at present. The regulatory bases too need to be revised in the light of integrated water resources management. Sustainability of existing infrastructures and promotion of transparent, equitable, and financially sustainable water services within the country are other areas where institutional and regulatory reforms are needed in Nepal. This ought to go hand-in-hand with human resource development and capacity building of the institutions and concerned stakeholders. Reinstatement of the Ministry of Water Resources, legal recognition to basin/sub-basin level stakeholders' organizations and implementation capacity building along with targeted program execution are therefore fundamental for competent water governance (*see Section 4.3*).

- Monitoring and verification require baseline data. Plus, data need to be updated on a regular basis and made available for concerned stakeholders and researchers alike. However, data pertaining to water resources of Nepal are very difficult to find. In Nepal, numerous paper based district water and sanitation profiles have been prepared throughout the last decade but all have used different terms of reference. There is no uniformity in the formats and data analysis, so comparison and consolidation is impossible (Sugden, 2003). Therefore, investment in establishing baseline data and institutional mechanism for gathering and updating data should be top priority programs that ought to be proposed. In this regard, if WECS takes the supervisory role in collection, compilation, processing and maintaining a strong data base and has to take a lead role in conducting the above activities, the problem could be reduced by a significant degree.

6.4 Adaptation Needs: Required Resources for the NAP process

- Nepal will need to make ample investment in the three I's: better and more accessible *Information*, stronger and more adaptable *Institutions*, and natural and man-made *Infrastructure* to store, transport and treat water and to maintain energy production base, expand and integrate transport/transmission and distribution networks (Sadoff and Muller, 2009). A suitable combination of three I's (*Information, Institutions*, and *infrastructures*) with the three E's (*equity*, *environment* and *economics*) is justified for a vigorous adaptation planning in water management.

- Climate change impacts on water resources may be addressed by focusing on (i) Research, (ii) Optimum observation network, (iii) Strong database and, (iv) research based action oriented program/projects. Furthermore, a strong institutional arrangement for CCA and water resources sector management in Nepal needs to be present. One recommendation would be to reinstate the Ministry of Water Resources and allow WECS to take charge of data collection, monitoring and disbursement.
- The four elements (*see Figure 1*) and steps under each of them may be undertaken as appropriate. In the context of Nepal, involvement of a particular group of stakeholders for each of these elements can be distinguished. For *Element A,* involvement of the government would be the most practical of options. For *Element B*, involvement of the academia and think-tanks would be beneficial. As for *Element C*, involvement of district level line agencies and non-government organizations might be the most plausible option whilst independent auditing institutions for *Element D* would make most sense.
- One of the biggest concerns to Nepal, based on the NAPA experience, is whether adequate amount of climate finance will be available to support NAPs (and pre-existing NAPAs), the timing of finance delivery, and the modalities for access. Given this uncertainty regarding whether funding levels will be sufficient or not, methods for differentiating adaptation support from development aid will be vital. One way to achieve this is by refining measurement, reporting and verification systems for CCA finance. The monitoring and evaluation of progress in adaptation planning and implementation at national (and international level) will be very important, although clear guidance from the UNFCCC does not yet exist. Nepal will benefit from developing M&E framework as part of the NAP process, or which the NAP can fit into, that benefits the broader economic development, social and policy-making needs.
- Good and effective water governance, that applies the principles of transparency, accountability, access to information, participation and cooperation, relevant for any political system, with due consideration of stakeholder engagement, integrity and local circumstances when developing and implementing policies, is crucial for NAPs to be formulated in Nepal with regard to water resources. Furthermore, improved methods of integrating technical, environmental, social and political aspects into water, including waste water management have to be gradually introduced.

6.5 Steps to be Taken after the Stocktaking Exercise

Stocktaking, which is one of the crucial steps within Element B of the technical guidelines of the NAPs process as furnished by LEG (2012), helps to compile and generate information regarding a particular sector which has been impacted by climate change. After stocktaking, the question now remains as to what the next steps ought to be in order to move ahead with the NAPs process.

The Step-by-Step Approach which has been discussed in length in Chapter 5 has four steps and this has been created by keeping in mind the technical guidelines of the NAPs process. Therefore, upon completing the stocktaking exercise, it is recommended that activities under Steps 3 and 4 of the Step-by-Step approach (*Chapter 5*) be carried out. In other words, given the complimentary nature of the Step-by-Step approach and the elements under the technical guidelines of the NAPs process, it is suggested that activities being suggested under Elements C and D (*see Figure 1*) be carried out.

Some questions that might be useful after completing the stocktaking exercise and before further moving into NAP process are listed below:

- Has the stage in which Nepal is in with regard to the NAP process been identified?
- Has the GoN been informed about the participatory nature of the NAP and the importance of having various NGOs, INGOs, civil societies, research institutions and relevant stakeholders as part of the process?
- Have information generated from Steps (1), (2) and (3) (*Step-by-Step Approach, Chapter 5*) been shared with the GoN that can be used to complement existing information?
- Has the need to include local level organizations in NAP planning been advocated for?
- If there is no multi-stakeholder steering committee, has such an establishment been recommended?

Water is fundamental for sustainability. No section or actor of society is an outsider when it comes to water, for it connects. Therefore, the NAP Process in Nepal pertaining to water ought to be built on the parallel work of all relevant major stakeholder groups. Governments, non-government and international organizations, academics, civil society and youth representatives should work alongside business leaders, private philanthropists and development institutions in order to find common grounds for the main components of a future water-related Sustainable Development Goal.

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