Bagmati Province Watershed Strategy
(2022-2030)

Province Government

Bagmati Province
Ministry of Forests and Environment
Province Forest Directorate

Soil Conservation and Watershed Management Office

Makawanpur Hetauda

May 2022

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Acknowledgement

Integrated watershed Management (IWM) is a suitable option for managing watersheds in Nepal. For sustainable IWM, coherent policies, coordinated institutional arrangements and effective program implementation are prerequisites in each province as well. Realizing these approaches, issues and facts, the Soil Conservation and Watershed Management Office, Makawanpur under Ministry of Forests, Environment, (MoFE) of Bagmati Province, decided to prepare Provincial Watershed Management strategy.

The objectives of the assignment has been achieved pursuing the participatory field study and stakeholder consultation in local and provincial level of Bagmati Province. The study team is grateful to all person, organization, government line agencies who have contribute for precious input in the document. Besides all contributor to the study, special gratitude to Chairperson of Melamchi Municipality Mr. Dambar Bahadur Aryal and his team who has played crucial role in enriching the document with remarks and feedbacks.

Special thank to Soil Conservation and Watershed Management Office, Hetauda, Makawanput and Ministry of Forest and Environment, Bagmati Province which have supported in all level work through linking and coordination for field study and consultation made a successful attempt on preparing exemplary province level watershed strategy in Bagmati Province.

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1 INTRODUCTION

1.1 Context

Nepal has rich basin landscapes and watersheds which are mainly drained by four major river systems viz. Koshi, Gandaki, Karnali, and Mahakali (Figure 1-1). These rivers also hold huge hydropower potential estimated at about 83,000 MW of which technically and economically feasible potential HP has been estimated at 45,000 MW and 42,000 MW respectively (WECS, 2013; MoEWRI, 2018). Nepal's rivers are broadly classified into three types based on their origins: The first category comprises of the four main river systems of the country: Koshi, Gandaki, Karnali and Mahakali river systems that originate from glaciers and snow-fed lakes. Each river system is characterized by unique features comprising of ecological, environmental, social and economic systems which function in varying state of harmony between human and nature in terms of resource conservation, livelihood improvement and prosperity pathways. Rivers of the second category originate from Mahabharat range which includes Babai, West Rapti, Bagmati, Kamala, Kankai, Mechi etc. Streams and rivulets originating mostly from the Chure hills make up the third category; these rivers cause damaging flash floods during monsoon rains and remain without any flow or very little flow during the dry season (MoEWRI, 2018; WECS, 2011).

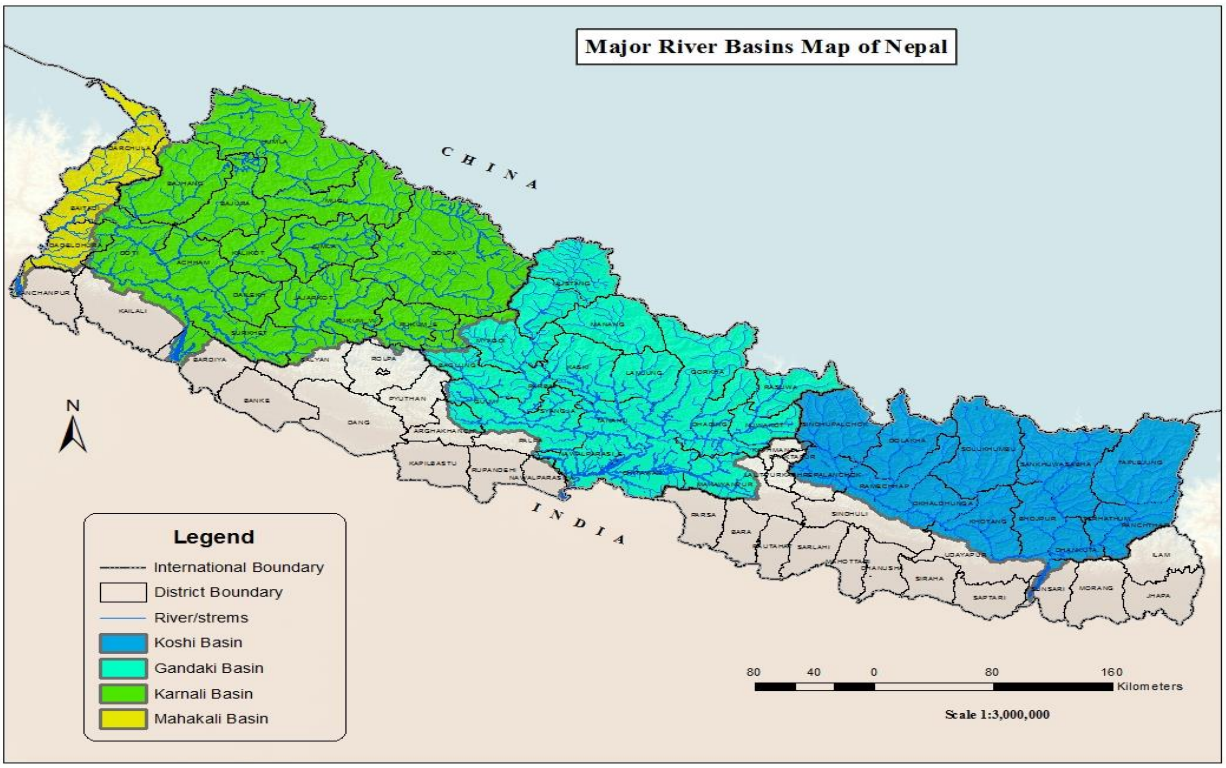

Figure 1-1: Major River Basin Map of Nepal

Politically, after Nepal adopted federal system of government, under Constitution of Nepal 2015, with three tiers of Government (Federal, Provincial and Local) having largely complimentary roles,

responsibilities, authorities and functions, management of country's environment and natural resources in a more integrated and coordinated manner has become more urgent and critical to avoid negative consequences of each government working independently. List of power of Federation, State and Local Government is given in Table 1 in Annex 1.

It is well understood that, unplanned, uncoordinated and poorly managed infrastructure development in the pursuit of rapid socioeconomic development goal toward prosperity, wellbeing and good quality of life might create increased threat to the river ecology and basin and watershed ecosystems of Nepal. Policy and legal framework for fair and incentivized access, use, maintenance and benefit sharing from natural resources management needs to be made coherent among different levels of government. These are some of major areas this integrated watershed strategy of Bagmati province.

It is clear that the task of integrated watershed management in Nepal is of strategic importance that has to be guided by three tiers of government's policies to ensure that watershed resources are managed in an ecologically sustainable, socio-culturally sound and economically efficient manner. Plans, policies and programs implemented by different ministries and agencies needs to have maximum cohesiveness achieving the twin goals of development and conservation in a balanced and sustainable manner. It is envisaged that the universally accepted principles and practices of Integrated watershed Management (IWM) is a suitable option for managing watersheds in Nepal. For sustainable IWM, coherent policies, coordinated institutional arrangements and effective program implementation are prerequisites in each province as well. Realizing these approaches, issues and facts, the Soil Conservation and Watershed Management Office, Makawanpur under Ministry of Forests, Environment, Soil Conservation (MoFESC) of Bagmati Province, decided to prepare Provincial Watershed Management strategy.

1.2 Objectives and Rationale

1.2.1 Objectives

The main objective of this assignment is to prepare "Bagmati Province Watershed Strategy" as per Terms of Reference of the study.

The specific objectives are to

(i) Review existing plans, policies, programs relevant to watershed management under River Basin, carry out SWOT analysis, and identify inter-sectorial linkages and gaps,
(ii) Prepare stakeholders consultation report on Watershed Management Strategy and action plan based on consultation workshops and meetings,
(iii) Prepare Bagmati Province Watershed Strategy.

1.2.2 Rationale

The main rationale for preparing Bagmati province watershed strategy is to wisely and sustainably manage Bagmati province's watersheds especially under the two basins: Koshi and Gandaki, and larger watershed – Bagmati river sub basin, keeping in view the federalised structure of the country. Under this task, the strategy is to be made by focusing or scoping not only on water resources but other critical resources especially forest, biodiversity and watershed-based ecosystem goods and services by integrating the growing threat of climate change and water induced disaster risk. More importantly, in the context of the federalised system of governance, a cross-government, cross-sector and multi-stakeholder institutional framework for good governance of the watershed under basins has to be developed for integrated and coordinated management of watershed generated ecosystem services.

2 METHODOLOGY AND PROCESS

During preparation of watershed strategy of Bagmati Province, the following approaches and methods:

2.1 Methodology

2.1.1 Literature Review:

Pertinent literatures, reports and policies related to Watershed Management approach were reviewed. The activity included collection and review of plans, policies, reports, studies, data and field intervention reports.

2.1.2 Consultation/Interaction programs

Series of interaction programs through workshops and short-meetings were carried out with all levels of Government including Ministry of Forests, Environment and Soil Conservation at Bagmati Province. A number of government offices such as Gandaki and Koshi River Basin Management Centres, Soil and Watershed Management Offices, Kulekhani Watershed Management Learning Centre and Local Governments (Rural Municipalities, Municipalities, Sub-Metropolitan Cities and Metropolitan Cities) of Bagmati province were consulted.

2.2 Process

2.2.1 GIS application

During the study, GIS-based analysis had carried out for the better results.

2.2.2 Report Submission

Relevant experts were deployed for the study. The experts did prepare a draft Watershed strategy in close coordination with the task committee. The draft had been reviewed from relevant experts. The final draft strategy incorporating suggestions from reviewers were shared with relevant stakeholders at central level. Comments/suggestions received were incorporated in the final report.

2.2.3 Terms of Reference (TOR)

Based on the above described objectives of the assignment and the efforts to fulfil the terms of reference (TOR) the expert team started the preparation of the strategy by conducting several round of discussions with the Ministry of Forest, Environment and Soil Conservation (MoFESC) and Soil Conservation and Watershed Management Office, Hetauda, Makawanpur district. Multi-stakeholder consultations and discussions were held in all the Bagmati provinces and finally the draft report was shared with key stakeholders before submission to the SCWMO, Hetauda.

3 MAJOR WATERSHEDS OF BAGMATI PROVINCE AND THREATS

Bagmati province and its watersheds are fall in Koshi Basin and Gandaki Basin as well as Bagamti river as large watershed. To work-out the Bagmati Province Watershed Strategy, one should know the Koshi and Gandaki Basin as well as Bagmati Watershed and Large watersheds (Figure 3-1). List of sub basins and large watershed are presented in the table below.

Table 3-1: Sub Basin and Large watershed of Bagmati Province

Distrit	Bagmati Province Sub Basin		
	Large Watershed	Koshi Basin	Gandaki Basin
Sindhuli	Kamala, Marin	Koshi river	
Ramechhap	-	Likhu, Khimti, Manthali and Ranjor	-
Dolakha	-	Tama Koshi, Chandrawati, Giridhunge Khola, Khimti River	-
Sindhupalchwok	-	Sunkoshi, Bhotekohsi, Balephi, Melachi, Indrawati	-
Kavreplanchwok	Kokhajor Khola	Roshi, Lower sunkoshi Bagmati river	-
Bhaktapur	Hanumante	-	-
Lalitpur	Nakhu Khola	-	-
Kathmandu	Bagmati	-	-
Rasuwa	-	-	Trishuli
Nuwakot	-	-	Trishuli, Tadi Khola, Betrawati
Makawanpur	Bagmati River, Bakaiya Khola	-	East Rapti, Karra and Samari Khola, Bakaiya Khola,
Dhading	-	-	Gandaki, Budhigandaki, Ankhu Khola
Chitwan	-	-	Rapti River, Reu Khola

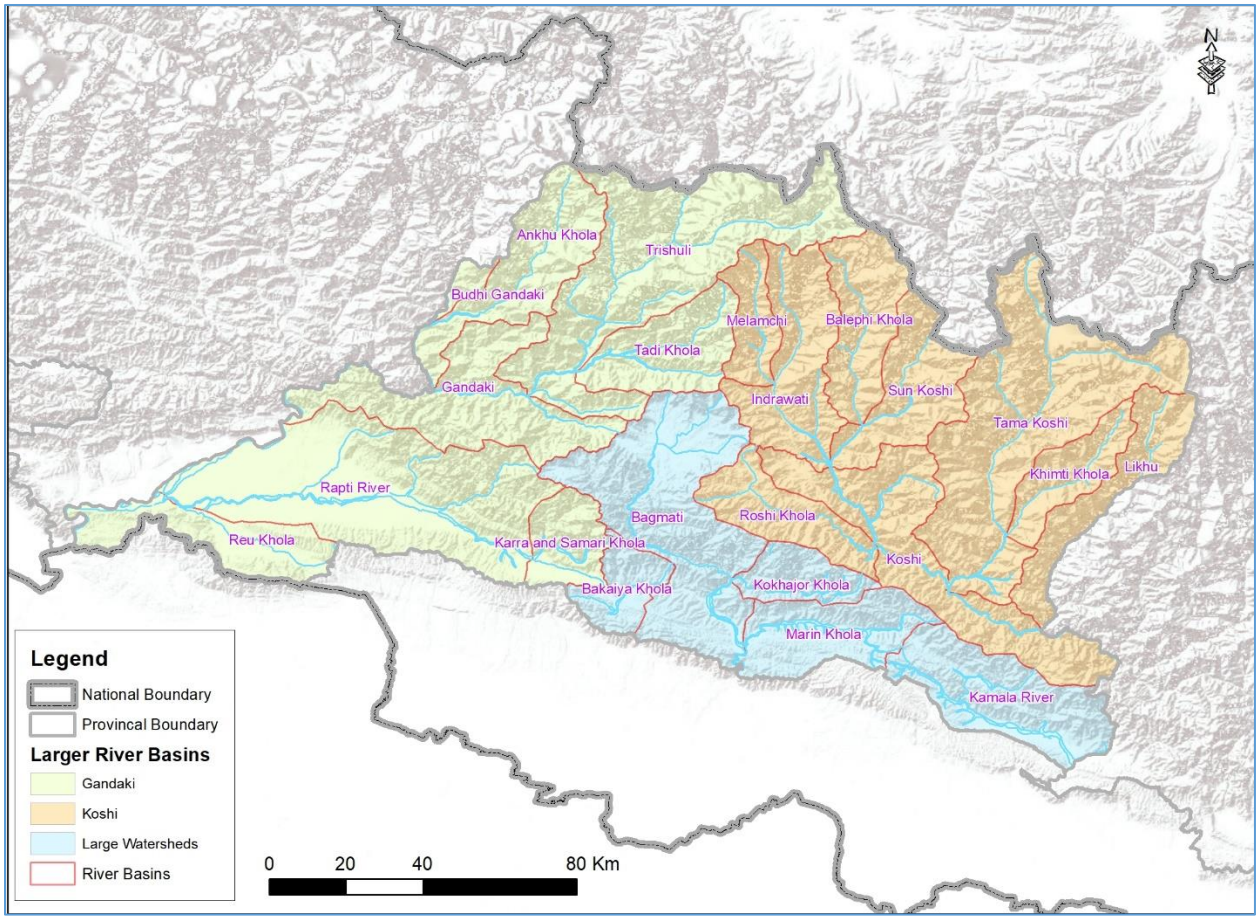

Figure 3-1: Major River Basin Bagmati Province

3.1 Watersheds in Koshi River Basin

3.1.1 Bio-physical description

The Koshi River is also known as Saptakoshi for its seven upper tributaries. These rivers: Tamor, Arun, Sun Koshi, Dudh Koshi, Bhote Koshi, Tamakoshi, Likhu Khola and Indrabati meet before they all form the Saptakoshi and flows into Tarai region of Nepal and northern Bihar. The Koshi River catchment covers six geological and climatic belts varying in altitude from above 8,000 m (26,000 ft.) to 95 m (312 ft.) comprising the Tibetan plateau, the Himalayan Mountains, the Middle hills or Mahabharat Range, the Siwalik Hills and the Tarai. This trans-boundary river basin is Nepal's largest transboundary river system. The total area of the basin is approximately 60,400 sq. km, of which 46 per cent (27,863 sq. Km) lies in Nepal (WECS, 2010; ICIMOD, 2018). About 10 per cent of its total catchment is covered with ice and snow (Figure 4).

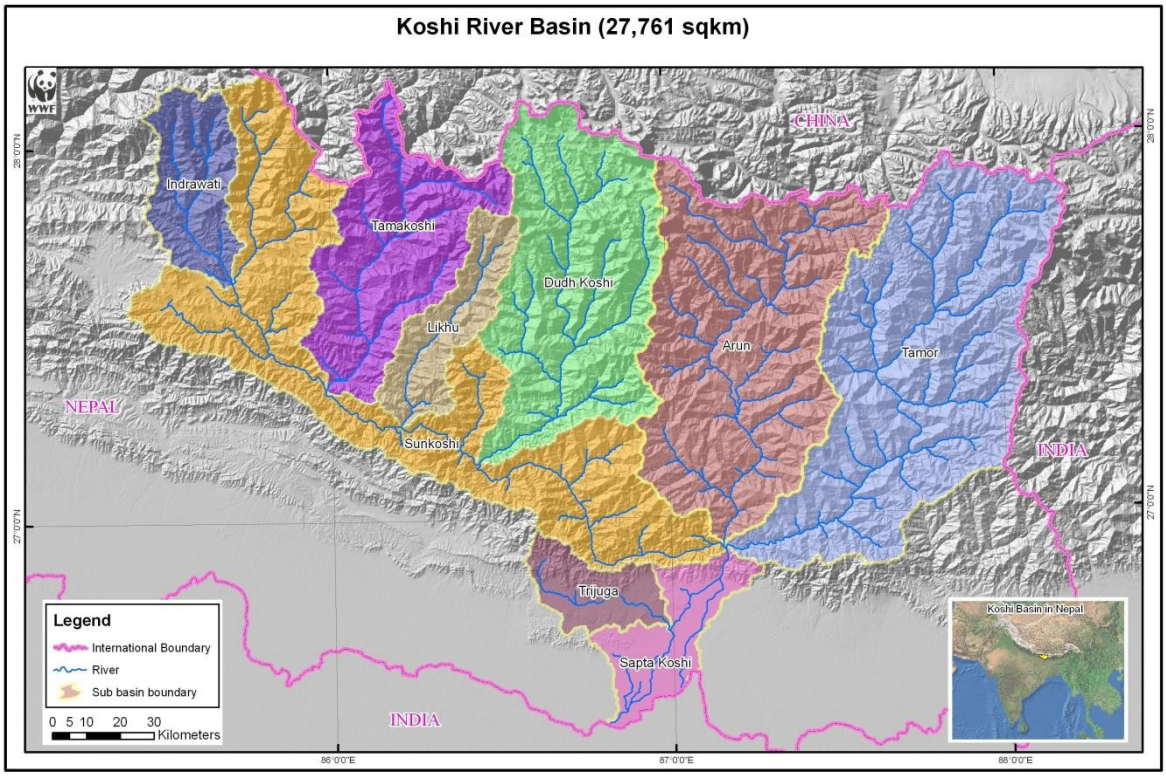

Figure 3-2: Map of Koshi River Basin

The basin is significant from many perspectives: According to ICIMOD (2018), over 40 million people depend on the basin for water, ecosystem services, and livelihoods. The basin is highly prone to natural disasters like floods, landslides, glacial lake outburst floods, and droughts. The basin is also one of the most vulnerable basins due to climate change as it is expected to affect water availability, and consequently agriculture and livelihood options for millions of people. Water induced disasters are likely to increase the basin's vulnerabilities. Due to climate change, more than 50 per cent of the basin is projected to experience frequent and devastating floods, and lower lean season flows by the 2050s (Bharati et al, 2018).

There are immense opportunities to harness the natural wealth of basins for the wellbeing of Nepalese people. The development of water infrastructure has the potential to make water availability more consistent and secure. The basin has great potential for expanding irrigated area, and generating hydropower to meet Nepal's growing energy demand and goal of making clean energy as dominant source of energy for the population to meet Nepal's climate mitigation commitments. Nearly 30,000 Gigawatt hours (GWh) of energy could be generated annually through the implementation of the11 water infrastructures on the Koshi Basin proposed by JICA. According to ICIMOD, the infrastructures can also be used to regulate low-flow conditions during post-monsoon and winter months, and promote positive upstream–downstream connectivity. Large upstream water storage facilities have long been considered the best way to control extensive floods that devastate the vast floodplains of the basin. A comprehensive study needs to be undertaken in order to evaluate the role of storage infrastructure to regulate floodplain flooding, and augment lean season water availability for hydropower and agricultural development.

In order to develop these water and power potentials of the basin, huge investment is needed for which simultaneous development and nurturing of good basin governance mechanism and coherent and effective institutional arrangements for the efficient, equitable, and sustainable governance and management of all the ecosystem goods and services provided by the basin is necessary (ICIMOD, 2018). In terms of the biodiversity richness of the basin, four protected and conservation areas are located in the Koshi River basin: Sagarmatha National Park (NP), Makalu Barun NP, Koshi Tappu Wildlife Reserve and Kanchenjunga Conservation Area. These areas are located both in high Himalayan catchments and Tarai capture rich bio-cultural diversity. The national parks provide habitat for snow leopards, red pandas, musk deer, Himalayan thars, and 208 bird species including Impeyan pheasant, bearded vulture, snow cock, and the yellow-billed chough. The Koshi basin provides habitat for hog deer, spotted deer, wild boar, blue bull, gaur, smooth-coated otter, jackal, 485 bird species including 114 water bird species, 200 fish species, 24 reptile and 11 amphibian species. The last surviving population of wild water buffalo in Nepal is found in the reserve, as well as Gangetic dolphin, swamp francolin and rufous-vented prinia. A small population of the critically endangered *Bengal florican* is present along the Koshi River. The bristled grass bird breeds is found in the reserve. The reserve together with the Koshi Barrage was identified as one of 27 Important Bird Areas of Nepal. The landscape in the park is rugged consisting of mountain peaks, glaciers, rivers, lakes, forests, alpine scrubs and meadows. The forests comprise stands of oak, blue pine, fir, birch, juniper and rhododendron. Rich social and cultural capital is found in the Koshi basin. Large number of tourists arrived in the area.

In Bagmati Province under Koshi river basin, Likhu River, Tama Koshi, Sunkohsi, , Indrawati are major sub basins (Fig.3-2).

3.1.2 Socio-economic Features

During the last two decades there has been an increasing trend for large scale out-migration from the rural areas to urban areas and overseas. The population of hilly parts of the basin has been decreasing as educated youth are moving to urban areas, and overseas for better employment opportunity. This trend has left many communities with populations largely comprising women, children and the elderly. As a consequence, the rural economy, agriculture and forest use and management are all changing substantially. In many cases agricultural land is being left fallow and trees are regenerating on less intensively-used lands. Cropping patterns and livestock management is also changing with less reliance on labour intensive crops and animals. Reduced availability or male labour and women, children and elderly having to perform major roles in agriculture and forestry are having a profound impact. Increased availability of animal fodder on private lands, declining availability of labour and changes in both the type and management of livestock is leading to a reduced reliance on community forests for fodder. Moreover, well-off families in more accessible areas are replacing firewood with cooking gas leading to a decreased demand for firewood from CFs by these households. Remittances now play a significant role in both the national and local economies, often enabling families to purchase at least some of their food needs from markets instead of being self-sufficient from farmlands. Two major economic trends are occurring: a) intensification of commercial agricultural production and harvesting of natural resources (e.g. increased evidence of cash crops and commercial harvesting of NTFPs

including Medicinal and Aromatic Plant (MAPs) including Large Cardamom, Lokta and Argeli (paper) and ringal bamboo) and b) increased linkages to foreign markets (notably China and India), including the possibility of a road being built along the Tamor river linking the Tarai to China. These trends not only bring economic opportunities, but they also generate risks of over-exploitation of resources (both timber and NTFPs) and degradation of ecosystems through the direct and indirect impact of infrastructure (roads and urbanization).

In Bagmati Province there is 60,84,042 population in 15,75,097 household with 30,33,574 male and 30,50,468 female. Tamang is the largest ethnic group in the province making up around 20.54% of the population. Hill Brahmans are the next largest group making up around 18.32%, followed by Chhetris (17.13%) and Newars (17.07%) respectively. Similarly Magar, Kami and Gurung make up 4.87%, 2.52% and 2.22% of the population respectively. Tharu (1.63%), Rai (1.52%), Damai (1.36%), Sarki (1.33%) and Chepang (1.16%) are other smaller ethnic groups in the province.

3.1.3 Fresh water biodiversity

ICIMOD (Rai et al 2018) carried out a rapid assessment of fresh water ecosystems in Koshi basin that found that almost 86 critical freshwater ecosystems exist in the basin – 38 in the High Mountains, 33 in the Middle Mountains, and 15 in the Tarai/Chure region. It reveals that parts of the Koshi River in the High Mountains are only slightly to moderately pollute and are in a good habitat condition compared to the segments in the low altitude of the Tarai/Chure region. Other studies have found that hydropower development has major effects on fish and the aquatic environment (Ghubaju, 2005) of the basin. Rai et al (2019) found that human interference (development activities such as dam construction for hydropower and irrigation, waste dumping, and unsustainable agricultural practices) and sparse vegetative cover have affected the vitality of the ecosystems in Koshi basins. It was also found that freshwater ecosystems, the major sources for irrigation and household use in the study sites, have been decreasing over time, and limited activities have been conducted till now to conserve these freshwater sources. Improving the social status of the fishermen communities is urgently needed, but among the major problems figure prominently the disturbance in the catchment and overfishing, both of which require urgent attention.

In Bagmati Province, major river like Bagmati, Trishuli, Karra and Rapti, Bhimphedi Khola, Suping Khola, Jhiku khola are polluted by virtue of unplanned urbanization and land use change. Few water lankes and reservoirs like Indrasarowar, Taudaha, Nagdaha, Kamalpokhari, Panch Pokhari, Gosaikunda, Ganesh Kunda, Dhap Reservior, Parbati Kunda are important freshwater source which are under continuous threats of encroachment, pollution, siltation, invasive species, poor water source, eutrophication, poor management.

3.1.4 Tourism Potential

Commercial River rafting, also known as white-water rafting and crayoning is available on the Sun Koshi River and tributaries. Sun Koshi has challenging rapid grades of class 4–5. Mahseer is widely distributed in Himalayan Rivers up to 1,650 m (5,410 ft.) altitude and also inhabits the Koshi River

and its tributaries. The global iconic mountains including Mt. Everest and Kanchenjunga plus rich bio-cultural heritage make this province a global tourism destination.

In Bagmati Province, rafting in Trishuli, Bunji Jump in Bhotekoshi george, Boating in large lakes (Indrasarowar) and rivers (Narayani river), Waterfalls are major tourism related activities in Bagmati province.

3.2 Watershed in Gandaki River Basin

3.2.1 Bio-physical Features:

The Gandaki River basin has a total catchment area of 46,300 square kilometres (17,900 sq. mi), most of it in Nepal. It lies between the Koshi basin to the east and the Karnali basin to the west. The Kali Gandaki river source is located at the border point with Tibet, China at an elevation of 6,268 metres (20,564 ft.) at the Nhubine Himal Glacier in the Mustang district of Nepal. The Gandaki river basin is reported to contain 1025 glaciers and 338 lakes. These contribute substantially to the lean season flows of the river. The Gandaki River catchment covers a different geological and climatic belts varying in altitude comprising the Tibetan plateau, the Himalayas, the Himalayan mid-hill belt, the Mahabharat Range, the Siwalik Hills and the Tarai (Figure 5)

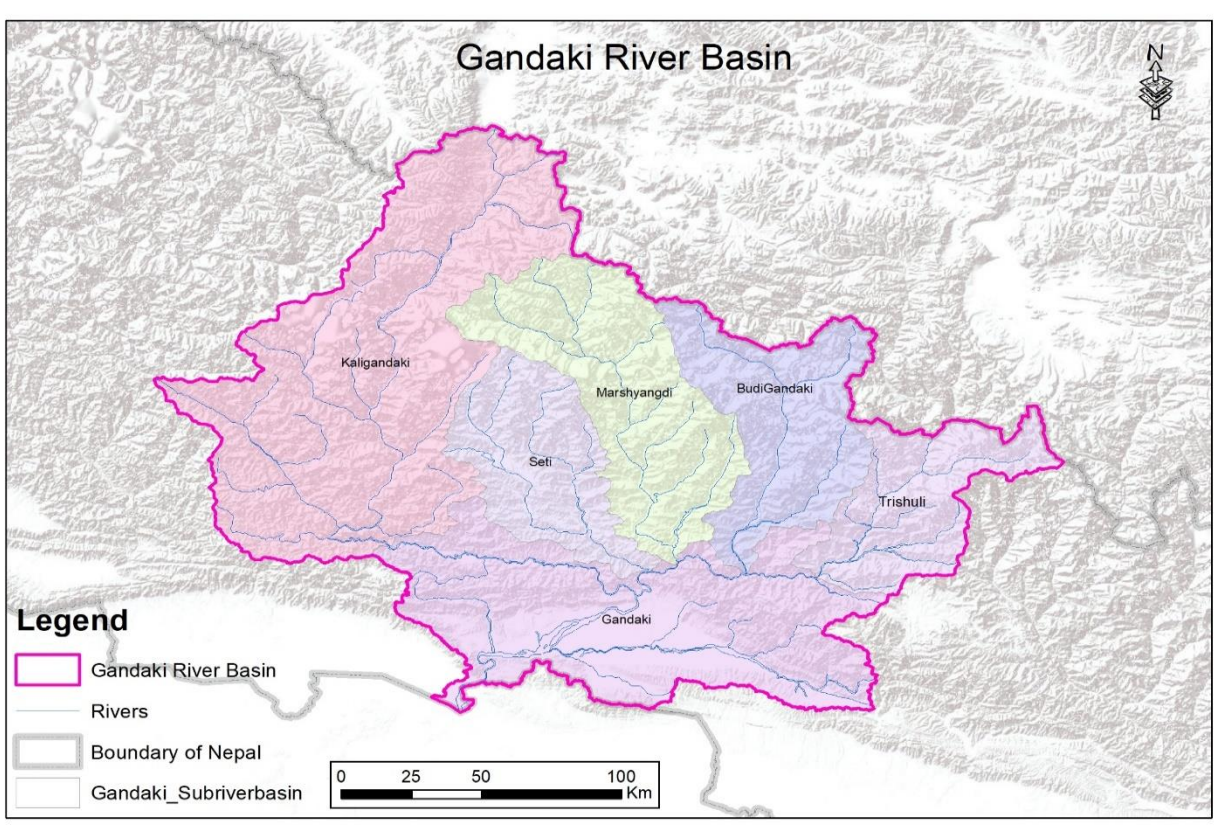

Figure 3-3: Map of Gandaki River Basin

A total of 1,226 species of plants (including 38 orchid species and 9 Rhododendron species), 101 species of reptiles and 22 species of amphibians have been recorded in the Annapurna Conservation Area. The area harbours rare and endangered wildlife species such as the Snow Leopard, Musk Deer, Tibetan Argali, Impeyan Pheasant and Tragopan Pheasant. The Annapurna Conservation Area (ACA) provides a large protected area with the entire habitat gradient from sub-tropical Sal forests to perennial snow in which to maintain the Biodiversity and integrity of the central Himalayas.

The basin is particularly vulnerable to water-induced hazards during the monsoon season. Of the 2,719 fatalities that resulted from floods and landslides in Nepal between 2000 and 2014, 939 (35%) occurred in the Gandaki basin, which has only 22% of Nepal's land area. Events tend to be more common in the mid hills, especially the districts of Parbat, Syangja, Gorkha, Dhading, and Nuwakot–Dhading had the highest incidence of floods and landslides with 123 events over the 15-year period. However, more families are affected downstream, with Nawalparasi having the highest number of affected families (8,187 out of 22,637) (Ministry of Home Affairs disaster database, accessed 2015). Such natural disasters are critical drivers of vulnerability for people in the basin. Although the most common disasters are floods and landslides, the greatest economic loss in the basin is from forest fires which are triggered by wind in the dry season.

In Bagmati Province under Trishuli river basin, Budi Gandaki River, Gandaki River are major sub basins (Fig.3-3).

3.2.2 Socio-economic features

The basin is inhabited by people from many different ethnic groups. Tamang, Gurung, Magar and Thakali are predominant ethnic groups in upstream areas. The southern plains are home to indigenous communities like Tharus as well as migrants from many different caste groups. The diverse topographical differences have led to different population densities: low in the upstream and gradually increasing downstream with the highest density in the plains. There is a marked sex bias in the population with more females than males everywhere except the high mountains. CBS (2012) also showed an increase in female-headed households from 15% in 2001 to 26% in 2011, with the absence of males mainly attributed to labour-related migration, which more than doubled between 2001 and 2011. Of the total number of households in GRB (3,831,100), 1.124% (10,120) has no land. Most households (47 per cent) in GRB have less than one hectare holding, and only three per cent of households have landholdings of more than 2ha. The average holding size is 0.61 ha. Landholdings are highly fragmented with average of 3.2 parcels per households (CBS, 2016). The landless are mostly dalits and marginalised indigenous groups.

3.2.3 Fresh water biodiversity

ICIMOD (Rai et al 2018) carried out a rapid assessment of fresh water ecosystems in Koshi basin that found that almost 86 critical freshwater ecosystems exist in the basin – 38 in the High Mountains, 33 in the Middle Mountains, and 15 in the Tarai/Chure region. It reveals that parts of the Koshi River in the High Mountains are only slightly to moderately pollute and are in a good habitat condition compared to the segments in the low altitude of the Tarai/Chure region. Other studies have found that hydropower development has major effects on fish and the aquatic

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3.2.4 Ecotourism Potential

GRB has tremendous nature based tourism potential. The basin contains three of the world's 14 mountains over 8,000 metres (26,000 ft.), Dhaulagiri, Manaslu and Annapurna I. The world famous Annapurna circuit trekking route and various small treks in and around Pokhara makes GRB as one of the most potent basins for harnessing both tourism revenue and conservation dividends. There is tremendous scope for white water rafting, adventure tourism such as paragliding and mountaineering in world famous Himalayan peaks of A Annapurna, Dhaulagiri and Nilgiri. Also, this area is important from religious point of view too, where the world famous Muktinath Chhetra lies. The iconic attraction Machhapuchhre mountain on the backdrop of enchanting lake city of Pokhara offer very good prospects of different types of tourism development in the GRB. There are numbers of protected areas and conservation areas in the Gandaki basin such as the Chitwan National Park (CNP) and Annapurna and Manaslu Conservation Areas (ACA & MCA). The CNP which is rich in flora and fauna, including Bengal Tiger (*Panthera tigris tigris*) and single-horned Indian rhinoceros (*Rhinoceros unicornis*) is a World Heritage Site since 1984.

In Bagmati Province, Ruby Valley Trekking rout of Dhading and Rasuwa, Rafting in Trishuli River, Boating in Narayani River.

3.3 Large Watershed in Bagmati Province

Larger Watersheds of Bagmati River are located in Kathmandu, Bhaktapu, Lalitpur, few park of Makwanpur and Kavere and Sindhuli District. Bagmati River in three district of Kathmandu Valley tribute with large number of small rivulets like Godawari Khola, Nakhu Khola, Hanumante Khola, Bishnu Mati Khola etc, In Sindhuli Distict, Kamala, and Marin are two major river forming large watershed tribute with Kamala Khola, Chadaha Khola, Tawa Khola.

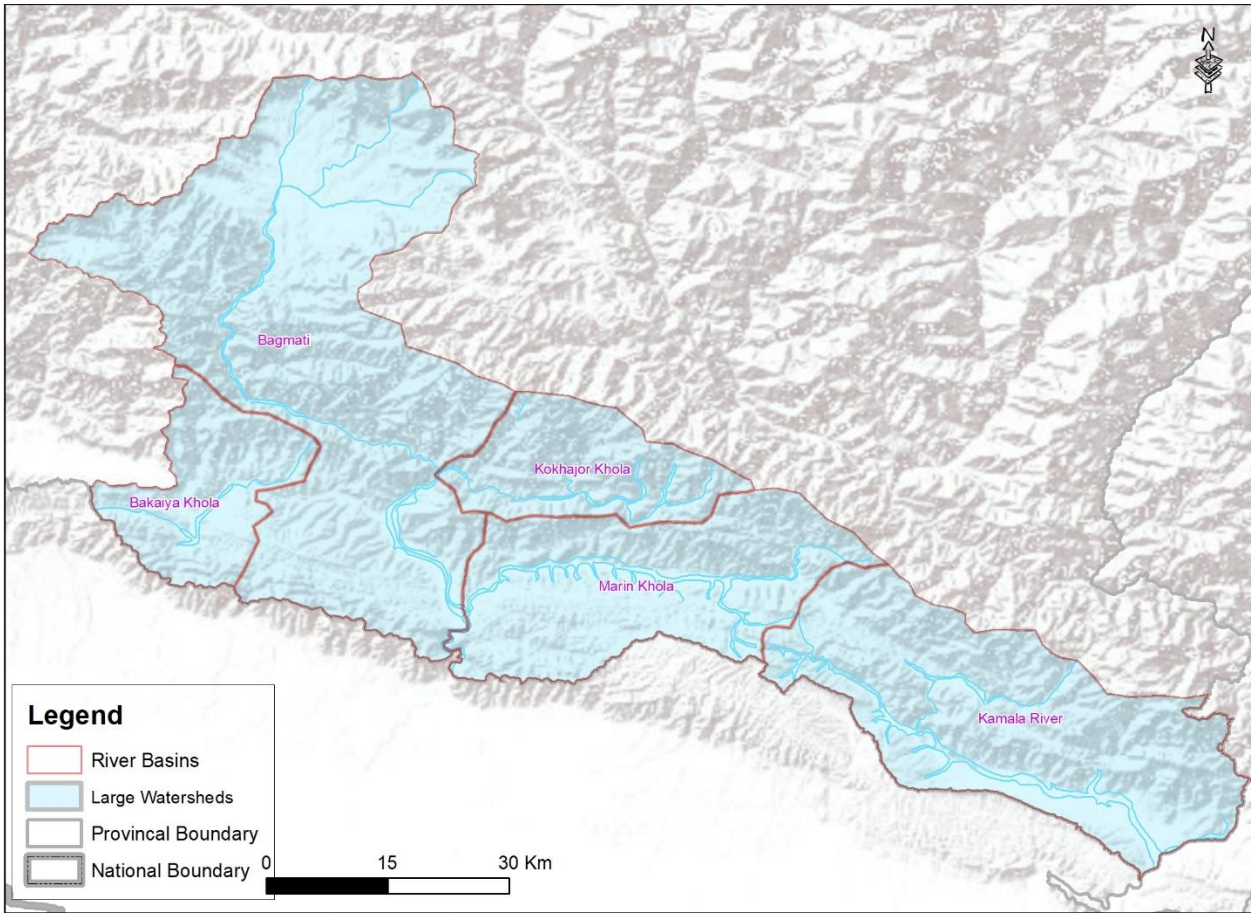


Figure 3-4: Large Watershed in Bagmati Province

3.4 Understanding Watersheds in Bagmati Province

3.4.1 Current Situation

3.4.1.1 Hydro-Meteorology

Hydro-meteorological characteristics of river basins in Nepal are mainly influenced by complex topographical variation and monsoon precipitation. Sharp changes in precipitation and climate occur from low to high altitudes within short spatial distances, including dominant orographic effects causing higher precipitation in foothills of the Himalayas. As such, this shapes the climatology and hydrology of the region. In addition to topography, the southwest monsoon governs the summer precipitation in Nepal and Westerly's influence the winter precipitation (Shrestha, 2015).

Nepal has large climate variability, making future trend harder to identify. Despite this, climate anomalies and changes in extreme events have been observed throughout the region, with intense rains, floods and droughts reported. A recent study by Department of Hydrology and Meteorology (DHM) Nepal (DHM, 2017) on observed climate trend analysis for the period of 1975-2014 had reflected a significant positive trend in annual maximum temperature data at the rate of 0.056 ^{0} c/year.

Regarding change in precipitation across the country, there is still a lack of a clear trend. Only in a few districts, the pre-monsoon and monsoon precipitations show significant upward trends, whereas pre-monsoon precipitation shows a significant negative trend in High Himalaya region. The number of rainy days is increasing significantly mainly in the north-western districts. Very wet and extremely wet days are decreasing significantly, mainly in the northern districts. Trends in warm days and warm nights show significant increase in the majority of the districts. Similarly, warm spell duration is increasing significantly in the majority of the districts. Fig 6 shows Annual Precipitation trend for districts (MoFE, 2019)

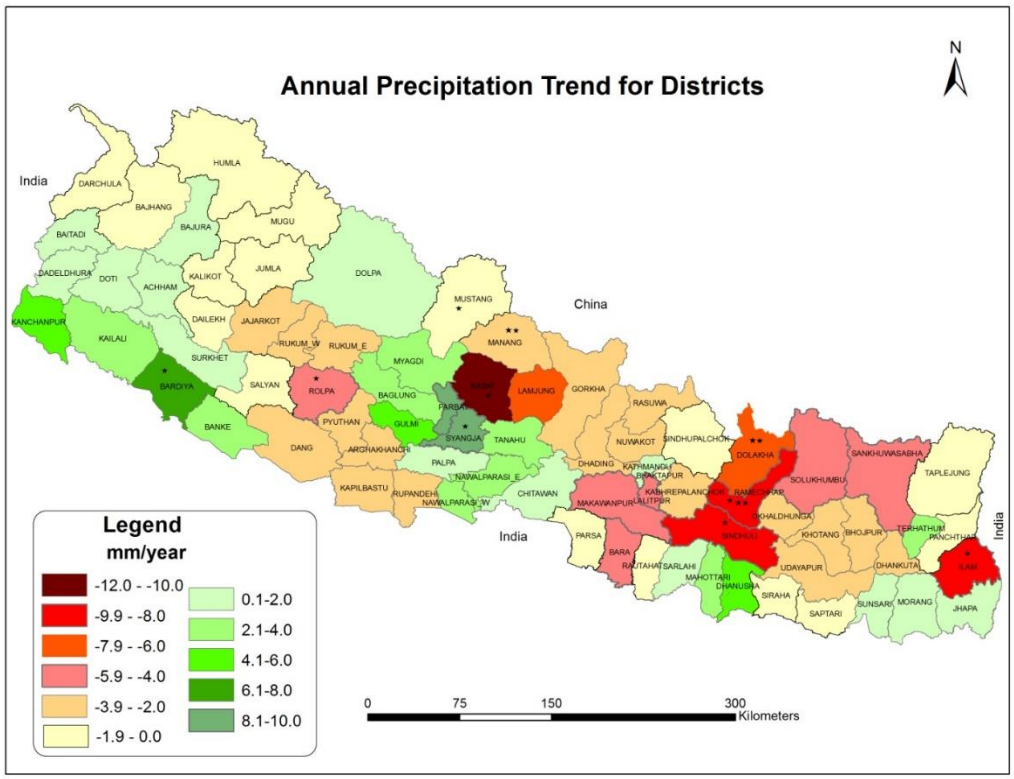


Figure 3-5: Annual Precipitation map for districts (Source: MOFE, 2019)

Future projection of climate, using the average change in precipitation and temperature for whole Nepal is based on ensemble mean of select 4 GCMs. This shows that the precipitation is likely to increase in the range of 2.1 to 7.9 % for RCP4.5 and 6.4 to 12.1% for RCP8.5 with respect to the reference period. Similarly, the temperature may increase in the range of 0.92 to 1.3 ºC for RCP4.5 and 1.07 to 1.82º C for RCP8.5 with respect to the reference period by the middle of the century. For the end of the century scenarios, both precipitation and temperature are likely to increase by 23% and 3.58 ºC respectively. Table 3-1 illustrates those projections (MoFE, 2019).

Table 3-2: Multi-model ensemble mean of change in precipitation and temperature

	RCP4.5			RCP8.5		
Time period	2016-2045	2036-2065	2071-2100	2016-2045	2036-2065	2071-2100
Change in precipitation (%)	2.1	7.9	10.7	6.4	12.1	23.0
Change in temperature (%)	0.92	1.3	1.72	1.07	1.82	3.58

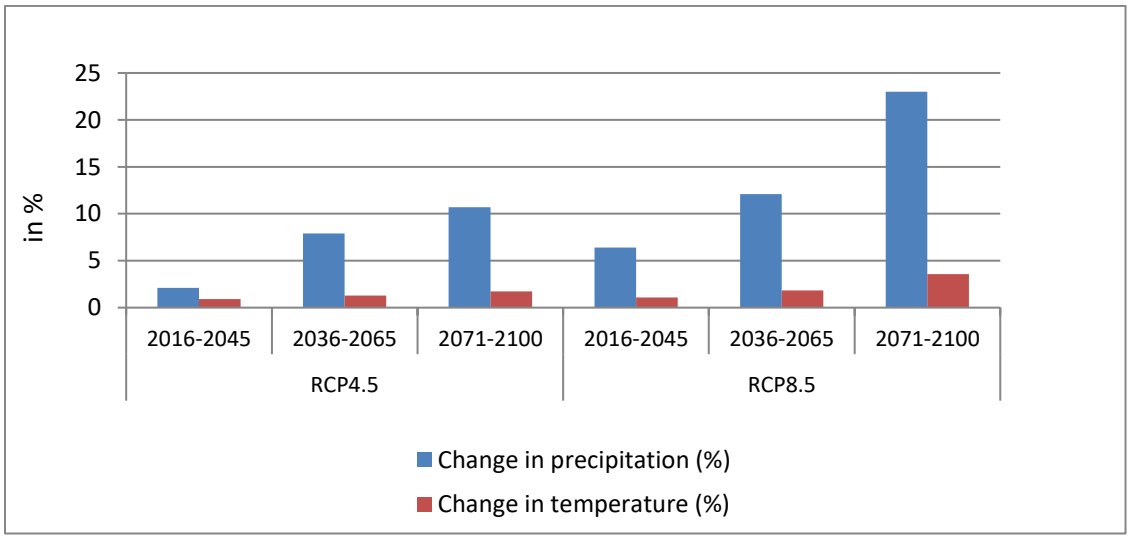


Figure 3-6: Model based projection of temperature and precipitation change in the next 80 years

3.4.1.2 Hydro power

The importance of hydropower to Nepal's overall development and prosperity cannot be overstressed as it is the only natural resource available to generate electricity on different scales in hilly and mountainous part of the country. Hydropower can satisfy long term energy demands and can also have a good export potential to neighboring countries. Since this energy resource is renewable and more environment friendly than other major resources, the country needs to shift its energy dependency to locally available hydropower. Recognizing this fact, Nepal has given priority to hydropower development since decades and a number of policies, strategies and plans have been developed for this purpose (GoN, 2018). Figure 7 presents current, committed and planned hydropower projects categorized by project and catchment type.

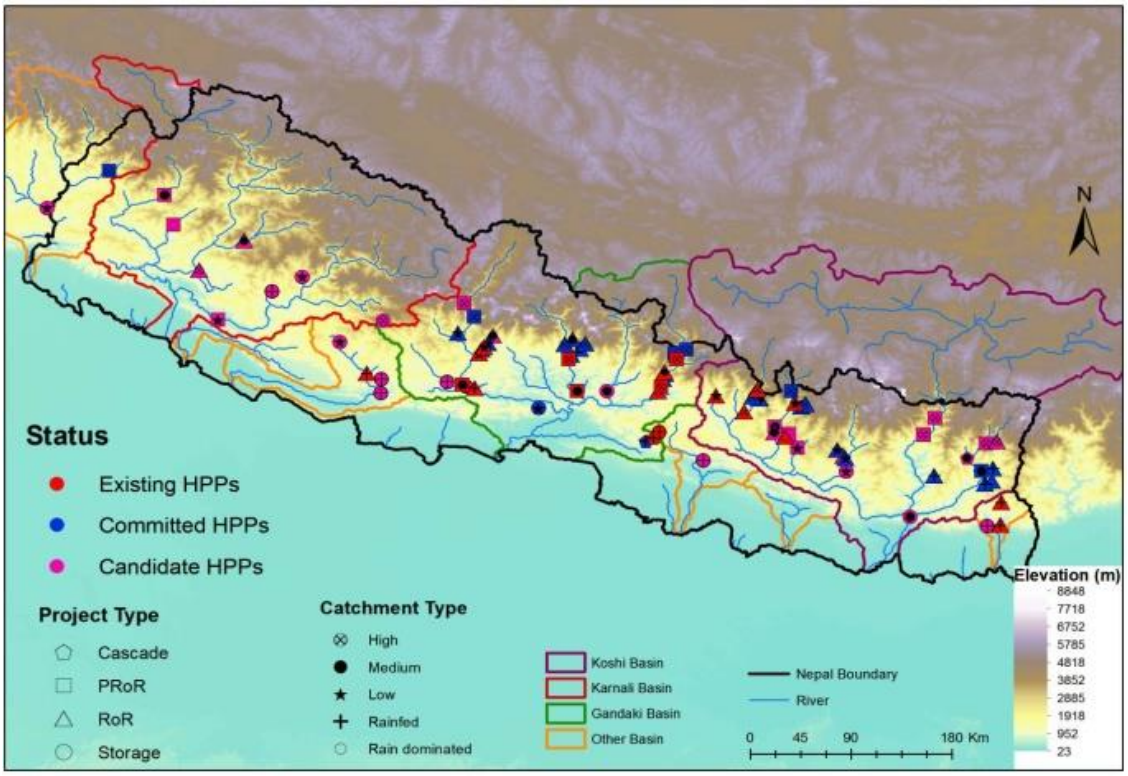


Figure 3-7: Hydropower projects, their type and catchment conditions (Source: CDKN, 2017)

3.4.1.3 Impacts of sediment

Rivers in Nepal are known to be the carriers of huge sediment load. Topsoil erosion, landslides and other mass wasting especially during heavy monsoon downpours in the upper catchment slopes are the major sources of sediment. The sediment load in the rivers during the monsoon season creates a problem for functioning of desilting basins, erodes the turbines and fills up large storage areas of reservoirs. It has been noted that a single 30-hour storm burst in July, 1993, scoured sediments off upstream mountainsides and deposited them in the Kulekhani reservoir, leading to a one-tenth reduction in dam storage capacity. Similarly, The Khimti hydropower plant (60 MW) has recorded a sediment concentration of up to 8536 ppm and The Kali Gandaki plant (144 MW) had also sediment problems at its desilting basin. High concentrations of sediments are causing damage to its turbines before their average life expectancy. High maintenance requirements of electro mechanical parts are one of the reasons behind increasing costs of electricity sales. Even with well-designed sediment settling and flushing systems, power plants like Middle-Marsyangdi, Khimti and Jhimruk are having severe erosion problems in the turbines.

3.4.1.4 Snow and Glacier melt

Runoff in the Himalayan catchments is composed of glacier melt, snow melt, rainfall-runoff, and base-flow (groundwater). Rainfall-runoff constitutes the major volume of flow hydrograph. Lutz and Immerzeel (2013) estimated that rainfall-runoff contributes about 66% of total runoff in Upper Ganges basin followed by 13.9% from base flow,11.5% from glacier melt and 8.6% from snow melt.

In monsoon, the rainfall-runoff dominates the hydrograph even though the glacier melt is higher in those months in compare to other months. In pre-monsoon months (April-May), the snow melt approximately has equal or more share in runoff contribution comparing to rainfall-runoff and base flow. In these months, the glacier melt just begins and has minimal contribution. In the case of the post-monsoon (October -November), rainfall-runoff still constitutes a major portion with increased base flow. In case of dry seasons (December - March), base flow is prominent to other components. Snow/glacier melt is significant in pre-monsoon months for snow fed rivers.

Besides, elevations of 3000m and 5000m are important benchmarks in examining the climate and flow characteristics. Below 3000m, hydrology is driven dominantly by rainfall. Likewise, threshold of 5000m is considered as permanent snow line. The transition area between 3000m and 5000m has major influence in hydrology as snow accumulation and melting process occurs in this area.

It is observed that annual water yield has increasing trend as percentage area above 3000m increases up to 20 per cent and then has decreasing trend thereafter. Similar trend is observed with dry season yield too. Similar nature is found with the per cent area greater than 5000m (Parajuli, A. et.al. 2015;).

3.4.1.5 River discharge projections

Trend analysis of river discharges in Nepal shows mixed results. The large basins, Karnali, Narayani and Koshi do not show any significant change. Kali Gandaki and Trishuli, both are tributaries of the Narayani River, and relatively large rivers, show opposite trends in their yearly discharges: Kali Gandaki show decreasing and whereas Trishuli show increasing trends (Dudh-Koshi, which is a tributary of Sapta Koshi, has no significant trend. Trends in southern rain-fed basins are also not significant. Climate change studies using model predictions also give conflicting reports on future possible changes in river flow. Some studies show increase in annual run- off ranging from 0 to 150 mm/yr. by the year 2050, relative to average run-off for the period 1961–1990, while the other shows a decrease of up to 250 mm/yr. (Nepal, S., 2016; Shrestha AB, and Aryal R., 2011). Analysis of nation-wide river discharges showed that, overall, trends observed in the river discharge are neither consistent nor significant in magnitude (Shrestha KL et al, 2003, Parajuli, A. et al., 2015).

3.4.2 Threats on Watershed in Bagmati Province

Major threats on watersheds of Bagmati Province are:

- Still lack of clear understating about political boundaries against Watershed/ Basin Boundary for integrated watershed management plan through Watershed Management Offices.
- Very difficult to motivate and allocate budget based on integrated watershed management plan.
- Unclear about the role and responsibility of Federal, Province and local level on watershed management.
- Reluctant to have organisational and institutional setup in line with basin and watershed boundary.

- Poor Institutional arrangement for coordination between different levels.
- Inadequate human resources and capacity development programs

3.4.3 Forest area and Land Cover changes

Land cover data of ICIMOD, show that 70.1 percent of land cover is occupied by forest, 23.5 percent by non-forest and 6.4 percent by water. Similarly, in 2000, 66.5 percent of land cover was occupied by forest, 27.8 per cent by Non-Forest and 5.7 by Water. In the time period of 20 year, forest area seems increased by 3.6 percent.

Table 3-3: Land Cover in Bagmati Province

		2000				
	Row Labels	Forest	Non-Forest	Water	Grand Total	Percent
2019	Forest	13010	1136	56	14201	70.1
	Non-Forest	240	4500	17	4757	23.5
	Water	214	4	1083	1301	6.4
	Grand Total	**13463**	**5640**	**1156**	**20259**	
	Percent	66.5	27.8	5.7		

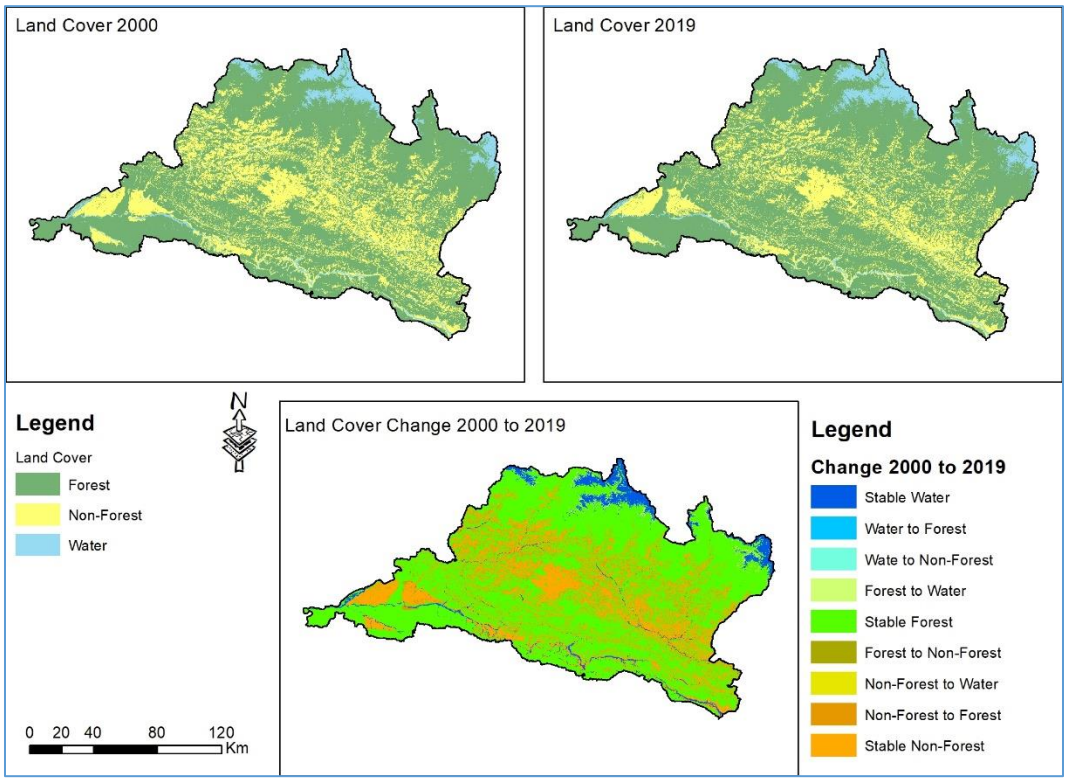


Figure 3-8: Land Cover Change Bagmati Province

3.4.4 Soil Erosion and Watershed Degradation

Annually large number of landslide occurs in monsoon season. Sindhuplachwok of one of the most landslide vulnerable district due to weak geological structure triggered by 2015 devastating earthquake, and infrastructure development like road networks, hydropower, construction material mining, adding traditional slope farming. Landslide in Jure, Sindhupalchwok, Landslide and flood of Melachi river, Narayanghad-Mugling landslide are recent large destructive incident that lose of lives, damaged properties, and development infrastructures.

3.4.5 Disasters Reports (Loss and Damage)

A devastating flood and landslide in Melamchi River on June 15, 2021 is crucial example caused massive destruction in Helambu Rural Municipality and downstream villages of Melamchi Municipality. The flood and landslide also devastated the head works of Melamchi Drinking Water Project. Researcher revealed that number of reason has triggered the devastating incident and loses.

Among 7 the most landslide-prone districts in Nepal, Dhading, Sindhupalchwok, and Nuwakot is form Bagmati province (MoFE, 2021).

District wise ranks of the overall impact of climate-induced disasters

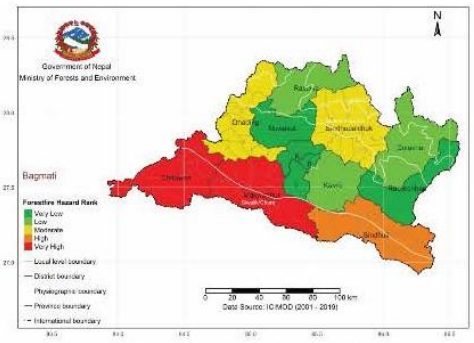
Impact Rank	Districts for historical impact scenario (1971-2019)
Very High (0.715 - 1)	Makawanpur, Chitawan,
High (0.512 - 0.714)	Sindhupalchok,
Moderate (0.317 - 0.511)	Dhading, Gorkha,
Low (0.146 - 0.316)	Rasuwa, Dolakha, Nuwakot, Kavrepalanchok, Dailekh,Ramechhap, Kathmandu
Very Low (0 - 0.145)	Lalitpur, Bhaktapur,

Source: (MoFE, 2021))

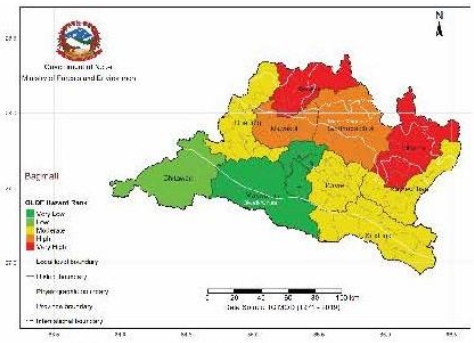
3.4.6 Climate Change Impacts on watershed of the Basin Ecosystem Services

Climate change has multi sectoral impact on watershed management. Impacts of climate change on the Bagmati province is more evident with, increase in average atmosphere temperature, extreme rainfall events, drought, forest fires. Climate change has increase and intensified natural disaster, increasing challenges in watershed management.

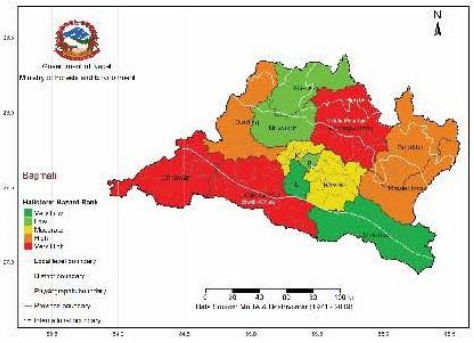
Climate change induced disaster status in Bagmati Province is portrayed in map below



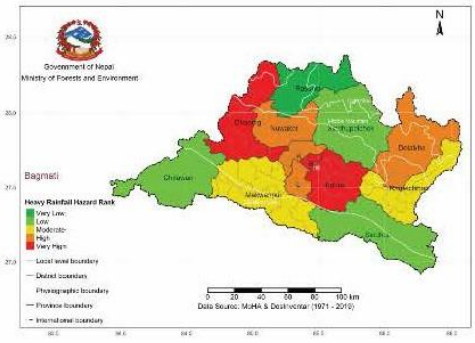
Forestfire Hazard Rank in Bagmati Province



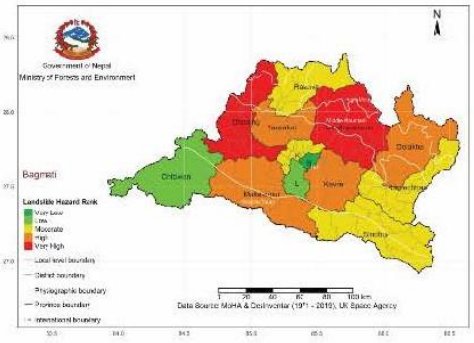
GLOF Hazard Rank in Bagmati Province



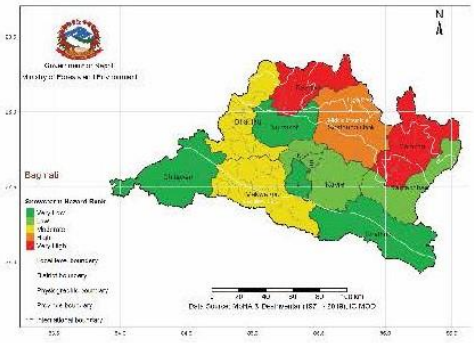
Hailstorm Hazard Rank in Bagmati Province



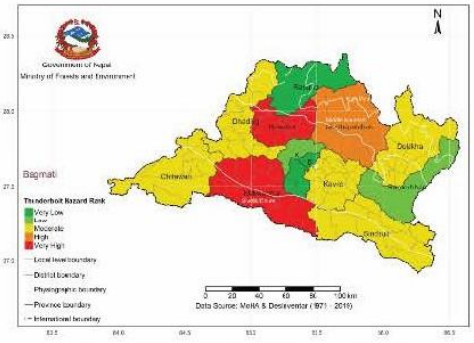
Heavy Rainfall Hazard Rank in Bagmati Province



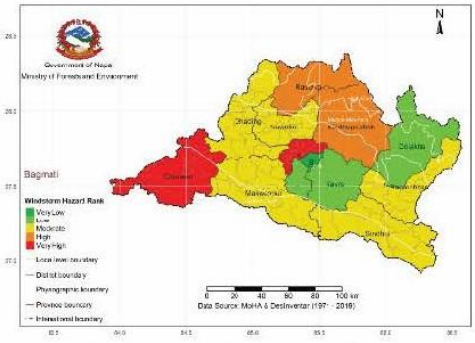
Landslide Hazard Rank in Bagmati Province



Snowstorm Hazard Rank in Bagmati Province



Thunderbolt Hazard Rank in Bagmati Province



Windstorm Hazard Rank in Bagmati Province

Figure 3-9: Climate Change induced disaster vulnerability

3.4.7 Livelihoods risks in Bagmati Province

Livelihood source of Bagmati Province is largely depended on Agriculture. This source of livelihood: agriculture and livestock product has found affected due to climate change effect, lack of integrated watershed management. Livelihood sources are in risk due to loses of cultivation land due to disaster like landslide and flood, decreasing productivity due to lose of fertile top soil, due to lose of agriculture infrastructure like irrigation cannel, elongated drought and abandonment of cultivation land , lack of agriculture labour.

Indigenous people like Chepang, Danuwar, Tamang, Jirel, Sherpa are serverly suffering from the land degradation, landslides and flood in the Bagmati Province particularly in Dhading, Makawanpur, Chitwan, Sindhuplachwok, Dolkha.

4 POLICY AND LEGAL CONTEXTS

4.1 Constitutional and Legal Provisions for Managing River Basins and Large watershed

The Constitution of Nepal 2015 has provisioned the power sharing between the three levels of government for natural resources management (Annex 1). In Schedule -5 of the Constitution, power has been given to the federal government for the formulation of policies relating to conservation and multiple uses of water resources and regulating central level large electricity, irrigation and other projects as well as National and international environment management. Schedule-6 of the Constitution has given power to the provincial government for the formulation of policies relating to the utilization of water resources. The river which is shared between different provinces the navigation is included under the concurrent power (Schedule-7) between federal and provincial governments. The local level drinking water, micro-hydropower and watershed management is included under the power of local level (Schedule-8). The water resource management is in the concurrent list of power (Schedule-9) of all three levels of governments. Therefore, the Constitution of Nepal has given rights and responsibility to all three levels of governments for the integrated river-basin management. Therefore, it is necessary to ensure participation in and coordination among all three levels of governments in the formulation of IRBSAP.

From the constitutional perspectives, it is clear that Nepal's river basins have multiple stakeholders and sectors. The key ones are of course the three levels of governments who have both independent and complimentary authorities and accountabilities. However, civil society organizations (CSOs), private sectors, and academia also have important roles. Since the governments at all levels lack knowledge, capacity, finance, technical knowhow and technologies, it is obvious that academia, private sector, NGOs, international NGOs, UN agencies, youth advocacy groups and various constitutional bodies have to be also engaged to manage Nepal's basin resources. Under the federalised system, a large number of federal and provincial government ministries related to energy, irrigation, drinking water, agriculture, forest & environment and local development have some form of role in basin management. The three tiers of government have both independent and overlapping roles, responsibilities, functions and authorities as they are empowered to manage different goods and services Nepal's shared river basin resources provide based on the provisions made in the constitution of Nepal. Under the federalised structure, the role of WECS is to support primarily the federal ministry of energy, water resources and irrigation but also facilitate, upon request, the formulation of policies and plans at the provincial and local levels. This strategy is tasked to clarify the roles and responsibilities of each level of governments, the agencies therein as well as non-state agencies especially private sector in basin management and to propose an appropriate institutional arrangement for this purpose. So this strategic plan is cross-scale, cross-sector, and inter-disciplinary in nature making it truly integrated, holistic, mainstreamed and inclusive.

The policy and program speech delivered by the Prime Minister of Nepal for the FY 2077/78 incorporated special programme for the protection of Himalaya which is the source of fresh water for Nepal and South Asia. Further, the speech included the water induced disaster control and river system and water resource conservation by protecting ice, snow and glacier lakes. In this connection, the budget speech delivered by the Finance Minister included the program to be implemented on Koshi, Gandaki, Karnali and Mahakali watershed integrated soil conservation program. In the budget of FY 2020l21, the Federal government allocated budget for multi-hazard mapping, Seti Integrated sub-basin watershed management program, spring source mapping, Fewa Lake Protection and management, Bagmati watershed integrated watershed management program. Similarly, budget also allocated for implementing watershed conservation and wetland protection at Province government level (MoFE, 2020). The 15th Development Plan (NPC, 2020): Section 6.1.6 on Forest, Biodiversity and Watershed Section describes the plan on harmonization strategy to address the concerns of various federal forestry related laws and policy.

4.2 Local Government Operation Act 2017

This Act has governed some of the rights, role and responsibilities to the local government based on the Section 11(2) and 11(4) for the water and river management considering Federal and Provincial laws. According to the Section 24 of this Act, the local governments have obligation to give priority for the environmental conservation during the formulation and implementation of local plan and program. The local governments can also develop a joint plan through partnership among local government for the implementation of large scale plan and program on environmental and disaster management (Section. 26). The local government can establish different institutional mechanism at local level for this purpose, which can be also helpful for the implementation of IRBSAP.

4.3 Other Important Acts

There are few important provision of environmental protection in Industrial Enterprise Act 2019, Mines and Minerals Act 1985 and Town Development Act 1998 supportive for watershed management. These Acts have also made some provisions for the environmental protection including water resources which may be helpful during the implementation of IRBSAP at different level.

4.4 Water Sector Policy and Legal Framework

4.4.1 National Water Resources Policy (NWRP), 2077

The Government of Nepal has just released the National Water Resources Policy (NWRP), 2077 (GON, 2020). The NWRP replaces National Water Plan (NWP), 2005 and the Water Resources Strategy (WRS), 2002 that “postulated doctrine of integration, coordination, decentralization and participation”. The NWP had prioritized Integrated Water Resources Management (IWRM) as the

main theme for the management of water and related resource. The NWRP, 2077 is a comprehensive document whose vision is to "achieve economic prosperity through multipurpose, coordinated and sustainable use of water". Each goal has separate set of policies and strategies that aim at maximizing the sustainable benefits of water use. Altogether, the NWRP policy has 8 (eight) goals, 28 policies and 109 strategies. The major goals of the MWRP are as follow: a. to make maximum and sustainable use water resources; b. to effectively protect, regulate and control water resources; c. to enhance collaboration and allocate roles and responsibilities among the water sector related agencies and three tiers of governments; d. to establish institutional framework for water sector development, management, regulation and protection; e. to control and mitigate water induced disasters by gradually improving effectiveness of Watershed Management; f. to increase study, research, knowledge and awareness in the area of water resources; g. to provide livelihood security and protection to communities affected/displaced by water resources development projects; and h. to ensure participation of private sector and other stakeholders in water sector development.

The goals or broad objectives mentioned above aim to develop water sector to contribute to the overall national goal of economic development, food, water and energy security, public health, human security and decent standards of living for the people. The NWRP does provide a more holistic framework compared to the existing water plan and strategy as it attempts to approach water sector in a more integrated and comprehensive manner involving all stakeholders especially all 3 levels of governments. The NWRP is however very ambitious document but lacks specific action plans for contributing to the vision of prosperity through water sector development. One of the policies under the institutional development in water sector that "Necessary institutional infrastructure need to be established to undertake study, research, regulation, use, development, management and protection."

4.4.2 Irrigation Policy, 2070

The policy has vision of providing year-round dependable and sustainable irrigation in all the cultivable agricultural land. The strategies to contribute to this vision are: a) development, strengthening and maintenance of multipurpose and diverse types of irrigation facilities including gravity flow, ground water, modern technology based, lift irrigation systems; b) depending on the feasibility of the existing irrigation infrastructure, transforming them into year-round irrigation system through Inter Basin Water Transfers, Multi-purpose reservoirs, and conjunctive use of surface and ground water facilities; c)Making water users' associations more responsible and accountable to improve the effectiveness of participatory irrigation systems; d) Improve the effectiveness and impact of irrigation sector by institutionalization and capacity building; e) Undertake adaptive management measures by studying the effects of climate change, water induced disaster, population growth, and f) based on the decentralization principles, build capacity of local governments to develop and manage small irrigation systems.

4.4.3 White Paper on Energy, Water Resources and Irrigation Sector, 2075

The White Paper (MoEWRI, 2018) has reported that the average annual run-off or river discharge rate of Nepal's river is estimated as 225 billion m3 /sec. Out of the total water resources, 0.5 and 0.01 billion m3 of water is being used in industries and service sectors. The water use capacity of Nepal is estimated at US $ 0.6 per m3 which is too low in terms of its utilization. For integrated development and management of water resource, the Water Resource Act, 2049; Water Resource Strategy 2002; and National Water Plan 2005 have been formulated and released. However, their implementation is weak and largely ineffective.

The current hydropower generation capacity of the country stands at 1016 MWs that are hooked into the National Hydropower System (Grid). Hydropower sector has been receiving highest priority for the overall development of Nepal. Efforts have been made for the development and promotion of this sector by attracting both domestic and foreign investment through active collaboration among government, private, community as well as international agencies and companies. Out of the total existing connected capacity of 1073 MW, the contribution of Nepal Electricity Authority (NEA) and Private Sectors are 562 MW and 511 MW respectively.

The total irrigable agriculture land in Nepal is about 17,66,000 ha, of which 8,13, 067 ha of agriculture land have received surface irrigation facilities. The last ten years' scenario of irrigation sector reflects that the irrigation sector of the country has not been able to address the actual irrigation demand of the farmers for meeting the need of planned agriculture development – a mainstay of basic livelihoods of majority of people. In irrigation sector, various projects of national pride are being implemented. Sikta Irrigation project in Banke, Rani-Jamara-Kulariya project in Kailali, Babai and Bheri-Babai irrigation project in Bardiya and Banke are in construction phase.

4.4.4 Water Resource Act 1992, Electricity Act 1992

This Act has defined the water resource and made a detail provisions on the ownership of water resource, use of water resource and its priority order, institutional arrangement and licensing system for the utilization of water resource, maintaining water quality and control water pollution, control adversarial environmental impacts in the water resources and law enforcement mechanism

According to the Section. 10a of this Act, the Provincial government and Local government can develop plan in order for the utilization of water resource particularly for the drinking water, hydropower and irrigation as defined in the Gazette Notification of the Government of Nepal. All these legal provisions of this Act are directly interrelated with the integrated river-basin management

The Electricity Act 1992 has not incorporated any specific legal provision for the river-basin management, although the Section 24 of the Act has given emphasis for the protection of environment during the generation, extension and distribution of hydro-electricity from the water resource

4.4.5 The Drinking Water Management Board Act 2063:

This Act has given responsibility of the management of the drinking water resources to the board. It has not incorporated specific provision for the river-basin management. The Water Resource Regulation 1993, Drinking Water Regulation 1998 and Irrigation Regulation 2000 are formulated under the Water Resource Act 1992 and all these regulations have also incorporated different legal procedures for the conservation and utilization of water resource, which can contribute for the implementation of IRBSAP.

4.5 Land Management

4.5.1 Land Use and Land Reforms Provision in the Constitution of Nepal

The constitution of Nepal, Section 51deals with policies of the State where the State is responsible (a) to make scientific land reforms having regard to the interests of the farmers, while ending the dual ownership existing in the lands, (b) to enhance product and productivity by carrying out land pooling, while discouraging inactive land ownership, (c) to make land management and commercialization, industrialization, diversification and modernization of agriculture, by pursuing land use policies to enhance agriculture product and productivity, while protecting and promoting the rights and interests of the farmers, (d) to make proper use of lands, while regulating and managing lands on the basis of, inter alia, productivity, nature of lands and ecological balance, and (e) to provide for the farmers' access to agricultural inputs, agro-products at fair price and market.

4.5.2 Land Use Policy, 2015

The Govt. of Nepal released Land Use Policy, 2015 this policy document relates to sustainable and optimum use, protection and effective management of Land and Land Resources (LLRs). It provides framework for legal and institutional arrangement for sustainable management of Lands and Land Resources (LLRs). The encroachment over arable lands, forests, government and public lands and various natural resources have been serious problems across the country because of the fast growing population, internal migration and unmanaged rapid urbanization. Further, the disaster-risks such as: soil erosion, floods, and landslides are escalating by the impact of geographical and geological conditions and/or ecological changes over the vulnerable landscape. A challenge has been poised to food security, secured human settlement, ecological balance and sustainable development. Several key problems, challenges and opportunities of current land-use across the country are described in the policy document

The Constitution (GoN, 2015) gives special attention to environment protection in Nepal. The right to live in clean environment is secured under fundamental rights (article 30) of the citizens. Biodiversity issues are considered the subject matters of all three levels of the governments: local, provincial, and federal. The national forest policy, national parks and wildlife reserves, wetlands and carbon trade are kept under exclusive power and responsibility of federal government while management of national forests is kept under the jurisdiction of provincial governments. Watershed management and wildlife conservation are under the jurisdiction of local governments. The Constitution mandates a shift to a federal system of national governance and envisages a substantial devolution of functions to provincial and local governments. This can mean an ambitious legislative agenda affecting all components of the government. The federalization of

the country's governance system, however, provides an unprecedented opportunity for furthering the sustainable management of forest and other natural resources and climate resilience into development policy, plans and investments.

4.5.3 Land Use Act 2019

According to the section 4 of this Act, the lands are classified into 11 sectors (Land-use Policy, 2072) out of which river, streams, lakes and wetland fall under the important classification of land. All levels of governments are responsible to prepare and implement the land-use plan after classification of land. The federal Ministry of Land Management, Cooperatives and Poverty (MoLMCP) has issued Land Use Act 2019. According to the section 4 of this act, the lands are classified into 9 sectors and out of them, river, streams, lakes and wetland is one the important classification of land. All level of governments is responsible to prepare and implement the land-use plan after classification of land. All types of natural resource, biodiversity, water use system and environmentally sensitive areas need to identify in the land-use plans, which are really very important for the integrated forest management. According to the section 8 of this act, after preparation and approval of land-use plans, only the Government of Nepal can decide to change the land-use classification for the specific purposes such as implementation of nationally prioritize projects. The act has made different provision for the formation of Land-use Council at national, provincial and local level for the approval of land-use plans from respective levels.

All types of natural resource, biodiversity, water use system and environmentally sensitive areas need to identify in the land-use plans, which are very essential aspects for the integrated river-basin management. According to the section 8 of this Act, after preparation and approval of land-use plans, only the Government of Nepal can decide to change the land-use classification for the specific purposes such as implementation of nationally prioritize projects. The Act has made different provisions for the formulation of Land-use Council at National, Provincial and Local level governments for the approval of land-use plans from the respective governments. The rule 34 of the Buffer Zone Regulation 1996, rule 51 of the Conservation Areas Management Regulation 2057 (BS) and rule 55 of the Kanchanjhanga Conservation Area Management Regulation 2064 (BS) have also made different provisions for the preparation of land-use plan in the buffer zones and conservation areas based on the consultation with local communities.

4.5.4 Land-use concept in different legislation

According to the sec. 3a of the Land Acquisition Act 1977, the provincial government and local governments have no rights to change the land-use and if they need to change the land-use, it is requiring to request with the Government of Nepal to get approval for the land-use change. The section 10 of the Forest Act 2019 has included a provision for preparation of land-use plan in the forest areas to maintain balance between development and environment. All these legal provisions on land-use plan are helpful for the implementation of IRBSAP. In order to manage the existing risks and challenges of lands and land resources management by addressing all the contemporary issues on a long term basis, this policy was formulated by addressing the gaps identified in the Land Use Policy, 2013 A.D. Key objectives of the policy as described are: a) To categorize/classify entire lands of the country into various Land Use Zones (LUZs); b) To devise of

level wise (Federal, Provincial and Local) Land Use Plans (LUPs); c) To ensure of the use of Land and Land Resources(LLRs) on the basis of land use plans (LUPs) for protection of agricultural land, hygienic, beautiful, well-facilitated settlement and sustainable urbanization ; d) To mitigate natural and human created-disastrous hazards and e) To assess and apply minimum property valuation and progressive tax system on lands on the basis of specific use after getting prepared of plot based records.

In order to achieve the aforesaid vision, mission and objectives, the policy document has recommended 15 policies and each policy have several strategies. Entire lands of the country have basically classified into 10 specific Zones like Agricultural Zone, Residential Zone, Commercial Zone, Industrial Zone, Mines and Minerals Zone, Cultural and Archaeological Zone, River and Lake-Reservoir Zones, Forest Zones, Public Use and Open Space Zone, Building Materials (Stone, Sands, Concrete) Excavation Zone and Other Zones as specified as per necessity. Those zones could be sub-classified into Land Use sub-Zones as per necessity. Policies related to various zones on Land and Land Resources (LLRs) such as: Forests, agriculture, urban development, settlement, irrigation, energy, industry, and tourism and education shall conform to the spirit of this Policy. For the execution of this policy, there exist the execution management frameworks like (a) Legal Frameworks, (b) Institutional Frameworks, c) Outcome Timeframe of Land Use Policy Execution (d) Monitoring and Appraisal.

4.6 Forestry Sector related Legal Framework

Nepal has given due importance to sustainable forest management and biodiversity conservation. The Constitution (GoN, 2015) gives special attention to environment protection. The right to live in clean environment is secured under fundamental rights (article 30) of the citizens. Biodiversity issues are considered the subject matters of all three levels of the governments: local, provincial, and federal. The national forest policy, national parks and wildlife reserves, wetlands and carbon trade are kept under exclusive power and responsibility of federal government while management of national forests is kept under the jurisdiction of provincial governments. Watershed management and wildlife conservation are under the jurisdiction of local governments. The Constitution mandates a shift to a federal system of national governance and envisages a substantial devolution of functions to provincial and local governments. This can mean an ambitious legislative agenda affecting all components of the government. The federalization of the country's governance system, however, provides an unprecedented opportunity for furthering the sustainable management of forest and other natural resources and climate resilience into development policy, plans and investments.

4.6.1 Forest Policy, 2019

Forest policy defines forest area as “covered by grassland, meadow, naked hill covered or not covered by snow, road, pond, lake, wetland, river, stream bank, lease or uncultivated land covered by marked or unmarked forest boundary or within forest that is owned by any individual”. It introduces inter-provincial forest and defines as "National Forests spread over more than one province, geographically and naturally connected, and ecologically interlinked". It also defines landscape as "forests and community, areas and natural resources interrelated with the forests". National Forest includes government managed forest, forest conservation area, community forest,

collaborative forest, religious forest, leasehold forest, national forest within province or inter-provincial forest. The land ownership of the National Forest area remains with the GoN. GoN delineates the boundary of interprovincial forests and national forests within province. The GoN in consultation with Provincial Government prepares integrated or province wise strategic plan for the management of the National Forests. Within Province and Interprovincial Forests. Remaining within the framework of strategic plan, the Provincial Government can take necessary steps for the protection, development and utilization of National Forests within Province (NFWP) and Inter Provincial Forests (IPF). Divisional Forest Officer prepares strategic plan of National Forests (includes FCA, NFWP and IPF) within his/her jurisdiction in a participatory way and implements it after approval from the concern authority.

Both the federal and provincial governments have placed high priority on biodiversity conservation and sustainable forest management. A number of policies, plans, strategies, and legislations have been developed in recent years and are being implemented. The National Biodiversity Strategy and Action Plan (NBSAP) 2014-2020 (GoN/MoFSC, 2014), Forestry Sector Strategy 2016-25 (GoN/MoFSC, 2016a), National Forest Policy 2019 (GoN/MoFE, 2019), National Climate Change Policy, 2019 (GoN/MoFE, 2019) Forest Act 2019, and Environmental Protection Act 2019 are some of the key national level policies and legislations that are relevant to forest and biodiversity management in the present context.

Forestry Sector Strategy 2016-25 has emphasized for sustainable management of timber and non-timber forest resources by adapting to the changing context. It has provided essential foundation for the National Forest Policies of 2016 and 2019. Building on the National Forest Policy of 2016, National Forest Policy 2019 has emphasized on sustainable forest management; *in-situ* and *ex-situ* conservation of rare, endangered and threatened plant species; conservation, expansion of cultivation, collection, processing, certification, commercialization and export promotion of NTFPs/MAPs; green enterprise development and creation of green jobs through collaboration among academic and research, cooperative, private sector, and bank and financial institutions; and ensuring equitable distribution of benefits that is obtained from forest and biodiversity management. The policy acknowledges the need for multistakeholder (including governments, forest users groups, cooperatives, private sector, and forest owners) involvement in sustainable forest management (GoN/MoFE, 2019a).

4.6.2 Forest Act 2019

The main objective of the Forest Act 2019 is to manage the forest biodiversity, river, streams and wetland across the country. The river, streams, wetlands, ponds, and other water sources which are located inside or surrounding the forest areas are also defined as forest area. Therefore, the water conservation including the river-basin management is also an integral part of forest management plans in Nepal. GoN can implement Land Use Plan in specific National Forests for sustainable protection, management and maintain balance between environment and development. GoN is responsible for the protection, promotion and management of wetlands inside National Forest areas. Based on the section 15 of the Forest Act 2019, the Government of Nepal can declare a Forest Protection Area by delineating a particular land-scape for the management of critical watershed areas and conservation of environment or ecosystems which are important from the national or international point of view. The Ministry of Forests and

Environment (MoFE) has authority to approve the management plans for the management of all those forest protection areas.

According to the section 44 of the Forest Act 2019, the Government of Nepal can develop different mechanism for the utilization of benefits generated from the management of environmental services particularly for hydropower, drinking water, tourism and other enterprises who are using the environmental services from forest sector. Based on this legal provision, the local communities such as FCUGs can also manage and provide environmental services based on their approved forest management plan which is one of the important opportunities to generate support for the river-basin management at local level. There are a number of other policies, plans, strategies and legilsations that are directly or indirectly relevant to sustainable forest management and biodiversity conservation (Annex, Table 1). Many of the legislations were formulated and enacted in 2019 under the framework of the new consitutional provisions and in the spirit of federated national governance.

Ineffective implementation of the policies, plans and strategies, due mainly to inadequate human, financial and technical capacities of the federal, provincial and local governments, and local forest user groups, is a major problem (NPC, 2015a). Inadequate inter-and intra-agency coordination and cooperation, poor enforcement of laws, lack of system for mainstreaming indigenous knowledge and innovations into national development programs, and lack of or unorganized knowledge management system are some other issues related to biodiversity management (GoN/MoFSC, 2014; GoN/MOFE, 2018b). Weak institutional capacity, poor inter-agency cooperation and coordination to deal with cross-cutting issues, and inadequate means and resources are the key immediate challenges that constrain the effective implementation and enforcement of climate change related policies and programmes (GoN/MoF, 2017).

4.6.3 National Park and Wildlife Conservation (NPWC) Act 1973:

The National Park and Wildlife Conservation Act 1973 has not incorporated specific provision for the integrated river-basin management. However, according to the different regulations related to this Act, some provisions include the river-basin approaches in the management plan of protected areas including buffer zones.

The section 5(2) of the NPWC Act 1973 has made a provision to use the water resource of national parks specifically for the drinking water, irrigation and fishing which has been using based on the customary practice of the surrounding local communities. Such utilization of water is regulating through permit system developed by the concerned offices of the Protected Areas. The Conservation Area Management Regulation 2057 (BS) has given emphasis to include the detail provision (including NTFP/MAPs) in the

4.6.4 Management plan of conservation areas for the river conservation inside the conservation areas.

The Shivapuri-Nagarjun National Park Regulation 2019 has incorporated a detail provision for the water resource utilization particularly for drinking water, irrigation, hydropower and other commercial use. During the utilization of water resource, the priority given for aquatic animal, wildlife, drinking water, irrigation, hydropower and other commercial use respectively. The Water

Users Groups are the main institutions for the utilization of water resources of the national park namely for drinking water supply and irrigation. During the utilization for any purpose, at least 50% dewater need to maintain in the dewater zone. The Water Users Groups and other commercial entities have obligation to pay the water charge to the office of National Park as defined in the annex-7 of the regulation.

4.6.5 Watershed Management Act 1982:

This Act and associated regulation has made a detail provisions for the declaration and management of watershed areas, however, all those provisions can implement only in the protected watershed areas. Except the Shivapuri Watershed, the Government of Nepal has not declared other protected watershed areas in Nepal. However, based on the section 16 of this Act and Gazette Notification dated on 2071/9/7 (BS), the Government of Nepal has formed a District Watershed Conservation Committee (Kaski) for the implementation of watershed management activities in the watershed areas of Phewa Lake of Kaski District . The provisions of this Act are more relevant for the integrated watershed and river-basin management in, although it requires declaring protected watershed areas for the implementation of this Act.

4.6.6 Aquatic Animal Protection Act 1960:

The main objective of this Act is to protect the aquatic animals in all types of water sources including rivers. The Act has defined the roles and responsibilities of different agencies and water users for the protection of aquatic animals during the utilization of water sources and harvesting of aquatic animals which are not prohibited for the harvesting. According to Section 5a of the Act, the provincial and local governments should protect the aquatic animals as per their laws. These provisions are useful in the context of implementation of IRBSAP. Rights to fishing regulation is applied to the National Park and Wildlife Conservation Regulations (Chitwan, Himali, Khaptad, Banke and Badiya) have incorporated specific legal provision for fishing from the rivers of protected areas by the surrounding Indigenous Peoples based on the permit obtained from the Office of concerned protected areas. Such regulatory provision for the fishing is also crucial for the implementation of IRBSAP.

4.6.7 Forest Sector Coordination Committee:

For the effective implementation of Forest Act 2019, the Ministry of Forest and Environment (MoFE) can form a national level Forest Sector Coordination Committee with the Chairmanship of Minister of MoFE. The representatives of the provincial ministries, local governments and local communities are the member of this committee which can support for the coordination to implement the activities under IRBSAP

4.6.8 Bagmati Provincial Forest Act, 2020

The act provisions for the definition of watershed and payment for ecosystem. It has provisioned for ecotourism and wetland management. The act has provisioned for the establishment of watershed management in Clause 80. Further, categorization of watershed, Provision for declaration of protected watershed area.

4.7 Environment Sector

4.7.1 National Environment Policy, 2019

The rationale of the new policy was felt due to the need to maintain balance between environment and development in order to achieve SDG. Also there is The goal of the policy is to ensure the rights of every citizen to live in clean and safe environment by sustainably managing solid waste, controlling pollutions and enhancing greeneries.The basin protection and conservation related strategic objectives are: a) to mainstream environmental consideration in infrastructure development; b) develop a culture of utilizing natural and human modified ecosystems by keeping the legal rights of both present and future generations; c) develop and support research and capacity for the protection and management of environment; d) Use of land as per the national land use plan; and e) Use recycled and renewed resources as much as possible.

4.7.2 Environmental Protection Act 2019

According to the Section 30 of the Environmental Protection Act 2019, the Government of Nepal can declare an environmental conservation area or green zone or a sensitive zone for the conservation of natural resource, aesthetic values of nature, river conservation, environmental conservation and ecological restoration based on the consultation with the local level government and local communities.

National Council for Environmental Protection and Climate Change Management under the chairmanship of the Prime Minister is one the main national level institution to be set to provide policy direction to the different ministers of the government in environment protectio0n and climate change, which is also a National level Institutional arrangement for the environmental protection and climate change. One of the important functions of this Council is to provide guidance to the concerned ministries for the management and utilization of natural resource including water resource and physical infrastructures.

4.7.3 EIA/IEE Provisions in River Basin Sectors

Some of the major provisions of this legislation for the enforcement of IEE/EIA in the river basin are as follows: a) each proponent of the development activities (which are listed in the Schedule-I, II and III of the Environmental Protection Regulation 2020) is responsible to prepare Environmental Study Reports (Small Scale Environmental Study, Initial Environmental Examination and Environmental Impact Assessment) before implementing such development activity; and b) without approval of Environmental Study Reports no one has right to implement any projects or proposals related to water resource. Therefore, based on these legal provisions it is required to prepare EIA reports before implementing major Hydropower and Road projects. Based on this Environmental legislation, the Government of Nepal has authority to approve such EIA report for basin based major infrastructure projects.

4.7.4 National Policies and Legal Framework on River Basin and Watershed Management

The Constitution of Nepal has given exceptional authority to the federal government for the formulation and implementation of policies to conserve environment including river-basin

management. The state policies of the Constitution (Article 51) have given priority for the sustainable utilization of natural resources considering the national interest, environmental protection and equitable sharing of the benefits of natural resources to the local communities with priority and preferential right. The state policy of the Constitution has also given emphasis to the following aspects, which are more important in the context of integrated river-basin management:

- To make multi-purpose development of water resources based on the priority to domestic investment and peoples' participation;
- To develop sustainable and reliable irrigation by making control of water-induced disasters and river management;
- To maintain the forest area in necessary and abandoned lands for maintaining ecological balance;
- To adopt appropriate measures to abolish or mitigate existing or possible adverse environmental impacts on the nature, environment or biological diversity;
- To make early warning, preparedness, rescue, relief and rehabilitation in order to mitigate risks from natural disasters.

4.7.5 Equitable Benefit Sharing with respect to water and energy resource:

Regarding benefit sharing practices among the basin users integrated basin development incorporates the needs of the upstream and downstream communities as well as the environment in line with the government of Nepal's water and energy policies. If the hydropower development is planned, coordinated, and managed effectively, then the hydropower investor, watershed communities, and the local environment all need to be benefited. The ADB (2019) study in DKRS examines the possible strategies to share benefits with and involve communities. The Payment for Ecosystem Service (PES) concept piloted in the Mid-Marsyangdi watershed is one of the innovative initiatives supporting the enhancement of ecosystem services (water quality through sediment retention in well managed watershed) that ultimately contributes to sustainable livelihoods of locals as well as an effective climate change adaptation strategy. The establishment of the adaptation plans, the capacity building activities, the PES fund and the demonstration site constitute the major activities undertaken and implemented within the current project. This PES project managed by CARE, Nepal includes district level ecosystem service providers network which aims to unite the community level implementation units and all the district level line agencies, the Federation of Nepal Chambers of Commerce and Industry (FNCCI); Middle Marsyangdi Hydropower Project, and Ecosystem Service Providers' Network. Additionally, Middle Marsyangdi Hydropower Project representatives are involved in the mediation for all necessary discussions and decisions related to the PES initiatives on the side of stakeholders from the hydropower projects (CARE Nepal, 2019).

4.8 Climate Change and Disaster Management Policy and Act

4.8.1 National Climate Change Policy, 2076 (2019)

The policy highlights that Climate Change is a serious problem emerging at global level. Poor and developing countries like Nepal are affected more compared to rich and developed ones. Despite its negligible contribution to total global emissions of green houses, Nepal is one of the countries

that as high risks of adverse effects of climate change. The negative effects of climate change have been directly experienced in forest and biodiversity, energy, human health, tourism, habitation, infrastructure development as well as in the areas of livelihood, while there has been huge loss of lives and property due to climate induced disasters such as flood, landslide, and windstorm and wild fire every year. Against this backdrop, this National Climate Change Policy, 2019 has been introduced with the objective of providing policy guidance to various levels and thematic areas towards developing a resilient society by reducing the risk of climate change impacts.

4.8.2 National Policy on Disaster Risk Reduction Strategy in 2018

The main objective of this policy is to substantially reduce the natural and non-natural disaster losses in lives and properties of persons, health, means of livelihood and production, physical and social infrastructures, cultural and environmental assets (MoHA,2018). The GoN promulgated Disaster Risk and Management Act, 2017 (GoN, 2017) which focuses on protecting public life, public and private property, natural and cultural heritages, physical properties and minimizing the disaster risks and damage. The Act repeals and replaces the natural calamity Relief Act of 1982. The government also brought into practice a relief fund to help the victims. The Prime Minister's Disaster Relief Fund was founded by the Nepali government in 2006 to help the victims of natural disasters (MoHA, 2006).

The Local Govt. Operation Act has made various provisions for the water-induced risk reduction and management at different level. National Council for Disaster Risk Reduction and Management is one of the main institutional mechanisms to provide policy direction to implement the Act (Sec.3). As per the Section 13a the provincial and local level Disaster Risk Management Committee can be responsible to work at respective levels. Similarly, the Disaster Management Fund is also established in each level of government for the generation of financial resource to implement the disaster risk reduction and management activities. Based on the Section 10 of the Act, a Disaster Risk Reduction and Management Authority have been established for operationalization of the Act. The Authority can be instrumental to support for the implementation of IRBSAP at different level.

The Government of Nepal committed to the implementation of the new Sendai Framework for Disaster Risk Reduction 2015-2030 in March 2015 on Disaster Risk Reduction, to enhance efforts to strengthen disaster risk reduction to reduce losses of lives and assets from disasters, increase the capacity for understanding about the disaster risks, strengthen the global cooperation for DRR and establish multi-hazard risk information management (EWS) system for potential disasters worldwide (Nepal DRR Portal, 2020).

5 CHALLENGES AND OPPORTUNITIES

A number of consultation meetings were held which explored the challenges and opportunities of integrated watershed management in Bagmati province.

The summary Table 5-1 below provide the glimpse of the provincial stakeholders' views, priorities and perspectives on major themes. The outputs of these consultations were carefully analysed and incorporated in the preparation of the strategy.

Table 5-1: Key highlights and major findings of the Bagmati Province level consultations

Major Themes	Key Issues	Key Priorities
Biodiversity and Ecosystems	Ecosystems are degrading and habitat fragmenting; land, water and air pollution on the rise; riverbed siltation, river cutting, haphazard infrastructure development and poor EIA system, unscientific upland farming and encroachment on different pretexts prevailing;	Large Watershed ecosystem and environment protection River sources based classification; Watershed classification and vulnerability assessment; Preparation of integrated watershed management plans Protection area identification based on natural ecosystem and biodiversity; River ecosystem protection; Landscape and ecosystem based management; Assessment of ecosystem service flow and payments for use
Water Resources Management	Water resource management issues (siltation in Hydropower (HP) reservoirs, PES not included in HP projects, high water abstraction for irrigation, Inter-provincial issues, river diversion, watershed conservation not included, source protection and fresh water wildlife and fish biodiversity protection issues not addressed)	Wise use of Water Resources Master Plan Preparation for Major River Basins; Mapping of Current Water Use; Upstream-Downstream Impact and Effects; Regulation of water use and e-flow; Fresh water based production of drinking water, energy, irrigation and water tourism goods and services; Payment for ecosystem services and appropriate use

Climate Change and DRR	MOHA based Disaster management authority's policy and strategy has weak links with MOEWRI, MoFE agencies, and provincial governments; Climate induced disaster risk reduction and management is weak; Linkages with ecosystem based adaptation, EcoDRR and Nature based solutions are missing, not effective coordination for early warning with DHM)	Disaster risk management Land capability classification and mapping; Vulnerability mapping an d classification; Climate change adaptation and resilience building; Disaster prevention, relief, rescue; Ecosystem based rehabilitation and Reconstruction;
Institutional Framework for Good Governance	River Basin offices are narrow sector focused; vertical communication and coordination missing; no horizontal linkages and coordination; Basin level- watershed management plan/land use plan are not jointly implemented, no long term vision, institutions are working in `silo' Gaps in planning, monitoring, reporting, evaluation and information sharing, Provincial-Local Govts. level: role/responsibility missing in Basin offices	Creation of Enabling Environment Reforming of Policy and Legal Framework; Institutional Strengthening and Development; Human and Institutional Capacity Building; Gender Empowerment and Social Inclusion; Livelihood Improvement; Mobilisation of Necessary Finance; Research and Knowledge Management; Monitoring and Evaluation;

Similarly, the study team also conducted institutional mapping and gap Identification in Bagmati province's stakeholders at various locations are given in the Table 5-2 below.

Table 5-2: Institutional Mapping and Gap Identification by Provincial Stakeholders

Existing institutional focus at the federal level	Major issues in the current institutional arrangements	Sector wise Issues and Gaps Identified in current institutional arrangements
MoEWRI focus: water use only for HP & Irrigation, DHM- weather forecast and data collection, early	Collection of revenue, but poor or no attention for land improvement and	Institutional Arrangements: Basin offices are narrow

warning, 3 DHM managed Basin Office for collect flow data for EWS) WECS- study and research on water and energy- has Basin section for research MoCTCA- water based tourism (e.g. white water rafting) MoFE- soil conservation, watershed management, Basin Management Center- 4 (Koshi, Gandaki, Karnali, Mahakali MoLMPA- land revenue, land use plan (yet to implement) MoALD- agriculture crop and livestock production (no soil and water conservation activities even on sloping land, riverside farming) MoHA- Disaster Risk Reduction and Management- DRRM Authority (mostly rescue and relief) MoPIT- Focusing only on infrastructure (roads and railways) development Water Policy/Plan/Strategy formulation support IWRM but no basin level mandate and for implementation	implementation of land use plan (Min. of Water Supply) No linkage between land and forest management with water resources based HP and irrigation No systematic study and coherent actions in river management No consideration of ecosystem condition in infrastructure development No much consideration on bioengineering for making roads resilient to landslides; no investment on soil erosion/landslides/eco-DRR; NBS; Blue water focus: Income from hydro but no investment on watershed management; siltation issues, huge money spent on de-silting /cleanup Only water based tourism, no investment to control of river pollution, river mining and biodiversity protection (no white-water for rafting)	sector focused; vertical linkages only Horizontal communication and coordination missing; Basin level- watershed management plan (MoFE)/Land use plan (MoLM) are not jointly implemented, no long term vision, institutions are working in `silo' Gaps in planning, monitoring, reporting, evaluation and information sharing, Provincial-Local Govts. level: role/responsibility missing in Basin offices Vertical linkages dominate; horizontal linkages missing Green water focus: Focus so far is on micro watershed and some river training, plantation and bioengineering, conservation farming and water pond construction, weak institutional set-ups for basin management

The team conducted SWOT (strength, weakness, opportunity and threat) analysis of the current practice of watershed management under basin management based on the framework of the integrated water resources management (IWRM) and identified the opportunities and challenges. Similarly, SWOT analysis was also carried out of the existing forestry sector policies and watershed / basin related institutional arrangements during provincial consultations. The result of the SWOT analysis is presented below in the form of Challenges and Opportunities.

5.1 Challenges in Watershed under River Basin Management Sectors

5.1.1 Water Resources Management

i. Many of the Working Policy sets by Water Resource Strategy, 2002 and National Water Policy, 2005 have not been achieved.
ii. Various commitments as stipulated in the Bilateral Agreements (Koshi, Gandaki, Mahakali,) between Nepal and India have not been implemented
iii. Integrated National Water Resource Policy has finally been developed and approved although its need was envisaged long time ago; The just released National Water Resources Policy, 2077 is also largely water centric and does not mainstream and integrate climate change, environment, forestry, watershed, disaster management and socioeconomic development needs fully.
iv. It is very essential to develop necessary policy and legal guidelines to resolve and manage the disputes in the distribution and use of available water resources among federal, provincial and local governments and enhancing their capacity development
v. The decision support system and knowledge management tools required for integrated water resources and water induced disaster management including information database development, documentation, dissemination and appropriate use in the decision making process have not been developed
vi. There are gaps in policy and guidelines in ensuring fair distribution of benefits different stakeholders and between upstream and downstream municipalities/provinces/countries while developing integrated and multi-dimensional water resource projects

5.1.2 Energy Sector

i. Almost all the hydropower projects are running through the run-of- the- river types of reservoirs. Water volume and flow in the rivers decrease in winter, which in turn have reduced the capacity of hydropower and thus the demands of electricity are not fulfilled during winter thus forcing Nepal to import power from India; the situation is going to be further strained because of climate change;
ii. Many of the hydropower projects identified by the Integrated Water Resource Master Plan are not designed and constructed in time, therefore the cost of the projects have been increasing with no significant outputs as expected.
iii. Developing policy regarding the appropriate sharing of cost and benefits among the hydropower project stakeholders that are to be developed in the same river basin have been very essential.
iv. In one hand, there is no guarantee of construction time of identified reservoir-based hydropower projects, while in the other hand there are challenges to stop the expansion of unplanned settlements and road construction in the periphery of the catchment of the reservoir.

5.1.3 Drinking Water and Sanitation

i. Bagmati Province still has full access to improved sanitation, and has complete an access to basic water services.; many villages/hamlets not served by water supply network;

ii. Nepal's 33 Per cent Urban Population Do Not Have Access To Hand washing With soap and Water and Bagmati province is also suffering problems.
iii. Functional status of water schemes and the quality of water remains poor with 71 per cent of all water sources and 91 per cent of those used by the poorest quintile contaminated with Escherichia coli bacteria in Nepal. Bagmati province is also suffering on the issues.
iv. Only 25 per cent of the water supply is reported to be fully functioning and almost 40 per cent requires major repairs; Open defecation is still practiced by 16 per cent of the population (NDHS) in Nepal. It is also hot issues in Bagmati province.
v. Twenty per cent of government schools lack improved water and sanitation facilities, with an additional 19 per cent lacking separate toilets for girls and boys and menstrual hygiene management in Nepal. It is long way to go for Bagmati province.
vi. Cost recovery percentages (for water supply, sewage and wastewater treatment) not satisfactory even in Bagmati province.

5.1.4 Irrigation and Water Induced Disaster Management

i. Almost all irrigation projects are built on the basis of run- of–the- river techniques; so there is no provision of collecting excess water that flow in the irrigation canal during summer so as to provide irrigation services during dry period; so the irrigation canals are not fully functional.
ii. Due to lack of adequate financial resources, peoples' participation, and effective planning of the Water Induced Disaster Management this aspect of water management has not been able to achieve expected outputs; poor planning, poor construction and lack of integrated flood management infrastructures for the protection of flood plain communities in the country.
iii. There is no control mechanism to discourage fragmentation of irrigated and irrigable agriculture lands and use of such lands for other purposes especially for urban settlements. No control measures have been adopted in the better use of marginal land for urban and other uses.
iv. Zoning of river banks has not been done; rampant encroachment of river banks, plotting and settlements in the encroached river bank areas that actually are flood plains have not been controlled.
v. Annually increasing landslides, erosion and watershed degradation in the upstream catchments, the river beds in the downstream are being raised due to heavy sediment deposition. The source and flow of sediment loaded rivers erode banks and cause heavy damage of properties and including forest and agriculture lands. Riverine flood havocs can be minimized through well management preventive and rehabilitation measures by regulating the mining of river bed and river side sand and grabble aggregates.
vi. Minimizing the risk and adapting to the impact of climate change induced disaster by managing both `too much and too little' water and addressing uncertainty in the future climate change should be the strategy in river basin management; Shrinking water resources, unexpected river flooding, abrupt change in temperature and rainfall patterns, increasing erosion and landslides need integrated response such as development of Climate Change resilient infrastructure which are challenging tasks.

5.1.5 Overall Watershed Management

The GON (2018) did a Stocktaking report primarily based on the review of published and unpublished documents related to countries scenarios on land degradation. The report reviews the existing national policies and plans of the country for the management of environment and land degradation. Documents like GoN Periodic plans, cross-sectoral policies, sectoral policies, multi-lateral environment agreement and its implementation (UNCCD) are thoroughly reviewed. The Stocktaking report provides basic information for assessment of national capacity to combat degradation and priority needs which helps to prepare a national capacity development plan. The national capacity development plan provides basis in getting international support for capacity enhancement. The main challenges identified are the following:

i. Capacity building, education and public awareness, are other supportive measures of UNCCD for successful implementation of National Action Plan (NAP) programs and promotion of scientific and technical cooperation.
ii. Activities for capacity building and strengthening have been categorized into four types like i) institution building, training and development of relevant local and national capacities, ii) interdisciplinary review of available capacity and facilities at the local and national levels, and the potential for strengthening them, iii) promotion of education and public awareness in understanding the causes and impacts of degradation and iv) establish and/or strengthen networks of regional education and training centers to combat degradation.

5.2 Opportunities

5.2.1 Integrated Water Management (IWM)

i. Integrated National Water Resource Policy, legislation and institutional infrastructure can be developed for its implementation. Under this policy, the existing institutional arrangement on Watershed Policy Planning can be restructured to make it more effective through the establishment of BPWSSC in the province.
ii. In view of integrated watershed resource management and the multidimensional use of watershed resources and considering the possibilities of sub- basin water transfer, basin plan of all watersheds
iii. Necessary Institutional arrangement can be established to resolve the possible conflict that may arise in the management and optimum utilization of available water resources between Federal - Province, Province – Province and Local level.
iv. Available water resource of the country can be developed and managed on the basis of designing and implementing multi-dimensional and multi-purposive projects
v. Appropriate modality can be planned for the construction, maintenance and operation of dam, power house and other structures for the projects of multi-purposive nature.
vi. In the areas having potential for the development of reservoir based water conservation projects, policy can be developed to regulate the construction of additional road, new settlements and other physical infrastructures.
vii. While developing reservoir based water conservation projects, appropriate modality can be developed for benefit sharing to the downstream countries

viii. Water induced disaster management related users' committee into the prospective of cooperatives
ix. Necessary Act can be promulgated and enforced to discourage encroachment of river bank for settlements, building of houses and other uses.
x. Capacity of all levels of governments for developing climate and water induced disaster management can be enhanced through the coordination among Federal, Province and Local government levels.
xi. Different models of working procedures, Regulations and Guidelines to develop watershed through Province and Local government can be developed
xii. The existing water induced disaster management policies can be revied and to provide important roles and ownerships to the province and local governments in disaster management initiatives.

5.3 Benefits

i. Increasing water supply through infrastructure and rejuvenation of springs
ii. Groundwater pumping using grid electricity and off-grid solar power
iii. Small and local-scale water storage and rainwater harvesting
iv. Inter-basin water transfer is possible due to advances in irrigation technologies, farming
v. technologies (demand management)
vi. Spring conservation and management through hydrogeological and community
vii. approaches; small and local-scale
viii. water storage and rainwater harvesting
ix. Increasing water supply (inter-basin water transfer)
x. Sustainable use of groundwater in an urban context

In order to protect river bank cutting, submerging of agriculture land, physical infrastructures and settlements from the big rivers during summer, the local participation based initiatives like People's Embankment (Janta ko Tatbandha) Rastrapati Chure Tarai-Madesh river control work, National Reconstruction Authority's river control and landslide management works, Narayani river Control project can be made more effective.

Priority River Flood Risk Management Project for flood control and management through structures and non –structures measures in Rapti river of tarai region can be implemented. Study and research in the Climate Change impacts on water resource, irrigation and water induced disaster management be made more effective in the coming years. Research, exploratory works and study of the impacts of climate change in existing physical infrastructures, impacts on agriculture crops due to increased temperature, change in water table of underground water resources, drying of surface water sources, floods, erosion/landslides, sediment yield crop is carried out in the coming years.

5.4 Forest and Watershed Management

Post federalization institutional arrangements whereby the Ministry of forest and Environment established earlier and now it has added soil conservation sector as well hence called MoFESC and has provided tremendous opportunities for integrated development and management of forest,

watershed and biodiversity sub-sectors with close interface with broader environment and climate change sub-sectors. Some of the opportunities are given below:

i. 1st Development Plan gives high priority for watershed management
ii. 15th Plan, Climate Change Policy 2019. Environmental Policy, 2019, and Forest Policy 2019, National Water Resources Policy 2020 of federal level stipulate integrated and sustainable management of natural resources keeping environment safeguards by adopting `Precautionary Principles' of NRM.
iii. Forest Act of Province incorporated the provision of protected watershed concept for sensitive watersheds.
iv. The NWR policy has incorporated a policy for multi-purpose use of water resources and watershed management
v. Recommended for the environmental conservation in all policies
vi. The policy has given emphasis to promote environmental service through maintaining linkage between upstream and downstream
vii. Environmental and disaster management are recognized as key security concern
viii. Classified the wetland for the management considering their special importance
ix. Inter-watershed management for the sustainability of irrigation system

5.5 Tourism Sector

River /Watershed natural resources and landscapes based eco-tourism has huge opportunities to be harness properly through the IWM approaches. Some of them are:

i. Use of landscape and/or ecosystem management as approach to nature friendly adventure/eco/nature-based tourism
ii. Promotion of trans-boundary solutions (inter province) by promoting co-operation in setting nature based tourism standards and best practice guidelines
iii. Proper valuation of tourism potential of river basins/watershed and proper accounting of the social, economic and cultural co-benefits for local and national development
iv. Promotion of Indigenous peoples and Local Communities (IPLCs) involvement in planning and management of tourism;
v. Supporting local enterprises and businesses by promoting locally produced products
vi. Involving local schools in conducting ecological tours and raise revenue for schools and learning for students
vii. Influencing Federal and provincial government officials as well as local governments to make good nature-based tourism policies that can enhance both environment and revenue
viii. Inclusion Sustainable Nature Based Eco-Tourism (SNBT) in school and college curricula so that employment in tourism sector can be promoted
ix. Organize local cultural festivals and heritage conservation campaign.

6 BAGMATI PROVINCE WATERSHED STRATEGY

6.1 Watershed Management Strategic Framework and Federal System

Based on the best practices and national legal system, the watershed and sub watershed under two river sub -basins (Koshi and Gandaki) in the Bagmati Province are planned in an integrated manner for multiple use management by multiple stakeholders involving all three levels of governments. Realizing multiple benefits, proper consideration will be given to protect environment and conserve biodiversity (both terrestrial and inland water and aquatic), and eco-system services for enhancing socio-economic status and maintaining bio-cultural heritage of the people living in the basins.

Planning a watershed plan under sub-river basin for multiple use and benefits requires an integrated approach to manage all the major ecosystem services river basins are capable of producing – now and in future. In other words, the sub river basins planning have been carried-out by applying sustainable and integrated management approaches while giving due consideration to the associated social and economic development objectives to meet increasing demands of growing population that depend on the resources in Bagmati Province's sub river basin and large watersheds under two basin of Nepal (Koshi and Gandaki).

The development of new approaches to sub-river basin planning is influenced by a number of emerging trends in the river water and other river basin based natural resources spread around at ecosystem (forest, watershed, rangelands and protected areas), and mosaic landscape (agriculture, forest, pasture, urban areas, hydropower reservoirs, irrigation and road infrastructure) levels covering food, water, energy and biodiversity sectors.

Based on the extensive literature review, it is proposed that elements of strategic sub-river basin planning framework for Bagmati Province of Nepal are recognized as described below:

i. Sub-river basin under two river basin, drained through the Bagmati province, ecosystems are complex so the goal of strategic sub river basin planning requires trade-off (making compromises) between social, economic and ecological development objectives
ii. Strategic sub-river basin and watersheds planning should be based on integrated components of development planning
iii. Strategic sub-river basin planning and watershed needs maintenance of ecosystem goods and services provided by the river basin
iv. Strategic sub-river basin and large watersheds planning needs cooperation and coordination between basin resource development institutions and environment planners at federal and province and local government level.
v. Strategic sub-river basin and large watersheds planning should be based on holistic consideration of social, economic and environmental systems and factors supported by the river system (not only based on technical optimization)

6.2 Thematic and cross-cutting areas considered for strategic watershed management under sub-river basin planning

Most of the strategic sub river basin and watershed plans are prioritized for addressing a limited number of key issues, themes, strategic thrusts and impact areas. In this plan, these are called sectoral and cross-cutting themes on which the strategic vision, goal, mission, objectives and action plans of a river basin are to be formulated.

Based on Nepal's national conditions and the major problems in the province to be addressed by a sub-river basin plan and watershed plans, following sectoral and cross cutting themes are proposed as shown by the diagram below in Figure 8 that presents the four themes as integrated and overlapping areas:

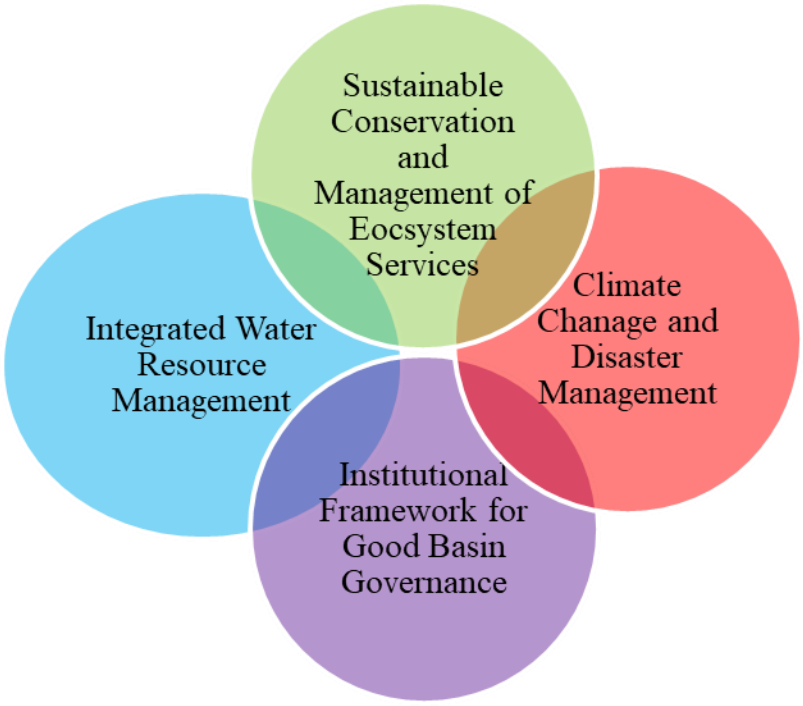


Figure 6-1: Key Sectoral and Cross Cutting Themes or Areas identified in Bagmati Provice for Strategic sub-River Basin and watersheds Planning

6.3 Vision, Mission, Goals, Outcomes, Strategies

6.3.1 Strategic Framework: Vision, Mission and Goals

The strategic framework need to place ecosystem restoration and conservation activities in a socio-economical context and manage them based on the principles of participatory management, inclusiveness and sustainability. The strategic framework includes visions (sub-river basin and large watershed) governance at provincial level for sub-river basin and large watershed management at each of the 2 basin levels), strategic goals, mission and outcomes.

Accordingly, along with vision, and mission statements, four (4) overarching Strategic Goals and twenty six (26) Strategies for tworiver basins drains in Bagmati Province have been prepared.

The vision of the strategy is based on the situation analysis, literature review and provincial stakeholder consultation. Two visions are presented the justification for which is that the proposed provincial level high powered Bagmati Province sub-river basin and large watershed Management Steering Committee (BPSRBWMSC) should aspire to see and work for ensuring that all watersheds udner two basins are being managed involving all the three tiers of governments and also all the major sector, stakeholders and disciplines.

The BPSRBWMSC will be a guiding, vision setting, enforcing and decision making body to ensure that minimum conflicts and environmental damage occur while livelihood, economic development and natural resources extraction occur within the watersheds in concerned river basins. It will have the ultimate responsibility to ensure that Bagmati Province 's watersheds under two basins are healthy in terms of its ecosystems, prosperous in terms of the quality of life of its people, and vibrant in terms of its dynamism, inclusiveness and effectiveness in the management of sub-basin resources.

This approach will make it truly provincial integrated watershed management helping not only to provincial but also to achieve the national goal of "Prosperous Nepal, Happy Nepali". At each of the two basin levels as the Chart 1 and Box 1 present the Bagmati Province Sub River Basin and Large Watershed Management Steering Committee (BPSRBLWMSC) will contribute to the vision of making watersheds in each basin thriving and healthy characterized by economic prosperity, social inclusiveness, gender empowerment and environmental rejuvenation. The Chart 1 below provides the Strategic framework of the Bagmati Province Watershed Strategy (BPWS):

6.3.2 Strategy and Expected Outcomes

6.3.2.1 The strategy

The strategy for the Bagmati Province sub river basins and large watersheds has been prepared for eight years (2022/23-29/30)(2079/80-2086/87). The strategy will be implemented by multi-tier, multi-ministerial, and interdisciplinary governing bodies reflecting the federalised structure of province's administration and hydrological connectedness of the local and provincial government units and sector ministries.

The Bagmati Province Watershed Strategy (BPWS) will focus its work on four broad strategic areas (three sectoral and one cross cutting themes) that are called Broad Strategies. These are related to strategic outcomes to be achieved through working policies for each strategic area. These broad strategies are designed by combining the priority areas expressed by provincial stakeholders and based on the situation analysis and review of relevant literature.

Strategic planning for trans-boundary sub-national river basins and large watersheds is done based on the conversion of strategic goals into outcomes. The highlight of the strategic broad strategies is that the thematic and cross cutting areas identified reflect the issues the on-going water, energy, biodiversity and social development sectors are trying to address but are struggling as well the needs to align with the most recent periodic national development plan i.e. 15th Plan and 1st Provincial Plan. The Bagmati provincial government will play a central role in sub-river basin governance and watershed management.

The apex body Bagmati Province Sub River Basin and Large Watershed Management Steering Committee (BPSRBLWMSC) will play a central role in promoting optimal and sustainable development taking the entire sub-basin-wide perspectives with full and active involvement of the provinces and local governments within watershed. The successful implementation of the four goals including the monitoring and evaluation and implementation mechanism through the institutional frameworks suggested under Strategy 4 is expected to yield the following outcomes:

6.3.2.2 Strategic outcomes;

Altogether 5 outcomes are expected to be generated at the end of eight (8) years if this priority strategy and action plans to be prepared based on Watershed Strategy) are implemented fully.

They are listed below:

Outcome 1: Increased co-operation and collaboration between and among local, provincial and federal governments in managing shared sub river basin and large watershed under river basins of the province;

Outcome 2: Improved management of ecosystem goods and services based on principles of sustainable use, inclusive participation and integrated conservation and livelihoods

Outcome 3: Pro-active and co-operative governance and management of SRBLWMSC / rivers mitigating both climatic and non-climatic risks and hazards and mainstreaming nature-based solutions in economic and infrastructure development;

Outcome 4: Watershed under sub-river basin management guided by evidence-based policymaking and good practices and strong enforcement of regulatory frameworks based on precautionary and polluters-pay principles .

Outcome 5: Regular monitoring, early warning, impact assessment and sharing of good practices strengthened for better decision making by policy makers and managers.

6.3.2.3 Strategy-wise Working Policies

Broad Strategy 1: Sustainable management Of Ecosystem Services Provided by River Basins and Large Watersheds

Background:

Provisional, regulating, supporting and cultural ecosystem services provided by Bagmati province's two river basins (Koshi and Gandaki) and large watersheds are the main livelihood support systems that help the majority of province population survive and make their economies grow. The early civilisation of Nepalese people grew and prospered near, on or around rivers, lakes, wetlands and valley plains for since centuries.

Sub-river basins or large watersheds (hydrological catchment that drains into river and provide river discharge) drained in Bagmati province, especially rivers provide a multitude of ecosystem goods and services (EGS) such as food, medicine, energy, water, variety of regulating services such as, waste assimilation, water and air purification, habitats for fisheries, energy production, flood risk reduction, spiritual, cultural and recreational benefits, and the habitat that supports a wide range of ecosystems that also include agricultural and urban ecosystems. It is precisely because EGS provide so many functions and values that planning for their use is so complex and multidimensional. The demands on river basins EGS increasingly exceed their carrying capacity resulting in overexploitation, unsustainable extraction, excessive siltation from farm lands, human induced landslides, slope failures, natural and human exacerbated floods, land, air and water pollution, increase of invasive alien species, floodplain and natural drainage alteration and habitat destruction. These failures are usually the consequence of poor foresight and poorly coordinated and top-down decision-making practices; inadequate and ineffective management; and inappropriate and haphazard planning.

This broad strategy adopts the approach of sustainable and wise utilization and management of EGS provided by province's sub-river basins and large, medium and small watersheds in Bagmati province. The strategic approach designs priority actions that will be implemented at watershed and ecosystems scales at provincial and local levels - necessary to maintain socio-ecological integrity and harmony between human and nature. Terrestrial and aquatic biodiversity especially at ecosystem level will be conserved in all major ecosystems that provide major watersheds-based ecosystem services (ES).

Water being the major ES provided by the sub-river basins and large watersheds is being given paramount importance. The BPW Strategy aims at implementing community-based effective protection of critical and endangered biodiversity, sustainable and community based conservation of ecosystems, and multi-stakeholder's engagement in wise management of harness-able ecosystem goods and services – mostly provisional and regulating services. The strategy considers both direct and indirect drivers and factors including cultural, social, economic and political

aspects by linking Bagmati province's administrative and hydrological boundaries as well as diverse groups of sub-river basin resources users, producers and managers. Especially, sub river basin and large watershed conservation is given due importance during integrated water resource management.

This Strategy comprises 4 (four) Broad Strategies, 10 Working Policies and 26 Action Plans. While specific details may vary, most of these management lineages converged on broadly defined common approaches to sustainably manage natural resources and human activities in river basins and large watershed in an integrated, interdisciplinary approach.

Strategy 1.1: Protect and conserve vulnerable, critical and important terrestrial and fresh water ecosystems

The provincial sub river basin and large watershed management strategy (BP-SR-BLWMS) gives high priority to protection and conservation of natural resources available in each sub river basin and respects nature which is foundation of the sustainable development. The strategy highlights high potential ecosystems and watersheds to protect and conserve through meaningful stakeholder involvement and all level of governments' participation in order to ensure that province's biodiversity and ecosystem services are conserved and sustainably utilised for the greater good of the province as well as Nepalese people.

The Midhills ecosystems are still under represented in otherwise extensive protected area system of Nepal as well as Bagmati Province. Furthermore, there are growing numbers of hydropower projects being developed in Bagmati Province's mountainous river basins whose up-stream areas are very fragile and need to be managed with interventions that are addressing multi-dimensional vulnerabilities (landslides, siltation in the reservoirs) they are facing from both the government and non-government agencies. In addition, province's boundary or Chure hills are under serious threats which directly affects the down-stream communities and ecosystems.

Working Policy

Working Policy1.1.1: By 2023, criteria and indicators developed to identify vulnerable, critical and important terrestrial and fresh water ecosystems using IUCN's Red Listing of Ecosystems (RLE).

Working Policy1.1.2: By 2024, RLE in each large watershed /basin implemented to identify the status and trends of potential of sustained supply of ecosystem services in both terrestrial and fresh water ecosystems

Working Policy 1.1.3: By 2030, 20% of critical ecosystems are protected, 30% of vulnerable ecosystems be restored, 50% of important ecosystems be sustainably managed in Bagmati province

Strategy 1.2: Sustainably manage the ecosystem goods and services generated by protected and conserved watersheds of the river basins

To begin with the federal governments, it will enable sub-river basin and large watershed management steering committee and provinces to create enabling policies and legal framework such as Payment for Ecosystem Services (PES), Rewarding Upland Ecosystem Services Providers (RUPES) and REDD+ to manage basin ecosystem services based on equitable sharing of costs and benefits for ensuring sustained supply of ecosystem services. There is a huge role of enabling policy and legal framework to implementing the sustainable management activities which must be done in cross-scale, cross-sector and cross-disciplinary manner. Utilising the vast experiences gained from the projects and programs in the country till date, effective policy regimes and enabling legal framework need to be framed.

Working Policy

Working Policy1.2.1: By 2030, 50% of the critical and important ecosystems will be sustainably managed based on the principles of sustainable forest, biodiversity and land management

Strategy 1.3: Develop mechanism to implement equitable access and sharing of benefits derived from management of sub-river basin ecosystems and all watersheds

Utilising the combined strength of three tiers of governments, some effective and efficient mechanism to manage province's critical, endangered and vulnerable ecosystems is necessary. Hence, a policy and programme initiatives will be necessary to establish a mechanism at the initial year of implementation.

Working Policies

Working Policy 1.3.1: By 2023, policy and legal framework facilitating the implementation of equitable benefit sharing mechanism developed and piloted in five watersheds in each basin (such as Indrawati, Bhotekoshi, Bagmati, Rapti and Upper Trishuli watershed).

Strategy 1.4: Adopt precautionary principles (Avoidance, No-Net-Loss of Biodiversity and Ecological Compensation) and best practices while planning for infrastructures development in river basins

Integrated biodiversity and ecosystem assessment in Bagmati Province is new and needs to be adopted for the large scale projects. The existing regulations of conducting EIA and IEEs need to be based on the assessment guidelines. Despite the province government's efforts, there are many lapses in the process and implementation in protecting ecosystem integrity and ecosystem restoration. Furthermore, there are a number of uncoordinated and haphazard activities being carried out by local governments which have also provided negative impact on biological, social and economic sectors. This strategy is particularly aimed at strengthening hydropower sector.

Working Policy

Working Policy 1.4.1: By 2024, all hydropower projects ensure full compliance of government's Environment Protection act/regulations prior to conducting project feasibility study at critical sites

Working Policy1.4.2: By 2025, all established project/industries (infrastructure) prepare and submit post environmental assessment reports

Working Policy1.4.3: By 2026, best practices adopted and implemented in at least four infrastructure development projects

Strategy 1.5: Promote climate and biodiversity friendly ecological, organic and conservation based agro ecosystem management practices

Being primarily an agrarian country, most of the population is drawing their livelihoods from the land area. While the country is now deficit in different agricultural products, farmers are leaving our agriculture land fallow for years which can, with proper interventions, be utilized for food production. Given the loss of agro-biodiversity especially the native varieties of our staples, and pest, diseases and soil quality related problems associated with improved variety of seeds. Our agriculture practices need to be made more ecosystems based.

The traditional cultivation practices on the steep slopes with the application of chemical fertilizer and pesticides have made the situation worst in watersheds/ river basin as the residual chemicals and silts are polluting river waters, destroying fish habitats and reducing the life of our reservoirs (Kulekhani Ramsar Site, Karrakhola, RaptiKhola, Indrawati river, Trishuli River are being polluted. Bagmati Province is losing a huge quantity of fertile soils from agriculture and pasture lands without getting any benefits but paying huge costs as the silt laden water aggravates floods and polluted water damage human and animal health and destroy aquatic lives including fish and other wild life populations.

Working Policy

Working Policy 1.5.1: By 2025, climate and biodiversity friendly ecosystem pocket/zone based conservation, organic and climate resilient agriculture ecosystem management practices designed and implemented in 20 macro watersheds of sub-river basins.

Strategy 1.6: Implement integrated land use or sustainable land use management plan in major river basins in a coordinated, collaborative and coherent manner

Unplanned, uncoordinated and haphazard use and misuse of land have created not only disaster but also causing a huge loss to national and local economy from households to nation. The recently passed Local Government Operation Act, 2074 has already mandated the local government to prepare land use plan and utilize the land accordingly to the principles of carrying capacity and environmental sustainability. However, local government currently do not have necessary human resources and technical know-how.

Working Policy

Working Policy 1.6.1: By 2025, all local governments incorporate integrated (upstream-downstream linked) river basin management (IRBM) or integrated watershed management (IWM) approaches in the land use plan within each local government.

Strategy 1.7: Promote Nature based tourism to create green jobs and support local livelihoods improvement and nature conservation initiatives

Nature based tourism, especially Himalayan Mountain tourism is the most recognized and important social, economic, cultural phenomena in Bagmati Province of Nepal, which directly and indirectly contributes to boosting local economy and national GDP of Nepal. It also generates rural employment and helps country earn precious foreign exchange earnings. In the post COVID19 era, nature based tourism is likely to gain more momentum as tourists are likely look for less crowded destinations. Therefore, building on already successful eco-tourism and adventure tourism business in Bagmati Province. This strategy aims at making the existing – rather old-fashioned - business models of ecotourism more broader and it is considered as the backbone for boosting the national economy of wider encompassing by transforming traditional eco-tourism strategy into sustainable ecotourism and adding another theme of Nature Based tourism under which the aim will be not only to make rich Himalayan mountain landscape such as Langtang, Gaurishankar, Rubi Valley , Daman, Kalinchok, Jiri, Chitlang, more popular destination but also by adding education component to tourists and students make the visitors more informed and educated about the Natural wealth of the region and make local community benefit by increasing the tourism revenue as the visitors are likely to stay for longer duration thus contributing more to the local economy.

This strategy is likely to benefit both visitors by providing them a more satisfactory visit and the country by creating the positive impacts on the environment and economy. The Nature based Tourism is a well-accepted concept also called Nature Based Solutions that gives special focus on conservation of river system, promotion of local water based cultures, economic benefits through water based tourism for local livelihoods, and create awareness/education to the visitors on river importance.

Among different tourist destinations of Bagmati Province in Nepal, the watershed of two river basins have tremendous potential for promoting nature tourism. Adventure tourism is one aspect of nature tourism which can be promoted by exploring the existing landscape attractions for tourism, while ecotourism and cultural tourisms are those which can be fostered through the attraction of natural, physical diversity and unique ecosystems of the river basins including fresh water wildlife and distinctive cultural systems of inhabitants of the river basins. To foster the concept, identification of destination, preparation of plan, support to develop policies, plans and procedure and education materials are essential programs in the journey.

Working Policy

Working Policy 1.7.1: By 2024, 7 new destinations for Nature Tourism (Kathmandu- Kalinchok-Jiri, Kathmandu- Kakani- Langtang, Tistung – Daman- Indrasarobar- Kulekhani Reservoir circuit) developing integrated tourism plan (adventurous, ecological and cultural) in two river basins are identified and prioritized

Working Policy1.7.2: By 2025, tourism plans in provincial program and budget for developing ecotourism in 2sub river basins are mainstreamed and implemented

Working Policy1.7.3: By 2025, experiences of tourism plan implementation used for preparing a handbook and educational materials for basin tourism management published

Broad Strategy 2: Integrated Water Resources Management (IWRM) River Water

Background

Sub River basins and large watersheds are naturally prone to hazards and risk due to weak geological make-up and excessive and unsustainable human activities. Depending on the nature and severity of challenges, disaster risk management must be made part of the long-term integrated water management strategy. While some risks and hazards can be addressed through routinely followed processes and practices (e.g. waste water treatment), complex risks such as those derived from climate change and socio-economic development perspectives (e.g. ecosystem health of water catchments and river basins) require new institutional arrangement and governance processes, especially in the context of federalized system of government prevailing in Nepal. These procedures and measures should be science-based, informed by good practices, robust and inclusive or participatory.

Bagmati Province's sub river basin ecosystem function can provide a diverse range of ecosystem goods and services. Understanding of dynamics of these services also help to improve sub river basin management at large. The managers have to also be cognizant that in spite of best understanding, knowledge gap and uncertainty will remain in water management. The water management planners therefore have to accept this reality and constantly interact with researchers, stakeholders, strengthen upstream-downstream linkages and thereby learn to adapt to the knowledge gap and uncertainty by applying the concept of Integrated Water Resources Management (IWRM). The IWRM, though complex, has now been universally accepted as a tool to manage the task related to sustainable water resources development. Successful IWRM can demonstrate how changing water cycle, demand-supply balance, floodplain area management, drinking water quality and irrigation water quantity can be managed among competing users and conflicting stakeholders. Risk-informed and adaptive management of water incorporating all these elements is possible through adaptive water management which is what Integrated Water

Resources Management (IWRM) framework does as it is based on holistic and integrated application of the key principles of water management.

The main objective of the IWRM is therefore to manage the water resource of the river basin through integrated water resources and watershed management of the river basin and to ensure sustained supply of water to meet the social and economic development of the country while maintaining the health of the river ecosystem. To meet the objective following key strategies are proposed.

i. Promote integrated water resource management (IWRM) principles to sustainably manage surface and ground water resources of the river basin among all water users.
ii. Promote integrated, multi-scale water governance and multi stakeholder policies in managing water resources of sub-river basins and large watershed.
iii. Mainstream IWRM principles in all relevant sector policies/ plan and legal frame work applicable to sub river basin management.
iv. Develop and implement E-flow principle and criteria to protect critical and important habitats for threatened aquatic species and lower riparian communities.
v. Ensure quality of surface and ground water for the protection of human and wildlife health in the entire sub-river basins of Bagmati Provinces.
vi. Balance water demand and supply situation for adaptive management in the context of Climate Change.

The Water & Energy Commission Secretariat (WECS) under the MoEWRI, Government of Nepal has promulgated a National Water Resources Policy. These new policy recommends an adoption of IWRM in managing Nepal's water resources as a part of the broader Integrated River Basin Management. Implementing IWRM at the river basin level is an essential element to managing water resources more sustainably, leading to long-term social, economic and environmental benefits. Because water is managed locally, IWRM under the broader river basin approach provides a practical framework, defined by geographical and hydrological characteristics, which facilitates implementation of IWRM by involving downstream and upstream basin wide issues as well as incorporating environmental and socio-economic aspects. Recognizing the importance of IWRM, this broad strategy identifies 6 (six) strategies, 6 Working Policies and 15 strategic actions and several action plans. Bagmati Province is urged to translate the NWRP and Act for provincial purposes.

Strategy 2.1 Promote integrated water resource management (IWRM) principles to sustainably manage surface and ground water resources of the river basin among all water users

The logic of undertaking integrated water resources management on a river basin scale is because water and land resources of a river basin are closely inter-related forming one composite complex ecosystem in which human activities constantly increase. Degradation of one resource produces tremendous impacts on other resource. Therefore, these two resources must be treated as a fundamental planning entity for avoiding water use conflicts due to seasonal and annual variability

in supply and for maintaining trade-offs and carrying out sustainable soil and land management practices. Therefore, it is essential to include as many stakeholders as possible in the deliberations and decision-making processes for river basin planning and water management within a particular river basin. One of the challenging tasks is the integration of all crosscutting sectors as well as individual water-related traditional subsectors in the river basin planning and water management.

Working Policies

Working Policy2.1.1: By 2024, comprehensive study of 2 sub river basins and large watersheds to identify status, trend and potential of implementing IWRM under the river basin management framework

Working Policy 2.1.2: By 2025, at least two comprehensive integrated and participatory sub-river basin management plan in each Province developed and implemented for demonstration

Strategy 2.2 Promote integrated and sustainable water and energy development and multi stakeholder water governance policies in equitably managing water resources of river basins

In order to implement the IWRM principles, certain institutional structures and processes are needed to be in place as a part of creating an enabling environment and effective institutional arrangements and development of decision support systems (DSS)/tools for taking water management decisions such as water resources assessment, water allocation and conflict resolution. However, in the context Bagmati Province also in Nepal, IWRM concept is still new and has been introduced as an ideal set of concepts into national policy documents. In order to make the incorporation of IWRM into river basin policy documents as a water management framework, necessary changes in institutional arrangements and governance practices would be necessary. Under this BP Watershed strategy effort will also be made to promote IWRM in influencing complementing the water resource management in the public sector.

Working Policy

Working Policy 2.2.1: By 2024 Provincial Integrated Water Resources Management Policy and Act developed by reviewing existing water resource management related Acts, policy and plans

Working Policy 2.2.2: By 2026 institutional frameworks are developed for operationalizing IWRM in each province and at least 50% of the municipalities to plan, design and implement integrated water resources management

Strategy 2.3 Mainstream IWRM principles in all relevant sector policies/ plan and legal frame work applicable to river basin management

Traditional water resources management in Bagmati Province also in Nepal has focused on the supply side where only technical solutions are considered to meet the growing demand for water. Isolated projects on irrigation, drinking water supply and sanitation, hydropower, flood control and other uses are being developed with poor coordination. Project evaluation and feasibility is

mainly based on economic criteria and some aspects of environment, whereas social dimension is not fully considered. Independent sector authorities mostly control these projects on the basis of command and control. The results, so far, have not been satisfactory, resulting in inter-sectoral, inter-province and riparian conflicts. Optimum utilization of water benefiting all stakeholders in a particular river basin could not be achieved in terms of efficiency, equity and environmental considerations.

The integrated water resources management (IWRM) principle recognizes this reality and recommends that water must be viewed from a holistic perspective, both in its natural state and in balancing the competing demands for domestic, agriculture, hydropower, industrial, cultural and environmental. Management of water resources services needs to reflect the interactions between various demands, and so must be coordinated within and across the sectors. More equitable, efficient and sustainable regime will emerge, provided crosscutting requisites are met, along with horizontal and vertical integration within the management framework of the water resources and services.

Working Policy

Working Policy 2.3.1: By 2024 the policy shift to community participation and private sector involvement in independent water resource development projects achieved

Working Policy 2.3.2. By 2023, Integrated River Basin and Large Watershed Steering Committee (BP-SRB WMSC) at provincial levels, IWRM units at provincial government are made functional and existing River Basin Unit at federal government are upgraded

Working Policy 2.3.3: By 2025 capacities of the proposed BP Large Watershed Management Executive Committee (BPLWMC) and River Basin Organizations (RBOs) in Bagmati province, Basin offices as well as in each province level concerned ministry and large watershed offices at federal government level improved for effective implementation of IWRM and enhanced quality of river basins management.

Strategy 2.4: Develop and implement E-flow principle and criteria to protect critical and important habitats for threatened aquatic species and lower riparian communities

An environmental flow is about the equitable distribution of and access to water and services provided by aquatic ecosystems. It refers to the quality, quantity, and timing of water flows required for maintaining the components, functions, processes, and resilience of aquatic ecosystems that provide goods and services to people. Environmental flows are central to supporting sustainable development, sharing benefits, addressing poverty alleviation and above all conserve the critical aquatic wildlife especially fish population. Yet allocating water for environmental uses remains a highly contested process. Investments in water resources infrastructure, especially dams for storage, flood control, or regulation, have been essential for economic development (including hydropower generation, food security and irrigation, industrial and urban water supply, and flood and drought mitigation), but, when they are improperly

planned, designed, or operated, they can cause problems for downstream ecosystems and communities because of their impact on the volume, pattern, and quality of flow.

Hydropower Development Policy introduced in 2001 specifically mentions the amount of minimum flow that must be released. It states that "Downstream release shall be maintained, either 10% of minimum mean monthly discharge or the quantum identified in the EIA study whichever is higher"; all projects licensed after 2001 require a minimum flow criterion. This flow is derived using a traditional hydrological method which calculates a fixed percentage of the mean monthly flow or minimum mean monthly flow in the dewatered section of the river. This method does not account for the natural variability of flow in the river. Developing and getting recognized by the Government if the importance of a scientifically and socio-economically appropriate e–flow in the river basin management is necessary and this strategy proposes the following actions and action plans in implementing appropriate e-flow enforcement:

Working Policy

Working Policy 2.4.1: By 2024, Ecological management classes or classification of varying e-flow rates for at least one large river basin or sub-basin of each province are made available

Working Policy2.4.2: By 2025, Ecological and economic management classes or ecological classification of highly potential river basins and Large Watersheds of Bagmati province is available.

Working Policy2.4.3: By 2026, Adaptive procedure of E-flow estimation is made mandatory in Environment Management Plan for Bagmati province

Strategy 2.5: Ensure quality of surface and ground water for the protection of human and wildlife health in the entire basins of all provinces

Watersheds and aquatic ecosystems are integral parts of river basin-based infrastructure development. Depending upon the source and discharge of the rivers of watersheds, they are used for various purposes like irrigation, hydropower, drinking and other economic purposes. From this perspective, watersheds and aquatic ecosystems have an indispensable role to play in the sustainable development of water resource sectors. In Bagmati Province of Nepal, the condition of watersheds and aquatic ecosystems has been deteriorating due to the mismanagement and overexploitation of natural resources. In addition, increased interventions due to growing population have induced human-made disasters and accelerated the process of natural disasters. Similarly, the aquatic resources are also in threatened conditions due to encroachment, periodic flash floods, pesticide and chemical pollution, landslides and erosion, water pollution and deforestation. The construction of dams has also affected the normal aquatic life. Aquatic drying of wetland and declining aquatic diversity are the major threats to the aquatic ecosystem.

Although efforts are being made to manage the watersheds and aquatic ecosystems, much still needs to be done to fully cope with the problem. Lack of strong institutional mechanisms has

hampered programme replication. Similarly, lack of data and mapping has hampered updating of programmes. Focus of water development programmes only on water based infrastructure has shadowed the environmental concerns, and lack of coordination between the institutions related with water-based infrastructures, watershed, and natural resources management has created a gap in watershed and aquatic ecosystem management at project level.

Working Policies

Working Policy2.5.1: By 2024, Water quality standard for ecosystem maintenance is prepared at least for 3 sub basin of Bagmati province

Working Policy2.5.2: By 2025, cause of water pollution and mitigation options are identified in the prioritized river system and water bodies of Sub basin of Bagmati province

Working Policy2.5.3: By 2026, Hazard and Risk Mitigation and Integrated Flood Management measures implemented at least in 3 sub river basin of Bagmati province

Strategy 2.6: Balance water demand and supply situation for adaptive management in the context of Climate Change

According to computer model predictions, evidence of changes in the hydrological cycle is becoming increasingly apparent, and with progressing climate change the hydrological cycle is expected to intensify over the coming decades. However, while there is more confidence in predicting changes in mean temperature and precipitation, the hydrologic extremes – that is, floods and drought events are highly uncertain. Thus, it is important to consider appropriate adaptation measures to ensure sustainable water security for social, economic and environmental needs. However, new measures to mitigate and adapt to the impacts of climate change cannot be identified without first assessing the vulnerability of existing water management infrastructures and water supply functions. Climate change is expected to impact the quantity and quality of water resources (e.g. trend of water spring drying in Midhills), but will also have an impact on water use. Thus, water management and efficiency of use must be improved in response to new risks created by the impacts of climate change. Setting up a viable IWRM framework is both necessary for current water management and as a platform for adapting to climate change as IWRM is implemented through interdisciplinary collaboration. Distinguishing the importance of impact of climate change, following strategic actions and action plans have been proposed.

Working Policy

Working Policy2.6.1: By 2025 Future water flows or flow dynamics in the river systems of at Bagmati provinces are prepared and projections made available

Working Policy2.6.2: By 2025 Uncertainty and Risk of existing and planned Water Resources Development projects are addressed in all sub river basin and watersheds .

Broad Strategy 3: Climate Change Adaptation, Flood Disaster Risk Reduction And Management

Background:

As envisioned in the Constitution of Nepal, National Disaster Risk Reduction and Management Act 2016, National Disaster Risk Reduction Policy and Strategic Action Plan (2018-2030), National Climate Change Policy, 2076 (2019) of Nepal, Approach Paper for the 15th National Periodic Development Plan, Nepal is vulnerable to both human and climate induced disasters. In addition, Nepal is already under Federalism which has three tiers of government to address the issues.

Bagmati Province Forest Act, 2020, envision of establishment of protected watershed which provide support on climate change mitigation activities.

A number of policy and regulations have visiting field

Further, large numbers of community based organizations and cooperatives have been engaged in the natural resources management and disaster risk reduction through mitigation and adaptation actions. In this context, river flooding is ranked as the most annual disastrous event to people living mostly in inner Tarai and Mid-hills districts across the country. The Tarai and some Mid hills districts show the higher incidence of floods than other ecological zones. However, the Siwalik is naturally the most affected region by river flooding.

River bank cutting, deposition of silts and debris flow into the river bed, inundating large territories after breaking through the natural levels along the bank are the common practice of river flooding in inner Tarai, the consequences of which are loss of human lives, as well as damage to prime agriculture lands, standing crops, houses, properties, and infrastructures. Further, the summer floods increase the contamination of drinking water, epidemics of diseases and famines in the flood hit areas of Inner Tarai and Tarai region.

In Inner and Mid-hill districts, a high proportion of the communities have encroached river floodplains and flooding zone and are experiencing devastating flooding and flash floods annually. These river dependent communities are more vulnerable to riverine and flash floods than the communities living away from the flooding zone. Melting snow in the high Himalayas due to global warming also contributes to river flooding in many parts of Hills and Mountain regions especially in early summer (Nepal Country Report: ISDR Global Assessment Report on Poverty and Disaster Risk 2009).

In the process of preparation of watershed strategy, wide consultations were done in some districts with key stakeholders and concerned communities. Based on the consultations and the findings from the SWOT analysis carried out at each province together with the concerns shown by the key stakeholders, it is envisioned that the flood disaster reduction could be one of the major theme to be incorporated in Bagmati Province Watershed Strategy. Thus, the team has proposed “Climate Change Adaptation, Flood Disaster Risk Reduction and Management “as the third Broad strategy for the Bagmati Province Watershed Strategy (2022-30).

The key objectives of the underlying strategyare to reduce the impacts of water induced disasters caused by the river flooding and safeguard the river dependent communities from the impact of climate change and water induced disaster. To achieve these objectives, following key strategies and action plans have been proposed:

Strategy 3.1 Develop flood hazard risk management framework for important river systems of the basins and command area

During each monsoon, river flooding and flood hazards are unavoidable in Bagmati Province of Nepal. Inner Tarai and hill districts are always at the risk of flooding and flood hazards. The scale of impacts and the degree of risk due to hazards are different from districts to districts, which in fact, depend on the human perceptions on flood risk, preparedness, awareness, susceptibilities and vulnerability of the communities, physical, social and economic factors of the flood risk area. In other words, the magnitude of hazard in any flood risk area is a function of the flood hazard, characteristics of the flood risk area, measures that have been taken to mitigate the potential impacts of flooding, the vulnerability of people and property and the consequences of the particular flood.

Development of flood hazard risk management framework should be commenced with its strategy and overall policy, identification of the hazard risk, analysis/assessment of the hazard's potential impact and development of flood risk management strategies that represent the mixture of the various structural and non-structural measures.

Despite of efforts and formulation of National Disaster Risk Reduction Strategy and Acts, the Bagmati Province still lacks a national flood hazard risk management framework and standards (upstream and downstream concept) in the country for maintaining the degree of protection of national development infrastructures, lives and properties of the river dependent communities. Therefore, a robust flood risk management framework is imperative for reducing the flood risk hazards of the development infrastructures and for protecting the lives and property of the vulnerable river dependent communities living in the floodplain. Recognizing the importance of national flood hazard risk management framework in the context of Bagmati Province's location in the globe and climate change scenario, following strategic actions and action plans have been proposed.

Working Policies

Working Policy 3.1.1: By 2024, disastrous hazardous and important river systems of Bagmati Province are identified

Working Policy 3.1.2: By 2025, carried out detail field survey on flood risk assessment of the 4 selected important large watershed /sub river basin systems of Bagmati province

Working Policy 3.1.3: By 2026, flood hazard risk management frameworks of 5 selected large river watershed of Bagmati Province are developed

Working Policy 3.1.4: By 2027, final flood hazard risk management framework of 5 river systems of Bagmati province produced and implementation started in Bagmati province

Strategy 3.2 Develop participatory and integrated water induced disaster risk reduction plan of vulnerable watersheds of the river basins

For the sustainable management of the sub-river basin, the approach to upstream watersheds management of a river basin is inevitable. Poor land use practices such as deforestation, cultivation in the marginal sloping land, unplanned construction of hill roads and destruction of native vegetation can lead to accelerated soil erosion in the upstream watersheds. Further, the occurrence of water induced natural disasters like landslides and erosion in the upstream, where soil and geological structures are fragile generate high amount of eroded materials like sediments and debris. Eroded materials thus originated from the poor land use practices and the fragile soil and geological land system will be transported into down slope and to the watersheds/ river basin. This process leads to the deposition of silts and debris into the river basin, which in turn, promotes meandering of the river course leading to the bank cutting, inundating human settlements and agriculture lands after breaking through the natural level or embankment along the bank. These are the common practices of flooding due to increasing vulnerability of upland watersheds of the river basin.

In recent years, there has been an increasing recognition of the relationship between the upstream and downstream of the watersheds of the river system of the sub- basin. Recognizing this relationship has aimed at improving the condition of vulnerable watersheds in the upstream for controlling the flood havocs and risk in the downstream of a river basin which ultimately generate negative impacts on hydropower dam, cultivated rich field, river-side communities, and other aspects.

Recognizing the significance of interactive relationship between the upstream vulnerable watersheds and the water induced disaster risk in the sub river basin (downstream), following strategic actions have been proposed.

Working Policies

Working Policy 3.2.1: By 2023, a technical guideline / manual for designing participatory and integrated watershed management plan that contains, water and sediment management, sustainable land use development, physical infrastructure protection, climate change adaptation and climatic disasters' risk reduction and livelihood promotion of vulnerable watersheds of the sub-river basin is produced

Working Policy 3.2.2: By 2025, at least 50% Palikas of Bagmati province capacitated and sensitized on the use of the technical manual

Working Policy 3.2.3: By 2026, at least 50 % Palikas developed one participatory and integrated water induced risk reduction plan of vulnerable sub-watershed in their respective Palikas and implement the plan

Strategy 3.3: Manage climate and human induced water scarcity risk through integrated adaptation and water resources development approaches

One of the major impacts of climate change has been identified as the drying and disappearance of springs and water sources across the country. Human induced land use changes like deforestation, cultivation in marginal sloping land, haphazard construction of roads in the hilly regions and destruction of native vegetation are also some of the factors responsible for drying and disappearance of spring and water sources.

Impact of the natural disaster like earthquakes also cause disappearance or shifting of existing water spring to some new sites which we witnessed from the April 2015 earthquake across many districts of Nepal. Therefore, the impacts of natural disasters like earthquakes and climate change and human induced disasters are the main factors leading to water scarcity risk in Bagmati provice's watersheds of the two river basins. Communities inhabiting in many upland watersheds of the river basins are under severe threats of drying up of springs/water sources due to climate impacts, change in existing land use, lack of appropriate technology, and absence of multiple integrated approach for planning to rejuvenate the existing water sources.

Recognizing the climate and human induced water scarcity risk at basins and watershed levels, the strategy and action plan aims to address the problems of water scarcity risk by managing the existing water resources through conservation measures and integrating climate smart adaptation practices at watershed levels of the all river basins.

This strategy will focus primarily on the conservation of water resources of the terrestrial ecosystems by improving water recharge of the existing water sources and to deliver increased quantity of water availability to the communities for drinking and irrigation purposes. Further, the strategy will assist for developing climate resilient communities in the watersheds of the river basins in terms of water use efficiency and conservation. Under this strategy, following Working Policies have been suggested:

Working Policy

Working Policy 3.3.1: By 2025, 10 % of the palikas developed adaptation plan of at least one watershed to demonstrate integrated adaptation practices for reducing the risk of water scarcity induced by climate change and human activities (at least one model palikas in one district)

Working Policy 3.3.2: By 2026, the 20% palikas incorporated the integrated water scarcity adaptation plan of the prioritized watershed in their development plan for implementation (model palika)

Strategy 3.4: Develop integrated floodplain management plan through community based approaches

Each year in the monsoon season, almost all rivers of Inner Tarai and hill districts get flooding due to heavy rainfall in their watersheds. Deposition of silts and debris into the river bed, meandering the river course, river bank erosion, inundation of human habitats and agriculture lands are the serious threats of river flooding. The local inhabitants especially the river dependent communities who are heavily dependent on the rivers for maintaining their livelihoods are adversely affected by such threats each year.

After the end of monsoon season, in most of the districts, private parties, and contractors together with local government agencies starts excavating the river flood plains for sand and gravels; which is often practiced against the legal framework. Some river floodplains are heavily exploited for sand and gravel mining beyond the capacity of the river floodplains to supply the materials. Such activities in the river floodplains are posing great threats to the surrounding and downstream environment of the people living on the river sides and floodplains and to the aquatic biodiversity of the rivers. The human habitats near the river side and floodplains are also very vulnerable to natural disasters (like havocs of riverine and flash floods and epidemic of diseases). Excessive exploitation of river resources disrupts the integrity of the watershed and river ecosystem of the river basin.

River floodplains are important natural resources of the all provinces and Palikas, which if manage properly, will help reduce vulnerability and enhance or improve the livelihoods or reduce the poverty of the river dependent poor communities. Further, the river floodplains management will help reduce the life and property damage, maintain ecological integrity between watersheds and floodplains, and foster aquatic bio-diversity and eco-tourism in long run.

Recognizing the importance of sustainable management of river floodplains for improving livelihoods of the river dependent poor communities and minimizing the negative impacts of over exploitation of river resources, as well as protection of infrastructures, following Working Policies and action plans have been formulated.

Working Policy

Working Policy 3.4.1: By 2023, major river floodplains (river reclaimed areas) in Bagmati province potential for the development of community based integrated management plan are identified.

Working Policy 3.4.2: By 2024, the identified river floodplains of the provinces are prioritized in terms of potential for their integrated management

Working Policy 3.4.3: By 2025, at least one community based integrated flood plain management plan (pilot plan) of one of the highly prioritized river flood plains of each province developed and implemented

Broad Strategy 4: Enabling Environment And Institutional Framework For Good Basin Governance

Background

The Constitution of Nepal, 2072 (2015) not only created three tiers of governments (federal, provincial and local) with an overlapping authority, roles, responsibilities and functions but also ensured the inclusive and participatory governance of natural resources. It has also ensured the active participation of women, indigenous and most disadvantaged communities in all sector/sub-sector strategies and actions at all levels. Under the federalized political system, complementary governance built based on the principles of trust and mutual respect especially in managing shared natural resources and strengthening upstream-downstream linkages is envisioned. To achieve this, clear roles and responsibilities among different levels of Government is a must along with co-operation and collaboration in implementing strategies and actions.

Bagmati Province's entire natural resources sector policies, legal framework and institutional arrangements are undergoing major reforms and restructuring as a part of the federalised governance system. The Constitution of Nepal envisions cooperative or a complimentary federal system of governance making co-operation and collaboration among three tiers of government administrations inevitable especially in the management of common and shared natural resources sector of the country. In the context of trans-jurisdictional river basin (between same or two or more levels of government) management, decentralisation of decision making layers and devolution of decision-making authority is key to ensure and effective and result based river basin governance. Such cross-scale, cross-sector and multi-stakeholder governance system facilitates engagement with different types of users of the basin generated ecosystem goods and services and helps integrated management of sub river basin resources at the local to national levels in a more efficient and sustainable manner. The strategic approach to river basin management has to reflect the need to achieve food, water and energy security and climate change resilience and river basin and large watershed Committee.

This is in line with the emerging international best practice and sustainable approaches in which human security and climate resilience are vital cross-sector themes of national development strategies. Strong leadership from central government is required to coordinate climate resilient river basin and large watershed development making it an integral part of national integrated river basin and integrated water resources management (IRBM and IWRM) strategies in order to reduce climatic, socio-economic, and bio-physical risks and hazards across all sectors and reinforce cross-sector integration.

Nepal is signatory to specific GESI focused Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW), the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), the Beijing Declaration and Platform for Action(BPFA),1995 (FAO&RECOFIC, 2015) the International Conference on Population and Development (ICPD), 1994, and Indigenous and Tribal Peoples Convention (ILO Convention No. 169) among others and tirelessly working towards achieving the Sustainable Development Goals(SDGs). Apart from these most international instruments and major global agreements now includes a gender component. Nationally the government has ensured progressive GESI mainstreaming measures in its Watershed Management Act 1982, Water Resource Act 1992 and constitution (2012) and mandatory involvement of 33% women in users' committees. Although the government has been gradually recognizing and incorporating gender equality and social inclusion in policies, plan and mechanisms opportunities offered by existing gender-responsive policies, strategies and frameworks are not being utilized effectively as women and disadvantaged remain under-represented in planning and decision-making mostly at the higher levels.

The Federal level MoFE has already established 4 River Basin Management Centre to manage Koshi, Gandaki, Karnali and Mahakali river basins which are functioning as envisioned in the Constitution of Nepal 2015. After the implementation of federalisation, new institutional arrangements are being made at central, provincial and local levels of governments as water, agriculture and land has been included in the concurrent list. New policy and legal framework have started guiding Nepal's river basins and food, water, energy and biodiversity sectors. The new institutional arrangements are being made based on the following 8 key guiding principles:

i. Decentralised supply and distribution of ecosystem goods and services through the meaningful involvement of public, private and community organizations and autonomous bodies such as users' groups,
ii. Formulation, design, development and management of water resource projects in a manner able to withstand the adverse impacts of climate change.
iii. Delivery of ecosystem services to be decentralized and managed in a manner that involves autonomous and accountable agencies (e.g., public, private, community and user-based agencies);
iv. Criteria of economic feasibility, social soundness (inclusiveness, equity and justice) and environmental suitability shall guide river basin resource development and management;
v. Participation of and consultation with all the stakeholders shall constitute the basis of river basin management and cross-sector, cross-scale and inclusive governance development;
vi. Institutional and legal frameworks for effective coordination, collaboration and transparency shall be an essential feature river basin management;
vii. Wider adoption of the best existing technologies and best practices, rapid innovation and adaptation of both institutional arrangements and new technologies based on scientific research shall be ensured in managing shared resources of Bagamati Province's river basins.

Strategy 4.1: Establish High Powered Bagmati Sub River Basin and Large Watershed Steering committee (BPSBLWC) at Province level and supporting federal and provincial level Large Watershed Management coordination, supervision, planning and monitoring bodies at both the large watershed, medium watersheds and sub-basin levels basins

Under federalised system of government, it is very important that river basin resources are managed in a manner that ensures integrated, participatory and holistic governance and management of river basin/large watersheds. Such strategy has to be at cross-scale meaning active and meaningful participations of all the three levels governments, cross-sector and multi-stakeholder manner. The role of central government needs to be strong to take impartial and sound decision as inter-province and intra-province conflicts are likely to be common. Therefore, following Working Policies and actions are envisaged under this strategy:

Working Policy

Working Policy 4.1.1: By 2023, set up a high powered Bagmati Provincial level Sub River Basin and Large Watershed Steering Committee to be chaired by the Hon. Minister of Forest, Environment and Soil Conservation (MoFESc); The Hon. Member of the PPC (Env. & Forest) will be its Deputy Chair; The Committee will have regulatory and enforcement authority with regards to the policy, governance and regulations in managing country's trans jurisdictional river basins and large watersheds.

Working Policy 4.1.2: By 2023, setup an inter-ministerial Bagmati Province Sub- River Basin and Large Watershed Management Executive Committee chaired by the Secretary, MoFE

Working Policy 4.1 3: by 2024 set up 10 integrated Large Watershed Management (Planning and Management) Committee for managing Bagmati province's 10 large watersheds (Koshi and Gandaki) at Palika level.

Working Policy 4.1.4: By 2023 set up 4 Sub River Basin Organizations (SRBOs) for managing country's 2 large river basins in an integrated, interdisciplinary and coordinated manner exclusively for Koshi and Gandaki-basins.

Working Policy 4.1.5: Sub-river basin Committee –by 2023, Large sub-river basin management coordination committee will be set up

Strategy 4.2: Promote good governance of the river based resources through accountability, transparency, participatory decision making

Good natural resources governance lies in the core of the integrated river basin management. The main elements of good governance will be inclusive and fair representation, meaningful engagement, democratized and participatory decision making, transparency, accountability and responsibility towards stakeholders and general public that have stakes in the basin resources

Working Policy

Working Policy 4.2.1: By 2024, Steering committee and (Executive) Committee will be running with inclusive staffing and autonomous status

Strategy 4.3. Ensure inclusive, active and meaningful participation of indigenous people and local communities (IPLCs) in the sustainable management of river basins

The community based natural resources management (CBNRM) movement throughout the developing world and community forest, water and land management experience of Nepal have clearly provided powerful evidence that without ensuring and encouraging active and meaningful participation shared natural resources such as river and lake water, forest, pasture, community land and water springs cannot be sustainably conserved and managed. It has been reported by the recently released Global Biodiversity Assessment report of the IPBES (IPBES, 2019) that bio-cultural landscapeswhere indigenous and local communities have been given meaningful role in conservation are showing slower rate of biodiversity loss.

Working Policy

Working Policy4.3.1: By 2025 proportionate per cent of IPLCs will be involved in all phases and activities of Both River Basin Planning and Management

Strategy 4.4: Adopt GESI principles in ensuring active and meaningful involvement of women and other disadvantaged groups in conservation, sustainable use and equitable sharing of benefits

Women are the main actors in water management in their house, community and farmland. Natural resources management also comprises a big section of their domain. They along with Indigenous people are also the conservation champions and have very ground level knowledge on the interdependent relationship between human and nature of that specific system. The poor and people with livelihood based on natural resources although are inseparable part of the basin system but are involved very scarily and at very local levels which hinders their actual needs and benefit absorbing capacity in decision making process. The current practices of GESI mainstreaming focuses mostly on participation and less on empowerment. The success of community forestry, farmers based irrigation system and community managed drinking water system has proved that community can execute initiations if opportunity is provided. The piloting of river environment protection in upper section (Sundarijal to Sinamangal) Bagmati river is a successful example of community involvement. The following actions create a base to effective community involvement in river basin environment protection;

Working Policy

Working Policy 4.4.1: By 2025, at least 50 per cent of women and proportionately 20 per cent of disadvantaged community from sub river basins and Macro watershed will be involved in all phases and activities of River Basin Planning and Management.

Strategy 4.5 Promote private sectors involvement in river basin resource conservation and development through incentivised nature based tourism

New and innovative partnerships with private sector can significantly scale-up funding for a range of basin management activities principally biodiversity protection and ecosystem conservation through sustainable nature based tourism and conservation based (using care and share principles) livelihoods. A significantly stepped-up finance is necessary if the current unsustainable use of natural resources especially river water, riverbed aggregates, NTFPs, MAPs is to be contained and further loss of biodiversity loss and renewable capacity of river ecology and land qualityis to be prevented. Public sector finance being grossly inadequate, both market and non-market-based mechanisms (e.g. Payment for Ecosystem Services (PES) including REDD+ and volunteer-based system such as eco-labelling) can better channelize private sector finance into conservation (established but incomplete). Application of natural capital accounting (NCA) system can assist in internalization of value of ecosystem services especially water within development programmes and generate options for enhancing revenue for financing conservation in all the 4 basins. Innovative partnerships between and among government, non-government, community and private sector organizations are already raising funds from the corporate sector for conservation (e.g. REDD+ and other PES instruments in municipal water management; catchment conservation for protecting hydroelectricity dams, renewable energy technology promotion; and carbon off-sets in waste management). Partnership with the financial institutions especially multilateral development banks promotes the transfer of technology, knowledge and capacity for cross-scale and cross-sector conservation and climate change mitigation

Working Policy

Working Policy4.5.1: Ensure one representative of the FNCCI and/or CNI in BPSBWMS and large house to recognise and enhance private sector's role in river basin management by 2023

Strategy 4.6 Enhance technical and institutional capacities at all levels of government and other relevant stakeholders for implementing integrated river basin strategy and action plan

The human, institutional, systematic and technical capacity of Province Govt. agencies especially at the province and local government levels is fragmented, uncoordinated, incoherent and weak due to poor awareness, knowledge, attitude, skill and weak political commitments. In order to improve the quality and effectiveness of the implementation of strategic action plans and programs especially, water, forest, land management, biodiversity conservation and climate change adaptation and mitigation related strategies and prepare country to fulfil the obligations under Paris Agreement (NDC and NAP implementation) and UN sustainable development goals (SDG)as well as the post 2020 biodiversity goals and Working Policies, Nepalese Govt. agencies especially the IRBCs need to significantly scale up their capacity to handle the projected multi-dimensional nature of the strategic plan.

Working Policy

Working Policy 4.6.1: By 2025, capacity will be enhanced at all levels and tiers of all stakeholders, Government and CBOs for effective implementation of the strategy.

Strategy 4.7 Mobilize required financial resources by innovative taxation and taping domestic and international sources

Realising the huge potential of private sector finance in basin management, it is proposed that the Governments at all 3 levels should remove perverse incentives, use of enabling policy and institutional tools, build partnerships with private sector, up-scale collaborative and community based management of natural resources and improve governance mechanisms to mobilise finance from private sectors. Due to high trade-offs that exist between biodiversity and sustainable development approaches in Nepal there is a need to reward private sector that comply with environmental regulation by practicing corporate social responsibility, bio-diversity offsets, and precautionary principles in hydropower and road development by adopting environmental friendly technologies such as Green Road building. Private sector companies can encompass climate change, disaster risk reduction, poverty reduction and social development programmes in Hydropower and Road building activities as there are already good examples within the country.

Working Policy

Working Policy 4.7.1: By 2024. Secure financial resource to implement the BP SRBLWMS and ensuring the functionality of BP SRBLWMS.

Strategy 4.8: Develop participatory monitoring and reporting framework for sustainable management of river basin resources based on Key Performance Indicators (KPI) developed as an integral part of strategic action plans

Participatory and learning monitoring and reflective and reflexive evaluation and lessons buildings are key to the success of modern basin management. Since the monitoring is as good as planning the IRBCs and RMCs need to be capacitated to prepare good plans for effective and efficient monitoring system.

Working Policy

Working Policy 4.8.1: by 2024, establish a participatory Monitoring and Evaluation system; and stakeholder engagement mechanisms to facilitate improved and two-way information-sharing to support actions

Strategy 4.9: Develop judicious and prudent mechanisms, (applicable to all rivers and river basins) for equitable sharing and allocating water resources respecting the conservation and utilization rights of the people and principles of sustainability and basic human rights

Since Nepal's constitution provides basic rights to its citizen to water, food, clean air and freedom to practice economic activities, efforts need to be made as a part of the basin management.

Working Policies

Working Policy 4.9.1: By 2024, develop criteria and framework for sharing sub-river basin resources in a fair, equitable and sustainable manner within the basin

7 INSTITUTIONAL ARRANGEMENT FOR PROVINCE WATERSHED STRATEGY IMPLEMENTATION

7.1 Overview:

The Constitution of Nepal envisioned the fundamental rights to clean environment and policies relating to protection, promotion and use of natural resources. To transform the constitutional provisions into practice, there must be Watershed Management Act, Regulations, Directives and necessary guidelines. Most importantly, there should be strong and committed institutional set up at Federal / Province Sub Basin and Large Watershed level to achieve the national goal "Prosperous Nepal Happy Nepali" and or provincial mission.

At Federal level, it is well noted that National Development Action Committee (NDAC) under the Chairpersonship of Rt. Hon'ble Prime Minister, has decided to prepare a National River Basin Strategy and Action Plan to settle the environmental and Socio-economic issues related with water and watershed resources in Nepal. In the journey, the province government is trying to settle it. In connection with federal and to mainstream the conservation and development efforts, to respect the nature, save life of people from water induced disaster, climate change and allow payment system for the ecosystem and protect and prolong life of large development project based on water resources, provincial institutional and local level mechanisms have been proposed.

Learning from best practice, the river basin /watershed management should be done taking the biophysical or hydrological scale not administrative scale. This is central to the thinking on adaptive basin or watershed governance. Learning from the practice of integrated water resources management, an ecosystem and trans-jurisdictional bio-regional approach should be used as the foundation for setting up large watershed or river basin level organizations. This idea has been warmly welcomed by scholars and practitioners worldwide and we therefore recommend that in order to restore and protect the ecological integrity of Bagmati Province's degraded and fragile watershed and river basins, this principle should be adopted.

7.2 Institutional Framework for Bagmati Provincial Watershed Management

Nepal's National Level River Basin and Large Watershed Level authority should be linked with provincial and local level.

The Bagmati Province Government should constitute a Sub river basin and large watershed level institutions for better coordination and integrated management of ecosystem services generated by sub river basin and large watersheds in the Bagmati province. Three sets of institutional arrangements are proposed:

Under the MoFE, each of the sub river basin and large watersheds level activities will be coordinated by Province Sub River Basin and Large Watershed Steering Committee (Planning and Monitoring). The PSRBLWSC will be chaired by the Secretary for the Forests and Environment of

the Bagmatic Province. The PSRBLWSC will function as an integrated planning, designing, standard setting, regulating, enforcing body for ensuring the effectiveness of rules and regulations, providing technical and capacity building support, providing integrated water and basin management guidance and coordination. It will also function as a clearing house for watershed data linking to river basin wide data, information and knowledge. The PSRBLWSC will be multidisciplinary members from Forests, Environment, Soil Conservation, Energy, Water Resource and Irrigation, Hydrology and Metrology, Tourism, Drinking Water, Urban Development, Land Management, Physical Planning and Management and Ministry of Home and other relevant disciplines.

The following structure (Chart 1) has been proposed for the structure of the proposed high powered PSRBLWSC

Chart 1 : Bagmati Province Sub River Basin and Large Watershed Steering Committee

Hon'ble Minister (MoFE) -	- Chair
Hon'ble PPC Member (Forests and Environment)	- Deputy Chair
Secretary (Ministry of Home Affairs)	- Member
Secretary (Ministry of Water Supply, Energy and Irrigation)	- Member
Secretary (Ministry of Agriculture ans Livestock Development)	- Member
Secretary (Ministry of Culture and Tourism)	- Member
Secretary (Ministtry of Physical Infrastructure Development))	- Member
Secretary (Land Management, Cooperative and Poverty Alliviation)	- Member
Secretary (MoFE)*	- Member Secretary
*PSRBLWSC's Secretariat will be based at MoFE	

The PSRBLWSC level organizations, will, *inter alia*:

- Facilitate and execute the decisions made by PSRBLWSC
- Develop working policy, strategy and legal instruments to implement Bagmati Province Watershed Strategy(BPWS)
- Provide guidance and direction to sub basin and Large watershed executive committees and related institutions for preparing watershed plans,
- Guide to prepare action plans for the implementation of watershed and water resources plans
- Maintain coordination and communication among the governments (federal, provincial and local), private and community-based institutions including Indigenous Peoples and Local Communities (IPLCs) for sustainable management of water and watershed resources.
- Conduct regular meeting, interaction, workshop, and conferences for sharing on going and future programs
- Resolve provincial level water and watershed resources management related conflicts among stakeholders

- Carry out regular and participatory monitoring and periodic evaluation of program and projects in the sub river basin and large watersheds

A second tier Committee to be called Province Watershed Strategy Execution Committee (PWSEC) will be set up under the chair personship of the MoFE Secretary. The following structure (Chart 2) has been proposed for the structure of the proposed high powered BPSRBWMEC

Secretary (MoFE)	- Chair
Under Secretary - PPC Member (Forests and Environment)	- Deputy Chair
Under Secretary (Prime Ministry Office)	- Member
Under Secretary (Ministry of Home Affairs)	- Member
Under Secretary (Ministry of Water Supply, Energy and Irrigation)	- Member
Under Secretary (Ministry of Agriculture ans Livestock Development)	- Member
Under Secretary (Minnstry of Culture and Tourism)	- Member
Under Secretary (Ministtry of Physical Infrastructure Development))	- Member
Under Secretary (Land Management, Cooperative and Poverty Alliviation)	- Member
Under Secretary (Provincial Forerst Directorate)*	- Member Secretary

Permanent Invitee to the Execution Committee:

Representatives from Metropolitan, Sub-Metropolitan and /Rural Municipality Associations (1 women with maximum 2);

FNCCI, FECOFUN, ACOFUN, Private Forestry and Family Forestry and Leasehold Forestry and other relevant province level federations related to Sub River Basin and Large watershed resources management) .

Permanent Invitee to the Execution Committee:

Representatives from Metropolitan, Sub-Metropolitan and /Rural Municipality Associations (1 women with maximum 2);

FNCCI, FECOFUN, ACOFUN, Private Forestry and Family Forestry and Leasehold Forestry and other relevant province level federations related to Sub River Basin and Large watershed resources management) .

The functions of the PWSEC will be

- To execute and supervise the implementation of the decisions of the PSRBLWSC ;
- To facilitate the organization of the steering committee meetings and other province level meetings and conferences on the integrated management of river basins and watersheds.
- To recommend the annual programme and budget as envisioned in the BPWS ;

- To commission state-of-art studies, supervision and evaluation missions on assessing the effectiveness of the regulatory and management instruments put in place by the BPSRBLWSC and the BPWSEC.

A Third tier Committee to be called Local Level Integrated Watershed Management Coordination Committee at Local Government Level (LLIWMCC) will be set up under the chair personship of the Chair/Mayor of Local government. The following structure (Chart 3) has been proposed for the structure of the proposed high powered LLIWMCC.

Chart 3: Local Level Integrated Watershed Management Coordination Committee at Local Government Level (LLIWMCC)

Mayor/ Chair Local Government	- Coordinator
Deputy Mayor/ Deputy Chair Local Government	- Deputy Coordinator
District Coordination Officer , DCC	- Member
Chief Exective Officer, Local Government	- Member
Chief/ Representative Officer , Basin Watershed Management Center	- Member
Chief / Representative officer Divisional Forest Office	- Member
Chief /Representation Soil and Watershed Management Office	- Member
Chief/Representative Agriculture Knowledge Center	- Member
Expert nominatedby Chair (including Femal one)	- Two Member
Planning Section Chief	- Member Secretary

Permanent Invitee to the Execution Committee:

FNCCI, FECOFUN, ACOFUN, Private Forestry and Family Forestry and Leasehold Forestry and other relevant local level networks related to Sub River Basin and Large watershed resources management).

The functions will be

- Facilitating Program and Budget Planning
- Coordination among NGOs and CBOs
- Facilitating Fund Mobilization through three tiers of Government and NGOs and Private Sector,
- Formation of Technical Working Group,
- Integrated Watershed Management Plan Implementation,

To implement the integrated watershed Plan, province government will be established Sub river Basin and Large Watershed Level Offices headed by Under Secretary and Officers with Multi disciplinary team.

8 PARTNERSHIP AND FINANCING OF THE STRATEGY IMPLIMENTATION

New and innovative partnerships with private sector can significantly scale-up funding for a range of river basin and watershed activities especially hydropower development, water management, biodiversity protection and ecosystem conservation efforts throughout the country. A significantly stepped-up finance is necessary if further and irretrievable ecosystem degradation, river water quality deterioration and dam sedimentation are to be prevented.

Public sector finance being grossly inadequate, both market and non-market-based mechanisms (e.g. Payment for Ecosystem Services (PES) including REDD+ and volunteer-based system such as eco-labelling) can better channelize private sector finance into basin watershed management and ecosystem conservation and sustenance of the flow of ecosystem goods and services. Application of natural capital accounting (NCA) system can assist in internalization of value of basin /watershed ecosystem services within development programmes and generate options for enhancing revenue for financing sub river basin and large watershed management and conservation in all watersheds in concerned two basins of Bagmati Province.

Innovative partnerships between and among government, non-government, community and private sector organizations are already raising funds from the corporate sector for conservation Similarly, in order to reduce excessive siltation, catchment conservation for protecting hydro electricity reservoirs and power plants can be done. Further, promotion of renewable energy technology, biodiversity off-sets or No-Net-Loss or Precautionary principles in land conversion, and carbon off-sets in waste management can involve private sector partnerships. Partnership with the financial institutions especially multilateral development banks and national development banks and cooperatives can promote the transfer of technology, knowledge and capacity for cross-scale and cross-sector conservation and climate change mitigation in the watersheds of each basin/ sub basin.

In short, these key financing institutions for the implementation of Bagmati Province watershed Strategy.

- Government level (Federal, Province, and Local Government)
- Non Government level (CBOs, NGO, Private Sector and Development Partners)

9 MONITORING AND EVALUATION

9.1 Monitoring

The mechanism for monitoring and evaluation as described as monitoring framework of Bagmati Provincial Watershed Strategy (BPWS) is described as follows:

9.1.1 Output Monitoring

The output monitoring of the BPWS will be led by Provincial Planning Commission (PPC) on a periodic basis. The PPC collaborates with sectoral provincial agencies including Forests, Environment, Energy, Water Resources, Irrigation, Drinking Water, Disaster Risk Management, Hydrology and Metrology, Road and Transportation etc.

The findings of the output monitoring need to be shared to the Steering Committee and Executive Committee and Coordination Committee Secretariat to mainstream the provincial mission for sustainable management of watershed and water resources through river system management. The issues and concern raised by the monitoring report needs to be resolved or implemented as soon as possible.

9.1.2 Process Monitoring

Strategy implementation or process monitoring is also regarded as important aspect of monitoring of the BPWS. This strategy has been designed to be implemented in two phases:

i. Initial phase (1-2 years)
ii. Mid term Phase (3-5 Years),and
iii. Long term phase (7-8 years).

The process monitoring is carried out to ensure whether the action plans are implemented as per the phase wise or not. It also seriously monitors the role of lead implementing agency and engagement and participation of collaborating partners and their performance as per envisioned role and responsibility by the strategy.

9.1.3 Activity / Action Plan Monitoring

An action plans will be prepared based on the Bagmati Province Watershed Strategy. The action plan will be designed to accomplish the given Working Policy with the time frame. The action plans will be prepared and carried out by the concerned authorities.

The monitoring of proposed action plans will be done to those activities that will be accomplished within the given time.

9.2 EVALUATION

9.2.1 Process of Evaluation

Provincial Planning Commission, sectoral government agencies and Steering committee, Executive Committee and Coordination Committee may involve internal or external sources for evaluation of the strategy. The result of Vision, Mission and Strategies are to be evaluated as follows:

Vision and Mission: The evaluation of the vision and mission of the strategy to be done by external agency.

Broad Strategies: The evaluation of achievement of the Broad Strategies to be done by sectoral government agencies.

Strategy : The monitoring and evaluation of the achievement of strategies to be done using the developed M& E format according to monitoring and evaluation process developed by Provincial Planning Commission.

9.2.2 Evaluation time frame

Initial evaluation:

The initial evaluation of the strategy will be done after the completion of 4 years (end of initial phase) of its implementation. This evaluation will mainly focus on the achievements such as institutional setup, research and studies and capacity building.

Final evaluation:

This final evaluation will be done after the end of its 8 years of implementation. This will include the evaluation of overall strategy and its result.

9.2.3 Monitoring and Evaluation Reporting

The reporting of both monitoring and evaluation held at different phases of the implementation of the strategy will be prepared by the responsible professionals, experts and designated Steering Committee, Executive Committee and Coordination Committee member and Monitoring Cell. The report will be shared amongst respective personnel to solicit comments in order to internalize the further implementation of the strategy.

REFERENCES

Acharya, BR (2011) Land use issues in Nepal: A country in dire need of solutions, GIM International, Mapping of the World; https://www.gim-international.com/content/article/land-use-issues-in-nepal

ADB (2019). Managing Nepal's Dudh Koshi River System For A Fair And Sustainable Future; Asian Development Bank; Isbn 978-92-9261-550-5 (Print), 978-92-9261-551-2 (Electronic) ;Publication Stock No. Tcs190053;Doi: Http://Dx.Doi.Org/10.22617/Tcs190053

ADB/DFID/WB (2012).Gender and Social Exclusion Assessment 2011 Sectoral Series Monograph 3 Sectoral Perspectives on Gender and Social Inclusion Forestry. Kathmandu: ADB, DFID, WorldBank. (Available at https://www.adb.org/sites/default/files/publication/30353/spgsi-monograph-3-forestry.pdf) (Assessed on April 25 2020).

Bajracharya, P. and C. Grace., (2014). The Nepal Civil Service and Res-structuring of the State. An Option Paper. Ministry of General Administration/UNDP. Project to Prepare the Public Administration for State Reforms (PREPARE).

Bajracharya,Tri Ratna, Acharya, Samanta , Ale, Bhakta Bahadur (2012). Changing Climatic Parameters and its Possible Impacts in Hydropower Generation in Nepal (A Case Study on Gandaki River Basin) Centre for Energy Studies, Institute of Engineering, Tribhuvan University, Nepal Corresponding email:samach@gmail.com

Basin Under Global Environmental Change: Koshi Basin Final Report. International Water

Bharati, L. et al. 2014. The Projected Impact of Climate Change on Water Availability and

Bharati, L. et al. 2015. Water Availability and Agricultural Adaptation Options of the Koshi

Bhatta, LD and Ranabhat, Sunita, (2019). Freshwater ecosystems of the Koshi River basin, Nepal: A rapid assessment, t: https://www.researchgate.net/publication/336208713

Bhatta, LD and Ranabhat, Sunita, (2019). Freshwater ecosystems of the Koshi River basin, Nepal: A rapid assessment, t: https://www.researchgate.net/publication/336208713

Chalise D, and Kumar L. (2020). Land use change affects water erosion in the Nepal Himalayas. PLoS ONE 15(4): e0231692. https://doi.org/10.1371/journal.pone.0231692

Chalise D, and Kumar L. (2020). Land use change affects water erosion in the Nepal Himalayas. PLoS ONE 15(4): e0231692. https://doi.org/10.1371/journal.pone.0231692

Development in the Koshi Basin, Nepal. Mountain Research and Development. 34.

Dixit, M. et al. (2009). Living with Water Stress in the Hills of the Koshi Basin, Nepal. Kathmandu: International Centre for Mountain Development

FAO&RECOFIC (2015), Gender and Forests in a Changing Landscape, Understanding Women's Participation in Forest in Nepal, A policy Brief. Bangkok. FAO&RECOFIC (https://www.researchgate.net/publication/306106039)(Assessed April 25 2020) 4.

file:///C:/Users/Dell/Desktop/Mahakali%20research%20paper.pdf

go.jp/617/617/617_116_10313856.html.
GoN (2005). Water Sector Plan, Nepal. 2005; WECS. Ministry of Water Resources, Govt. of Nepal
GoN (2018) Ministry of Forests and Soil Conservation (20184). Nepal Sixth National Report To Convention On Biological Diversity. Kathmandu. GoN (https://www.cbd.int/doc/world/np/np-nr-05-en.pdf)
GoN (2018). National Forest Policy, 2075 BS; Ministry of Forest and Environment, Govt. of Nepal, Singh Durbar, Kathmandu, Nepal
GoN, (2002). Water Sector Strategy, Nepal. 2002. WECS; Ministry of Water Resources, Govt. of Nepal
GoN, 2015. Constitution of Nepal, Government Of Nepal
GoN/MoFSC (2014). Nepal Biodiversity Strategy and Action Plan 2014-2020. Kathmandu: Government of Nepal, Ministry of Forests and Soil Conservation. p. 101,114.
Government of Nepal, Ministry of Water Resources. (2001). Hydropower Development Policy, 2058.; Japan International Cooperation Agency. 1985. Master Plan Study on the Koshi River Water Resources Development: Final Report. http://open_jicareport.jica.
Gupta AD. (2011). Challenges and opportunities for integrated water resources management in Mekong River Basin. In: Role of Water Sciences in Transboundary River Basin Management, Thailand, 2005. Thailand: School of Civil Engineering, Asian Institute of Technology, pp 221–230. http://www.ihwb.tu-darmstadt.de/media/fachgebiet_ihwb/lehre/iwrdm/literature/challengesandopportunitiesforiwrminthemekongriverbasindasgupta.pdf
GWP (2000). Integrated Water Resources Management. Technical Advisory Committee (TAC) Background Paper No. 4. Global Water Partnership; Stockholm, Sweden: GWP, TAC.
GWP, (2002). Policy Brief 2. Building on the Foundations of Integrated Water Resources Management; Global Water Partnership..http://www.gwp.org/globalassets/global/wcdp-files/wacdep-publications/watersecurity_brief2_web.pdf
GWP, (2002). Policy Brief 2. Building on the Foundations of Integrated Water Resources Management. http://www.gwp.org/globalassets/global/wcdp-files/wacdep-publications/watersecurity_brief2_web.pdf
Hooper BP. (2008). Covenant action to facilitate integrated river basin management. Water SA 34(4):456–460.
Hooper, B.P., (2005). Integrated River Basin Governance. Learning from International Practice. IWA Publications. London. https://brucehooper.files.wordpress.com/2013/12/integrated-river-basin-governance-iwa-publications-2005.pdf
http://www.wepa-db.net/policies/state/nepal/state.htm
https://en.wikipedia.org/wiki/Ghaghara
https://en.wikipedia.org/wiki/Koshi_River
https://en.wikipedia.org/wiki/Sharda_River

https://floodresilience.net/blogs/a-critical-review-on-water-resource-development-and-its-sustainable-management-in-the-karnali-river-basin
https://nepaleconomicforum.org/neftake/revisiting-nepals-infrastructural-bottlenecks-and-progress/
https://www.amherst.edu/system/files/media/0972/fulltext.pdf
https://www.hakahakionline.com/np/wp-content/uploads/2019/04/Draft-Lower-Mahakali-Watershed-Profile.pdf
https://www.intechopen.com/books/renewable-hydropower-technologies/hydropower-development-in-nepal-climate-change-impacts-and-implications
https://www.researchgate.net/publication/313234431_Land_Cover_Status_in_the_Koshi_River_Basin_Central_Himalayas
https://www.researchgate.net/publication/318673442_The_Gandaki_Basin_-Maintaining_Livelihoods_in_the_Face_of_Landslides_Floods_and_Drought
https://www.wecs.gov.np/uploaded/water-recource-climate-change.pdf
in Nepal; August 2019; Nepal River Conservation Trust (NRCT); USAID
in the Tropics and Subtropics· June 2015; DOI: 10.13140/RG.2.2.25064.01288; file:///C:/Users/DELL-PC/Downloads/W06_RupeshShrestha_11102856.pdf10.13140/RG.2.2.25064.01288.
International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal
Kaini, P and G. Annandale (2019) Hydro Review: The Way Forward for Nepal's Hydropower Development; In HYDRO review. Magazine; https://www.hydroreview.com/2019/01/11/hydro-review-the-way-forward-for-nepal-s-hydropower-development/#gref
Karki, Madhav Bahadur, Arun Bhakta Shrestha, and Matthias Winiger (2011); Enhancing Knowledge Management and Adaptation Capacity for Integrated Management of Water Resources in the Indus River Basin. In: Mountain Research and Development, 31(3):242-251. 2011; Published By: International Mountain Society; DOI: 10.1659/MRD-JOURNAL-D-11¬00017.1 URL: http://www.bioone.org/doi/full/10.1659/MRD-JOURNAL-D-11-00017.1
Karki, Madhav Pradeep Mool, and Arun Shrestha (2011). Impacts of Climate Change on the Water and Ecological Security of the Himalayan Mountains and need for Adaptation through South-South Exchange. In: Climate Change and Water: Experiences from the Field; proceedings of the XIVth IWRA World Water Congress. link; http://ccwiwra.files.wordpress.com/2011/07/impacts-of-climate-change-himalaya-andean-mountains.pdf MoHA, 2006. The Prime Minister's Disaster Relief Find, 2006. Ministry of Home Affairs.
Kennedy K, Simonovic S, Tejada-Guibert A, de Franc¸a Doria M, Martin JL. (2009). IWRM Implementation in Basins, Sub-basins and Aquifers: State of the Art Review. The

Unitedtions World Water Development Report 3. Paris, France: United Nations Educational, Scientific and Cultural Organization.

Livelihoods, Practices and Ecotourism Development In Selected Watersheds Across

Management Institute (IWMI). Kathmandu: IWMI-Nepal.

MoEWRI (2018/2075). Current status of Energy, Water Resources and Irrigation and Future Roadmap, Hon. Minister, Barshman Pun, MoEWRI, Govt. of Nepal

MoFE, (2019). Climate change scenarios for Nepal for National Adaptation Plan (NAP). Ministry of Forests and Environment, Kathmandu

MoFE, (2020). Yearly Development Program FY 2020/2021, Ministry of Forest and Soil Conservation.

MoHA (2019). Nepal Disaster Report; 2019; Government for Nepal, Ministry of Home Affairs, June, 2019

MoHA, (2018). National Policy for Disaster Risk Reduction, 2018. Ministry of Home Affairs.

MRC (2015). Strategic Plan 2016-2020: Cambodia . Lao PDR . Thailand . Viet Nam; Mekong River Commission (MRC) For sustainable development; Vientain, Laos PDR.

Muhar, Susanne, Jan Sendzimir, Mathias Jungwirth (2018), Restoration in Integrated River Basin Management; Riverine Ecosystem Management, 2018, Volume 8; ISBN : 978-3-319-73249-7

Musafili I. (2020). Rocky Road to Agriculture Transformation (Blog) Feminization, Agricultural Transition, and Rural Employment (FATE). Available at: https:// https://fateproject.wordpress.com/2020/02/24/ [Accessed 5/14/2020].

NEA (2014). Nationwide Master Plan Study on Storage-type Hydroelectric Power Development in Nepal Final Report; Appendix (1/2); Nepal Electricity Authority (NEA); Nepal; February 2014; Japan International Cooperation Agency; Electric Power Development Co., Ltd.

Nepal, S., Shrestha, A. B., Goodrich, C. G., Mishra, A., Prakash, A., Bhuchar, S., Vasily, L. A., Khadgi, V. & Pradhan, N. S. (eds.) (2019). Multiscale Integrated River Basin Management from a Hindu Kush Himalayan Perspective, Resource Book, ICIMOD, Kathmandu;

Nepal, Santosh (2016). Impacts of climate change on the hydrological regime of the Koshi river basin in the Himalayan region. Journal of Hydro-environment Research 10 (2016) 76–89

Oxfam. (2019).Emerging women leadership in Transboundary Water Governance Stories of women from the Mahakali River Basin, Oxfam, UK

PAANI Target River Basins.

Parajuli, A. et. al. (2015). Impact of Climate Change on River Discharge and Rainfall Pattern: A Case Study from Marshyangdi River basin, Nepal Authors: Achut Parajuli1, 2, Lochan Prasad Devkota3 , Tirtha Raj Adhikari3 , Susmita Dhakal1, Rijan Bhakta Kayastha2; TU and KU, Kathmandu.

Pegram G. Y. Li, T. Le. Quesne, R. Speed, J. Li, and F. Shen. 2013. River basin planning: pp. 118–130.

Principles, procedures and approaches for strategic basin planning. Paris, UNESCO

Provincial Planning Commission (2019). *First Periodic Plan of Province 1 (FY 2019/20-2023/24)* (in Nepali language). Biratnagar: Provincial Planning Commission, Government of Province 1. p. 65.

Rai, R., Ranabhat, S., Bhandari, R., Lamichhane, S., Timalsina, K., Wahid, S. & Bhatta, L.D. (2019). Freshwater ecosystems of the Koshi River basin, Nepal: A rapid assessment. ICIMOD Working Paper 2019/6. Kathmandu. ICIMOD. 15

Rajbhandari, R et al. (2017) Extreme climate projections over the transboundary Koshi River Basin usinga high resolution regional climate model: Authors: Rupak RAJBHANDARIa,*, Arun Bhakta SHRESTHAb, Santosh NEPAL b, Shahriar WAHIDb,REN Guo-Yuca (2017;Available online 15 September 2017

Sharma B, Amarsinghe U, Xueliang C, de Condappa D, Shah T, Mukherji A, Bharati L, Ambili G, Qureshi A, Pant D, Xenarios S, Singh R, Smakhtin V. 2010. The Indus and the Ganges: River basins under extreme pressure. Water International 35(5):493–521. http://dx.doi.org/10.1080/02508060.2010.512996.

Sharma, Raj & Shakya, Narendra Man. (2006). Hydrological changes and its impact on water resources of Bagmati watershed, Nepal. Journal of Hydrology. 327. 315-322. 10.1016/j.jhydrol.2005.11.051.

Shrestha, Rupesh. (2015). Koshi River Basin Inventory, Nepal. Experiment Findings; Cologne University Of Applied Sciences; Institute for Technology and Resources Management

Shrestha, T.K., (1997). Status, Ecology and Behavior of Fishes of Arun River (Nepal). In: Recent Advances in Fish Ecology, Limnology and Eco-conservation (S. Nath, ed.), III: 1-26.

Suhardimana,D. et al (2019). The politics of river basin planning and state transformation processes in Nepal; International Water Management Institute (IWMI), Authors: Diana Suhardiman, Ram C. Bastakoti, Emma Karki and Luna Bharati

Swar, D., 1992. Effect of impoundment on the indigenous fish population in Indrasarovar Reservoir, Nepal. In: Reservoir Fishing Management in Asia (S. S. De Silva, ed.): 111-118. IDRC, Ottawa.

TU (1998) Tribhuwan University; Yearly Progress, 2055/56. Limnobiological/Biological Study of Sunkoshi River. In: Yearly Progress Report of Inland Aquaculture Fisheries Section Balaju. Kathmandu.

UNDRR (2019). Disaster Risk Reduction in Nepal: Status Report 2019. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific

UNESCO-IHP [International Hydrological Programme of the United Nations Educational, Scientific and Cultural Organization and the Network of Asian River Basin Organizations]. 2009. Introduction to the IWRM; Guidelines at River Basin Level. Paris, France: UNESCO. http://unesdoc.unesco.org/images/0018/001850/185074e.pdf; accessed on 5 June 2011.

UNESCO-IHP [International Hydrological Programme of the United Nations Educational, Scientific and Cultural Organization and the Network of Asian River Basin Organizations]. 2009.

Introduction to the IWRM Guidelines at River Basin Level. Paris, France: UNESCO. http://unesdoc.unesco.org/images/0018/001850/185074e.pdf; accessed on 5 June 2011.

Upreti B.R. Shivakoti S. (2017). Women in Value Chain of Cardamom in Eastern Nepal: Reflections on challenges and oppurtunities in the current context(Blog) Feminization, Agricultural Transition, and Rural Employment (FATE). Available at: https://fateproject.wordpress.com/2017/06/14/ [Accessed 5/13/2020].

USAID (2018).PAANI Pariyojana, Nepal -Assessment Of Aquatic Resource Based

USAID/NCRT (2019).Strategic Considerations for River Conservation Legislation

Viviroli D, Archer DR, Buytaert W, Fowler HJ, Greenwood GB, Hamlet AF, Huang Y, Koboltschnig G, Litaor MI, Lo´pez-Moreno JI, Lorentz S, Scha¨dler B, Schreier H, Schwaiger K, Vuille M, Woods R.2011. Climate change and mountain water resources: Overview and recommendations for research, management and policy. Hydrology and Earth System Sciences 15:471–504. http://dx.doi.org/10.5194/hess-15-471-2011

Wang, Guangyu & Mang, Shari & Cai, Haisheng & Liu, Shirong & Zhang, Zhi-Qiang & Wang, Liguo & Innes, John. (2016). Integrated watershed management: evolution, development and emerging trends. Journal of Forestry Research. 10.1007/s11676-016-0293-3.

Wani, Suhas & Garg, Kaushal. (2009). Watershed Management Concept and Principles.

Water & Energy Commission Secretariat; Singha Durbar, Kathmandu, Nepal ; May 2010

WECS (2010). Koshi River Basin Management Strategic Plan (2011-2021).Government of Nepal.

WECS (2013). National Energy Strategy of Nepal; Current Energy Scenario; Water and Energy Commission Secretariat Singha Durbar, Government of Nepal; 2013, Kathmandu

WECS, 2011. Water Resources of Nepal in the Context of Climate Change; Water and Energy Commission Secretariat (WECS); Govt. of Nepal

Wester, P., A. Mishra, A. Mukherji, A. B. Shrestha (eds.) (2019) The Hindu Kush Himalaya Assessment—Mountains, Climate Change, Sustainability and People Springer Nature Switzerland AG, Cham.; (HIMAP Report, ICIMOD, 2019)

WU Xue, GAO Jungang, ZHANG Yili, LIU Linshan, ZHAO Zhilong, Basanta PAUDEL 2017. Land Cover Status in the Koshi River Basin, Central Himalayas J. Resour. Ecol. 2017 8(1) 10-19, DOI: 10.5814/j.issn.1674-764x.2017.01.003

WWF/N (2010). Indrawati Sub Basin – A joint undertaking of Water and Energy Commission Secretariat (WECS) and WWF Nepal supported by Govt. of Finland

ANNEXES

Annex 1: List of power of Federation, State and Local Government

Government Level	Power
Federation	1. International treaties or agreements, extradition, mutual legal assistance and international borders, international boundary rivers 2. Policies relating to conservation and multiple uses of water resources 3. Inland and inter-State electricity transmission lines 4. Central level large electricity, irrigation and other projects 5. Civil aviation, international airports 6. National transportation policies, management of railways and national highways 7. Mines excavation 8. National and international environment management, national parks, wildlife reserves and wetlands, national forest policies, carbon services 9. Land use policies, human settlement development policies, tourism policies, environment adaptation
State	1. State level electricity, irrigation and water supply services, navigation 2. Management of lands, land records Exploration and management of mines 3. Use of forests and waters and management of environment within the State
Federal and State	1. State boundary river, waterways, environment protection, biological diversity Industries and mines and physical infrastructures 2. Early preparedness for, rescue, relief and rehabilitation from, natural and manmade calamities 3. Tourism, water supply and sanitation Utilization of forests, mountains, forest conservation areas and waters stretching in inter-State form 4. Land policies and laws relating thereto
Local	1. Local level development plans and projects Local market management, environment protection and bio-diversity 2. Local roads, rural roads, agro-roads, irrigation 3. Distribution of house and land ownership certificates 4. Agriculture and animal husbandry, agro-products management, animal health, cooperatives 5. Management, operation and control of agricultural extension 6. Water supply, small hydropower projects, alternative energy 7. Disaster management 8. Protection of watersheds, wildlife, mines and minerals

Federation, State and Local	1. Agriculture 2. Services such as electricity, water supply, irrigation 3. Service fee, charge, penalty and royalty from natural resources, tourism fee 4. Forests, wildlife, birds, water uses, environment, ecology and bio-diversity 5. Mines and minerals 6. Disaster management 7. Landless squatters management 8. Royalty from natural resources

Annex 2: Field Photographs

Workshop in Melamchi Municipality

Participants in Melamchi Municipality Workshop

Extraction of Construction Materials from rivers

Indrawati river flood plain of

Destruction at Melamchi area from upstream landslide

Demage devastating landslide and flood at Indrawati area from upstream landslide

DFO office Sindhupalchwok (Key Stakeholder)

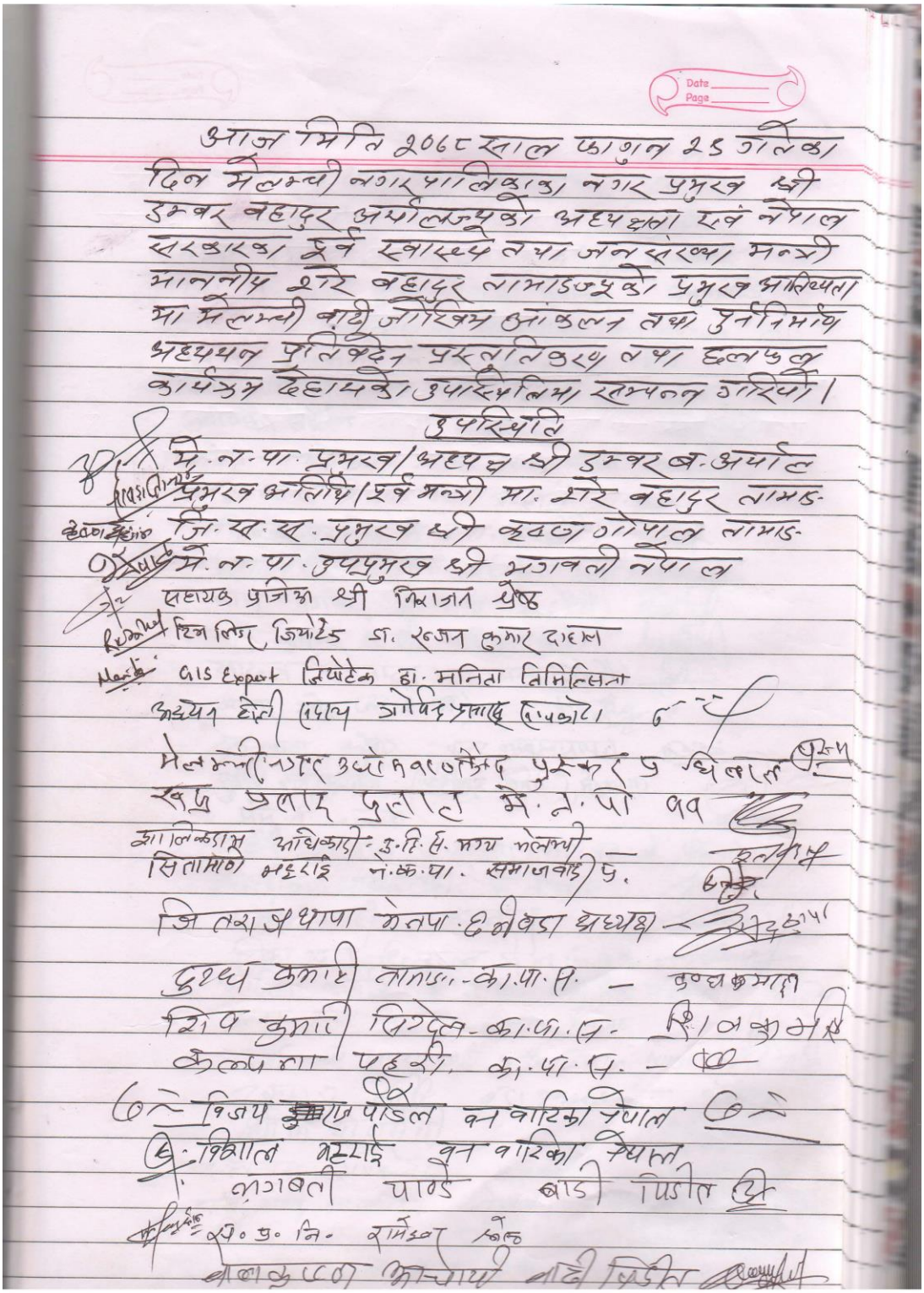
Indrawati River Valley Landscape

Site Visit of Watershed Management Study site, Makawanpur

Ankhu Khola River Valley Dhading Landscape

Landslide in steep slope of Upper Dhading

Annex 3: Meeting Minutes



आज मिति २०८८ साल फाल्गुन २५ गते का दिन मेलम्ची नगरपालिकाका नगर प्रमुख श्री इश्वर बहादुर अर्याल ज्यूको अध्यक्षता एवं नेपाल सरकारका भूमि व्यवस्था तथा जनसंख्या मन्त्री माननीय श्री बहादुर लामाडज्यूको प्रमुख आतिथ्यता मा मेलम्ची बाढी जोखिम आंकलन तथा पुनर्निर्माण अध्ययन प्रतिवेदन प्रस्तुतिकरण तथा छलफल कार्यक्रम देहायको उपस्थितिमा सम्पन्न गरियो।

उपस्थिति

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अध्यक्ष ज्यूबाट उपस्थित प्रतिनिधिहरुलाई स्वागत
मेलम्ची नगर अध्ययनबारेको प्रस्तुतिकरण
यस प्रतिवेदन तयार मे.न.पा. वार्ड
प्रतिवेदनमा अधिकांश टु.टि.ई. मार्ग मेलम्ची सिताम्ढी भइरहेको मे.क.पा. समाजवादी पु.
जि.स.स. अध्यक्ष केन्द्रीय प्रतिनिधि
दुर्ध कुमारी लामा - का.पा.प. - कुन्चोकसाङ
दिप कुमारी तिरुवल - का.पा.प. - मे.न.पा. भेमी
केकिला पहरी - का.पा.प. -
विजय पौडेल वनपाँडिका नेपाल
विशाल भट्टराई वनपाँडिका नेपाल
नगरवती पार्क बाढी पिडित
प्र.प.नि. - दार्मेश्वर श्रेष्ठ
बालकुटा आचार्य बाढी पिडित

निर्णयहरू

१. यस मेलम्ची नगरपालिकाद्वारा मेलम्ची खानी जोडिने आंकलन तथा पुनर्निर्माणसँग सम्बन्धित अध्ययन जियोटेक सोलिड्स प्रा.लि. मार्फत गराइएकोमा उक्त अध्ययनको निष्कर्ष तथा सुझावसँग सम्बन्धित प्रस्तुतिकरण तथा फलफाल भव्य कुमार लामाले गरियो।

२. मेलम्ची क्षेत्रमा मिति २०७८ असार ५ तथा तत्पश्चात आएको विनाशकारी बाढीबाट जनधनको क्षति भएको सन्दर्भमा दिगो रूपले जलाधारको सुरक्षा, विपद् व्यवस्थापन तथा जमिनको उत्पादन बढाउन जलाधारीय अवधारणा अनुरूप भूउपयोग, संरक्षण र विकासको क्रियाकलापहरू सञ्चालन गर्नु अपरिहार्य भएकाले सोही अनुरूप जलाधारिय अवधारणामा आधारित संगठन निर्माण, कार्यक्रम तथा बजेट सहित सम्पूर्ण प्रदेश जलाधारिय रणनीति समेत आवश्यक देखिने सोही अनुरूप उक्त सम्बन्धित पक्षलाई अनुरोध गर्ने निर्णय गरियो।

Annex 4: Other national policies, startegies and Acts relevant to forest and biodiversity

Policy, Strategy, Act	Key Provisions Related to Forest and Biodiversity	Reference
Land Use Policy 2015	Sustainable and optimum use, protection and effective management of country's land and land resources; Categorization of lands into various land use zones	GoN/MoLRM, 2015
Land Use Act 2019	Main aim of the Act is to ensure that land is properly used and managed and that land set aside for one purpose is not used for other. Requires preparing and implementing land use plans after classification of land by all levels of the governments. The plans are to identify and include management provisions for all types of natural resources, biodiversity, water use system and environmentally sensitive areas.	GoN/MoLCPA, 2019
National Climate Change Policy 2019	Some objectives are: to build resilience of ecosystems that is at risk of adverse impacts of climate change; promote green economy by adopting the concept of low carbon emission development; and mainstream or integrate climate change issues into policies, strategies, plans and programs at all levels and sectors.	GoN/MoFE, 2019b
Nepal National REDD+ Strategy 2018	Emphasizes on "addressing and respecting social and environmental safeguards" as one of the nine guiding principles of Nepal's REDD+, and effective implementation of the safeguards measures.	GoN/MoFE, 2018a
National Environment Policy 2019	Mainstreaming of environmental consideration in infrastructure development; developing a culture of utilizing natural and human modified ecosystems by keeping the legal rights of both present and future generations; and developing and supporting research and capacity for the protection and management of environment are some of the strategic objectives.	GoN/MoFE, 2019c

National Strategic Framework for Sustainable Development. 2015-2030	Emphasizes enhancing conservation of ecosystems, species and genetic diversity (both *in-situ* and *ex-situ*) building on the strong community based conservation movement in the country.	NPC, 2015a
Fifteenth Five-Year Periodic Plan 2019-2024	Has set the vision of "Prosperous Nepal, Happy Nepali" and milestone Working Policies for 25 years' development pathway to become a middle-income country by 2030 and a developed country by 2043. Gives emphasis and priority to the community forestry program.	NPC, 2019
Intergovernmental Fiscal Management Act 2017	Enacted with the objective of managing the issues related to revenue rights, revenue sharing, budget management, public expenditure and fiscal discipline among the federal, provincial and local level entities. Has provision for sharing of royalties generated from the mobilization of natural resources between three levels of governments, which is one of the important financial resources for the governments to manage community forestry, ecotourism, green enterprises, wild life protections and farming, PES, biodiversity and water resources in an integrated way.	GoN/NNRFC, 2017
Local Government Operation Act 2017	Aimed at institutionalizing legislative, executive and quasi-judiciary practice of the local government. According to the Act (section 24), local governments have obligations to give priority for the environmental conservation during formulation and implementation of local development plans and programs	GoN/MoFAGA, 2017

Annex 5: Hierarchy of Strategic Watershed Planning